

# Contrast Documentation

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May 29, 2025 EOP 3.12.3

This document contains guidance on the core, supported, and recommended way to use Contrast Security products.



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# Welcome to Contrast

Contrast supports real-time application security through all phases of your software development life cycle (SDLC).

Take a walk through (page 18) an example of how you can use Contrast in your environment.

| If you want to...  | Contrast offers...   |
|--|--|
| Analyze your applications for security vulnerabilities during the development and test (QA) phases of your SDLC: <ul style="list-style-type: none"><li>• <b>In the development phase:</b> Get instant and accurate vulnerability feedback for applications and the libraries that they use.<br/>By exercising your application, you can simulate the routes in your application and, with the data from Contrast, ensure that you are checking in secure code.</li><li>• <b>In the test phase:</b> Get assurance that applications are evaluated for security vulnerabilities as you apply manual or automated test cases or in a CI/CD pipeline.</li><li>• <b>In production:</b> Get full visibility into attacks and defend applications from malicious exploitation in the production phase of your SDLC.</li></ul> | <ul style="list-style-type: none"><li>• <b>Agents (page 50)</b> Supports a variety of programming languages, frameworks, and container technologies that instrument your applications with sensors.</li><li>• <b>Contrast Assess: (page 27)</b> Uses tuneable detection rules to accurately find vulnerabilities. It provides details on how the issue was discovered, how to reproduce it, and how to fix it.</li><li>• <b>Scan: (page 32)</b> Identifies vulnerabilities in uploaded binary packages by performing a fast and efficient static scan.</li><li>• <b>Protect (a component of ADR): (page 29)</b> Automatically identifies attacks and either monitors them or prevents them from being exploited in production. Protect discovers and blocks attacks from within the running application but can also integrate with Web Application Firewalls (WAF).</li></ul> |
| Analyze libraries that your applications use.  | <b>Contrast SCA: (page 28)</b> Offers visibility into security risks and legal issues introduced by open-source libraries used during applications at run time. It identifies vulnerabilities in open-source libraries. It also identifies if a current library is out-of-date and should be updated.  |
| Find vulnerabilities in your code earlier in the SDLC and get easy-to-understand guidance on how to fix them.  | View <b>vulnerability (page 1305)</b> data that includes suggestions on <b>how to fix (page 1317)</b> vulnerabilities that Assess, Scan, and SCA discover.   |
| View an architecture diagram that provides an interactive view of where data and resources are shared within your organization and beyond it.  | <b>Flow maps (page 671)</b> provide a detailed diagram of your application, the layers of technologies within it, and the back-end systems to which it connects.   |
| Integrate Contrast into your CI/CD pipeline.   | A wide variety of <b>integrations (page 1331)</b> that let you to integrate Contrast actions and data into developer IDEs, build system, communication tools, and more.  |

## Access control and customization

Contrast provides a variety of options for customizing data access, data views, and data collection from applications that you've added to Contrast. Customization helps you to enhance your views of the data that Contrast provides.

| Option                       | Description   |                            |                   |                            |                         |                              |                        |
|------------------------------|---|----------------------------|-------------------|----------------------------|-------------------------|------------------------------|------------------------|
| Role-based access control    | <p><b>Hosted customers:</b></p> <p><a href="#">Resource groups (page 1572)</a>, <a href="#">roles (page 1579)</a>, and <a href="#">user access groups (page 1577)</a> let you assign permissions and capabilities for specific users. You can associate specific applications with one or more resource groups.</p> <p>This feature provides built-in groups and roles, or you can create custom groups and roles that let you fine-tune the permissions for users</p> <p><b>On-premises customers:</b></p> <p><a href="#">Access groups (page 1446)</a> let you assign permissions and capabilities for specific users. You can assign different types of access, based on role, for each application associated with a group.</p> <p><b>Group strategy:</b></p> <p>It is useful to plan a resource group (hosted customer) or an access group (on-premises customers) strategy before you add applications to Contrast.</p> <p>If you do not specify the access or resource group in the Contrast configuration file when you first add the application to Contrast, you can only add it to a group from the Contrast web interface. If you want to add applications using a Contrast configuration file, you will need to delete the application and add it again to associate it with your access group.</p> <p>Start by creating or adding a user or application (or both) to an existing group in the Contrast web interface.</p> <p>Then, using a Contrast configuration file for each application, you can associate an application with an access group when you add the application to Contrast.</p> <pre># application:  # Add the name of the application group with which this # application should be associated in the Contrast UI. # group: NEEDS_TO_BE_SET</pre> |                            |                   |                            |                         |                              |                        |
| Custom filters               | <p>Contrast provides tag options that let you create customized filters. The benefit of creating custom filters is you can view data according to your specific needs, in addition to using the default filters.</p> <p>You can create custom filters through the use of <a href="#">application metadata (page 1456)</a></p> <p>You can also apply tags to specific <a href="#">application (page 652)</a> data or <a href="#">vulnerability (page 1313)</a> data in Contrast. After you tag an application or a vulnerability, you can use that tag as a filter on the Applications page or the Vulnerabilities page in the Contrast application.</p> <p><b>Example: Application metadata</b></p> <p>This example shows how to create free form, custom fields in the Contrast web interface to request application metadata:</p> <table> <tr> <td>Custom field: managersInfo</td><td>Value: "John Doe"</td></tr> <tr> <td>Custom field: businessUnit</td><td>Value: "NodeGoat Group"</td></tr> <tr> <td>Custom field: officeLocation</td><td>Value: "New York City"</td></tr> </table> <p><b>Example: Application tags</b></p> <ul style="list-style-type: none"> <li>• <b>Appname:</b> The name of a specific application.</li> <li>• <b>Groupname:</b> The name of an access group.</li> <li>• <b>Environment:</b> The environment in which you are testing the application (development, QA, or production).</li> <li>• <b>Server Name:</b> The name of the server hosting the application.</li> </ul> <p><b>Example: Vulnerability tags</b></p> <ul style="list-style-type: none"> <li>• <b>Build:</b> A specific build number</li> <li>• <b>Version:</b> A specific release version</li> </ul>  | Custom field: managersInfo | Value: "John Doe" | Custom field: businessUnit | Value: "NodeGoat Group" | Custom field: officeLocation | Value: "New York City" |
| Custom field: managersInfo   | Value: "John Doe"   |                            |                   |                            |                         |                              |                        |
| Custom field: businessUnit   | Value: "NodeGoat Group"   |                            |                   |                            |                         |                              |                        |
| Custom field: officeLocation | Value: "New York City"  |                            |                   |                            |                         |                              |                        |

| Option                        | Description   |
|-------------------------------|---|
| Custom data from applications | <p><a href="#">Session metadata (page 656)</a> lets you identify the source of vulnerabilities in your application.</p> <p>When you add the necessary property to your agent configuration file, the agent reports this information along with the rest of the standard vulnerability data to the Contrast web interface for filtering.</p> <p>If you change the values of metadata in the Contrast configuration file for the agent, you can filter the vulnerability data based on the different values. For example, if you change the values for Branch name or Version, you can filter data based on the different versions or branches.</p> <p><b>Example:</b></p> <p>In this example for a Java application, you add an entry in the line where you add your javaagent flag. In this example, you set the property <code>contrast.application.session_metadata</code> to a set of key-value pairs that identify a branch, a committer, and a repository.</p> <pre>-Dcontrast.application.session_metadata="branchName=build22,committer=Jane,repository=Contrast-Java"</pre> |
| Custom naming                 | <p>You have the option of providing customized names for <a href="#">applications (page 651)</a> and <a href="#">servers (page 1197)</a> that host the applications.</p> <p>By default, a Contrast agent creates a name based on data it discovers in your code.</p> <p>To specify a custom name, you can use an agent configuration file when you <a href="#">add the application (page 51)</a> to Contrast or set the name in the Contrast web interface after you add an application.</p>  |

## Next steps

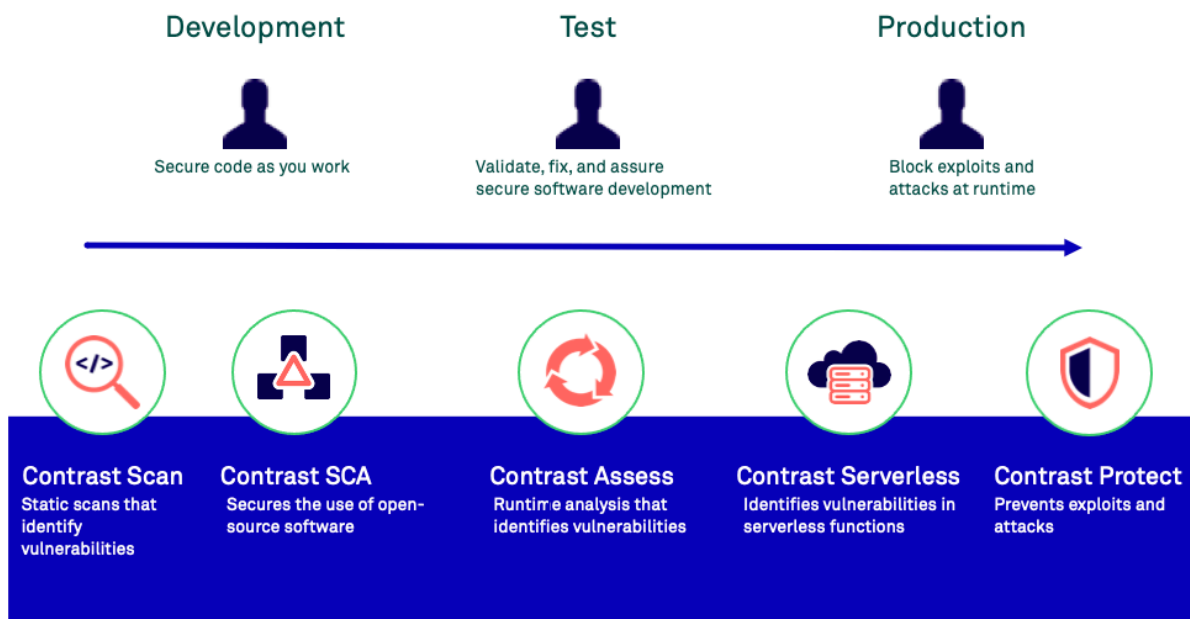
- Get an overview of [how Contrast works \(page 16\)](#)
- Try Contrast for free with [Community Edition \(CE\) \(page 35\)](#)
- [Install and configure a Contrast agent \(page 51\)](#)
- [Install Contrast \(on-premises\) \(page 1467\)](#)
- Get started with a particular [integration \(page 1331\)](#)

## How Contrast works

Contrast Security provides accurate, continuous, real-time application security testing and attack blocking for your application portfolio. Contrast works within each application to secure it across the entire software development life cycle (SDLC).

Contrast transforms functional tests into security tests, so that you get security feedback every time you exercise your applications through your quality assurance function. Contrast delivers results continuously and in real time, so you are integrating security into your entire development pipeline from source code to running applications, and all points in between.

## How Contrast integrates with your development environment



## Analysis techniques and data sources

Contrast combines numerous data sources and a variety of analysis techniques including:

- Runtime control flow and dataflow (IAST)
- Application code or APIs (SAST)
- HTTP requests and responses
- All libraries and frameworks in the application and how they are used (SCA)
- Configuration information
- Back-end connections
- Static scans of local files (SAST)

## Contrast agents

Contrast Assess and Contrast Protect use [agents \(page 50\)](#) to analyze data flow and identify vulnerabilities in fully-assembled and running applications. Contrast Assess and Contrast Protect use the same agent to analyze data flow and identify vulnerabilities in fully-assembled and running applications. You do not need one agent for Assess and another for Protect.

[Adding and configuring an agent \(page 51\)](#) inserts Contrast code in the application's existing methods across custom code and libraries. Sensors in the agents observe the locations where data enters and leaves the application (routes). This action creates real-time visibility into any data that flows through the application and allows Contrast to detect security flaws or vulnerabilities in this code path and report them to Contrast. The agents also allow Contrast to identify and block attacks.

## Agent configuration

Configuring an agent consists of editing a YAML configuration file, using environment variables on a command line, or other methods native to the language and tools you are using.

When you configure an agent for an application, you specify information for the following settings:

- Agent communication with Contrast
- Agent-specific settings

- Settings for Assess and Protect rules
- Application-specific settings
  - These settings include session and application metadata that are available to you as additional information for each vulnerability reported or as a way to filter them.
- The server hosting the application and the agent:
  - Developer's local application server running in the integrated development environment (IDE)
  - Continuous integration application server that's used during the automated testing process
  - Application test server
  - Application staging server
  - Embedded server in an appliance
  - Application server running in a virtual machine
  - Remote application server running in the cloud
  - Production application server

## Static scans

[Contrast Scan \(page 672\)](#) is a static application security testing (SAST) tool that makes it easy for you to find and remediate vulnerabilities during the development phase of software development lifecycle (SDLC).

To scan applications, you [upload a source code or bytecode file \(page 706\)](#). Contrast technology identifies vulnerabilities based on a set of rules that Contrast defines for you.

## Protection for cloud-native applications

[Contrast Serverless Application Security \(page 32\)](#) is a next-generation application security testing solution for serverless-based applications.

Contrast Serverless Application Security uses cloud-native architecture to map all resources within your environment, while automatically validating and prioritizing the results, eliminating false-positive results and alert fatigue. It uses a ReadOnly access to your AWS account to continuously monitor the environment and collect relevant information.

## Integrations

Contrast works with several different [integrations \(page 1331\)](#) to provide accurate security feedback with tools you are already using. This approach accelerates the software development process by encouraging security and development to work together effectively.

## Contrast walk through

Let's take a closer look at how you can use Contrast to ensure your code is secure from critical vulnerabilities and protect your applications from attacks.



In this example, you are using the Contrast Java agent to configure applications for security testing and blocking attacks, as the application is exercised.

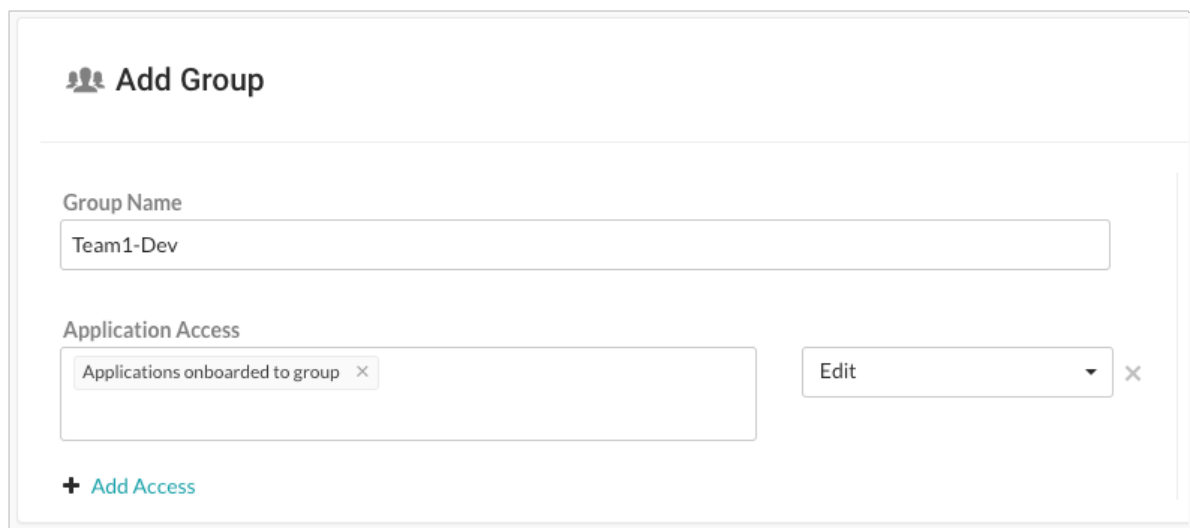
## Customize the Contrast environment

Once you have access to the Contrast web interface, you think about customizing your environment so that you can find important test results easily and control access to Contrast data.

## Access groups

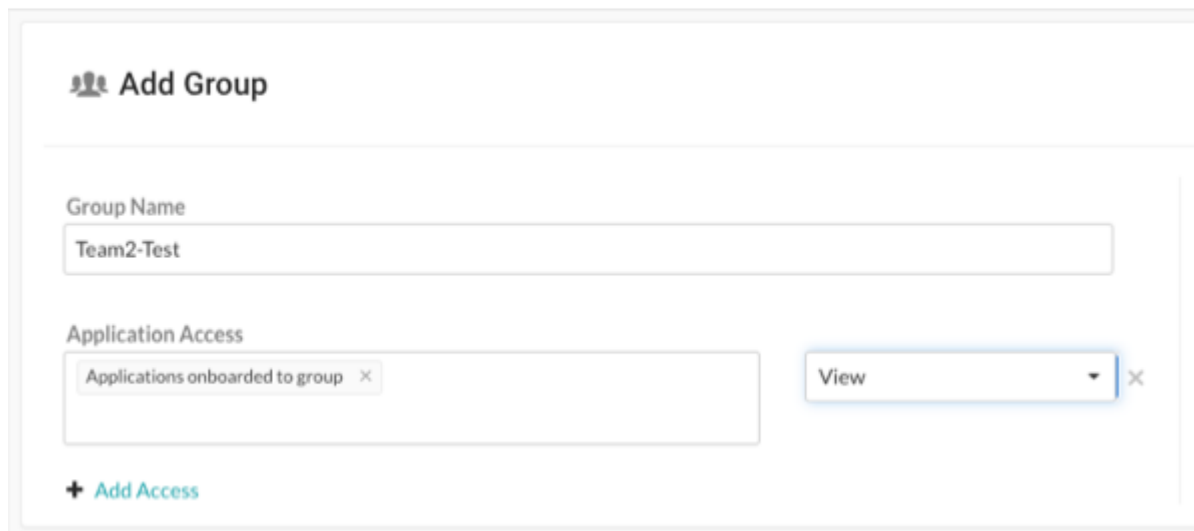
You have three teams involved with your financial applications. You create these access groups and specify them in the Contrast configuration files:

- **Team1-Dev** is for developers and has these settings:



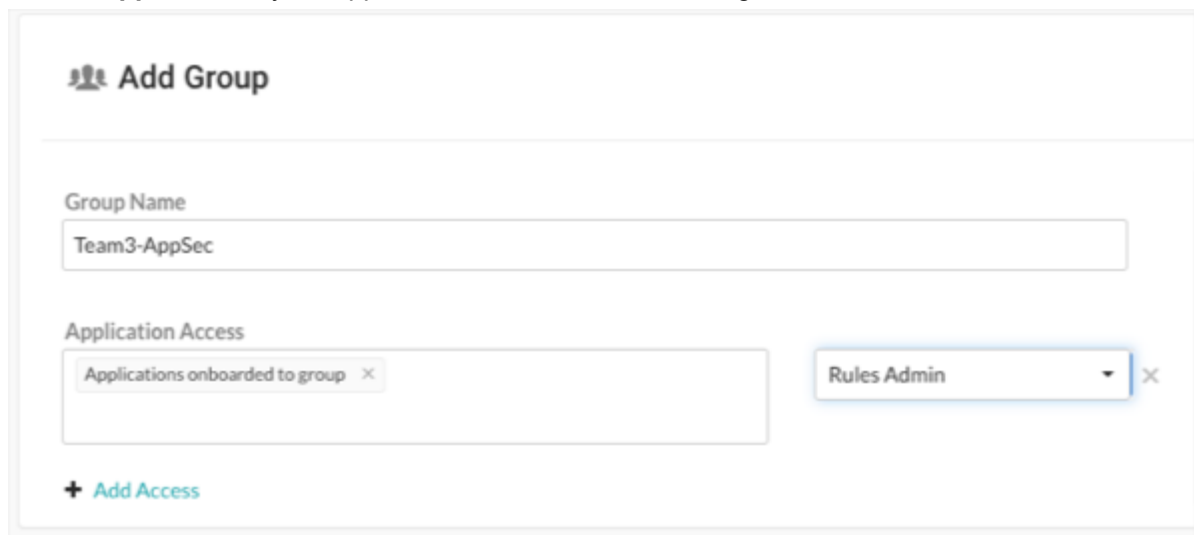
Developers can remediate findings, add tags, manage vulnerabilities, edit attributes, merge applications, add or delete applications, and create servers.

- **Team2-Test** is for your test team and has these settings:



Test staff can see scores, libraries, vulnerabilities and comments, but can't perform edits to traces to the application.

- **Team3-AppSec** is for your AppSec team and has these settings:



The AppSec team can edit rules and policies in the application, enable Protect, and manage notifications and scoring for the application.

## Application and server naming

Since all teams are working on the same application, you use the same name in each Contrast configuration file. You plan to use one configuration file for the development environment and one for the test environment.

Although you are using two configuration files, since you use the same name for the application in both files, Contrast displays data as if you only have a single instance of the application.

You decide to let Contrast determine the server name.

## Session metadata

You want to be able to view vulnerabilities and route information for a specific branch, committer, and repository. You define session metadata values in your Contrast configuration file to collect this information:

```
-Dcontrast.application.session_metadata="branchName=release24,committer=Jane,repository=finapp-Java"
```



**NOTE**

Most Contrast agents now automatically create a unique fingerprint that is equal to that unique build of an agent and populates session metadata values. The key used for this is called `artifactHash`. [Session metadata \(page 656\)](#) lists the supported agent versions for this feature.

**Step 1: Configure applications for security testing**

During development, you want to make sure developers are checking in code that's secure. During testing, you want to verify that your applications have no vulnerabilities that will allow attacks when in production.

You decide to add Contrast to your applications so that you can do the necessary security testing before releasing your products to the public. Since your applications use Java, you are going to use the Contrast Java agent.

1. You [download the agent \(page 126\)](#) from the Maven Central repository because you use Maven for your build processes. You also download a [YAML configuration file \(page 112\)](#) from the Contrast web interface.
2. For your development environment, you edit the YAML configuration file to include settings similar to these:

```
api:
  # ***** REQUIRED *****
  # Set the URL for the Contrast UI.
  url:https://mycontrast.mycompany.com:8080/Contrast/
  # ***** REQUIRED *****
  # Set the API key needed to communicate with the Contrast UI.
  api_key:A2xxxxxxxxxxxxxxxxxxxxxxxxG9N
  # ***** REQUIRED *****
  # Set the service key needed to communicate with the Contrast
  # UI. It is used to calculate the Authorization header.
  service_key:service_key:88xxxxxxxxxx5Z
  # ***** REQUIRED *****
  # Set the user name used to communicate with the Contrast
  # UI. It is used to calculate the Authorization header.
  user_name:agent_XXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX@mydevorg
.
.
.
#
=====
=====
# server
# Use the properties in this section to set
# metadata for the server hosting this agent.
#
=====
=====
# server:
# Override the reported server environment.
environment: development
```

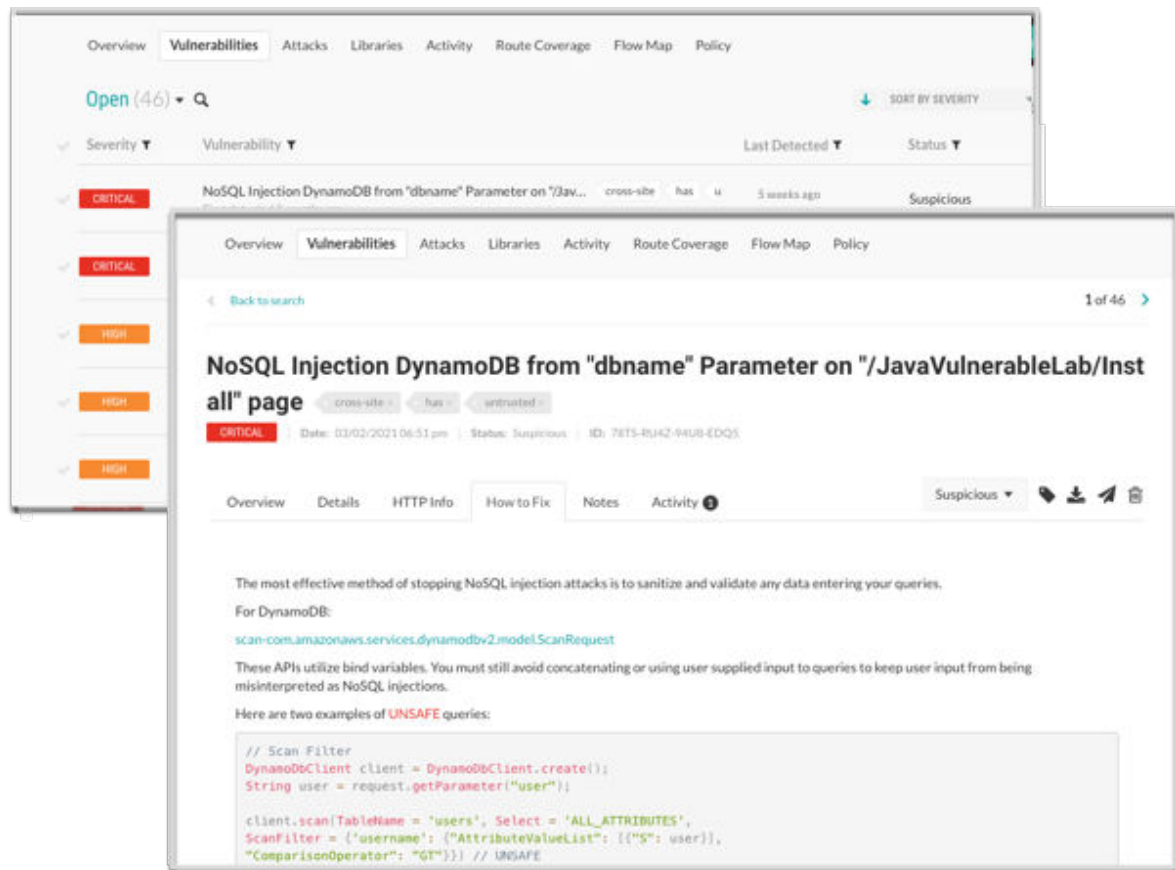
```
.  
.
.
```

3. For your test environment, you edit a Contrast YAML configuration file with settings similar to these:

```
api:
  # ***** REQUIRED *****
  # Set the URL for the Contrast UI.
  url:https://mycontrast.mycompany.com:8080/Contrast/
  # ***** REQUIRED *****
  # Set the API key needed to communicate with the Contrast UI.
  api_key:A2xxxxxxxxxxxxxxxxxxxxxxxxG9N
  # ***** REQUIRED *****
  # Set the service key needed to communicate with the Contrast
  # UI. It is used to calculate the Authorization header.
  service_key:service_key:88xxxxxxxxxx5Z
  # ***** REQUIRED *****
  # Set the user name used to communicate with the Contrast
  # UI. It is used to calculate the Authorization header.
  user_name:agent_XXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX@mydevorg
.
.
.

#
=====
=====
# server
# Use the properties in this section to set
# metadata for the server hosting this agent.
#
=====
=====
# server:
# Override the reported server environment.
  environment: QA
.
.
.
```

4. Next, you start your application and run functional tests to exercise all the routes and data endpoints that the application and business logic expose.
5. Using the Contrast web interface, you first check the Application page to make sure that Contrast recognizes your application. Then, you check for vulnerabilities and how to fix guidelines to determine what actions to take to secure your code.



- After initial tests, you decide to use the [Maven plugin \(page 1384\)](#) to integrate Contrast in to your CI/CD process. You configure the integration so that builds fail if Contrast discovers vulnerabilities with a Critical or High status.

## Step 2: Configure applications to block attacks

Although you've been using Contrast during your development and test phases, you also want make sure that your users are not subject to malicious activity when they use your product. You decide to add Contrast to the applications that are in production to protect your application, users, and data.

First, you make sure that you have a Protect license and that Protect is enabled for your organization.

Similar to how you installed and configured an agent for your application in development and test, you need to configure a new configuration file for the production environment that enables Contrast Protect. After you create the new configuration file, you run the application and verify that the Contrast web interface displays your application for a production environment.

```
api:
# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url:https://mycontrast.mycompany.com:8080/Contrast/
# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key:A2xxxxxxxxxxxxxxxxxxxxxxxxG9N
# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key:service_key:88xxxxxxxxxxxxx5Z
# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
```

```
user_name:agent_XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX@myprodorg
.
.
.
#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Use the properties in this section to determine if the
# Protect feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: true
.
.
.
#
=====
==
# server
# Use the properties in this section to set
# metadata for the server hosting this agent.
#
=====
==
# server:
# Override the reported server environment.
environment: production
.
.
.
```

Once the application is in production, you monitor the Attacks page in the Contrast web interface to see if attacks occur.

CONTRAST

ApplicationsServersLibrariesVulnerabilitiesAttacksSearch Contrast+ Add Agent

joan.goldstein@contrast...

MonitorAttacksAttack Events

Effective (137)Find AttackSet Date RangeAdvanced

| Source IP | Status     | Application                  | Server       | Rule  | Start       | End         | Events |
|-----------|------------|------------------------------|--------------|---|-------------|-------------|--------|
| 1         | EXPLOITED  | Cat-Engine-2                 | Cat-Server   | Command Injection<br>Cross-Site Scripting<br>Path Traversal<br><a>Show more</a> | 5 hours ago | 5 hours ago | 55     |
| 1         | EXPLOITED  | Cat-Engine-2                 | Cat-Server   | Command Injection<br>Cross-Site Scripting<br>Path Traversal<br><a>Show more</a> | 8 hours ago | 8 hours ago | 22     |
| 1         | EXPLOITED  | Cat-Engine-2                 | Cat-Server   | Command Injection<br>Cross-Site Scripting<br>Path Traversal<br><a>Show more</a> | a day ago   | a day ago   | 11     |
| 1         | EXPLOITED  | Cat-Engine-1<br>Cat-Engine-2 | Cat-Server   | Command Injection<br>Cross-Site Scripting<br>Path Traversal<br><a>Show more</a> | 5 days ago  | 5 days ago  | 66     |
| 1         | BLOCKED IP | Grape-on-rack                | Grape-Server | Cross-Site Scripting  | 7 days ago  | 7 days ago  | 8      |

### Step 3: Fix code and retest applications

After you analyze the results of testing with Contrast and identified attacks, you update the code and ensure that Contrast displays the latest version of your application. You verify that the new version is free of the vulnerabilities you blocked in production and re-deploy the application.

## Hosted (SaaS) versus on-premises deployment

When you consider deploying Contrast Security solutions, you have two primary options: a hosted solution (cloud installation) or an on-premises instance. Each approach has its benefits and drawbacks, influenced by cost, control, customization, security, and scalability.

### Benefits and drawbacks of hosted solutions

- **Benefits**
  - **Immediate access to updates and advanced new features:** Updates are readily available without delay, promoting the latest security posture. New features are always supported for hosted solutions.
  - **Reduced IT overhead:** Contrast manages infrastructure and maintenance and thus, streamlines operations. Also, freedom from system-wide management tasks.
  - **Scalability:** Easier to scale resources as your needs increase.
  - **Cost:** Pricing for SaaS deployments are subscription-based, allowing flexibility and scalability
- **Drawbacks**
  - **Data management:** Data is stored on Contrast servers, instead of locally. However, Contrast complies with these data protection policies:
    - General Data Protection Regulation (GDPR)
    - General Data Protection Regulation-UK (UK-GDPR)
    - California Consumer Privacy Act (CCPA)
    - Protection of Personal Information (APPI)
    - System and Organizational Control Type II Audit (SOC II)

### Benefits and drawbacks of on-premises solutions

- **Benefits:**
  - **Complete control:** More control over system-wide settings.
  - **Data privacy:** Data is stored locally - For deployments that require specific security compliance, sensitive data never leave your company.

## • Drawbacks

- **Resource intensive:** Requires significant investment in IT, networking, and infrastructure along with coordination, planning and maintenance.
- **Delayed updates:** Updates for product enhancements are often delayed after Contrast releases while for hosted solutions receive them immediately.
- **No support for new features:** Advanced new features are often not supported for on-premises solutions. For example, Contrast Scan, static SCA. GitHub App for SCA , and Contrast Serverless are not supported for on-premises instances.

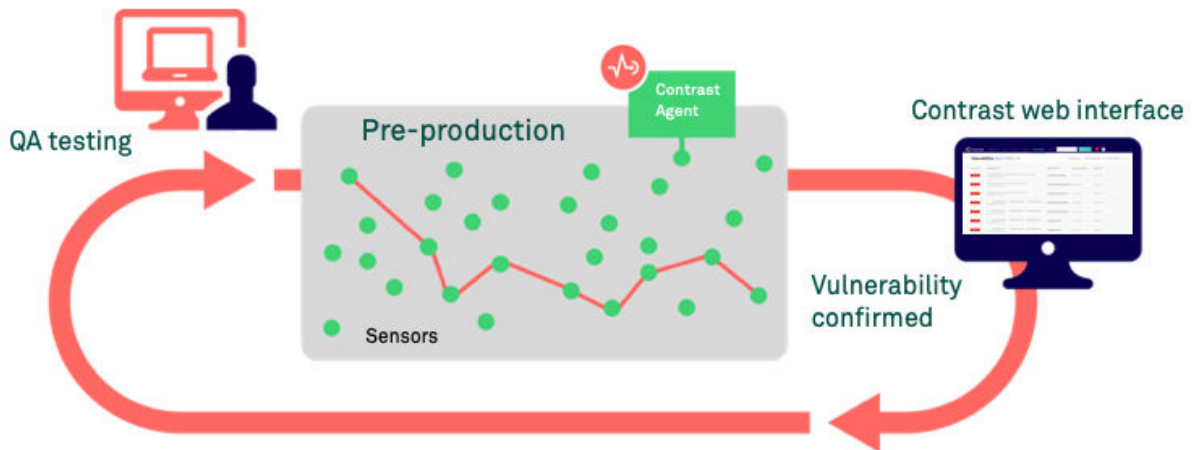
## Contrast feature comparison

| Feature                             | Hosted   | On-premises   |
|-------------------------------------|--|---|
| Installation and updates            | Contrast installs, configures, and updates the software.   | Hosted customers are responsible for installing, configuring, and updating the software.  |
| Management at a system level        | Contrast takes care of all system management tasks.<br><br>With the correct permissions, a user can control a variety of configuration settings and access control entities                | A SuperAdmin is responsible for all settings and configuration at a system-wide level.  |
| Single Sign On (SSO)                | Contrast Support configures authentication; however, you may be granted permissions to set up SSO for your organization.   | System Administrators can configure SSO at a system-wide level.   |
| TLS connections and certificates    | For Contrast agents, Contrast uses strong TLSv1.2 connections and certificates signed by industry standard certificate authorities (CAs).  | On-premises customers may need to configure Contrast agents to use enterprise CAs. They may want the agents to send client certificates in the TLS handshake. |
| Licenses                            | Hosted customers can allocate Assess and Protect licenses for their organization.  | SuperAdmin or ServerAdmin role can allocate Assess and Protect licenses to a particular organization.   |
| New integrations                    | Hosted customers have access to all new integrations that Contrast adds to the platform.   | On-premises customers have limited access to integrations that Contrast supports.   |
| Impersonation                       | Contrast support manages impersonation when needed for troubleshooting.  | SuperAdmins manage impersonation when needed for troubleshooting.   |
| Code scanning (SAST)                | Hosted customers can use the Contrast scan engines from the Contrast web interface or a local scan engine. The local scan engine does not require uploading your source files to Contrast. | Not available   |
| Software composition analysis (SCA) | Contrast Support enables this feature for the organization.  | A SuperAdmin can enable SCA.  |
| SCA repository scanning             | Hosted customers can use SCA repository scanning capabilities to look for known vulnerabilities in the software components that are included in a repository.                              | Available except for air-gapped environments.   |
| Static scanning of libraries        | Hosted customers can automatically scan, in close to real-time, relevant static code and configuration assessments to discover new vulnerabilities.  | Available except for air-gapped environments.   |
| Organization management             | Users with administrator permissions can manage their organization.  | SuperAdmins and System Administrators can manage all organizations at a system-wide level.  |
| Runtime security testing (IAST)     | Available  | Available   |
| Serverless                          | Hosted customers can use Contrast Serverless for dynamic scanning, static scanning, graph visualization, and resource observability for AWS functions.                                     | Not available   |
| Software bill of materials (SBOM)   | Contrast Support enables this feature for the organization. Users can generate an SBOM from the Applications tab.  | A SuperAdmin can enable users to generate an SBOM from the Applications tab.  |
| Attack protection (RASP)            | Contrast Security grants permissions that let users access Protect data.   | SuperAdmins can grant permissions that let all or some user roles in one or more organizations access Protect data.   |

| Feature                                   | Hosted  | On-premises  |
|---|---|--|
| Updated attack events user interface      | Hosted customers have access to updated views of attack data that Protect provides.   | Hosted customers have access to legacy attack views only.  |
| Enhanced role-based access control (RBAC) | Hosted customers have access to an advanced access control system that lets them fine-tune roles and permissions for their organization.  | Not available. On-premises customers use the legacy access control.<br><br>On-premises customers can add multiple users at one time.             |
| Contrast Security Observability           | Hosted customers can access a model of an application's security architecture and behavior at runtime.<br><br>This information provides a better understanding of the underlying behavior of applications for threat modeling, pen test support, and contextual information around vulnerabilities and attacks. | Not available.   |
| Enhanced audit log                        | Hosted customers can access an updated and enhanced audit log view.   | Not available. On-premises customers use the legacy audit log view.  |
| Diagnostics                               | Contrast Support enables this option of diagnostic information is needed for troubleshooting.   | A SuperAdmin, ServerAdmin or System Administrator can enable this option at a system-wide level.   |
| Email                                     | Users with administrator permissions can set default settings for Contrast notifications at an organization level.<br><br>Individual users can adjust their own settings.   | System Administrators can enable, disable, and configure Contrast to communicate with an appropriate SMTP system to receive these notifications. |

## Assess

Contrast Assess is an application security testing tool that combines Static (SAST), Dynamic (DAST), and Interactive Application Security Testing (IAST) approaches to provide highly accurate and continuous information on security vulnerabilities in your applications.



Contrast Assess uses an agent that instruments applications with sensors. The sensors look at data flow in real time and analyze the application from within to help figure out vulnerabilities in:

- Libraries, frameworks, and custom code
- Configuration information
- Runtime control and data flow
- HTTP requests and responses
- Back-end connections

Assess is appropriate for environments such as a test, QA, or staging servers. It is also applicable to developer workstations. When coupled with Contrast integrations, such as Visual Studio, developers can find and fix vulnerabilities without leaving their integrated development environment (IDE).

## Features

Once you [install and configure an agent \(page 51\)](#) and [enable Assess \(page 1435\)](#), Contrast offers you these features:

- A list of [vulnerabilities \(page 1305\)](#) in the application, along with remediation guidance.
- [Application scores \(page 1557\)](#) to gauge the security of an application at a glance.
- [Route coverage \(page 659\)](#) that detects possible routes by associating vulnerabilities with the originating web request.
- [Flow maps \(page 671\)](#) that provide insight into the architecture of the running application.
- [Compliance and policy reporting \(page 1323\)](#).

## Customization

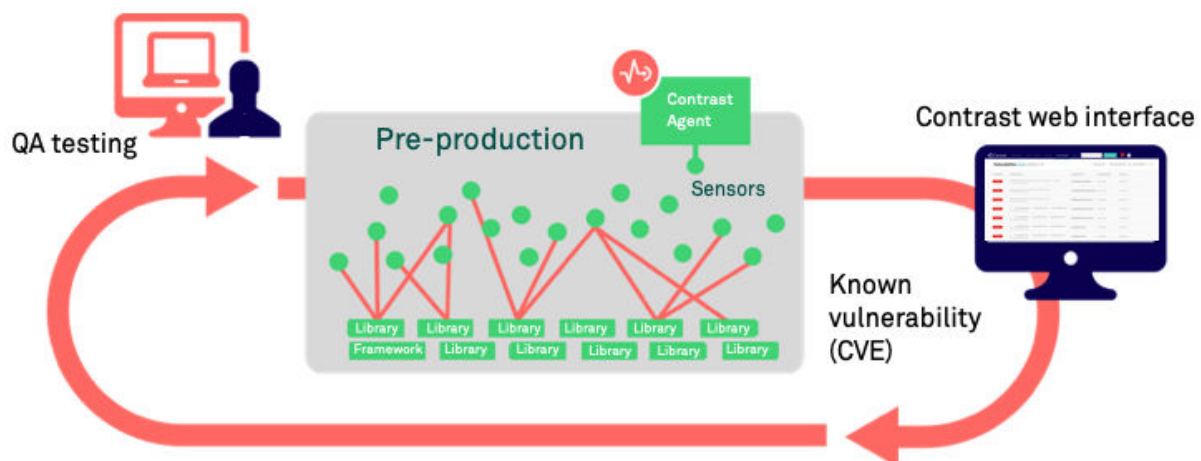
To customize Assess for your needs, you have the option of configuring these types of policies:

- [Assess rules \(page 1401\)](#) that you can enable or disable to fine tune the detection capabilities of Assess.
- [Security controls \(page 1402\)](#) are methods in your code that make sure data is safe to use.

## SCA

Contrast SCA identifies open-source components through run-time analysis, file system scanning, and dependency analysis. Leveraging these techniques, SCA reports an exact inventory to Contrast.

By default, Contrast Assess includes powerful SCA capabilities. With an SCA license, you have access to advanced SCA capabilities.



## Features

To simplify the process and merge open-source analysis with custom code analysis, SCA is integrated as part of the Contrast platform. Here's what you can do with SCA (some of these features are free and other require an SCA license):

- **Open-source license management:** Contrast SCA provides [license data \(page 1215\)](#) tied to open-source components. This data helps you understand intellectual property compliance and mitigate operational risk.  
This feature requires an SCA license.



- **Open-source policy:** With SCA, you can set policies to denylist open-source licenses. If a denylisted license type is deployed in your applications, it triggers an alert. To keep your library usage safe, [set compliance policies \(page 1429\)](#) for your organization. To restrict use of specific open-source libraries and licenses, as well as set version requirements, you can [set library policies \(page 1433\)](#). This feature requires an SCA license.
- **Identification of CVE vulnerabilities** Contrast SCA identifies the CVE vulnerabilities for each library that your applications are using. This data includes a description of each CVE vulnerability for a selected library as well as the number of applications using that library. This feature is available without an SCA license.
- **CLI and dependency tree:** The Contrast CLI performs software composition analysis (SCA) on your application to show you the dependencies between open source libraries, including where vulnerabilities were introduced. The data that the [Contrast CLI \(page 1298\)](#) collects is used to display a [dependency tree \(page 1216\)](#) that brings awareness to underlying library dependencies. This feature is available without an SCA license.
- **GitHub action:** Use this integration to analyze a project's dependencies for vulnerabilities. The action will run Contrast SCA Action to detect vulnerable libraries. See [Contrast SCA Action](#) for more information.
- **Repository scans:** [Connect a repository \(page 1217\)](#) to Contrast to scan for vulnerabilities.

## Contrast data

Once a library is reported to Contrast, you can access:

- Library usage analysis to identify whether vulnerable components are actually used by the application
- Library version identification and guidance on the latest version
- Comprehensive vulnerabilities coverage
- Portfolio wide, real-time reporting of open-source components

## Static SCA

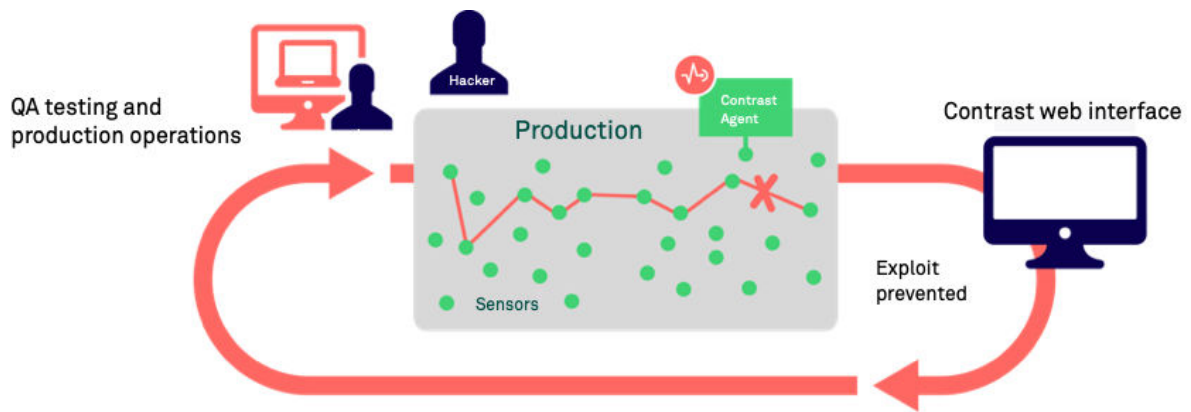
As of June 2024, Static SCA is an opt-in feature. Contrast will support current users by resolving reported bugs.

## Protect

Protect is a defensive control for production environments that monitors attacks and actively defends applications based on specific vulnerabilities, for example, command injection.

It offers Runtime Application Self-Protection (RASP) that complies with NIST 800-53, PCI-DSS, PCI-SSS, and other industry standards. Protect operates directly inside runtimes such as [Java \(page 122\)](#), [.NET \(page 212\)](#), [.NET Core \(page 270\)](#), [Node.js \(page 335\)](#), [Ruby \(page 506\)](#), and [Python \(page 424\)](#), to leverage in-app intelligence without any manual tuning.

Contrast Protect blocks both automated and advanced threats attacking web applications and API, and provides valuable and timely application layer threat intelligence across the entire application portfolio.



## How Protect works

Contrast Protect works inside application software to understand complete data flow rather than network traffic. Instead of only analyzing incoming data, Protect sees the same data and watches its impact on underlying actions, such as complete SQL queries, command arguments, and more.

This analysis improves detection accuracy, separating the noise of many attacks that might be false positives to focus on attacks that met their intended target. This insight can be shared with external systems, such as a SIEM, to focus on key attack events.

Protect limits its impact on application performance by operating with the same shared memory as the application to avoid additional overhead. Contextual defense improves performance by avoiding unnecessary actions. For example, NoSQL applications do not need checks against SQL injection if the SQL APIs are never invoked.

## Customization

When Protect is enabled, you can customize these policies and rules:

- **Protect Rules:** (page 1412) Set applications to monitor for attacks.
- **CVE shields:** (page 1416) Specify CVE shields that block vulnerabilities.
- **Virtual Patches:** (page 1420) Define custom defenses against specific vulnerabilities.
- **Log Enhancers:** (page 1422) Provide additional instrumentation instructions.
- **IP Management:** (page 1431) Manage a denylist and allowlist (trusted hosts).

## See also

[Agent performance with Protect \(page 613\)](#)

## Contrast Protect licensing guide

This guide describes the Contrast licensing model for Protect. It explains key terms and provides real-world examples to illustrate how Contrast applies Protect licensing.

The goal of this guide is to provide clarity about the licensing model for technical and non-technical audiences.

## Assess versus Protect licenses

- **Assess licenses:** These licenses apply to individual applications, regardless of the number of times they are running.
- **Protect licenses:** These licenses are based on the number of servers in the production environment. The licenses can adjust based on the changing number of servers in use. Contrast allows for burst flexibility; license use can go beyond the number of licenses purchased. This option allows for dynamic scaling of applications and ensures Contrast is able to provide continuous service with minimal interference.

## Common scenarios

- **One application to one server**

If you are running one application on one server, you need one Protect license. This scenario is the most basic one.

- **One application across multiple servers**

If you have one application distributed across several servers, each server requires its own Protect license. This scenario is typical in high-availability or load-balanced configurations.

- **Multiple applications on one server**

If you are running several applications on a single server, you need just one Protect license for that server. This scenario is common in environments that use Java Virtual Machines (JVMs) or Microsoft Internet Information Services (IIS), where multiple applications coexist on a single server.

## Example: StreamFlix, a Video Streaming Platform

This real-world example shows how you could use Protect licensing.

### Background

StreamFlix operates a video streaming platform and employs a microservices architecture. They have several microservices, including User Authentication, Video Playback, and Analytics. StreamFlix uses ephemeral servers that can scale up or down based on demand.

### Event

A highly anticipated series premiere is scheduled. As users start logging in to watch, there's a sudden surge in traffic.

### Microservice behavior

| Phase            | User authentication service   | Video playback service  | Analytics service   |
|------------------|---|---|---|
| Normal operation | 5 servers   | 10 servers  | 3 servers   |
| Premiere day     | 20 servers<br>Due to the influx of users logging in, the number of servers scale up to handle demand. | 50 servers<br>More users are streaming.   | 5 servers<br>More servers are required to process the higher volume of user data. |
| Post premiere    | 5 servers<br>As traffic normalizes, the number of servers scales down.                                | 15 servers<br>Once the rush subsides, the numbers of servers scales down to a slightly higher number due to continued interest. | 3 servers   |

### Protect licenses

| Phase            | Protect licenses                               |
|------------------|--|
| Normal operation | 18 licenses (5 + 10 + 3 servers)               |
| Premiere day     | License use surges to 75 (20 + 50 + 5 servers) |
| Post premiere    | License use adjusts to 23 (5 + 15 + 3 servers) |

## Key insights

- **Adaptive Licensing:** Protect licensing dynamically adjusts to the changing number of servers during high-demand events, ensuring continuous service.
- **Distinct Focus:** Asses licensing focuses on unique applications. Protect licensing focuses on the servers running these applications in a production environment.

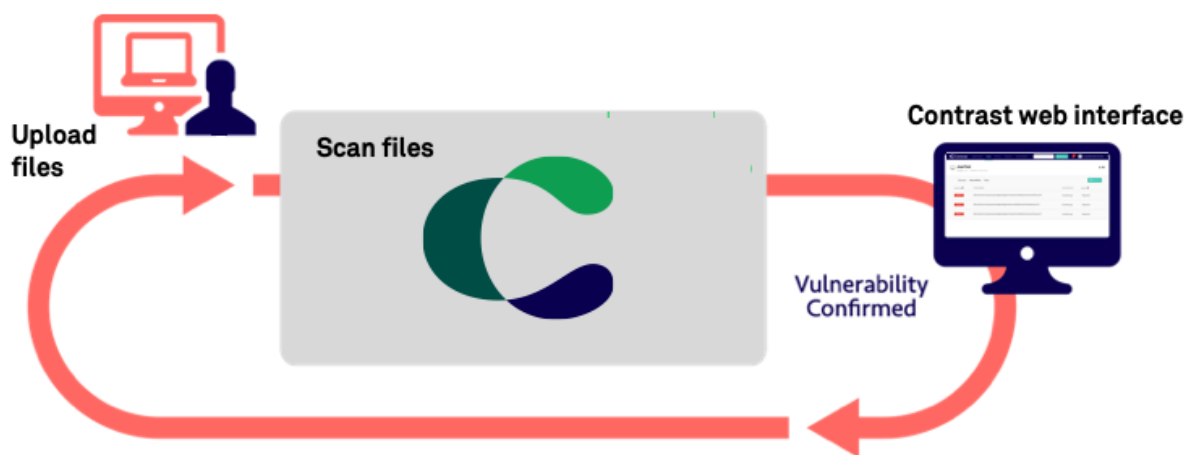
## Scan

[Contrast Scan \(page 672\)](#) is a static application security testing (SAST) tool that makes it easy for you to find and remediate vulnerabilities. It is a valuable tool to use during the development phase of an application. Licensed, hosted customers have access to this feature.

To scan an application, you upload binary packages to a Contrast secure environment. After you upload the code, you start the scan. The scan observes the data flows in the source code and identifies vulnerabilities that could allow malicious attacks. Some examples of these malicious attacks include SQL injections, command injections, and server-side injections.

The scan results identify vulnerabilities in custom code. After fixing these issues, running the scan again verifies that the code changes removed one or more vulnerabilities.

No open-source code or libraries are included in the scan.



## Features

- Ability to create scan groups that enable you to track results of multiple scans
- Scan settings that let you change the name of a scans
- Starting or stopping scans
- Views of identified vulnerability details
- Monitoring of scan progress and history
- Assignment of status to vulnerability records
- Integration of scanning into your CI/CD pipeline
- Information about risk and approaches for fixing each type of vulnerability

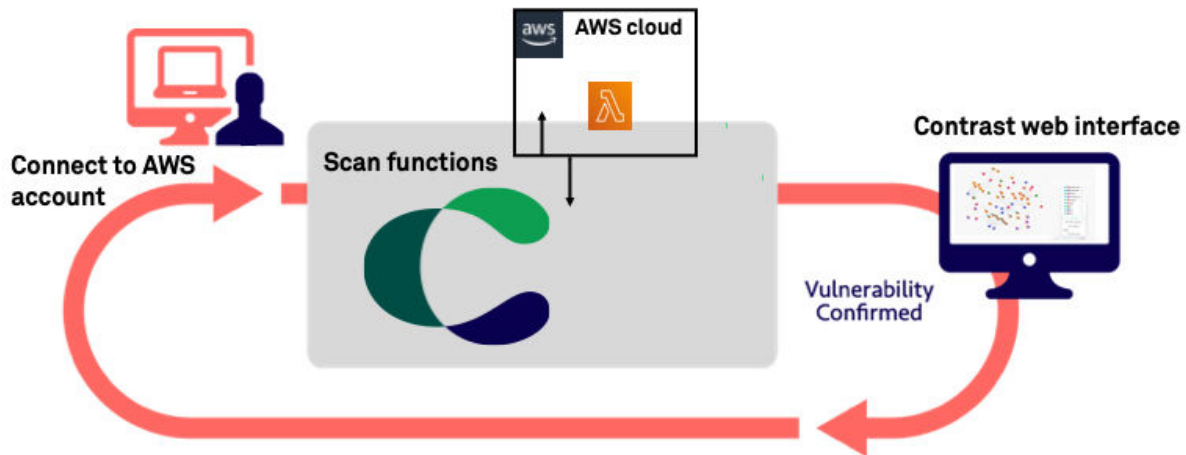
## See also

[Scan supported languages \(page 697\)](#)

## Serverless Application Security

Contrast Serverless Application Security is a next-generation application security testing solution for serverless-based applications.

Contrast Serverless Application Security uses cloud-native architecture to map all resources within your environment, while automatically validating and prioritizing the results, eliminating false-positive results and alert fatigue. It scans for vulnerabilities in your custom code (for example, injection attacks), dependencies (for example, CVEs), and configuration risks (over-permissive function policies).



## Features

- **Easy connection to AWS**  
With two clicks and approximately two minutes, you connect to your AWS account through the Contrast web application.
- **Discovery of your inventory**  
Once you connect to your AWS account, Contrast creates an inventory of your functions, resources, policies, and services in your AWS environment.
- **Analysis of vulnerabilities**  
Dynamic and static scans analyze your code, discovering weaknesses, data flows, attack surfaces, and exposure to vulnerabilities.
- **Continuous monitoring**  
As your code changes, Contrast continues to monitor your Lambda functions, identifying vulnerabilities that require attention.
- **Simulation of attacks**  
A dynamic scan generates and executes curated attacks on resources and data flows, without making changes to your code.
- **Visual representation of function and service relationships**  
In addition to viewing relationships between functions and services in your account, you can view details about each element including applicable risks.
- **Reporting**  
Scan results list CVEs, permission violations, vulnerabilities, and other exposures in your code.

## Benefits

- **Fast and easy deployment**  
You do not need a large staff of specialists or consultants or a lot of time to integrate with Contrast.
- **Non-intrusive integration**  
You can add serverless security without significant changes to the development process. It's easy to find and fix exploitable vulnerabilities early in the development phase, ensuring that your applications are more secure when you deploy them to production.

## How it works

Contrast connects to your AWS account with ReadOnly access. It uses this access to continuously monitor the environment and collect relevant information.

Contrast deploys one Lambda function (Cloud Agent) within the monitored environment, to perform activities such as code analysis and sending back to Contrast meta-data about the scanned resources (Lambda functions).

All the information is used by our contextual engine to build a tailored attack profile for every resource and change to this environment. The attack simulations will be executed, inside the customer's account, by the Cloud Agent.

All finding results will go through an internal validation mechanism to qualify them, providing zero false-positive and real prioritized results.

## Security and privacy

- Contrast does not collect code or code-snippets from your monitored account. Contrast only sends back meta-data information such as:
  - Identified vulnerabilities
  - Function names and metadata (for example, policy handlers)
  - Used libraries
  - AWS API calls (for example, boto3 and asw-sdk)
  - Service configurations (for example, bucket notifications, API gateway paths, and methods)
- Contrast makes no changes to your code. However, during the scan time (for example, when a function is deployed or modified), Contrast temporarily instruments a layer into the scanned function and makes some configuration changes (for example, timeouts or handlers). Once the scan completes, Contrast restores the layer and the configurations to their original states. This process is completely transparent and occurs automatically. During a scan, you can continue to run your own tests (function calls).
- During dynamic scans, Contrast executes with scanned function using malicious data. This process has no effect on your code. It does, however, execute code that could potentially trigger any action that the function makes. This function is disabled by default. Use the Settings tab to enable it at any time.
- All data that Contrast receives from the monitored AWS account is encrypted in transit and at rest. Contrast uses Amazon EventBridge with a shared secret to send and receive all data. There are no web or REST APIs that Contrast uses to communicate with your AWS account.

## Requested permissions

When you use Contrast to connect to your AWS account, you consent to these access permissions:

- ReadOnlyAccess from the Contrast AWS account to your monitored AWS account. This policy is used during beta activities only.
- Lambda Read/Write access from the Contrast AWS account to the Lambda functions deployed in your AWS account.
- The Lambda function that Contrast installs in your monitored AWS account requires these access policies:
  - Read CloudWatch Logs
  - Read Layer versions
  - Invoke function
  - Change function configuration
  - Write EventBus messages
  - Read KMS keys
  - Read/Write objects to specific S3 buckets (Contrast creates these buckets)

## See also

- [Get started with Contrast Serverless \(page 1252\)](#)

## Contrast performance and resource consumption

Minimize the impact of Contrast on production servers by using the proper configuration:

- **Development environments:** Contrast Assess should be on and Protect can be off. This provides the strongest insight into an application's security posture. This detailed insight favors deep insight over performance to focus on helping developers locate security flaws.
- **Test environments:** Contrast Assess or Protect should be enabled based on what the team needs. Teams should strike a balance to achieve the overall goals of the team:
  - If little testing is done in development, teams should leverage Assess to find vulnerabilities as the application is used.
  - When evaluating performance, Contrast Assess should be turned off and only Protect should be enabled. This provides a corrective control that favors performance but still retrieves code-level information when corrective action is needed.
- **Production environments:** Only Contrast Protect should be on. This provides contextual defense while favoring performance.

## See also

[Agent performance with Protect \(page 613\)](#)

[System requirements for .NET Framework agent \(page 64\)](#)

[.NET Core system requirements \(page 72\)](#)

[System requirements for the Node.js agent \(page 83\)](#)

[PHP agent system requirements \(page 89\)](#)

[System requirements for the Python agent \(page 94\)](#)

[System requirements for the Ruby agent \(page 101\)](#)

## Community Edition (CE)

Community Edition offers near full access to Contrast products (Assess, SCA, and Protect), with developers receiving interactive application security testing (IAST), software composition analysis (SCA), and runtime application self-protection (RASP) solutions—all for free.



### IMPORTANT

Contrast Community Edition will reach its end-of-life (EOL) on **June 30, 2025**. To try Contrast, sign up for our [sandboxes](#) instead.



### NOTE

Community Edition lets you add **one** Java, .NET Core, or Node.js application to Contrast.



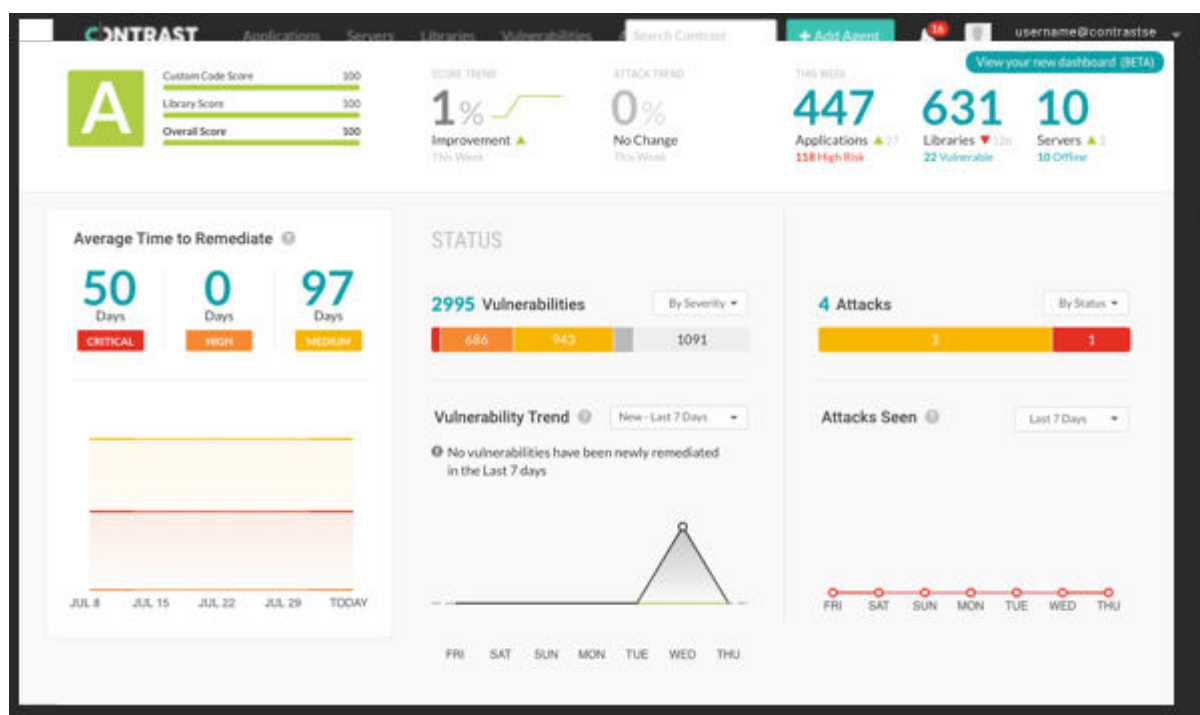
## Community Edition features

Community Edition offers:

- Contrast Assess, which allows developers to focus only on fixing vulnerabilities derived from custom code that actually matter.
- Contrast SCA, which delivers unparalleled visibility into and management of security risks from vulnerabilities introduced through open-source and third-party libraries  
Contrast SCA is an open-source security or software composition analysis (SCA) solution.
- Contrast Protect, which monitors and automatically blocks attacks on applications using instrumentation from within the application— even if the vulnerability still exists in self-written code or open-source libraries.

## Community Edition portal

Here's an example of the CE portal that you interact with when using Contrast:



## Next steps

- [Install the .NET Core agent \(page 272\)](#)
- [Install the Java agent \(page 125\)](#)
- [Install the Node.js agent \(page 336\)](#)



## Contrast for developers

### The Contrast platform

Your first step is understanding the technologies in the Contrast platform so you can choose an appropriate analysis strategy.

### Code analysis during development

- **Contrast Scan**

Contrast Scan is a static application security testing (SAST) tool that lets you quickly scan code to identify vulnerabilities in early stages of development.

- **Why use Contrast Scan?**

Contrast Scan provides exceptional speed without sacrificing accuracy. It takes just a few minutes and clicks to start a scan. In addition, you can use a local scan engine to avoid uploading your content to the Contrast platform directly. Contrast Scan is a good choice for client-side code such as Angular, React, or Vue.js based applications.

- **Contrast Serverless**

For functions as a service (FaaS)-style serverless, Contrast Serverless protects you in a number of ways:

- It does some static and dynamic analysis to detect vulnerabilities.
  - It does some SCA analysis for open source libraries.
  - It also analyzes your functions to determine the least privilege configuration necessary for your serverless functions to operate but closes off avenues for attackers.

For serverless offerings like AWS Fargate, you can use Contrast Assess. For Azure Functions, you can use both Contrast Serverless and Contrast Assess. You can use the Contrast CLI to access a subset of the functionality, which also provides you with a pipeline integration option. However, the primary mode for Contrast Serverless is identifying and protecting all the functions in your cloud-provider account with only a few clicks and a few minutes worth of work.

- **Why use Contrast Serverless?**

- It provides you with a comprehensive list of your functions and enables you to make them secure from attack
    - No additional time or retooling of DevOps pipelines is required to benefit from serverless function scanning
    - No extra overhead is needed to look at invalid data
    - Contrast Serverless assists you in making your code more secure by guiding you to select appropriate policies.

### Analysis of open source libraries

#### Contrast SCA

Contrast has always provided runtime Software Composition Analysis (SCA) capability with Assess, but now, you can also use Contrast SCA to detect vulnerabilities in your 3rd party dependencies (mostly open source) statically using a command line interface (CLI) and through our GitHub integrations, that allows bulk onboarding of projects to Contrast

#### Why use Contrast for SCA instead of other good (and often free or inexpensive) SCA tools?

Contrast SCA lets you focus only on what matters. Contrast runtime SCA provides a unique ability to not only tell if your application dependency manifests specify a vulnerable version of a vulnerable library but it can tell you which libraries are actually invoked, and to what degree, at runtime. This ability lets you lower the priority on the 70% that aren't invoked at runtime. Contrast SCA can also detect libraries

that are not listed in the manifests but injected at runtime by the environment -- a blindspot for pure static SCA solutions like most free ones.

## Code analysis during runtime

### Contrast Assess

Contrast Assess is the *interactive application security testing* (IAST) part of the Contrast platform. The core of an IAST tool is sensor modules, software libraries included in the application code. These sensor modules keep track of application behavior while the interactive tests are running. IAST analyzes code in runtime to find vulnerabilities, like *static application security testing* (SAST) tools do prior to compile and execution. It analyzes runtime behavior, like *dynamic application security testing* (DAST) tools. It also serves as the collector for our runtime *Software Composition Analysis* (SCA) capability. So, you can think of Contrast Assess as four tools in one.

### Why use Contrast Assess?

Assess has a fraction of the false positives while finding up to twice the true positives as other SAST tools, without adding any additional scan wait times for both SAST and DAST tools. That's because with Contrast Assess, each interaction of the application by a user or your automated QA tests raises valuable telemetry about the security of the code in operation. This information makes IAST the simplest and least intrusive security process to add earlier in the development cycle, since no changes to your process are needed and will add no delays to your release schedule

## Protection for production builds

### Contrast Protect

Contrast Protect, is a *runtime application self-protection* (RASP) tool. Using the same technology as Assess, it blocks traffic that would have resulted in a successful attack.

### Why should you integrate Protect into builds that you deploy to production?

Contrast Protect provides negative-day protection for zero-day attacks. The three-year-old version of Protect was able to block the infamous Log4Shell remote code execution attacks. For actively developed applications, this gives you time to upgrade, avoiding the late-night rush when a new zero-day emerges.

For maintenance-mode applications, it might serve as a long-term protection allowing you to stay focused on new applications. It also provides developers with actionable threat intelligence because it not only tells you attacks are occurring (information you may or may not be getting from your security team) but it also shows you the code paths used by the blocked attackers so you can easily eliminate them.

## Next step

[Review analysis paths \(page 38\)](#)

### Contrast analysis paths

Contrast provides multiple ways to you integrate secure code analysis into your development workflow.

This topic presents suggested paths for integrating Contrast analysis into your development workflow. Your environment might require different workflows.

## Analysis paths during development

|   |   |  |   |   |   |  |
|---|---|--|---|---|---|--|
| Static scanning with Contrast Scan                              | ➔ | Use any of these:  | ➔ | Get results from:   | ➔ | Integrate with your CI/CD system (page 49) |
|   |   | <ul style="list-style-type: none"> <li>Contrast CLI (page 41)</li> <li>Contrast GitHub action (page 44)</li> <li>Contrast web interface (page 45)</li> </ul> |   | <ul style="list-style-type: none"> <li>SARIF files (page 47)</li> <li>Contrast CLI (page 46)</li> <li>Contrast web interface (page 47)</li> </ul> |   |  |
| Static and real-time function scanning with Contrast Serverless | ➔ | Use any of these:  | ➔ | Get results from:   | ➔ | Integrate with your CI/CD system (page 49) |
|   |   | <ul style="list-style-type: none"> <li>Contrast CLI (page 41)</li> <li>Contrast web interface (page 45) (scan set up only)</li> </ul>                        |   | <ul style="list-style-type: none"> <li>Contrast CLI (page 46)</li> <li>Contrast web interface (page 47)</li> </ul>                                |   |  |

## Analysis paths for open source libraries

|                                     |   |  |   |   |   |  |
|-------------------------------------|---|--|---|---|---|--|
| Static scanning with Contrast SCA   | ➔ | Use any of these:  | ➔ | Get results from:   | ➔ | Integrate with your CI/CD system (page 49) |
|                                     |   | <ul style="list-style-type: none"> <li>Contrast CLI (page 40)</li> <li>GitHub app</li> <li>BitBucket or GitLab repo connections (page 43)</li> </ul> |   | <ul style="list-style-type: none"> <li>Contrast CLI (page 46)</li> <li>Contrast web interface (page 47)</li> <li>Workflow integrations (page 1331)</li> </ul> |   |  |
| Run-time scanning with Contrast SCA | ➔ | Use this:  | ➔ | Get results from:   | ➔ | Integrate with your CI/CD system (page 49) |
|                                     |   | Instrumentation with Contrast agents (page 44)   |   | <ul style="list-style-type: none"> <li>Contrast web interface (page 47)</li> <li>Workflow integrations (page 1331)</li> </ul>                                 |   |  |

## Analysis path during runtime

|   |   |  |   |   |   |  |
|---|---|--|---|---|---|--|
| Find application vulnerabilities with Contrast Assess | ➔ | Use any of these::   | ➔ | Get results from:   | ➔ | Integrate with your CI/CD system (page 49) |
|   |   | <ul style="list-style-type: none"> <li>Instrumentation with Contrast agents (page 45)</li> <li>Contrast CLI (page 42)</li> </ul> |   | <ul style="list-style-type: none"> <li>Contrast CLI (page 46)</li> <li>Contrast web interface (page 47)</li> <li>IDE integrations (page 46)</li> <li>Workflow integrations (page 1331)</li> </ul> |   |  |

## Protection path for production builds

|   |   |  |   |  |
|---|---|--|---|--|
| Protect production builds with Contrast Protect | ➔ | Use this:  | ➔ | Get results from:  |
|   |   | Instrumentation with Contrast agents (page 48)<br><br>Contrast GitHub action (page 44) |   | <ul style="list-style-type: none"> <li>Contrast web interface (page 47)</li> </ul> |

## Code analysis

Once you decide on your approach for code analysis, you're ready to start testing your open source and source code.

| To analyze...         | With...                     | Go to:  |
|-----------------------|-----------------------------|---|
| Open source libraries | CLI                         | <a href="#">Use CLI for open source library analysis (page 40)</a> (static analysis)  |
|                       | GitHub app                  | <a href="#">Use GitHub app for open source library analysis (page 43)</a> (static analysis)   |
|                       | BitBucket connection        | <a href="#">Connect repos for open source library analysis (page 43)</a> (static analysis)  |
|                       | GitLab connection           | <a href="#">Connect repos for open source library analysis (page 43)</a> (static analysis)  |
|                       | Application instrumentation | <a href="#">Instrument applications for open source library analysis (page 44)</a> (runtime analysis)   |
| Source code           | CLI                         | <ul style="list-style-type: none"> <li>• <a href="#">Use CLI for static scanning (page 41)</a></li> <li>• <a href="#">Use CLI for serverless function scanning (page 41)</a></li> </ul>   |
|                       | GitHub action               | <a href="#">Use GitHub action for static scanning (page 44)</a>   |
|                       | Application instrumentation | <a href="#">Instrument applications to find vulnerabilities (page 45)</a>   |
|                       | Contrast web interface      | <ul style="list-style-type: none"> <li>• <a href="#">Use Contrast web interface for static scanning (page 45)</a></li> <li>• <a href="#">Use Contrast web interface to set up serverless function scanning (page 45)</a></li> </ul> |

## Next steps

- [Get results from the CLI \(page 46\)](#)
- [Get results from IDE integration \(page 46\)](#)
- [See results in SARIF files \(page 47\)](#)
- [See results in the Contrast web interface \(page 47\)](#)

## Use CLI for open source library analysis

The Contrast CLI lets you analyze open source libraries for vulnerabilities and returns the results.

By default, the CLI doesn't store the results locally. To maintain persistent data, use the `CLI---track` option to send the results to the Contrast web interface.

## Before you begin

- Learn about the [Contrast CLI \(page 1278\)](#).
- [Install the CLI \(page 1279\)](#).

## Steps

1. Store your Contrast credentials locally with this command in a terminal window:

```
contrast auth
--api-key <ContrastAPIKey>
--authorization <ContrastAuthorizationHeader>
--host <YourHostDomain>
--organization-id <ContrastOrganizationID>
```

Get the Contrast API key, the authorization header, and organization ID by logging into the Contrast web interface and selecting **user menu > User settings**.

2. Find vulnerable libraries by using this command in a terminal window:

```
contrast audit [option]
```

- Use the `--track` option to send persistent results to the [Libraries \(page 1206\)](#) Static tab in the Contrast web interface.

- Use the `--file` option to specify a directory or file to audit.  
[CLI commands \(page 1286\)](#) describes all the valid options for the `audit` command.

## Next steps

- [Get results with the CLI \(page 46\)](#)
- [See results in the Contrast web interface \(page 47\)](#)

## Use CLI for static scanning

Instead of using the Contrast web interface, you can use the CLI to scan your code.

## Before you begin

- Learn about the [Contrast CLI \(page 1278\)](#).
- [Install the CLI \(page 1279\)](#).

## Steps

1. Store your Contrast credentials locally with this command in a terminal window:

```
contrast auth
--api-key <ContrastAPIKey>
--authorization <ContrastAuthorizationHeader>
--host <YourHostDomain>
--organization-id <ContrastOrganizationID>
```

Get the Contrast API key, the authorization header, and organization ID by logging into the Contrast web interface and selecting **user menu > User settings**.

2. Upload and scan a package by using this command in a terminal window:

```
contrast scan --file <FileName>
```

[CLI commands \(page 1293\)](#) describes all the valid options for the `scan` command.

## Next steps

- [Get results with the CLI \(page 46\)](#)
- [See results in the Contrast web interface \(page 47\)](#)

## Use CLI for serverless function scanning

Instead of using the Contrast web interface, you can use the CLI for scanning your serverless functions.

## Before you begin

- Learn about the [Contrast CLI \(page 1278\)](#).
- [Install the CLI \(page 1279\)](#).

## Steps

1. Store your Contrast credentials locally with this command in a terminal window:

```
contrast auth
--api-key <ContrastAPIKey>
--authorization <ContrastAuthorizationHeader>
```

```
--host <YourHostDomain>  
--organization id <ContrastOrganizationID>
```

Get the Contrast API key, the authorization header, and organization ID by logging into the Contrast web interface under **user menu > User settings**.

- Find vulnerabilities by using this command in a terminal window:

```
contrast lambda --function-name <function> [options]
```

- Use `--json` to return the response in a JSON format.
- Use `--verbose` to return extended information to the terminal window.
- [CLI commands \(page 1295\)](#) describe all the valid options for the `lambda` command.

## Next steps

- [Get results with the CLI. \(page 46\)](#)
- [See results in the Contrast web interface. \(page 47\)](#)

## Use CLI to find vulnerabilities

The Assess CLI lets you use Contrast Assess to display vulnerabilities in real time.

The following Contrast agents support the Assess CLI:

- Java
- Node.js
- .NET
- Python
- Ruby
- Go

## Before you begin

- Learn about the [Contrast CLI. \(page 1278\)](#)
- [Install the CLI. \(page 1279\)](#)
- Verify you can use the Assess CLI with your application by checking the supported technologies for your agent.

## Steps

- Install or update an agent.
- In a terminal window, enter the following command:

```
contrast assess
```

This command creates the agent configuration file that both the Assess CLI and the agent share. The default locations for the file are:

- MacOS and Linux:** `/etc/contrast/contrast_security.yaml`
- Windows** `%ProgramData%\Contrast\contrast_security.yaml`

To specify a different file location, use the `config-path` option. [CLI commands \(page 1286\)](#) describes all the valid options for the `assess` command.

- Run your application in your IDE or a second terminal window.
- Exercise your application.
- View the results in the terminal window where you entered the Assess CLI command.

## Next steps

[Get results with the CLI. \(page 46\)](#)

## See also

[Use Assess CLI with Java agents \(page 1281\)](#)

[Use Assess CLI with Node.js agents \(page 1283\)](#)

[Use Assess CLI with .NET agents \(page 1282\)](#)

[Use Assess CLI with Python agents \(page 1283\)](#)

[Use Assess CLI with Ruby agents \(page 1284\)](#)

[Use Assess CLI with Go agents \(page 1285\)](#)

## Use GitHub app for open source library analysis

The Contrast GitHub app lets you connect your GitHub repo with Contrast. Once you establish this connection, Contrast scans the open source libraries in selected repos to identify vulnerabilities.

## Before you begin

- To connect to the GitHub app, you need the subdomain and host for your Contrast account (for example: `app.contrastsecurity.com`)

## Steps

1. Log in to the Contrast web interface and select **Add New** in the header.
2. Select the Repositories card tab and then, select **Connect GitHub**.
3. When prompted to do so, specify where you want to install the app in GitHub.
4. Follow the displayed steps until you complete the final authorization in the Contrast web interface. The Projects list start populating from your GitHub repositories.
5. Add more repositories at any time by selecting **Add repositories**.

## Next steps

[View results in the Contrast web interface. \(page 47\)](#)

## Connect repos for open source library analysis

For open source library analysis, you can connect to the GitHub, BitBucket, or GitLab platform. Once you connect to any of these platforms, Contrast displays scan results in the Projects tab.



### NOTE

Connections to Bitbucket and GitLab are available by request only. Contact [Contrast Support](#) to enable these connections.

## Steps

1. In the Contrast web interface, select the **Projects** tab.

2. Select **Add repository**.
3. To connect to GitHub, select the **GitHub card**. This option uses the [Contrast Security GitHub App \(page 1218\)](#) to connect with Contrast.
4. To connect to BitBucket, select the **BitBucket card**. This option connects to your [Bitbucket repository \(page 1221\)](#).
5. To connect to GitLab, select the **GitLab card**. This option connects to your [GitLab repository \(page 1221\)](#).  
You must have a GitLab Owner or Maintainer role to write the required variables into a GitLab repository.

## Use GitHub action for static scanning

The GitHub Contrast Scan Analyze action compares the code scanning analysis of a pull request (PR) with the last code scan analysis of the destination branch.

### Before you begin

- You need the following information from the Contrast web interface, under **user menu > User settings**:
  - Your API key
  - User authorization header
  - Organization ID

### Steps

1. Access the GitHub action in the [Contrast repository](#).
2. [Set up the action](#).

### Next steps

- [Get results in a SARIF file \(page 47\)](#).
- [See results in the Contrast web interface. \(page 47\)](#)

## Instrument applications for open source library analysis

Instrumenting an application with a Contrast agent identifies open-source libraries included in an application. Contrast identifies any vulnerabilities found in your libraries and also confirms if the library is used at runtime.

### Steps

1. [Install and configure a Contrast agent \(page 51\)](#) for the language that corresponds to the language your application uses.  
You can download agents from a package manager or repository.  
You can install agents directly or use [integrations \(page 1331\)](#) that work with Contrast.
2. Run the application to verify that Contrast is working. For example, click on your application's web interface or send some API or CLI commands.

### Next steps

- [See results in the Contrast web interface \(page 47\)](#).
- [See results in an IDE. \(page 46\)](#)



## Instrument applications to find vulnerabilities

To find application vulnerabilities, you use Contrast agents to instrument your application. You have the option of using a Contrast extension with your IDE so you can see results and resolve vulnerabilities in the IDE.

### Basic steps

1. [Install the agent \(page 51\)](#) to the local directory where the application is located.
2. [Configure the agent \(page 107\)](#) using a YAML file or set environment variables that include the Contrast connection data.  
The [Agent configuration editor \(page 113\)](#) provides an easy method to configure the agent.
3. Start the application and exercise routes.

### Steps for using a Contrast IDE plugin

1. Install the agent to the local directory where the application is located.
2. Configure the agent using a YAML file or set environment variables that include the Contrast connection data.  
The [Agent configuration editor \(page 113\)](#) provides an easy method to configure the agent.
3. Start the application.
4. Configure a [Contrast IDE plugin \(page 1331\)](#) with the required connection information.  
In this case, you need your personal key or API information found in the Contrast web interface, under **user menu > User settings > Profile**.
5. Exercise routes in the application.

### Next steps

[Review vulnerabilities in the IDE. \(page 46\)](#)

## Use Contrast web interface to set up function scanning

Use the Contrast web interface to set up scanning for serverless functions.

### Steps

1. Log in to the Contrast web interface and connect to your account: [AWS \(page 1252\)](#) or [Azure \(page 1258\)](#).
2. Set up scanning:
  - a. Select **Serverless** in the header.
  - b. Select the account that contains the functions you want to scan.
  - c. [Select the functions you want to scan \(page 1259\)](#).

### Next steps

[See results in the Contrast web interface. \(page 47\)](#)

## Use Contrast web interface for static scanning

The Contrast web interface makes it easy to scan your code.

### Before you begin

- [Check the supported languages \(page 697\)](#) for scanning.
- Learn about [preparing packages \(page 699\)](#) for scanning.

- Locate the artifacts you want to scan.
- [Create a scan project \(page 706\)](#).

## Steps

1. Log in to the Contrast web interface
2. Select **Scans** in the header.
3. Select the scan project for the file you want to scan.
4. Start the scan:
  - a. Select **New scan**.
  - b. Upload the file.

## Next steps

[See results in the Contrast web interface. \(page 47\)](#)

## Analysis results

You have multiple options for viewing results after analyzing your open source libraries and code:

- [Get results when you use the CLI \(page 46\)](#)
- [Get results in your IDE \(page 46\)](#)
- [Get results in a SARIF file \(page 47\)](#)
- [See results in the Contrast web interface \(page 47\)](#)

## Get results from the CLI

The CLI returns results in the terminal window after you run commands. The CLI doesn't store these results. Depending on the commands you use, you can send results to the Contrast web interface or download results in a SARIF file.

## Steps

1. If you use the `audit` command, use the `--track` option to send results to the Static view on the Libraries page in the Contrast web interface.
2. If you use the `scan` command, use the `--save` option to download a SARIF file to the current working directory.

## Get results from IDE integration

If you use a Contrast IDE plugin, you can view the vulnerability information directly in your IDE environment.

The IDE plugins that Contrast supports includes:

- Eclipse
- IntelliJ
- Visual Studio
- Visual Studio Code
- Visual Studio for Mac

## Before you begin

Instrument your application by [installing and configuring a Contrast agent \(page 51\)](#).

## Steps

1. Find a [Contrast IDE plugin \(page 1331\)](#).
2. Follow the plugin set up instructions.

## Get results in SARIF files

You can choose to get results from static scanning in a SARIF file instead of in a terminal window (if using the CLI). You can also download a SARIF file from the Contrast web interface.

### Steps

1. If you are using the CLI for static scanning, use this command option to store results in a SARIF file:

```
contrast scan --save
```

This command downloads the file to the current working directory with a default name of `results.sarif`. You can view the file with any text editor.

2. If you are using the Contrast web interface, download the results to a SARIF (or CSV) file:
  - Select **Scans** in the header.
  - In the Scan project list, select a project.
  - At the end of the row for a scan, select the Download icon (⬇️). Results are available for download for up to five days after the scan completes.
3. If you are using the GitHub action for static scanning and want to view results in the Security tab in the repository, include this GitHub action in your setup:

```
- name: Upload SARIF file
  uses: github/codeql-action/upload-sarif@v2
  with:
    sarif_file: results.sarif
```

The SARIF file name must be `results.sarif`.

## Get results in the Contrast web interface

In most cases, no matter how you integrate your development workflow with Contrast, you can see results from code analysis in the Contrast web interface.

### Before you begin

- Log in to the Contrast web interface.

### Steps

1. To view findings for open source library analysis, select **Libraries** in the header. This view shows all libraries across all projects (static) and applications (runtime). You can also view libraries for a specific application in the Libraries tab of that application.
  - In the Libraries list, to view details about specific vulnerabilities, select a name or a section in the vulnerability bar.
2. To view findings for open source libraries after you use the CLI to analyze manifest files or from a repo connection, select **Projects** in the header.
  - In the Projects list, to view details about specific vulnerabilities, select a name or a section in the vulnerability bar.
3. To view application vulnerability information, select **Applications** in the header.
  - In the Applications list, to view details about specific vulnerabilities, select a section in the vulnerability bar.

4. To view static scan details, select **Scans** in the header.
  - a. In the Scans list, select a scan project.
  - b. To view details about vulnerabilities, select the **Vulnerabilities** tab .
5. To view serverless function scan details, select **Serverless** in the header.
  - a. To view details about vulnerabilities, select the **Results** tab.
  - b. To view details about vulnerabilities for a specific function, select the function in the **Results** list

## Monitor or block attacks

Contrast Protect lets you configure Contrast agents to identify and manage malicious attacks for applications in production environments.

As a developer, you can [configure an agent \(page 48\)](#) to use Contrast Protect rules to monitor and block attacks. The agent reports these results in the [Contrast web interface \(page 48\)](#).

## Instrument applications for Protect

Turning on Protect lets you use Contrast agents to identify, monitor, or block attacks for your applications in production environments.

### Before you begin

- Check with a SuperAdmin to verify that Protect is turned on for your organization.
- Check with an Organization administrator to verify that you have permissions to view Protect data.

### Steps

1. [Install and configure a Contrast agent \(page 51\)](#) for the language that corresponds to the language your application uses.

You can download agents from a package manager or repository. You can install agents directly or use [integrations \(page 1331\)](#) that work with Contrast.

In the agent YAML file:

  - a. Turn on Protect.
  - b. Configure the modes for the Protect rules (monitor, block, or off)
2. Run the application to verify that Contrast is working. For example, click on your application's web interface or send some API or CLI commands.

### Next step

[View attack data in the Contrast web interface \(page 48\)](#).

## View attack data in the Contrast web interface

The Contrast web interface displays details about attacks that occurred in your production environments.

### Steps

1. In the Contrast web interface, select **Attacks** in the header.
2. Explore the different tabs to view data about attacks that affected your applications.

## Integration options for continuous integration/continuous delivery

Contrast provides options for integrating Contrast with your continuous integration/continuous delivery (CI/CD) pipelines. If you are not responsible for CI/CD automation, discuss these options with your DevOps team.

| Option  | Description  |
|---|--|
| <a href="#">Azure Pipelines extension (page 1349)</a> | Use the Azure Pipelines extension to configure tasks and release gates that can fail based on vulnerability information that Contrast reports.   |
| <a href="#">Bamboo (page 1354)</a>                    | The Contrast Bamboo plugin lets you configure profiles for connecting to Contrast and verify builds against vulnerability thresholds.  |
| <a href="#">Circle CI</a>                             | The Contrast Circle CI orb lets you query the Contrast API to check if vulnerabilities were found in your application. If vulnerabilities are found above a set threshold, you can fail the build.   |
| <a href="#">GitHub</a>                                | Add a step to a GitHub pipeline which acts as a security gate, based on results that Contrast reports. You can configure a Job Outcome Policy or a threshold to specify which vulnerabilities trigger the pipeline to fail.                                |
| <a href="#">GitLab</a>                                | You can create a stage within a GitLab pipeline which acts as a security gate, based on results that Contrast reports. You can configure GitLab variables that specify which vulnerabilities trigger the stage to fail.                                    |
| <a href="#">Gradle (page 1364)</a>                    | The Contrast Gradle plugin lets you integrate the <code>Contrast.jar</code> file with your build. It's capable of authenticating to Contrast, downloading the latest Java agent, and verifying your builds.  |
| <a href="#">Jenkins (page 1369)</a>                   | The Contrast plugin for Jenkins lets you add application security gates to this pipeline. These gates contain criteria that can fail the Jenkins job for a vulnerable application with a build result like <code>Failure</code> or <code>Unstable</code> . |
| <a href="#">Maven (page 1384)</a>                     | The Contrast Maven plugin can integrate Contrast Assess and Scan into your project's Maven build.  |

# Agents

Contrast agents are responsible for gathering security relevant data from an application, analyzing that data, and reporting findings to Contrast when necessary. In specific situations, a Contrast agent can also take actions within an application to prevent exploitation or enable a security defense.

A Contrast agent gathers security relevant information using a variety of security instrumentation techniques, including code scanning, library scanning, [instrumenting an application \(page 51\)](#), configuration file scanning, and other techniques. Any security instrumentation technique that gathers information is a sensor.

Sensors generate events that snapshot information directly from within an application. For example, a sensor might capture an incoming HTTP parameter, or the details of a SQL query being made to the database. Some sensors may also take action if necessary to help strengthen defenses or block malicious activity, typically by throwing a security exception that causes a vulnerability to be bypassed.

Events generated by sensors are all reported to the tracking and analysis part of the agent. Over time, the analysis engine [receives events \(page 1316\)](#) from all over the code of the application and builds them into traces. The analysis engine watches these traces for patterns of behavior that represent a violation of the Contrast rules.

For example, the analysis engine might see a data flow like this:

- An incoming HTTP parameter event
- Then another event shows that parameter being appended to a SQL query
- Finally, another event shows that query being sent to a database

If the analysis engine sees that data flow without the proper defenses (escaping or parameterization), it recognizes that trace to match the Contrast rule for SQL injection reports it to Contrast. The vast majority of the analysis is done locally in the agent, which enables Contrast's scalability and performance.

Use the agents that matches the language of the application you want to instrument:

- [Java \(page 122\)](#) instruments Java web applications and web APIs running on your container.
- [.NET Framework \(page 212\)](#) instruments .NET web applications and APIs running on IIS.
- [.NET Core \(page 270\)](#) instruments applications and APIs running in the .NET Core runtime.
- [Node.js \(page 335\)](#) instruments Node.js web applications and APIs.
- [PHP \(page 393\)](#) analyzes PHP web applications at runtime for library usage and vulnerability detection.
- [Python \(page 424\)](#) instruments Django, Flask and Pyramid web applications.
- [Ruby \(page 506\)](#) instruments Ruby on Rails web applications.
- [Go \(page 567\)](#) instruments Go web applications for library support and vulnerability reporting.



## NOTE

Contrast agents are supported for one year after release. Older agents may continue to function and remain compatible, but they are no longer fully supported.

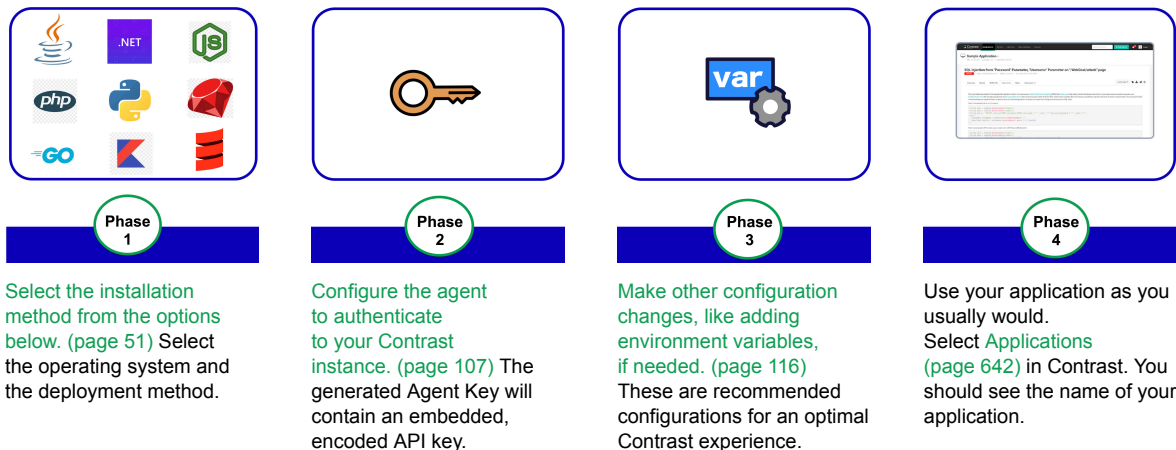
Contrast applies bug fixes and develops new features on the latest version of the agent. Code changes are not backported to previous versions. While a workaround may be provided for a bug, to resolve issues, you should update to the release in which the issue was addressed.

## Install an agent

Contrast uses agents to install sensors that monitor your code for vulnerabilities. Agents analyze for vulnerabilities in development environments and look for attacks in runtime production environments.

As your application runs, the agent analyzes information (such as HTTP requests, data flow, backend connections, and library dependencies) and sends vulnerabilities and attacks to Contrast where you can view, prioritize, and take immediate action.

Instrumenting an app with Contrast can be divided into several phases. These guides should enable you to get Contrast up and running on your application in just a few minutes, allowing you to see how it works.



Installation varies depending on the agent, the Contrast product(s) you are using, and where you want to install Contrast. For example, this could be:

- On an application server or web server
- In a build pipeline or container
- In a Develop, QA, or Production environment

Once you see how it works, there are many ways to modify this to suit your needs. You can explore [Contrast Documentation \(page 50\)](#) for further information about how to adapt Contrast to your situation.



### TIP

For future installations, consider your organization's build tools and deployment pipeline, your security goals and the environments where you want to use Contrast. You can read about [other methods to install Contrast \(page 1331\)](#) that may better adapt to your situation.

## Java

View the [installation and configuration workflows \(page 54\)](#).

| Install for executable JAR  | Install to an app server   | Install with build automation tool integrations  | Install in a container   | Install with cloud orchestration services   | Install with infrastructure as code tools  |
|---|--|--|--|---|--|
| <p>Install the agent in one application with a JAR file.</p> <p>Install with <a href="#">Maven Central (page 126)</a>, <a href="#">Debian (page 128)</a>, or <a href="#">RPM (page 127)</a> repositories.</p> | <p>Install the agent to an app server to provide security analysis for applications running in a test/QA or production environment.</p> <p>For <a href="#">JBoss/Wildfly (page 144)</a>.</p> <p>For <a href="#">Jetty (page 145)</a>.</p> <p>For <a href="#">Tomcat (page 146)</a>.</p> <p>For <a href="#">Weblogic (page 147)</a>.</p> <p>For <a href="#">Websphere (page 148)</a>.</p> <p>For <a href="#">Axis2</a>.</p> <p>For <a href="#">Glassfish</a>.</p> | <p>Install the agent with Contrast plugins to automate the installation.</p> <p>For <a href="#">Maven (page 1384)</a>.</p> <p>For <a href="#">Gradle (page 1364)</a>.</p> <p>For <a href="#">Bamboo (page 1354)</a>.</p> <p>For <a href="#">Azure pipelines (page 1349)</a>.</p> <p>For <a href="#">VMware Tanzu (page 136)</a>.</p> | <p>Install the agent in a container image or via a Kubernetes operator.</p> <p>Add the agent to the <a href="#">Docker base or application image (page 129)</a>.</p> <p>For <a href="#">OpenShift</a>.</p> <p>Add the agent to <a href="#">Kubernetes pods via Contrast k8s operator (page 592)</a>.</p> | <p>Install the agent for <a href="#">Google App Engine</a>.</p> <p>Install agent with <a href="#">AWS Elastic Beanstalk (page 134)</a>.</p> | <p>Install the agent with <a href="#">infrastructure as code tools (page 136)</a>.</p> |

You can also use the Contrast Java agent with Contrast Assess or Contrast SCA to analyze [Scala-based \(page 122\)](#) applications or to analyze [Kotlin-based \(page 122\)](#) applications.

## .NET Framework

View the [installation and configuration workflows \(page 63\)](#).

| Install with an installer   | Install with Azure  | Install in a container   | Install with infrastructure as code tools  |
|---|---|--|--|
| Install with an <a href="#">agent installer (page 215)</a> for self-hosted applications or applications in IIS. | Install the agent with <a href="#">Azure App Service (page 218)</a> . | Install the agent in a container image ( <a href="#">page 221</a> ). | Install the agent with <a href="#">infrastructure as code tools (page 285)</a> . |

## .NET Core

View the [installation and configuration workflows \(page 70\)](#).

## Windows



| Basic installation  | Install with an installer   | Install with Azure   | Install in a container  | Install with infrastructure as code tools  |
|---|---|--|---|--|
| Install the .NET Core agent with the <a href="#">basic install (page 272)</a> . | Install with an <a href="#">agent installer (page 276)</a> for self-hosted applications or applications in IIS. | Install the agent with the <a href="#">Azure App Service (page 280)</a> .<br><br>Install the agent with <a href="#">Terraform (page 290)</a> . | Install the agent in a container image or via a Kubernetes operator.<br><br>Add the agent to the <a href="#">Docker base or application image (page 283)</a> .<br><br>Add the agent to <a href="#">Kubernetes pods via Contrast k8s operator (page 592)</a> . | Install the agent with <a href="#">infrastructure as code tools (page 285)</a> . |

## Linux

| Basic installation  | Install in a container  |
|---|---|
| Install the .NET Core agent with the <a href="#">basic install (page 272)</a> . | Install the agent <a href="#">in a container image (page 283)</a> . |

## Node.js

View the [installation and configuration workflows \(page 79\)](#).

| Basic installation   | Install in a container   | Install with Cloud deployment integrations   | Install with infrastructure as code tools   |
|--|--|--|---|
| Install the Node agent with the <a href="#">basic install (page 353)</a> . | Install the agent <a href="#">in a container image (page 345)</a> .<br><br>Add the agent to <a href="#">Kubernetes pods via Contrast k8s operator (page 592)</a> . | Install with <a href="#">IBM Cloud (page 337)</a> .<br><br>Install with <a href="#">VMware Tanzu</a> . | Install the agent with <a href="#">Ansible playbook for Contrast (page 585)</a> . |

## PHP

View the [installation and configuration workflows \(page 89\)](#).

| Install by repository  | Install in a container  | Install to an app server   |
|--|---|--|
| Install the PHP agent with the <a href="#">Debian (page 398)</a> or <a href="#">RPM (page 396)</a> or <a href="#">Amazon Linux 2023 (page 396)</a> repository. | Add the agent to <a href="#">Kubernetes pods via Contrast k8s operator (page 592)</a> . | Install PHP agent on a <a href="#">Lando application server (page 394)</a> . |

## Python

View the [installation and configuration workflows \(page 94\)](#).

| Install with Contrast Runner  | Install in a container  |
|---|---|
| Install and instrument the Python agent with the <a href="#">Contrast Runner (page 505)</a> . | Add the agent to <a href="#">Kubernetes pods via Contrast k8s operator (page 592)</a> . |

## Ruby



### IMPORTANT

The Ruby Agent is not currently being sold to new customers. Please contact our Sales team if you have any questions about our offerings and support for the Ruby language.

View the [installation and configuration workflow \(page 99\)](#).

| Install by middleware  |
|--|
| Install the Ruby agent with Rails or Sinatra <a href="#">middleware (page 508)</a> . |

## Go

View the [installation and configuration workflow \(page 103\)](#).

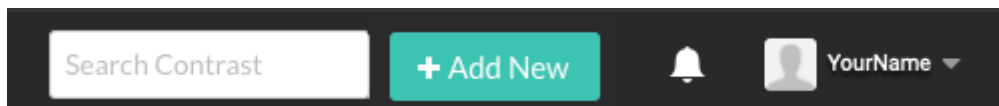
| Install with an installer   |
|---|
| Install the Go agent with the <a href="#">Contrast installer (page 567)</a> . |

## Download an agent configuration file

You can download an agent's YAML configuration file that is pre-populated with required settings.

### Steps

1. In the Contrast web interface, select **Add new**.



2. Select the Application tile.
3. Select the application language.
4. Download the pre-populated YAML file.

## Java installation and configuration workflows

Follow these workflows to make sure you have covered the steps for installing and configuring the Java agent.

- [Java with JAR files \(page 56\)](#)
- [Java to an app server \(page 58\)](#)
- [Java with build automation tool integrations \(page 59\)](#)
- [Java in a container \(page 60\)](#)
- [Java in pipelines \(page 62\)](#)
- [Java with infrastructure as code tools \(page 136\)](#)

## Advanced topics

For additional installation and configuration details, visit these topics:

- [Java advanced installation \(page 122\)](#)
- [Java app servers \(page 143\)](#)
- [Java advanced configuration \(page 151\)](#)

## Supported technologies for Java (Kotlin, Scala) agent

### Java

| Technology   | Supported versions  | Notes  |
|--|---|--|
| Java runtime   | <ul style="list-style-type: none"> <li>IBM 8</li> <li>Oracle 8. *Versions 11+ follow our OpenJDK support.</li> <li>OpenJDK 8, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23</li> </ul>   | <p>OpenJDK support is designed to work with all <a href="#">publicly available builds</a> within the current version support shown here. Popular varieties like Azul and Amazon Corretto fall into this category of supported JDKs.</p> <p><b>Not supported:</b></p> <p>JDK preview features</p>   |
| Java runtime for Legacy Java agent                           | <ul style="list-style-type: none"> <li>IBM 6, 7</li> <li>Oracle 6, 7</li> <li>OpenJDK 6, 7</li> </ul>   | <p><b>See also</b></p> <ul style="list-style-type: none"> <li><a href="#">Support-Bulletin-End-of-Support-of-Java-6-and-7</a></li> <li><a href="#">FAQ: End of Support for Java 6 and 7</a></li> </ul>   |
| Use with Java agent 3.x only                                 |   |  |
| Application servers  | <ul style="list-style-type: none"> <li>GlassFish 4, 5, and 6</li> <li>Grizzly 2.3.20 and later</li> <li>JBoss EAP 6.x and 7.x</li> <li>Jetty 7, 8, 9, 10, 11</li> <li>Karaf 3.0.x</li> <li>Netty 4.x</li> <li>Payara 5, 6</li> <li>Play 2.4</li> <li>Resin 4</li> <li>Tomcat 5, 6, 7, 8, 9, 10</li> <li>Vert.X 3.1.0, 4.x</li> <li>WebLogic 10, 11g, 12c, 14</li> <li>WebSphere* 8.5, 9.0</li> <li>WebSphere Liberty 22, 23, 24</li> <li>WildFly 10, 11, 14, 18, 23-32</li> </ul> | <p>* Contrast offers limited support for zSeries and AIX environments. Customers using WebSphere on SPARC Solaris require version 8.5.5.11.</p> <p><b>Route coverage support:</b></p> <ul style="list-style-type: none"> <li>GlassFish 4, 5, and 6</li> <li>Jetty 11.0, 10.0. 9.4, 8.1, and 7.6</li> <li>Resin 4.0</li> <li>Tomcat 5, 6, 7, 8, 9, and 10</li> <li>WebLogic 12, 14</li> <li>WebSphere 8.5 and 9.0</li> <li>Wildfly 10, 11, 14, 18, 23-32</li> </ul> |
| Optimizers   | Proguard  | <p><a href="#">Proguard</a> includes Java bytecode optimization features which break basic assumptions that runtime agents like Contrast rely on. Proguard users that want to protect their applications with Contrast need to avoid these optimizations by using Proguard's -<a href="#">dontoptimize configuration option</a>.</p>   |
| Databases  | <ul style="list-style-type: none"> <li>DB2</li> <li>DynamoDB</li> <li>MySQL</li> <li>Oracle</li> <li>PostgreSQL</li> <li>SQL Server</li> <li>SQLite JDBC drivers</li> </ul>   |  |
| Message services   | <ul style="list-style-type: none"> <li>Message services: JMS 2.0</li> <li>IBM MQ 9.x</li> <li>Spring JMS 2.x</li> </ul>   | <ul style="list-style-type: none"> <li>Agent version: Java 4.7.0 and later</li> <li>Contrast version: 3.9.9 and later</li> </ul>   |
| Contrast supports message services for Contrast Assess only. | <ul style="list-style-type: none"> <li>Kafka streaming</li> </ul>   | <ul style="list-style-type: none"> <li>Agent version: Java 5.0.0 and later</li> </ul>  |

| Technology              | Supported versions   | Notes   |
|-------------------------|--|---|
| Other Java technologies | <ul style="list-style-type: none"><li>• ADF JSF</li><li>• Apache POI, fileupload, HttpComponents</li><li>• Axis (RPC), XMLRPC, RMI, Apache CXF, JMS (javax.jms)</li><li>• Direct Web Remoting (DWR)</li><li>• DropWizard</li><li>• Freemarker</li><li>• Glowroot*</li><li>• GSON, Kryo, minidev, org.json</li><li>• Google Web Toolkit (GWT)</li><li>• gRPC 1.4.x, 1.5.x, 1.6.x</li><li>• Hibernate 6.2 - 6.4</li><li>• http4k (4.6.0.0 and 4.17 for Contrast Assess)</li><li>• J2SE</li><li>• JDBC, JDBI, MongoDB</li><li>• JSF (MyFaces, RichFaces, Sun)</li><li>• java.nio, java.beans</li><li>• Java EE/J2EE, Servlet/JSP</li><li>• Jersey</li><li>• MyBatis</li><li>• OWASP ESAPI, AntiSamy, Coverity</li><li>• PrimeFaces</li><li>• Quarkus RESTeasy</li><li>• Seam</li><li>• Spring, Spring Boot, Spring AOP</li><li>• Spring Cloud</li><li>• Spring WebFlux 5 and 6</li><li>• Spring Web Services</li><li>• Struts, Struts 2</li><li>• Wicket</li><li>• XStream, Jackson (JSON/XML)</li><li>• Xerces, JAXB, nu.xom</li></ul> | <p>*If you are using Glowroot, the Contrast Java Agent jar should be included and loaded prior to the Glowroot jar.</p> <p><b>Route coverage support:</b></p> <ul style="list-style-type: none"><li>• http4k-core 4.17</li><li>• http4k-core 4.6</li><li>• Jersey server 2.25, 2.28, 2.36, 2.6</li><li>• Quarkus RESTeasy 2.15</li><li>• Spring Web MVC 4.2, 5.3, and 6.0</li><li>• Spring WebFlux 5 and 6</li><li>• Spring Web Services</li><li>• Struts 2</li></ul> |

## Kotlin

| Technology     | Supported versions    |
|----------------|-----------------------|
| Contrast agent | 3.9.1.25108 and later |
| Java Run Time  | JDK 8 and up          |
| Kotlin version | 1.5.x - 1.8.x         |

## Scala

| Technology     | Supported versions     |
|----------------|------------------------|
| Contrast agent | 3.8.11.23624 and later |
| Java Run Time  | JDK 8 and up           |
| Scala version  | 2.12, 2.13             |
| Play version   | 2.6, 2.7, 2.8          |
| Akka HTTP      | 10.2.4                 |

## WebSphere configuration

If you are using WebSphere as an application server, refer to the information in [Configure the Java agent for Websphere \(page 148\)](#) before you deploy the agent.

## Java installation and configuration with JAR files

Use this workflow with the Add New Java agent wizard to ensure you have all the steps covered for installing and configuring the Java agent with an executable JAR file. Using the wizard is the simplest way to deploy a new agent.

## Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- Your web application is packaged in a JAR file
- It must use [supported versions, frameworks, and tools \(page 55\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

## Start the Java agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **Java**.
4. Select the operating system you are using.

## Install the agent

1. Under Select application deployment method, select **Install manually**.
2. Under Select agent installation method, select any of these options:
  - **Direct download:** Use the curl command in the Java agent wizard to download the `contrast.jar` file and install the agent.
  - **Debian:** Follow the steps in the Java agent wizard to get the Debian repository packages and install the agent.
  - **RPM:** Follow the steps in the Java agent wizard to get the RPM repository packages and install the agent.

## Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. For agent versions 6.10.1 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.  
Copy the displayed code and set the variable in a location where the agent has access to it.

4. For agent versions earlier than 6.10.1, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
5. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.
6. Under **Select application server**, select **Executable Jar**.
7. Use the displayed command to load and run the agent based on where it's installed.  
Replace `<ApplicationJarPath>` with the path to your application. For example: `./MyApplication.jar`.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## Java installation and configuration to an application server

Use this workflow with the Add New Java agent wizard to ensure you have all the steps covered for installing and configuring the Java agent on an application server. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- Your web application is packaged in a JAR file
- It must use [supported versions, frameworks, and tools \(page 55\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

## Start the Java agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under **Select a language**, select **Java**.
4. Select the operating system you are using.

## Install the agent

1. Under **Select application deployment method**, select **Install manually**.
2. Under **Select agent installation method**, select **Direct download**.
3. Copy the displayed command to download the agent from Maven Central.

## Configure the agent

Under **Configure the agent**, select the best options to get the configuration details that the agent needs to communicate with Contrast:

**NOTE**

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. For agent versions 6.10.1 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.  
Copy the displayed code and set the variable in a location where the agent has access to it.
4. For agent versions earlier than 6.10.1, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
5. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.
6. Under Select application server, select one of these application server options:
  - [JBoss/Wildfly \(page 144\)](#)
  - [Jetty \(page 145\)](#)
  - [Tomcat \(page 146\)](#)
  - [Weblogic \(page 147\)](#)
  - [Websphere \(page 148\)](#)
  - [Axis2](#)
  - [Glassfish](#)
7. Under Configure application server, copy the displayed commands to complete the configuration.

**Verify the agent deployment**

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

**Java installation and configuration with build automation tool integrations**

Use this workflow to ensure you have all the steps covered for installing and configuring the Java agent with build automation tools.

**Before you begin**

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.

- Your web application is packaged in a JAR file
- It must use [supported versions, frameworks, and tools \(page 55\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

## Steps

1. **Set up variables.** Configure agent authentication configuration variables.
  - Set the minimum configuration values defined [here \(page 107\)](#)
  - Configure additional values (application metadata, session metadata)
2. **Continue with the plugin type.** Install and configure based on your plugin type.
  - [Maven \(page 1384\)](#). Remember to set the [usage goals](#).
  - [Gradle \(page 1364\)](#)
  - [Bamboo \(page 1354\)](#). Remember to configure the [vulnerability thresholds \(page 1354\)](#).
  - [Azure pipelines \(page 1349\)](#). Remember to [add a release gate to a pipeline \(page 1351\)](#).
  - [VMware Tanzu \(page 136\)](#)
3. **Verify.** To verify that Contrast is working, use your application as you usually would. For example, click on your application's web interface, or send some API commands.  
Then in the Contrast web interface, select **Applications** in the header. You should see the name of your application.  
You can also select **Server** in the header and you should see the hostname of your (local) server.

## Java installation and configuration in a container

Use this workflow with the Add New Java agent wizard to ensure you have all the steps covered for installing and configuring the Java agent with in a container. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- Your web application is packaged in a JAR file
- It must use [supported versions, frameworks, and tools \(page 55\)](#) or [supported technologies \(page 593\)](#) for the agent operator
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

### Start the Java agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **Java**.
4. Select the operating system you are using.

### Select method to deploy with containers

1. Under Select application deployment method, select **Install with a container**.
2. Under Select method to deploy with containers, select **Dockerfile** or **Kubernetes** (Linux or OS X only).  
If you want to use Openshift, use [these instructions](#).



## Dockerfile: Build image with the agent

1. Under Build image with agent, copy the displayed command and add it to your Dockerfile.
2. Copy the displayed command to build the image.

## Dockerfile: Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. For agent versions 6.10.1 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.  
Copy the displayed code and set the variable in a location where the agent has access to it.
4. For agent versions earlier than 6.10.1, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
5. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.

## Kubernetes: (Linux and OS X only)

1. Under Select method to configure agent operator, select **Helm** (recommended) or **Manifest**.
2. **For Helm:**
  1. Under Download and set up files, copy the displayed commands to create a values files.
  2. Under Label the deployments, use the displayed commands to label your deployments.
  3. Under Install and deploy Helm chart, copy the displayed commands to complete the configuration.
3. **For Manifest:**
  1. Under Install operator, copy the displayed commands to install the Contrast agent operator.
  2. Under Configure operator, copy the displayed commands to configure the Contrast agent operator.
  3. Under Inject workloads, copy the displayed commands to configure an AgentInjector entity.
  4. Optionally, under Configure cluster agent and cluster, copy the displayed commands to configure these entities.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## Java installation and configuration with build pipelines

Use this workflow with the Add New Java agent wizard to ensure you have all the steps covered for installing and configuring the Java agent with build pipelines. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- Your web application is packaged in a JAR file
- It must use [supported versions, frameworks, and tools \(page 55\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

### Start the Java agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **Java**.
4. Select the operating system you are using.

### Install the agent

1. Under Select application deployment method, select **Install with a pipeline**.
2. Under Select method to deploy pipelines, select **Github** or **Bitbucket**.
3. Under Install Agent, copy the displayed commands to install the agent.

### Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



#### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.

When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.

3. Select **Use Connection Token**.

This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.

Copy the displayed code and set the variable in a location where the agent has access to it.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## .NET Framework installation and configuration workflows

Follow these workflows to make sure you have covered the steps for installing and configuring the .NET Framework agent.

- [.NET Framework with an installer \(page 65\)](#)
- [.NET Framework with Azure App Service \(page 66\)](#)
- [.NET Framework in a container \(page 67\)](#)
- [.NET Framework in a pipeline \(page 69\)](#)
- [.NET Framework with an infrastructure as code tool \(Ansible playbook\) \(page 585\)](#)

## Advanced topics

- [.NET Framework advanced installation \(page 213\)](#)
- [.NET Framework advanced configuration \(page 230\)](#)

## Supported technologies for the .NET Framework agent

The Contrast .NET agent supports analysis of web applications built on the following technologies.

| Technology                        | Supported versions  | Notes   |
|-----------------------------------|---|---|
| <b>.NET Framework for Windows</b> |   |   |
| Application runtime version       | 4.5 and later   | Most users are able to use the modern .NET Framework agent, even if their application targets an older version of .NET 4, due to .NET framework application compatibility.<br><br><b>Not supported:</b> <ul style="list-style-type: none"><li>• Classic ASP<br/>Classic ASP applications don't run on the .NET runtime.</li><li>• Mono runtime<br/>The agent uses the CLR Profiling API to instrument applications. The CLR Profiling API is a Component Object Model (COM)-based interface exposed by the CLR. Linux does not support COM. Therefore Mono does not support the CLR Profiling API and Contrast cannot support Mono.</li></ul> |
| Server runtime version            | 4.7.1, 4.7.2, 4.8   |   |
| CLR                               | CLR4  |   |
| Web servers                       | <ul style="list-style-type: none"><li>• IIS</li><li>• IIS Express</li></ul> |   |

| Technology             | Supported versions  | Notes   |
|------------------------|---|---|
| Application frameworks | <ul style="list-style-type: none"><li>ASP.NET MVC 3-5</li><li>ASP.NET Web Forms</li><li>ASP.NET Web Pages</li><li>IIS-Hosted ASMX-based Web Services</li><li>IIS-Hosted Web API</li><li>IIS-Hosted WCF Services</li><li>OWIN Hosted Web API (via a Windows service or a command line application)</li></ul> | <p>These frameworks are explicitly tested, however, you may still be able to analyze other applications if the framework simply wraps the typical ASP.NET classes (for example, System.Web.HttpRequest).</p> <p>Not supported:</p> <ul style="list-style-type: none"><li>Analysis of .NET Framework ASP.NET Core applications (use our <a href="#">.NET Core agent (page 270)</a> to analyze .NET Core applications).</li><li>Applications running under partial trust.</li></ul> |



## NOTE

- For Azure App Service, .NET Framework applications must use the .NET Framework [site extension](#) or [NuGet package](#).
- .NET Core applications must use the .NET Core-specific [site extension](#) or [NuGet package](#).

## System requirements for .NET Framework agent

Before installing the .NET Framework agent, you must meet the following requirements:

- You have administrative access to a web server, and the server is supported by Contrast.
- There is a deployed application to be analyzed, and the web application technology is supported by Contrast.
- IIS can be restarted.
- The web server has network connectivity with Contrast.
- The server meets the minimum requirements.

| Requirements           | Recommended   | Notes   |
|------------------------|---|---|
| Server runtime version | 4.7.1 or later  | While .NET 4.7.1 or later is required to install the .NET Framework agent, the agent can analyze applications that target .NET 4.5 and later due to .NET Framework application compatibility. |
| Operating system       | <ul style="list-style-type: none"><li>Windows 10</li><li>Windows Server 2012, 2012 R2, 2016, 2019, 2022</li><li>Azure Virtual Machines, Cloud Services, Mobile Services</li><li>Azure App Service</li></ul> |   |
| Processor architecture | <ul style="list-style-type: none"><li>32-bit</li><li>64-bit</li></ul>   | On 64-bit systems, you can use the agent to analyze both 32-bit and 64-bit web applications.  |
| CPU                    | At least 4  | Minimum: 2  |

| Requirements | Recommended  | Notes   |
|--------------|--|---|
| Memory       | At least 8 GB<br><br>The .NET agent roughly doubles the memory requirements of analyzed applications. Applications should use less than half of the available memory when the .NET agent is not installed. | Minimum: 4 GB   |
| Server       | <ul style="list-style-type: none"><li>.NET Framework 4.7.1</li><li>CLR 4 (.NET 4.0 and later).</li></ul>   | For servers on earlier versions use the <a href="#">Legacy .Net Framework agent</a> . |



## NOTE

- The .NET Framework agent uses the CLR Profiling API to perform data and code flow analysis (for example, detect SQL-injection, XSS, weak cryptography) as well as to detect libraries and technologies used by analyzed applications.
- The Contrast agent can [exist alongside other .NET Profiler agents \(page 265\)](#), such as performance or APM tools with the `agent.dotnet.enable_chaining` configuration setting enabled.
- For servers on earlier versions use the [Legacy .NET Framework agent](#).

## .NET Framework installation and configuration with an installer

Use this workflow with the Add New .NET Framework agent wizard to ensure you have all the steps covered for installing and configuring the .NET Framework agent with an installer. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported technologies \(page 63\)](#) and [system requirements \(page 64\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

### Start the .NET Framework agent wizard

- Select **Add New** at the top of the Contrast web interface.
- Select the **Application** card.
- Under Select a language, select **.NET Framework**.
- Select the operating system you are using.

### Download the installer

Under Download the installer, copy the displayed shell commands and run them.

### Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:

**NOTE**

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. For agent versions 51.0.40 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.  
Copy the displayed code and set the variable in a location where the agent has access to it.
4. For agent versions earlier than 51.0.40, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
5. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.

**Run the installer**

1. Extract the downloaded ZIP archive on the web server.
2. Run `ContrastSetup.exe` from the content directory located in the extracted directory.

**Verify the agent deployment**

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

**.NET Framework installation and configuration with Azure App Service**

Use this workflow with the Add New .NET Framework agent wizard to ensure you have all the steps covered for installing and configuring the .NET Framework agent with a the Azure App Service. Using the wizard is the simplest way to deploy a new agent.

**Before you begin**

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported versions, frameworks, and tools \(page 55\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

## Start the .NET Framework agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **.NET Framework**.
4. Select the operating system you are using.

## Select an application

Locate an ASP.NET Framework web application where you can add the Contrast extension.

If you do not have a web app, create an application hosted on Azure App Service. Then, publish your application to Azure and confirm that it works as expected without Contrast.

## Configure application settings

Configure the displayed settings to let the agent connect to Contrast. Add the displayed values in the Application Settings section of the Environment variables blade for your application.

## Add extension for the application

1. In the [Azure Portal](#), select your hosted application.
2. Select **Extensions**.
3. Select **Add**.
4. Select **Contrast .NET Framework Site Extension for Azure App Service**.
5. Select **OK** and agree to the Terms and Conditions.
6. Wait a few seconds and confirm the site extension is correctly installed.
7. Go back to the application overview and **Restart** the application.
8. Go to the application, and confirm the application is reporting to Contrast.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## .NET Framework installation and configuration in a container

Use this workflow with the Add New .NET Framework agent wizard to ensure you have all the steps covered for installing and configuring the .NET Framework agent in a container. Using the wizard is the simplest way to deploy a new agent.

## Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported technologies \(page 63\)](#) and [system requirements \(page 64\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

## Start the .NET Framework agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **.NET Framework**.
4. Select the operating system you are using.

## Install the image with the agent

1. Under Select application deployment method, select **Install with a container**.
2. Under Select method to deploy with containers, select **Dockerfile**.
3. Under Build image with agent, copy the displayed commands and add them to your Dockerfile.
4. Under Build image with agent, copy the displayed command to build the image.

## Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. For agent versions 51.0.40 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.  
Copy the displayed code and set the variable in a location where the agent has access to it.
4. For agent versions earlier than 51.0.40, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
5. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.

## Add Contrast configuration to the image

Under Add Contrast configuration to the image, add the displayed command to your Docker file to download the agent configuration (YAML) file to the same location as your Dockerfile.

## Run your container

Copy the displayed command to run your container.



## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## .NET Framework installation and configuration workflow with pipelines

Use this workflow with the Add New .NET Framework agent wizard to ensure you have all the steps covered for installing and configuring the .NET Framework agent in a pipeline. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported versions, frameworks, and tools \(page 94\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

### Start the .NET Framework agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **.NET Framework**.
4. Select the operating system you are using.

### Install the agent

1. Under Select a method to deploy an agent, select **Install with a pipeline**.
2. Under Select method to deploy with pipelines, select **GitHub** or **Bitbucket**.
3. Under Install agent, copy the displayed commands to add a step to a GitHub action or a Bitbucket pipeline.
4. Under Install an agent, copy the displayed commands to add the step running the application.

### Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



#### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. For agent versions 51.0.40 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.  
Copy the displayed code and set the variable in a location where the agent has access to it.
4. For agent versions earlier than 51.0.40, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
5. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## .NET Core installation and configuration workflows

Follow these workflows to make sure you have covered the steps for installing and configuring the .NET Core agent.

- [.NET Core basic install \(page 72\)](#)
- [.NET Core with an installer \(page 74\)](#)
- [.NET Core with Azure App Service \(page 75\)](#)
- [.NET Core in a container \(page 76\)](#)
- [.NET Core in a pipeline \(page 78\)](#)
- [.NET Core with an infrastructure as code tool \(Ansible playbook\) \(page 585\)](#)

## Advanced topics

- [.NET Core advanced installation \(page 270\)](#)
- [.NET Core advanced configuration \(page 297\)](#)

## .NET Core supported technologies

We support the following technologies for this agent.

| Technology                                   | Supported versions  | Notes   |
|--|---|---|
| Application frameworks                       | <ul style="list-style-type: none"> <li>ASP.NET Core (3.1.X, 5.0.X, 6.0.X, 7.0.X, 8.0X)</li> <li>Model-View-Controller (MVC)</li> <li>Razor Pages</li> <li><a href="#">Grpc.AspNetCore</a></li> <li><a href="#">Blazor</a> (6.0.X, 7.0.X, 8.0X)</li> <li><a href="#">Blazor Server</a> (Server-Side) only, <a href="#">Blazor WebAssembly</a> is not supported</li> <li><a href="#">SignalR</a> (6.0.X, 7.0.X, 8.0X) <ul style="list-style-type: none"> <li>Transport protocols: WebSockets, Server-Sent Events, and Long Polling</li> </ul> </li> </ul> | <p><b>Limited support</b></p> <p>ASP .NET Core 3.1.X and 5.0.X</p> <p><b>Not supported:</b></p> <ul style="list-style-type: none"> <li>.NET Core or ASP.NET Core version 2.1 or below</li> <li>ASP.NET Core applications running under the .NET Framework (Windows) or Mono (Linux/Windows)</li> <li><a href="#">Grpc.Core</a><br/>The future of gRPC in C# belongs to <a href="#">grpc-dotnet</a> contains additional details.</li> </ul>  |
| Runtime                                      | <ul style="list-style-type: none"> <li>.NET Core Runtimes: 3.1.X, 5.0.X, 6.0.X, 7.0.X, 8.0X, 9.0.X</li> <li>.NET Core target framework monikers: <ul style="list-style-type: none"> <li>netcoreapp3.1</li> <li>net5.0</li> <li>net6.0</li> <li>net7.0</li> <li>net8.0</li> <li>net9.0</li> </ul> </li> </ul>  | <p><b>Limited support:</b></p> <p>.NET Core Runtimes 3.1.x and 5.0.X</p> <p><b>Not supported:</b></p> <ul style="list-style-type: none"> <li>Running with an ASP.NET Core application that's a higher version than the runtime (for example, an application with the .NET Core 3.1 runtime that references ASP.NET Core 5.0)</li> <li>Running with a .NET Core application for which the referenced ASP.NET Core version and the target runtime selected during compilation time don't match</li> </ul> |
| <b>.NET Core for Windows</b>                 |   |   |
| Windows operating systems                    | <ul style="list-style-type: none"> <li>Windows Server (LTSC) (x86, x64): 2012 R2, 2016, 2019, 2022</li> <li>Windows Server (SAC) (x64): 1809, 1903</li> <li>Windows workstation (x86, x64): 7, 8/8.1, 10</li> </ul>   | <p>On 64-bit systems, you can use the agent to analyze both 32-bit and 64-bit web applications.</p> <p><b>Not supported:</b></p> <ul style="list-style-type: none"> <li>Windows on ARM</li> </ul>   |
| Server container                             | Kestrel, IISHttpServer  | <p><b>Not supported:</b></p> <p>Http.sys (formerly called WebListener)</p>  |
| Hosting container                            | Self-hosted, IIS, IIS Express   |   |
| <b>.NET Core for Linux operating systems</b> |   |   |
| Linux operating systems                      | <ul style="list-style-type: none"> <li>Ubuntu: 18.04 and later (x64, ARM64)</li> <li>Debian: 10 and later (x64, ARM64)</li> <li>openSUSE: 15 and later (x64)</li> <li>Alpine: 3.13 and later (x64, ARM64)</li> <li>CentOS Stream 8 and later (x64)</li> <li>Red Hat Enterprise Linux: 7 and later (x64)</li> </ul>  | <p><b>Not supported:</b> Red Hat Enterprise Linux 6</p>   |
| Server container                             | Kestrel   |   |
| Hosting container                            | Self-hosted   |   |



## IMPORTANT

- .NET Core 2.2 is not supported after the .NET core agent version 1.5.20. If you are using .NET Core 2.2, you'll need to use .NET Core agent version 1.5.20 or lower until you can upgrade your application's .NET Core runtime.
- As of .NET core agent version 1.9.9, we no longer support .NET Core 2.1. If you are using .NET Core 2.1, you'll need to use .NET Core agent version 1.9.9 or lower until you can upgrade your application's .NET Core runtime.
- Microsoft support for .NET 5.0 ended on May 10th, 2022 and support for .NET Core 3.1 ended on December 13th, 2022. Contrast support for .NET 5.0 and .NET Core 3.1 entered limited support with .NET Core agent version 3.0.0. Under limited support, Contrast will only solve problems that can be reproduced under supported language versions. Contrast strongly recommends that you upgrade your applications to a supported version of .NET.



## NOTE

The .NET Core agent does not support applications that do not reference `System.Runtime` and ASPNET Core. The agent also does not support [trimmed self-contained deployments and executables](#), because the compiler can potentially trim assemblies that the agent depends on.

## .NET system requirements

Before installing the .NET agent, confirm you can meet the following requirements:

- You have administrative access to a server, and the [server is supported by Contrast \(page 70\)](#).
- There is a deployed application to be analyzed, and the [web application technology is supported \(page 70\)](#) by Contrast.
- The web server has network connectivity with Contrast.
- The server meets the minimum requirements (stated below).

| Requirement            | Recommended   | Minimum | Notes   |
|------------------------|---|---------|---|
| CPU                    | at least 4  | 2       |   |
| Memory                 | at least 8 GB   | 4 GB    | Agents running in Assess roughly double the memory requirements of analyzed applications. Applications should use less than half of the available memory when an agent isn't installed. |
| Operating system       | <ul style="list-style-type: none"><li>• Windows</li><li>• Linux</li></ul>   |         | macOS is not supported.   |
| Processor architecture | <ul style="list-style-type: none"><li>• 32-bit x86 processors</li><li>• 64-bit x86 processors</li><li>• 64-bit ARM processors</li></ul> |         | Windows on ARM processors is not supported.   |

## .NET Core basic installation and configuration

Use this workflow with the Add New .NET Core agent wizard to ensure you have all the steps covered for installing and configuring the .NET Core agent with a basic installation. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported technologies \(page 70\)](#) and [system requirements \(page 72\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

## Start the .NET Core agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **.NET Core**.
4. Select the operating system you are using.

## Install the agent

1. Under Select application deployment method, select **Install manually**.
2. Under Install agent, copy the displayed commands to complete the installation.

## Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. For agent versions 4.2.22 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.  
Copy the displayed code and set the variable in a location where the agent has access to it.
4. For agent versions earlier than 4.2.22, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
5. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.

## Set environment variables

Under Set environment variables, set the displayed environment values for your application's process.

## Run Contrast with your application

Under Run Contrast, copy the displayed command to run your application.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## .NET Core installation and configuration with an installer

Use this workflow with the Add New .NET Core agent wizard to ensure you have all the steps covered for installing and configuring the .NET Core agent with an installer. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported technologies \(page 70\)](#) and [system requirements \(page 72\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

### Start the .NET Core agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **.NET Core**.
4. Select the **Windows** operating system.

### Download the installer

1. Under Select application deployment method, select **Install with Contrast Windows installer**.
2. Under Download the installer, copy the displayed commands to download the Contrast Windows installer.

### Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



#### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. For agent versions 4.2.22 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.  
Copy the displayed code and set the variable in a location where the agent has access to it.
4. For agent versions earlier than 4.2.22, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
5. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.

## Run the installer

1. Extract the downloaded ZIP archive on the web server.
2. Under Run installer, use the displayed command to run `contrast-dotnet-core-agent-for-iis-installer.exe` from the content directory located in the extracted directory.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## .NET Core installation and configuration with Azure App Service

Use this workflow with the Add New .NET Core agent wizard to ensure you have all the steps covered for installing and configuring the .NET Core agent with the Azure App Service. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported technologies \(page 70\)](#) and [system requirements \(page 72\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

## Start the .NET Core agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **.NET Core**.
4. Select **Windows** for operating system.

## Install the agent

1. Under Select application deployment method, select **Install with Azure**.
2. Locate an ASP.NET Core web app where you can add the Contrast extension.  
If you do not have a web app, [create an application](#) hosted on Azure App Service. Then publish your application to Azure, and confirm that it works as expected without Contrast.

## Configure application settings

Under Configure application settings, use the displayed values to configure settings that allow the agent to connect to Contrast. Add these values in the Application Settings section of the Environment variables blade for your application.

## Add an extension for the application

1. Go to the [Azure Portal](#).
2. Select your hosted application.
3. Select **Extensions**.
4. Select **Add**.
5. Select **Contrast .NET Core Site Extension for Azure App Service** (this is the extension for .NET Core applications).
6. Select **OK** and agree to the terms and conditions.
7. Wait a few seconds and confirm the site extension installed correctly.
8. Go back to the application overview and **Restart** the application.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## .NET Core installation and configuration in a container

Use this workflow with the Add New .NET Core agent wizard to ensure you have all the steps covered for installing and configuring the .NET Core agent with a container. Using the wizard is the simplest way to deploy a new agent.

## Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported technologies \(page 70\)](#) and [system requirements \(page 72\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

## Start the .NET Core agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **.NET Core**.



4. Select the operating system you are using.

### Select method to deploy with containers

1. Under Select application deployment method, select **Install in a container**.
2. Under Select method, to deploy containers, select **Dockerfile** or **Kubernetes** (Linux only).

### Dockerfile: Build image with agent

1. Under Build image with agent, copy the displayed commands and add them to your Dockerfile.
2. Use the displayed command to build the image.

### Dockerfile: Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



#### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. For agent versions 4.2.22 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.  
Copy the displayed code and set the variable in a location where the agent has access to it.
4. For agent versions earlier than 4.2.22, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
5. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.

### Dockerfile: Add Contrast configuration to image

Under Add Contrast configuration to image, add the displayed command to your Dockerfile.

This command downloads the agent the configuration (YAML) file to the same location as your Dockerfile. Use this file to configure settings that you want to use across all instances of the application

### Dockerfile: Run your container

Under Run your container, copy the displayed command to run the container.

## Kubernetes: (Linux only)

1. Under Select method to configure agent operator, select **Helm** (recommended) or **Manifest**.
2. **For Helm:**
  1. Under Download and set up files, copy the displayed commands to create a values files.
  2. Under Label the deployments, use the displayed commands to label your deployments.
  3. Under Install and deploy Helm chart, copy the displayed commands to complete the configuration.
3. **For Manifest:**
  1. Under Install operator, copy the displayed commands to install the Contrast agent operator.
  2. Under Configure operator, copy the displayed commands to configure the Contrast agent operator.
  3. Under Inject workloads, copy the displayed commands to configure an AgentInjector entity.
  4. Optionally, under Configure cluster agent and cluster, copy the displayed commands to configure these entities.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## .NET Core installation and configuration in a pipeline

Use this workflow with the Add New .NET Core agent wizard to ensure you have all the steps covered for installing and configuring the .NET Core agent in a pipeline. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported technologies \(page 70\)](#) and [system requirements \(page 72\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

### Start the .NET Core agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **.NET Core**.
4. Select the operating system you are using.

### Install the agent

1. Under Select method to deploy with pipelines select **GitHub** or **Bitbucket**.
2. Under Install the agent, copy the displayed commands to add a step to your GitHub action or your Bitbucket pipeline.

3. Under Install the agent, copy the displayed command to add variables to the step running your application

## Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. Select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.  
Copy the displayed code and set the variable in a location where the agent has access to it.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## Node.js installation and configuration workflows

Follow these workflows to make sure you have covered the steps for installing and configuring the Node.js agent.

- [Node.js basic install \(page 83\)](#)
- [Node.js in a container \(page 85\)](#)
- [Node.js with a pipeline \(page 87\)](#)
- [Node.js with Cloud deployment integrations \(page 88\)](#)

## Advanced topics

For additional installation and configuration details, visit these topics:

- [Advanced installation \(page 336\)](#)
- [Advanced configuration \(page 357\)](#)
- [Ansible playbook for Contrast \(page 585\)](#)

## Supported technologies for Node.js

This page reflects the supported technologies and capabilities of the latest version available on [npmjs.com](https://npmjs.com) unless otherwise specified in the notes.



### NOTE

The Contrast Node.js agent may not function with versions of modules tagged as deprecated on npmjs.com. Deprecated modules present a high security risk and may negatively impact the agent's function.

It also does not support applications that use bundlers like `webpack`, `parcel`, or `esbuild` to package or compress the server-side JavaScript code.

| Technology   | Supported versions  | Notes   |
|--|---|---|
| Language versions                                    | <ul style="list-style-type: none"> <li>JavaScript ECMAScript 5</li> <li>JavaScript ECMAScript 6</li> <li>ECMAScript modules (ESM)</li> <li>TypeScript</li> </ul>  | <p>Contrast supports even numbered Node.js versions in "active LTS" or "maintenance" status.</p> <p>The Node.js LTS versions support <a href="#">these features for JavaScript ECMAScript5 and 6</a>.</p> <p>TypeScript is only supported if the agent is configured to point to the compiled entry point for your application.</p> |
| System   | <ul style="list-style-type: none"> <li>Node.js LTS version 16, 18, 20, 22</li> <li>Processor support - Apple M1/M2, Intel/AMD (AMD64)</li> <li>Operating System Support - Windows Server, Windows 10/11, MacOS, Linux (Debian, CentOS, etc)</li> <li>PM2</li> <li><a href="#">System requirements for the Node.js agent (page 83)</a></li> </ul>  | <p>The 5.X version of the Node.js agent is the only version that supports Node.js LTS 22.</p>   |
| NPM version  | <ul style="list-style-type: none"> <li>&gt;= 8.5.5</li> </ul>   |   |
| Application frameworks                               | <ul style="list-style-type: none"> <li><a href="#">Express</a> 4, 5</li> <li><a href="#">Fastify</a> 3, 4, 5</li> <li><a href="#">Hapi</a> 19, 20, 21</li> <li><a href="#">Koa</a> 2.3 and later</li> <li><a href="#">Restify</a> 8, 9, 10, 11</li> </ul>   |   |
| Database drivers and object-relational mapping (ORM) | <ul style="list-style-type: none"> <li><a href="#">MarsDB</a>. No longer maintained but required by the JuiceShop vulnerable app.</li> <li><a href="#">Mongoose</a> 6.X, 7.X, 8.X</li> <li><a href="#">MongoDB</a> 2.2.36, 3.3.0 and later, 4.X, 5.X. Compatible with database versions 4.X, 5.X, 6.X.</li> <li><a href="#">MySQL2</a> 2.0.0 and later. Compatible with MySQL database versions 5.6.51, 5.7.X and 8.0.X.</li> <li><a href="#">MSSQL</a> 6.4.0 and later</li> <li><a href="#">Postgres driver</a> 7.5.0 and later; 8.X</li> <li><a href="#">Sequelize</a> 5.X (this is deprecated by the maintainer); 6.X</li> <li><a href="#">SQLite3 driver</a> 4.X. Compatible with database versions 3.26.0 and later. This is mainly for JuiceShop and demo apps, SQLite is not a "production" database.</li> </ul> | <ul style="list-style-type: none"> <li>MongoDB 2.2.36 is only supported because it is required by the NodeGoat vulnerable application.</li> <li>SQLite and MarsDB are not for use in production and are only supported to enable running and testing with the JuiceShop vulnerable application.</li> </ul>                          |

| Technology                    | Supported versions   | Notes |
|-------------------------------|--|-------|
| Validation packages/libraries | <ul style="list-style-type: none"> <li>• <a href="#">Class-validator</a> 0.13.0 and later</li> <li>• <a href="#">Joi</a> 17 and later</li> <li>• <a href="#">Validator</a> 13 and later</li> </ul> |       |
| Templating engines            | <ul style="list-style-type: none"> <li>• <a href="#">Pug</a> 3</li> <li>• <a href="#">EJS</a> 3.X</li> </ul>   |       |
| Other packages/libraries      | <ul style="list-style-type: none"> <li>• <a href="#">Express-session</a> 1.15.6 , 1.16.0 and later</li> </ul>  |       |
| Other Node.js technologies    | <ul style="list-style-type: none"> <li>• HTTP/2</li> <li>• GraphQL</li> </ul>  |       |

## Supported technologies for v4 Node.js (Legacy)



### NOTE

The Contrast Node.js agent may not function with versions of modules tagged as deprecated on npmjs.com. Deprecated modules present a high security risk and may negatively impact the function of the agent.

It also does not support applications that use bundlers like `webpack`, `parcel`, or `esbuild` to package or compress the server-side JavaScript code.

| Language version   |  |
|--|--|
| <ul style="list-style-type: none"> <li>• JavaScript ECMAScript 5</li> <li>• JavaScript ECMAScript 6</li> <li>• ECMAScript modules (ESM)</li> <li>• TypeScript</li> </ul>   | <p><b>Notes</b></p> <p>Contrast supports even numbered Node.js versions in "active LTS" or "maintenance" status.</p> <p>The Node.js LTS versions support <a href="#">these features for JavaScript ECMAScript5 and 6</a>.</p> <p>The Contrast Node.js agent provides limited support for working with user apps that use ESM.</p> <p>TypeScript is only supported if the agent is configured to point to the compiled entry point for your application.</p>  |
| Node.js Long-Term Support (LTS)  |  |
| <p>All versions in Active and Maintenance LTS status, currently:</p> <ul style="list-style-type: none"> <li>• 12* and 14*</li> <li>• 16* (only for agent version 4.5.0 and later)</li> <li>• 18 (only for agent version 4.25.0 and later)</li> </ul> | <p><b>Notes</b></p> <p>You should always use Node.js LTS versions that are active or in maintenance status.</p> <p>*Although the Contrast agent should function when running 12 LTS, 14 LTS, or 16 LTS they reached EOL at the end of April 2022, April 2023 and September 11, 2023, respectively. These EOL versions present serious security risks since they are no longer patched.</p> <p>The Node.js agent doesn't guarantee support for Node.js features classified as Experimental (Stability: 1). It also doesn't instrument the native <code>net</code> module. It only provides functionality for <code>HTTP(S)</code> application servers built using the supported application frameworks in this table.</p> <p>HTTP/2 is supported for the Node.js agent when using the Node.js core HTTP/2 or <code>spdy</code> library.</p> <p>For customer applications using HTTP/2 with Contrast Node.js agent, you must configure the agent to use <code>assess.enable_lazy_tracking: false</code>.</p> <p>Node.js version status is shown in <a href="#">Node.js Long-Term Support Release Schedule</a>.</p> |

|   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• 20 (only for agent version 4.33.0 and later)</li> </ul>  | <p>The agent does not support the feature that allows applications to run with the <code>--experimental-permission</code> flag and with <b>reduced permissions</b>. Reduced permissions inactivate native modules, and if the agent is instrumented with reduced permissions, it will immediately crash.</p>   |
| <b>Node package manager (npm)</b>   |  |
| <p>npm versions:</p> <ul style="list-style-type: none"> <li>• <code>&gt;=6.13.7</code></li> <li>• <code>&gt;=7.11.0</code></li> <li>• <code>&gt;= 8.5.5</code></li> </ul>   | <p>The Node.js agent requires access to one of these npm versions to reliably report libraries to the Contrast UI. Versions 6 or 8 are preferred over version 7.</p>   |
| <b>Application frameworks</b>   |  |
| <ul style="list-style-type: none"> <li>• <b>Express</b> 4</li> <li>• <b>hapi</b> 16*, 17*, 18*, 19*, 20</li> <li>• <b>Fastify</b> 3</li> <li>• <b>Koa</b> 2.3 and later</li> <li>• <b>Kraken</b> 2.2.0 and 2.3.0</li> <li>• <b>LoopBack</b> 3*, 4</li> <li>• <b>Restify</b> 8</li> <li>• <b>Sails</b> 1.2.3 and later</li> </ul>  | <p><b>Notes</b></p> <p>*Deprecated by the maintainer, these libraries could present a security risk.</p>   |
| <b>Database drivers and object-relational mapping (ORM)</b>   |  |
| <ul style="list-style-type: none"> <li>• <b>DynamoDB</b> (Assess only) AWS SDK for JavaScript: 2.X and 3.X</li> <li>• <b>MongoDB</b> 2.2.36*, 3.3.0 and later, 4.X. Compatible with database versions 3.6, 4.X, 5.X)</li> <li>• <b>MySQL2</b> 2.0.0 and later. Compatible with MySQL database versions 5.6.51, 5.7.X and 8.0.X.</li> <li>• <b>Mongoose</b> 5.X, 6.X</li> <li>• <b>MSSQL</b> 6.4.0 and later</li> <li>• <b>Postgres driver</b> 7.5.0 and later, 8.X</li> <li>• <b>RethinkDB</b> driver version 2.4.0 and later</li> <li>• <b>Sequelize</b> 5.X and 6.X</li> <li>• <b>SQLite3 driver</b> 4.X. Compatible with database versions 3.26.0 and later).</li> </ul> | <p><b>Notes</b></p> <p>*Deprecated by the maintainer, the agent will still function but these libraries/versions present a security risk.</p>  |
| <b>Validation modules</b>   |  |
| <ul style="list-style-type: none"> <li>• <b>Joi</b> 17 and later</li> <li>• <b>Validator</b> 13 and later</li> <li>• <b>Class-validator</b> 0.13.0 and later</li> </ul>   |  |
| <b>Templating engines</b>   |  |
| <ul style="list-style-type: none"> <li>• <b>Handlebars</b> 4</li> <li>• <b>Pug</b> 3</li> <li>• <b>EJS</b> 2.6.2, 3.0.1</li> <li>• <b>Mustache</b> 4.x and later</li> </ul>   |  |
| <b>Other technologies</b>   |  |
| <ul style="list-style-type: none"> <li>• <b>Express-session</b> 1.15.6 , 1.16.0 and later</li> </ul>  |  |
| <b>Test suite</b>   |  |
| <p><b>Node Test Benches</b></p>   | <p>When changes are made to the Node.js agent, Contrast runs this battery of automated tests to ensure that it detects findings in supported technologies across all supported versions of Node. The Node Test Benches include tests that exercise the agent with all of our supported frameworks. Each framework within the monorepo is updated as Contrast adds more third-party library support to the agent.</p> |

## System requirements for the Node.js agent



### IMPORTANT

The Node.js agent now has limited support for running on Macs with the M1/M2 chip. One limitation is the Node.js agent does not yet support running Alpine based docker containers on the Apple M1/M2 (ARM64). Running Slim based Docker images is supported.

This page reflects the system requirements and capabilities of the latest version available on [npmjs.com](https://www.npmjs.com) unless otherwise specified in the notes.

Before installing the Node.js agent confirm you can meet the following requirements:

- There is a deployed application with a `package.json` file to be analyzed, and the web application technology is supported by Contrast.
- The agent has network connectivity with the Contrast server.

Using the Node.js agent requires increasing the application's available CPU and memory due to the increased processing and analysis of inbound information. Using the Node.js agent will use more resources than your application on its own. CPU load will also increase but this is heavily influenced by the specific application architecture and existing CPU usage profile.

If you are using Assess, you should double the available memory in each container compared to what you would normally use without the Contrast Node.js agent.

| Requirement      | Recommended  | Notes   |
|------------------|--|---|
| CPU              | <ul style="list-style-type: none"><li>• AMD 64, x86_64 and compatible</li><li>• Apple M1/M2 ARM64 (limited support)</li></ul>  |   |
| Operating system | <ul style="list-style-type: none"><li>• CentOS/RHEL 7.9, 8 and later</li><li>• Ubuntu 14.04 LTS, 16.04 LTS, 18.04 LTS, 20.04 LTS, 22.04 LTS</li><li>• Debian 9, 10, 11</li><li>• Windows</li><li>• macOS</li></ul> |   |
| Process managers | <ul style="list-style-type: none"><li>• PM2: 4.5.0 and later and 5.1.0 and later</li></ul>   | <ul style="list-style-type: none"><li>• The Contrast Node.js agent supports running in both fork and cluster mode.</li><li>• The start command used when running the Contrast Node.js agent must include the full path to the installed <code>@contrast/agent</code> module. For example:<pre>node --import /Users/michael/Dev/my-app/node_modules/@contrast/agent app.js</pre></li></ul> |
| Containers       | <ul style="list-style-type: none"><li>• Distroless containers</li></ul>  | <ul style="list-style-type: none"><li>• Distroless container images do not include a shell which allows executing operating system commands. The latest Contrast Node.js agent (5.19.0 or later) reports libraries and findings even when you install it in an application that runs in a distroless container image.</li></ul>   |

## Node.js basic installation and configuration

Use this workflow with the Add New Node.js agent wizard to ensure you have all the steps covered for installing and configuring the Node.js with the basic installation. Using the wizard is the simplest way to deploy a new agent.

## Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported technologies \(page 81\)](#) and [system requirements \(page 83\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

## Start the Node.js agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **Node**.
4. Select the operating system you are using.

## Install the agent

1. Under Select application deployment method, select **Install manually**.
2. Under Install agent, select any of these options:
  - Install the latest version of the agent from [npm](#)
  - Run the yarn command
3. Add the provided command to the scripts section of your application's `package.json` file.

## Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. For agent versions 5.15.0 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values.  
Copy the displayed code and set the variable in a location where the agent has access to it.
4. For agent versions earlier than 5.15.0, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
5. If you prefer to configure the agent using a YAML file, select **Download configuration**.



Copy the displayed code to generate a YAML file that contains your authentication settings.

6. Run your application with the agent using the displayed code

### Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands.
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## Node.js installation and configuration in a container

Use this workflow with the Add New Node.js agent wizard to ensure you have all the steps covered for installing and configuring the Node.js in a container. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported technologies \(page 81\)](#) and [system requirements \(page 83\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

### Start the Node.js agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **Node**.
4. Select the operating system you are using.

### Select method to deploy with containers

1. Under Select application deployment method, select **Install with a container**.
2. Under Select method to deploy with containers, select Dockerfile or Kubernetes (Linux or OS X only) or follow agent installation instructions (for Windows).

### Install with Linux or OS X

#### Select method to deploy with containers

Under Select method to deploy with containers, select **Dockerfile** or **Kubernetes**.

#### Dockerfile: Build image with the agent

1. Under Build image with agent, copy the displayed command and add it to your Dockerfile.
2. You can modify your application with the provided command to include the Agent.
3. Copy the displayed command to build the image.

#### Dockerfile: Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:

**NOTE**

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. For agent versions 5.15.0 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values.  
Copy the displayed code and set the variable in a location where the agent has access to it.
4. For agent versions earlier than 5.15.0, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
5. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.
6. Continue by verifying the agent deployment.

**Kubernetes: Select a method to configure agent operator**

1. Under Select method to configure agent operator, select **Helm** (recommended) or **Manifest**.
2. **For Helm:**
  1. Under Download and set up files, copy the displayed commands to create a values files.
  2. Under Label the deployments, use the displayed commands to label your deployments.
  3. Under the Install and deploy Helm chart, copy the displayed commands to complete the configuration.
3. **For Manifest:**
  1. Under Install operator, copy the displayed commands to install the Contrast agent operator.
  2. Under Configure operator, copy the displayed commands to configure the Contrast agent operator.
  3. Under Inject workloads, copy the displayed commands to configure an AgentInjector entity.
  4. Optionally, under Configure cluster agent and agent, copy the displayed commands to configure these entities.
4. Continue by verifying the agent deployment.

**Install with Windows****Build image with the agent**

1. Under Build image with agent, copy the displayed command and add it to your Dockerfile.
2. You can modify your application with the provided command to include the Agent.
3. Copy the displayed command to build the image.

## Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:

1. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
2. For agent versions 5.15.0 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values.  
Copy the displayed code and set the variable in a location where the agent has access to it.
3. For agent versions earlier than 5.15.0, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
4. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.
5. Continue by verifying the agent deployment.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands.
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## Node.js installation and configuration with a pipeline

Use this workflow with the Add New Node.js agent wizard to ensure you have all the steps covered for installing and configuring the Node.js with a pipeline. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported technologies \(page 81\)](#) and [system requirements \(page 83\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

### Start the Node.js agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **Node**.
4. Select the operating system you are using.

### Install the agent

1. Under Select application deployment method, select **Install with a pipeline**.
2. Under Select method to deploy pipelines, select **Github** or **Bitbucket**.
3. Under Install Agent, copy the displayed commands to install the agent.

## Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. Select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.  
Copy the displayed code and set the variable in a location where the agent has access to it.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands.
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## Node.js installation and configuration with Cloud deployment integrations

Use this workflow to ensure you have all the steps covered for installing and configuring Node.js with Cloud deployment integrations.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported technologies \(page 81\)](#) and [system requirements \(page 83\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

### Steps

1. **Set up variables.** Configure agent authentication configuration variables.
  - Set the minimum configuration values defined [here \(page 107\)](#)

- Configure additional values (application metadata, session metadata)
2. **Continue with deployment type.** Install based on the cloud deployment type.
    - With [IBM Cloud \(page 337\)](#)
    - With [VMware Tanzu](#)
  3. **Verify.** To verify that Contrast is working, use your application as you usually would. For example, click on your application's web interface, or send some API commands. Then in the Contrast web interface, select **Applications** in the header. You should see the name of your application.  
You can also select **Server** in the header and you should see the hostname of your (local) server.

## PHP installation and configuration workflows

Follow this workflow to make sure you have covered the steps for installing and configuring the PHP agent.

- [PHP by repository \(manually\) \(page 90\)](#)
- [PHP in a container \(page 91\)](#)
- [PHP with a pipeline \(page 93\)](#)

## Advanced topics

For additional installation and configuration details, visit these topics:

- [Advanced installation \(page 394\)](#)
- [Advanced configuration \(page 399\)](#)

## PHP agent supported technologies

We support the following technologies for this agent.

| Technology                | Supported versions   | Notes   |
|---------------------------|--|---|
| Language version          | <ul style="list-style-type: none"> <li>• 7.4, 8.0, 8.1, 8.2, 8.3</li> </ul>                                    | <p>The agent depends on the <code>mbstring</code> and <code>curl</code> extensions.</p> <p>Support only for NTS versions of PHP.</p>  |
| Application frameworks    | <ul style="list-style-type: none"> <li>• Laravel 6-11</li> <li>• Symfony 5-7</li> <li>• Drupal 8-11</li> </ul> |   |
| Servers                   | <ul style="list-style-type: none"> <li>• Apache</li> </ul>   | <p>Other servers using <code>mod_php</code> or <code>php-fpm</code> may work but are not currently supported.</p> <p>If you are using <code>php-fpm</code>, set <code>clear_env</code> to <code>no</code>. This setting ensures that the required environment variables are available to the PHP worker processes. If you use the default value, all shell environment variables are cleared before they reach the PHP worker processes, which prevents the agent from functioning correctly.</p> <p>You can usually find the <code>php-fpm</code> pool configuration file in <code>/usr/local/etc/php-fpm.d/www.conf</code>.</p> |
| Package manager           | <ul style="list-style-type: none"> <li>• Composer</li> </ul>   | Supported by SCA analysis.  |
| Content management system | <ul style="list-style-type: none"> <li>• WordPress 6</li> </ul>  |   |

## PHP agent system requirements

Before installing the PHP agent, your system must meet the following requirements:

| Requirement    | Version  |
|----------------|--|
| Runtime system | <ul style="list-style-type: none"> <li>• 64-bit Linux</li> </ul> |

| Requirement            | Version  |
|------------------------|--|
| Operating systems      | <ul style="list-style-type: none"><li>CentOS 8</li><li>RHEL 8, 9</li><li>Debian (Ubuntu) 18.04 and higher</li><li>Amazon Linux 2023 (AL2023)</li></ul> |
| Processor architecture | <ul style="list-style-type: none"><li>AMD64</li><li>ARM64</li></ul>  |

## PHP installation and configuration by repository (manually)

Use this workflow with Add New PHP agent wizard to ensure you have all the steps covered for installing and configuring PHP with manual installation. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported technologies \(page 89\)](#) and [system requirements \(page 89\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

### Start the PHP agent wizard

- Select **Add New** at the top of the Contrast web interface.
- Select the **Application** card.
- Under Select a language, select **PHP**.
- Select the operating system you are using.

### Install the agent

- Under Select application deployment method, select **Install manually**.
- Under the Installation method, select **Debian** or **RPM** or **AL2023**.
- Under Install and configure, install the agent package using the provided commands to register it into your system.
- Use the provided command lines to configure and enable the agent in your environment.

### Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



#### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

- Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. For agent versions 1.34.0 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values.  
Copy the displayed code and set the variable in a location where the agent has access to it.
3. For agent versions earlier than 1.34.0, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
4. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands.
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## PHP installation and configuration in a container

Use this workflow with the Add New PHP agent wizard to ensure you have all the steps covered for installing and configuring the PHP agent in a container. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported versions, frameworks, and tools \(page 94\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

## Start the PHP agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **PHP**.
4. Select the operating system you are using.

## Select method to deploy with containers

1. Under Select application deployment method, select **Install with a container**.
2. Under Select method to deploy with containers, select **Dockerfile** or **Kubernetes**.

## Dockerfile: Build image with the agent

1. Under Build image with agent, copy the displayed command and add it to your Dockerfile.
2. Copy the displayed command to build the image.

## Dockerfile: Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:

**NOTE**

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. For agent versions 1.34.0 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.  
Copy the displayed code and set the variable in a location where the agent has access to it.
4. For agent versions earlier than 1.34.0, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
5. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.

**Kubernetes**

1. Under Select method to configure agent operator, select **Helm charts** (recommended) or **Manifest**.
2. **For Helm:**
  1. Under Download and set up files, copy the displayed commands to create a values file.
  2. Under Label the deployments, use the displayed commands to label your deployments.
  3. Under Install and deploy Helm chart, copy the displayed commands to complete the configuration.
3. **For Manifest:**
  1. Under Install operator, copy the displayed commands to install the Contrast agent operator.
  2. Under Configure operator, copy the displayed commands to configure the Contrast agent operator.
  3. Under Inject workloads, copy the displayed commands to configure an AgentInjector entity.
  4. Optionally, under Configure cluster agent and agent, copy the displayed commands to configure these entities.

**Verify the agent deployment**

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.



## PHP installation and configuration with a pipeline

Use this workflow with the Add New PHP agent wizard to ensure you have all the steps covered for installing and configuring the PHP agent with a pipeline. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported versions, frameworks, and tools \(page 94\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

### Start the PHP agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **PHP**.
4. Select the operating system you are using.

### Install the agent

1. Under Select application deployment method, select **Install with a pipeline**.
2. Under Select method to deploy pipelines, select **Github** or **Bitbucket**.
3. Under Select installation method, choose **Debian** or **RPM**.
4. Under Install agent, copy the displayed commands to add a step to your GitHub action or Bitbucket pipeline.

### Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



#### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. Select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.

Copy the displayed code and set the variable in a location where the agent has access to it.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## Python installation and configuration workflows

Follow these workflows to make sure you have covered the steps for installing and configuring the Python agent.

- [Python by manual installation \(page 95\)](#)
- [Python in a container \(page 96\)](#)
- [Python with a pipeline \(page 98\)](#)

## Advanced topics

For additional installation and configuration details, visit these topics:

- [Advanced installation \(page 425\)](#)
- [Advanced configuration \(page 427\)](#)

## Supported technologies for the Python agent

We support the following technologies for this agent.

| Technology       | Supported versions   | Notes  |
|------------------|--|--|
| Language version | <ul style="list-style-type: none"><li>• 3.13.X: First supported agent was 9.8.0</li><li>• 3.12.X: First supported agent was 5.27.0</li><li>• 3.11.X: First supported agent was 5.19.0</li><li>• 3.10.X: First supported agent was 5.2.0</li><li>• 3.9.X: First supported agent was 4.2.0</li></ul> | <p>Contrast supports Python Long-Term Support (LTS) versions in <b>bugfix</b> and <b>security</b> status. Support for Python versions is shifted as the working group <a href="#">shifts its LTS window</a>.</p> <p><b>Not supported:</b></p> <ul style="list-style-type: none"><li>• 3.6.X, 3.5X, and 2.7.X: Last supported agent was 4.14.3</li><li>• 3.7.X: Last supported agent was 5.27.0</li><li>• 3.8.X: Last supported agent was 9.8.0</li><li>• Contrast does not currently support Python's experimental JIT compiler or free-threading. The agent will not run in an environment where either of these features is enabled.</li></ul> |

| Technology                                | Supported versions  | Notes  |
|---|---|--|
| Application frameworks                    | <ul style="list-style-type: none"> <li><a href="#">Aiohttp</a> 3.7 - 3.9</li> <li><a href="#">Bottle</a>: 0.13</li> <li><a href="#">Django</a>: 3.2 - 5.2</li> <li><a href="#">Django Rest Framework</a>: 3.12 - 3.15</li> <li><a href="#">Falcon</a>: 3.0 - 3.1</li> <li><a href="#">FastAPI</a>: 0.71 - 0.111</li> <li><a href="#">Flask</a>: 1.1 - 3.1</li> <li><a href="#">Pyramid</a>: 1.10 - 2.0</li> <li><a href="#">Quart</a>: 0.15 - 0.20</li> </ul> | <p>The Python agent is meant to be WSGI-compatible. It may be compatible with other WSGI applications as long as the guidelines are followed.</p> <p>The Agent is also compatible with frameworks that provide ASGI interfaces including Django, FastAPI, and Quart.</p> <p>FastAPI and Starlette (on which FastAPI depends) are relatively new libraries that are undergoing continuous development changes, which may break Contrast support. FastAPI states that <a href="#">development moves quickly</a>. Contrast will maintain support up to the stated version and update documentation when new support is released.</p> <p>Micro/patch versions are omitted for simplicity, but we encourage and only explicitly test the latest patch within each minor version series. For example, 3.2 refers to the latest 3.2.x version of the package available on PyPI.</p> |
| Platforms                                 | <ul style="list-style-type: none"> <li>macOS: x86-64 / ARM64</li> <li>manylinux: x86-64 / ARM64</li> <li>musllinux (alpine): x86-64 / ARM64</li> </ul>  | On Alpine systems, <code>libgcc</code> is required. This can be installed with <code>apk add libgcc</code> .   |
| Web servers                               | <ul style="list-style-type: none"> <li><a href="#">Gunicorn</a> 0.16.1 –21.2.X</li> <li><a href="#">uWSGI</a> 2.0.14 - 2.0.X</li> <li><a href="#">Uvicorn</a>: 0.14.X - 0.23.X</li> </ul>   |  |
| Databases                                 | <ul style="list-style-type: none"> <li><a href="#">Mongo</a> (<a href="#">pymongo</a>)</li> <li><a href="#">MySQL</a> (<a href="#">PyMySQL</a> and <a href="#">mysql-connector</a>)</li> <li><a href="#">PostgreSQL</a> (<a href="#">psycopg2</a>)</li> <li><a href="#">SQLite3</a> (<a href="#">sqlite3</a> and <a href="#">pysqlite2</a>)</li> </ul>  |  |
| Object-relational mapping databases (ORM) | <ul style="list-style-type: none"> <li><a href="#">Flask-SQLAlchemy</a></li> <li><a href="#">SQLAlchemy</a></li> </ul>  |  |

## Python installation and configuration by manual installation

Use this workflow with the Add New Python agent wizard to ensure you have all the steps covered for manually installing and configuring the Python agent. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported versions, frameworks, and tools \(page 94\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

### Start the Python agent wizard

- Select **Add New** at the top of the Contrast web interface.
- Select the **Application** card.
- Under Select a language, select **Python**.
- Select the operating system you are using.

## Install the agent

1. Under Select application deployment method, select **Install manually**.
2. Under Install agent, install the agent using the `pip` command.

## Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. For agent versions 8.6.0 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values.  
Copy the displayed code and set the variable in a location where the agent has access to it.
4. For agent versions earlier than 8.6.0, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
5. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.
6. Start your application with the [Contrast Runner \(page 505\)](#).

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands.
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## Python installation and configuration in a container

Use this workflow with the Add New Python agent wizard to ensure you have all the steps covered for installing and configuring the Python agent in a container. Using the wizard is the simplest way to deploy a new agent.

## Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported versions, frameworks, and tools \(page 94\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

## Start the Python agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **Python**.
4. Select the operating system you are using.

## Select method to deploy with containers

1. Under Select application deployment method, select **Install with a container**.
2. Under Select method to deploy with containers, select **Dockerfile** or **Kubernetes**.

## Dockerfile: Build image with the agent

1. Under Build image with agent, copy the displayed command and add it to your Dockerfile.
2. Copy the displayed commands to build the image.

## Dockerfile: Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. For agent versions 8.6.0 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.  
Copy the displayed code and set the variable in a location where the agent has access to it.
4. For agent versions earlier than 8.6.0, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
5. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.

## Kubernetes

1. Under Select method to configure agent operator, select **Helm charts** (recommended) or **Manifest**.
2. **For Helm:**
  1. Under Download and set up files, copy the displayed commands to create a values file.
  2. Under Label the deployments, use the displayed commands to label your deployments.
  3. Under Install and deploy Helm chart, copy the displayed commands to complete the configuration.
3. **For Manifest:**
  1. Under Install operator, copy the displayed commands to install the Contrast agent operator.
  2. Under Configure operator, copy the displayed commands to configure the Contrast agent operator.
  3. Under Inject workloads, copy the displayed commands to configure an AgentInjector entity.
  4. Optionally, under Configure cluster agent and agent, copy the displayed commands to configure these entities.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## Python installation and configuration with a pipeline

Use this workflow with the Add New Python agent wizard to ensure you have all the steps covered for installing and configuring the Python agent with a pipeline. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported versions, frameworks, and tools \(page 94\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

### Start the Python agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **Python**.
4. Select the operating system you are using.

### Install the agent

1. Under Select application deployment method, select **Install with a pipeline**.
2. Under Select agent installation method, select **Github** or **Bitbucket**.
3. Under Install Agent, copy the displayed commands to install the agent.

## Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.

When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.

3. Select **Use Connection Token**.

This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.

Copy the displayed code and set the variable in a location where the agent has access to it.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## Ruby installation and configuration workflow



### IMPORTANT

The Ruby Agent is not currently being sold to new customers. Please contact our Sales team if you have any questions about our offerings and support for the Ruby language.

Follow this workflow to ensure you have covered installing and configuring the Ruby agent.

- [Ruby by middleware type \(page 101\)](#)

## Advanced topics

For additional installation and configuration details, visit these topics:

- [Advanced installation \(page 507\)](#)
- [Advanced configuration \(page 510\)](#)

## Supported technologies for the Ruby agent



### IMPORTANT

The Ruby Agent is not currently being sold to new customers. Please contact our Sales team if you have any questions about our offerings and support for the Ruby language.

We support the following technologies for this agent.

| Technology             | Supported versions   | Notes   |
|------------------------|--|---|
| Language version       | <ul style="list-style-type: none"><li>• 3.2.X: First supported agent was 6.13.0</li><li>• 3.1.X: First supported agent was 6.0.0</li></ul>   | <p>Contrast supports Ruby Long-Term Support (LTS) versions in normal maintenance and security maintenance status. Contrast shifts its support for Ruby versions as the working group shifts its LTS windows.</p> <p>See the <a href="#">Ruby Maintenance Branches schedule</a> for specific release dates.</p> <p>See <a href="#">Ruby end of life</a> for dates.</p> <p><b>Not supported:</b></p> <ul style="list-style-type: none"><li>• 2.5.X: Last supported agent was 4.14.1</li><li>• 2.4.X: Last supported agent was 3.9.1</li><li>• 2.6.X: Last supported agent was 5.3.0</li><li>• 2.7.X: Last supported agent was 6.15.3</li><li>• 3.0.X: First supported agent was 4.6.0</li></ul> |
| Application frameworks | <ul style="list-style-type: none"><li>• <a href="#">Rails</a> 7.X</li><li>• <a href="#">Sinatra</a> 3.X</li></ul>  | <p>While the agent can still run on <a href="#">Rack-based web frameworks</a> that aren't officially supported, Contrast may produce less-specific findings than it does for supported frameworks. Instead of reporting that a vulnerability occurs in your application code, Contrast may report it within the framework code where it interfaces directly with the Rack methods.</p>  |
| Databases              | <ul style="list-style-type: none"><li>• <a href="#">MongoDB</a></li><li>• <a href="#">MySQL2</a></li><li>• <a href="#">PG</a></li><li>• <a href="#">SQLite3</a></li></ul>  |   |
| Web servers            | <ul style="list-style-type: none"><li>• <a href="#">Passenger</a> 5.37 and 6.X</li><li>• <a href="#">Puma</a> 3.7 - 5.X</li><li>• <a href="#">Thin</a> 1.7.2 - 1.8.X</li><li>• <a href="#">Unicorn</a> 5.0.X - 6.X</li></ul> |   |



## System requirements for the Ruby agent



### IMPORTANT

The Ruby Agent is not currently being sold to new customers. Please contact our Sales team if you have any questions about our offerings and support for the Ruby language.

Before installing the Ruby agent, your system must meet the following requirements:

- There is a deployed application to be analyzed, and the web application technology is supported by Contrast.
- The application can be restarted.
- The web server has network connectivity with Contrast.
- The web server has network connectivity with RubyGems or the agent manually installed.
- The server meets the minimum requirements shown in this table.

| Requirement      | Versions   | Notes  |
|------------------|--|--|
| Operating system | <ul style="list-style-type: none"><li>• 64-bit Linux (recommended)</li><li>• 64-bit Alpine</li></ul>   | <p>Starting with agent version 3.0.0, the gem installation step requires the compilation of C extensions. This process is automatic, but you may need to install the following in the target environment:</p> <ul style="list-style-type: none"><li>• <code>gcc</code>, <code>make</code>, <code>automake</code> and <code>autoconf</code> (Package names may vary. You may install your platform's version of <code>build-essential</code>.)</li><li>• system headers</li></ul> <p>The agent runs in the Ruby application layer with some C dependencies so it may need to be installed with the <code>--platform ruby</code> flag to allow for compilation in either <i>glibc</i> or <i>musl libc</i> based systems.</p> |
| Ruby gems        | <ul style="list-style-type: none"><li>• <code>ougai</code>: <code>~&gt;1.8</code> (1.8 and later, earlier than 2)</li><li>• <code>rack</code>: <code>&gt;=2.0</code> (2.0 and later)</li></ul> |  |

## Ruby installation and configuration by middleware



### IMPORTANT

The Ruby Agent is not currently being sold to new customers. Please contact our Sales team if you have any questions about our offerings and support for the Ruby language.

Use this workflow with the Add New Ruby agent wizard to ensure you have all the steps covered for installing and configuring the Ruby agent by middleware. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.

- It must use [supported technologies \(page 100\)](#) and [system requirements \(page 101\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

## Start the Ruby agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **Ruby**.
4. Select the operating system you are using.

## Install the agent

1. Under Select application deployment method, select **Install manually**.
2. Under Install Ruby agent, copy the displayed command to install the latest version of the agent or a specific version of the agent.
3. Under Select middleware, choose one of the types of middleware options.  
If you select Rails, middleware configuration is not required. You can move to the *Configure the agent* step.  
If you select Sinatra or Grape, copy the provided commands to configure your application.

## Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.  
  
If only one key exists, it's preselected.  
  
[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.
2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. Select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
4. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands.
2. Go to the Contrast web interface and select **Applications** in the header.

3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## Go installation and configuration workflow

Follow these workflows to make sure you have covered the steps for installing and configuring the Go agent.

- [Go with an installer \(page 104\)](#)
- [Go in a container \(page 105\)](#)
- [Go in a pipeline \(page 106\)](#)

## Advanced topics

- [Go advanced installation \(page 567\)](#)
- [Go advanced configuration \(page 570\)](#)

## Supported technologies for the Go agent

We support the following technologies for this agent.

| Technology                   | Supported versions   | Notes  |
|------------------------------|--|--|
| Language version             | <ul style="list-style-type: none"> <li>• 1.23</li> <li>• 1.24</li> </ul>   | <p>Contrast follows the <a href="#">Go release support policy</a> which consists of the two most recently released major versions. Support for Go language versions is shifted as new major versions are released. The application dependencies must be specified in a <code>go.mod</code> file.</p> <p><b>Not supported:</b></p> <ul style="list-style-type: none"> <li>• 1.22: last supported agent was 7.3.0</li> <li>• 1.21: Last supported agent was 6.14.0</li> <li>• 1.20: Last supported agent was 6.10.0</li> <li>• 1.19: Last supported agent was 5.12.0</li> <li>• 1.18: Last supported agent was 4.2.0</li> <li>• 1.17: Last supported agent was 3.6.0</li> <li>• 1.16: Last supported agent was 3.6.0</li> <li>• 1.15: Last supported agent was 1.12.0</li> </ul> |
| Platforms                    | <ul style="list-style-type: none"> <li>• darwin/amd64</li> <li>• darwin/arm64</li> <li>• linux/amd64</li> <li>• linux/arm64</li> </ul>   | <p>Contrast builds and tests <code>contrast-go</code> for the listed platforms.</p> <p>You can use <code>contrast-go</code> to cross-compile for other platforms, however, compatibility is not guaranteed.</p>  |
| Dependency management system | Go mod   | The application must be part of a <a href="#">Go module</a> . An application can be initialized with modules by running <code>go mod init</code> .   |
| Protocol stacks              | <ul style="list-style-type: none"> <li>• net/http</li> <li>• <a href="#">github.com/valyala/fasthttp</a> v1.46.0 and later</li> <li>• <a href="#">google.golang.org/grpc</a> v1.17.0 and later</li> </ul>  | The agent relies on the protocol implementation to understand application behavior. If the application uses an unsupported protocol package, the agent is not able to report vulnerability or route information.   |
| Routers and frameworks       | <ul style="list-style-type: none"> <li>• <a href="#">github.com/gofiber/fiber</a> v2.40.0 and later</li> <li>• <a href="#">github.com/go-chi/chi/v5</a></li> <li>• <a href="#">github.com/julienschmidt/httprouter</a></li> <li>• <a href="#">github.com/gin-gonic/gin</a> v1 and later</li> <li>• <a href="#">github.com/go-openapi/swag</a></li> </ul> | <p>The agent can work with an unlisted framework as long as the framework's underlying HTTP implementation is supported. However, some features might be missing or less accurate.</p> <p>For example, the agent might not correctly discover routes registered with an unrecognized router.</p> <p>If your framework is not in the list of supported frameworks or you need assistance, contact <a href="#">Contrast support</a>.</p>   |
| Database support             | database/sql   | The agent instruments the <code>database/sql</code> package in the standard library to support databases registered as database drivers. See the examples in <a href="#">SQLDrivers</a> .  |

## Go installation and configuration with an installer

Use this workflow with the Add New Go agent wizard to ensure you have all the steps covered for installing and configuring the Go agent with the Go installer. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported technologies \(page 103\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

### Start the Go agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **Go**.
4. Select the operating system you are using.

### Install the agent

1. Under Select application deployment method, select **Install manually**.
2. Under Run installer, copy the displayed command to install the latest version of the agent or a specific version of the agent.
3. Under Build application, copy the displayed command to build the application.

### Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



#### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. For agent versions 6.11.0 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.  
Copy the displayed code and set the variable in a location where the agent has access to it.

4. For agent versions earlier than 6.11.0, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
5. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## Go agent installation and configuration in a container

Use this workflow with the Add New Go agent wizard to ensure you have all the steps covered for installing and configuring the Go agent with a container. Using the wizard is the simplest way to deploy a new agent.

### Before you begin

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported versions, frameworks, and tools \(page 94\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

### Start the Go agent wizard

1. Select **Add New** at the top of the Contrast web interface.
2. Select the **Application** card.
3. Under Select a language, select **Go**.
4. Select the operating system you are using.

### Install the agent

1. Under Select application deployment method, select **Install with a container**.
2. Under Select method to deploy with containers, select **Dockerfile**.
3. Under Build the image:
  - a. Copy the displayed command and add it to your Dockerfile.
  - b. Use the displayed command to modify your application command to include the Go agent.
  - c. Use the displayed command to build the image.

### Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:

**NOTE**

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. For agent versions 6.11.0 and later, select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.  
Copy the displayed code and set the variable in a location where the agent has access to it.
4. For agent versions earlier than 6.11.0, select **Use API configuration**.  
This configuration method uses individual variables to specify authentication values.  
Copy the displayed code and set these variables in a location where the agent has access to them.
5. If you prefer to configure the agent using a YAML file, select **Download configuration**.  
Copy the displayed code to generate a YAML file that contains your authentication settings.

**Verify the agent deployment**

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

**Go agent installation and configuration in a pipeline**

Use this workflow with the Add New Go agent wizard to ensure you have all the steps covered for installing and configuring the Go agent in a pipeline. Using the wizard is the simplest way to deploy a new agent.

**Before you begin**

Make sure you have everything you need before you start.

- The agent will need to be able to reach your Contrast instance. It can be a local/on-premise instance or a hosted instance. A proxy can be configured if the environment has limited network access.
- It must use [supported versions, frameworks, and tools \(page 94\)](#)
- Understand the [order of precedence \(page 111\)](#)
- You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast

**Start the Go agent wizard**

1. Select **Add New** at the top of the Contrast web interface.

2. Select the **Application** card.
3. Under Select a language, select **Go**.
4. Select the operating system you are using.

## Install the agent

1. Under Select application deployment method, select **Install in a pipeline**.
2. Under Select method to deploy pipelines, select **GitHub** or **Bitbucket**.
3. Under Install an agent:
  - a. Copy the displayed command to add a step to your GitHub action or Bitbucket pipeline.
  - b. Copy the displayed command to the step running your application:

## Configure the agent

Under Configure the agent, select the best options to get the configuration details that the agent needs to communicate with Contrast:



### NOTE

You have the option of using the [Contrast Agent Configuration Editor \(page 113\)](#) to configure agent settings. Select **Use configuration editor** next to Use connection token or Use API configuration.

1. Select the agent key that you want to use.

If only one key exists, it's preselected.

[Configure agent keys \(page 1444\)](#) describes how to create multiple agent keys.

2. Optionally, select **Register the application**.  
When you register an application, you can assign it to groups for access control. You can also assign tags and metadata to the application.
3. Select **Use Connection Token**.  
This configuration method uses a single variable to specify authentication values. The Connection Token is the recommended configuration option.  
Copy the displayed code and set the variable in a location where the agent has access to it.

## Verify the agent deployment

1. Interact with your application as you normally would. For example, interact with your application's web interface or send API commands
2. Go to the Contrast web interface and select **Applications** in the header.
3. Verify that you see the name of your application in the list.
4. Select servers in the header.
5. Verify that you see the name of your local server in the list.

## Configure an agent

When you install an agent, you must configure it so that it recognizes your application and can communicate information back to Contrast.

Configuration follows this [order of precedence \(page 111\)](#).

**NOTE**

An expired license or exceeding a license quota disables all agent behavior regardless of configuration.

## Steps

1. **Recommended:** Use the Agent token to configure the required authentication variables (you can find this value in Contrast) (page 109).

```
api:
  token: <token-value>
```

Where the <token-value> is a base64 encoded JSON object containing the url, api\_key, service\_key, and user\_name values, allowing you to set them in a single variable.

**Legacy settings:** If you are using an older version of the agent, configure these authentication variables:

```
api:
  url: https://<environment>-agents.contrastsecurity.com
  user_name: contrast_user
  api_key: demo
  service_key: demo
```

where:

- **url:** Address of the Contrast installation you would like your agent to report to. Defaults to: `https://<environment>-agents.contrastsecurity.com/Contrast`
- **user\_name:** Contrast user account
- **api\_key:** Your organization's API key
- **service\_key:** Contrast user account service key

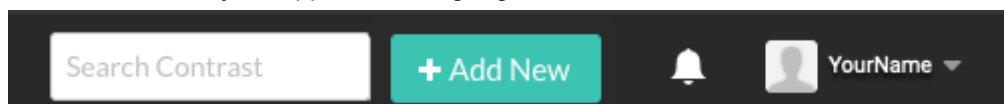
You can set these authentication variables with either:

1. Environment variables.

The simplest way to configure these values is to use an agent wizard (In the Contrast web interface, select **Add New**, select the **Application** card, and follow the instructions for your language). You can open the [Contrast agent configuration editor \(page 113\)](#) from the agent wizard to configure these values.

2. YAML configuration file.

- You can download a [YAML configuration file \(page 112\)](#) that is pre-populated with your organization keys. Select **Add new** in the Contrast web interface, select the **Application** card, and choose your application language to find a download link.



- You can also configure the file with the [Contrast agent configuration editor \(page 113\)](#) which you can open from the agent wizard.
3. Other methods native to the language and tools you are using, such as system properties or command line flags. Refer to the individual documentation pages for more details.



**NOTE**

See [Contrast agent configuration editor](#) to view a full list of options and their default values.

2. Configure any additional variables.

- Use [session metadata \(page 656\)](#) to filter vulnerabilities and route information for a specific branch, build, committer, or repository.
- Use [application metadata \(page 1456\)](#) to filter applications by custom values.

When you add the necessary configuration settings to your agent configuration file, the agent reports this information along with the rest of your standard vulnerability data to Contrast. Look [here \(page 116\)](#) for the full list of configuration values and what they do beyond the necessary values described above.

## Find the agent keys

Agent keys are values that authenticate the agents. Unlike user and service level authentication, they can only be used to report data collected for your organization; they cannot be used for UI access or data retrieval. Your organization can have multiple agent keys with different authentication credentials.

By using different agent keys for each team or service instead of a single, shared agent key, you can reduce security risks and gain more granular control over agent deployments.

**IMPORTANT**

If you download a YAML configuration file from Contrast instead of using the configuration that an agent wizard creates (select **Add new** in the top right, select **Live Application**, and go to the **Configuration** step), the file is pre-populated with the agent keys for a specified agent key name.

If you create your own YAML file, you'll need to add the keys yourself.

Contrast provides a default agent key. [Configure agent keys \(page 1444\)](#) describes how to add multiple agent keys.

## Preferred keys

The preferred key to use when installing agents is the Agent token. The Agent token replaces these legacy keys: Agent service key, Agent username, API key, and Contrast URL.

The agent versions that support the Agent token are:

- Java 6.10.1 or later
- .NET Framework 51.0.40 or later
- .NET Core 4.2.22 or later
- Node.js 5.15.0 or later
- Python 8.6.0 or later
- PHP 1.34.0 or later
- Go 6.11.0 or later

## Legacy keys



### NOTE

Currently, you can continue to use the legacy keys instead of the preferred Agent token. For new agent deployments, however, it's best to use the Agent token.

For older agents, these keys are required when installing agents:

- Agent key name (API\_\_user\_name)
- Agent service key
- API key  
This API key is for all agents. For the API key to use with custom scripts, use the API key under User settings.
- Contrast URL

## Steps

1. Select **User name > Organization settings** in the top right corner.
2. Select **Agent keys**.



### NOTE

If you don't see the keys on this page, it may mean that a license has not been applied to your organization. [Contact Support](#) for help with this.

3. Select a key name.

**Organization Settings**

Organization  
Groups  
Users  
Access Control  
Audit Log  
Security  
**Agent Keys**  
Single Sign-On  
Integrations  
Servers  
Applications  
Notifications  
Score Settings  
Scan projects

**Agent Keys**

Use agent keys when configuring agents to communicate the Contrast. Learn how in our [API documentation](#).

Search key name

+ Add key name

| KEY NAME               | CREATED               | LAST SEEN | ACTIONS |
|------------------------|-----------------------|-----------|---------|
| Michael-dev-team-1     | 1/17/2025, 2:42:04 PM |           |         |
| Michaels-dev-team-beta | 1/17/2025, 3:40:35 PM |           |         |

Page 1 of 1 Showing 1-3 out of 3 results Results per page 10 20

4. Copy the keys you need.

### Agent Keys

#### Agent Keys

Agent Key Name (API username)

agent\_6dev-team-1

Agent Token

\*\*\*\*\*

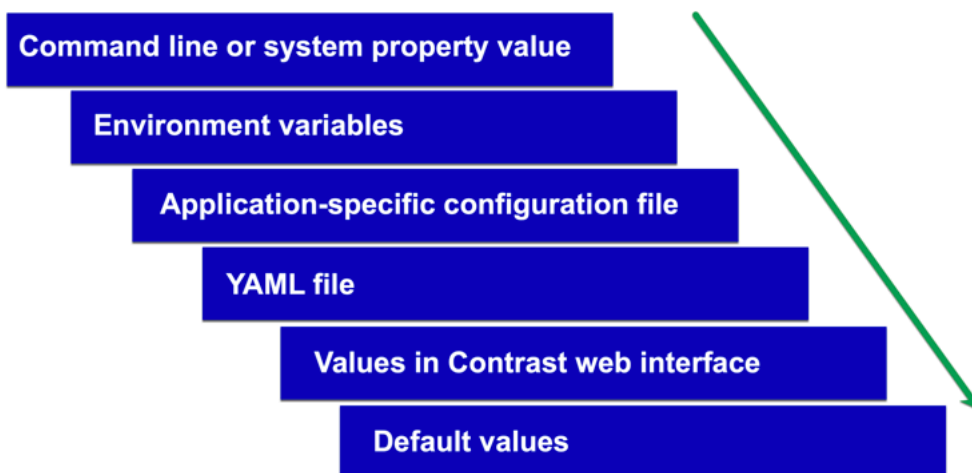
Legacy Agent Keys ▾

Looking for your API keys? Go to [User Settings](#).

- a. For newer agents, copy the agent key name and the agent token.
- b. For older agent, select **Legacy agent keys** and copy the displayed keys.
  - The Contrast URL is `https://<environment>-agents.contrastsecurity.com/` Contrast, or the URL of your on-premises or private cloud instance.

## Order of precedence

Active configuration values are determined using the following order of precedence:



1. An expired license or exceeding a license quota disables all agent behavior regardless of configuration.
2. Command line or system property value (if appropriate for the language you are using).  
For example: `-Dcontrast.enable`
3. [Environment variables \(page 115\)](#).  
For example: `CONTRAST__ENABLE`
4. An application-specific configuration file (.NET Framework only).  
For example: [web.config \(page 231\)](#)
5. Configuration values in a [YAML file \(page 112\)](#) are pulled from all files, taking the value from the highest precedence file.

For instance, if `contrast_security.yaml` in the current working directory has the application-specific value for `application.tags` and the file in `/etc/contrast/contrast_security.yaml` has the organization-level connection details, the agent would have access to both. If `/etc/contrast/contrast_security.yaml` also had an `application.tags` default value, only the value in the current working directory's configuration, as a higher precedence, would be read; the two values of `application.tags` are not combined.

- a. A YAML file indicated by the user

For example:

- Java: the `contrast.config.path` [system property \(page 151\)](#)
- Any agent: the `CONTRAST_CONFIG_PATH` environment variable.

- b. A `contrast_security.yaml` file in the current working directory (all agents except Java)

For example: `./contrast_security.yaml`

- c. A `contrast_security.yaml` file in the application's configuration directory (Ruby and Python only)

For example:

- Ruby on Rails: `./config/contrast_security.yaml`
- Django: `./settings/contrast_security.yaml`

- d. A `contrast_security.yaml` file in an agent-specific configuration directory. For agents that use a service, use this directory if you need to use separate YAML files for agent and service.

For example:

- `/etc/contrast/agentname/contrast_security.yaml` (where *agentname* is one of: *dotnet*, *go*, *java*, *node*, *python*, *ruby*, or *webserver*)
- `%ProgramData%\contrast\agentname\contrast_security.yaml` (where *agentname* is one of: *dotnet*, *dotnet-core*, *java*, *node*, *python*, *ruby*, or *webserver*)

- e. A `contrast_security.yaml` file within the server's `/etc/contrast` directory (all agents except .NET Framework, and .NET Core). For agents that use a service, use this directory if you need to share YAML files between agent and service.

For example:

- `/etc/contrast/contrast_security.yaml`
- `%ProgramData%\contrast\contrast_security.yaml`

6. Values set in the Contrast web interface.

For example: Server mode toggles for Assess and Protect, which map to `assess.enable` and `protect.enable`

7. The default value set by Contrast Security.

## See also

[Additional configuration \(page 116\)](#)

## YAML configuration

You can use a YAML configuration file to set configuration properties for your agent. These values can be overridden with environment variables or command line arguments.

While all Contrast agents share the same property formatting in YAML configuration files, each agent must use its own specified file as there are unique properties that apply to each agent.

The configuration file must be called `contrast_security.yaml` and placed properly in the [load path \(page 111\)](#).

When you download the agent configuration file from Contrast, it will contain all the basic properties required for your instance of Contrast. If you create your configuration file, you must add [these keys \(page 109\)](#) yourself.

The minimum required `contrast_security.yaml` content for the latest version of the agents should look like this:

```
api:
  token: <token-value>
```

Where the `<token-value>` is a base64 encoded JSON object containing the `url`, `api_key`, `service_key`, and `user_name` values, allowing you to set them in a single variable.

**Legacy settings:** For older agents, the minimum required *contrast\_security.yaml* content for all agents should look like this:

```
api:
  url: https://<environment>-agents.contrastsecurity.com/Contrast
  user_name: contrast_user
  api_key: demo
  service_key: demo
```



### TIP

- Use the [Contrast agent configuration editor \(page 113\)](#) to create or upload a YAML configuration file, validate YAML and get setting recommendations.
- Since YAML is a natural superset of JSON, you can also configure your agent using JSON in your YAML file.

You can use these YAML templates to create a *contrast\_security.yaml* for each agent:

- [Java \(page 152\)](#)
- [.NET Framework \(page 232\)](#)
- [.NET Core \(page 299\)](#)
- [Node.js \(page 359\)](#)
- [PHP \(page 400\)](#)
- [Python \(page 427\)](#)
- [Ruby \(page 511\)](#)
- [Go \(page 571\)](#)



### CAUTION

Take care when editing the YAML template as it relies on whitespace, and uses spaces but not tabs. Configuration guidance is provided in the template as comments. (A space followed by the pound sign `"#"` starts a comment.)

## Use the Contrast agent configuration editor

The [Contrast agent configuration editor](#) is a web application that can be used to validate and generate the configuration for Contrast agents.

### Before you begin

- Use this editor to help edit, validate, and generate configurations for Contrast agents.

- If you already have a YAML file, you can open it in the editor by selecting **Import**.
- The editor executes entirely in the browser and any sensitive information such as your API key won't leave the local machine.

## Steps

1. Open the [Contrast YAML configuration editor](#) in your browser.

The screenshot displays the Contrast YAML configuration editor. At the top, there's a header with the Contrast logo, a 'Validate using the' dropdown set to '.NET Core Agent', and buttons for 'Reset', 'Import', 'Export', and 'Share'. The main editor area shows a YAML configuration with line numbers 1 through 13. The configuration includes fields for API settings, inventory tags, application name, and server tags, many of which are currently set to 'TODO'. A right sidebar, titled 'Filter Options', contains a 'Show advanced settings' checkbox and detailed descriptions for various configuration fields: api.url, api.api\_key, api.service\_key, api.user\_name, inventory.tags, assess.tags, application.name, and application.group. At the bottom, a table lists validation messages for the 'TODO' placeholders.

| Type | Message  | Line number |
|------|--|-------------|
| TODO | Placeholder value 'TODO' should be replaced for setting: api.api_key     | 3           |
| TODO | Placeholder value 'TODO' should be replaced for setting: api.service_key | 4           |

2. Either import an existing YAML file by selecting **Import**, or paste your YAML content in the main window.
3. As you edit text, an error warning will appear if you enter invalid YAML. Select an option from the **Validate using the** list for agent-specific YAML validation. These types of validation are performed:
  - **YAML syntax validation** verifies that the text can be parsed as YAML. Invalid YAML will result in an **error** that prevents further validation.
  - **Setting key validation** verifies that the YAML nodes represent setting keys supported by the selected agent. An unrecognized setting key will result in a **warning**.
  - **Setting value validation** verifies that the YAML values match type expectations including boolean, numeric, and enum (e.g., log level). Invalid values will result in a **warning**.
  - **Setting compatibility validation** verifies that specific incompatible settings are not both present. This is currently limited to `application.session_id` and `application.session_metadata` settings. Incompatible settings will result in a **warning**.

- **Placeholder value validation** notifies the user when a setting has the placeholder value `TODO`. Placeholder value will result in a **note**.

Select the **error**, **warning**, or **note** in the list of issues to move the text editor's cursor to the start of text causing the issue.

4. Use the panel on the right to search for available settings with descriptions. Select the plus sign (+) to add that setting to your YAML file.

Adding new settings using this feature will format the YAML which may re-order nodes and will remove any extra whitespace in the YAML.

Click **Reset** to go back to the original file settings.



#### NOTE

YAML generation is disabled when the YAML in the text editor has a syntax error or is not valid YAML.

5. When you are finished, export your configuration file either as a YAML or environment variables. You can also share the file with other collaborators.



#### NOTE

At this time, the Contrast configuration editor executes completely offline (meaning after first visit, the page is accessible without an internet connection). Updates are downloaded in the background automatically. Upgrading to newer versions requires closing all agent configuration app tabs; refreshing is not enough to activate the new version.

## Environment variables

You can configure the agent with any of the supported properties through environment variables.

The environment variables need to be set before the agent starts up, and in a location where the agent has access to it. Environment variables can be set within the same process or system-wide.



#### IMPORTANT

If you set system-wide environment variables, this may impact other Contrast agents running on the same server.

You can convert any Contrast property between command line, YAML and an environment variable.

To convert a command line formatted variable to an environment variable, replace the path segment delimiters (.) with double underscores (\_\_).

To convert a YAML formatted variable to an environment variable, start with the top-level property and separate every nested property with a double underscore (\_\_).

Then, prepend the "contrast" namespace (either `contrast.` or `CONTRAST__`).

Environment variables should be in all caps and have no spaces.

For example:

| Command line         | YAML property    | Environment variable   |
|----------------------|------------------|------------------------|
| contrast.server.name | server:<br>name: | CONTRAST__SERVER__NAME |
| contrast.api.api_key | api:<br>api_key: | CONTRAST__API__API_KEY |

You can see a list of all supported properties for each agent in their respective YAML templates:

- [Java \(page 152\)](#)
- [.NET Framework \(page 232\)](#)
- [.NET Core \(page 299\)](#)
- [Node.js \(page 359\)](#)
- [PHP \(page 400\)](#)
- [Python \(page 427\)](#)
- [Ruby \(page 511\)](#)
- [Go \(page 571\)](#)

### See also

[Additional configuration \(page 116\)](#) for more details about the environment variables used for configuration.

## Additional configuration

You can set these common variables with either system properties, environment variables, a YAML file, or default values.

## Additional configuration values set with environment variables

Use these common variables to configure your system.

See the [Contrast YAML Configuration Editor](#) for a complete list as this can be updated with language-specific and advanced settings.

| Environment variable       | Description  | Language   |
|----------------------------|--|--|
| CONTRAST__API__TOKEN       | Set these values needed to communicate with Contrast: URL, API key, service key, and user name.<br><br>This variable is the preferred method for setting the authentication credentials. | Latest versions of Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| CONTRAST__API__URL         | Set the URL for Contrast.  | Java, .NET Framework, .NET Core, Node.js, Python, PHP, and Go                          |
| CONTRAST__API__API_KEY     | Set the API key needed to communicate with Contrast.   | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go                    |
| CONTRAST__API__SERVICE_KEY | Set the service key needed to communicate with Contrast. It is used to calculate the Authorization header.   | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go                    |
| CONTRAST__API__USER_NAME   | Set the user name used to communicate with Contrast. It is used to calculate the Authorization header.   | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go                    |
| CONTRAST__INVENTORY__TAGS  | Apply a list of labels to libraries. Labels must be formatted as a comma-delimited list. Example: label1, label2, label3.  | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, and PHP                        |
| CONTRAST__ASSESS__TAGS     | Apply a list of labels to vulnerabilities and preflight messages. Labels must be formatted as a comma-delimited list. Example: label1, label2, label3.                                   | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go                    |



| Environment variable           | Description   | Language  |
|--------------------------------|---|---|
| CONTRAST__APPLICATION__NAME    | Override the reported application name.<br>Note: On Java systems where multiple, distinct applications may be served by a single process, this configuration causes the agent to report all discovered applications as one application with the given name. | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| CONTRAST__APPLICATION__GROUP   | Add the name of the application group with which this application should be associated in Contrast.   | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| CONTRAST__APPLICATION__CODE    | Add the application code this application should use in Contrast.   | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| CONTRAST__APPLICATION__VERSION | Override the reported application version.  | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| CONTRAST__APPLICATION__TAGS    | Apply labels to an application. Labels must be formatted as a comma-delimited list. Example: label1, label2, label3.  | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| CONTRAST__SERVER__NAME         | Override the reported server name.  | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| CONTRAST__SERVER__ENVIRONMENT  | Override the reported server environment. Valid values include QA, PRODUCTION and DEVELOPMENT.  | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| CONTRAST__SERVER__TAGS         | Apply a list of labels to the server. Labels must be formatted as a comma-delimited list. Example: label1, label2, label3.  | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |

## Additional configuration values set by web.config

If you use .NET Framework or .NET Core with any of the following, you will also need to configure these variables.

| Platform                             | Variable set   |
|--------------------------------------|--|
| Web.config<br>(.NET Core IIS Module) | <pre> &lt;environmentVariable name="CONTRAST__API__URL" value="https:// app.contrastsecurity.com/Contrast/" /&gt; &lt;environmentVariable name="CONTRAST__API__API_KEY" value="" /&gt; &lt;environmentVariable name="CONTRAST__API__SERVICE_KEY" value="" /&gt; &lt;environmentVariable name="CONTRAST__API__USER_NAME" value="" /&gt; &lt;environmentVariable name="CONTRAST__INVENTORY__TAGS" value="" /&gt; &lt;environmentVariable name="CONTRAST__ASSESS__TAGS" value="" /&gt; &lt;environmentVariable name="CONTRAST__APPLICATION__NAME" value="" /&gt; &lt;environmentVariable name="CONTRAST__APPLICATION__GROUP" value="" /&gt; &lt;environmentVariable name="CONTRAST__APPLICATION__CODE" value="" /&gt; &lt;environmentVariable name="CONTRAST__APPLICATION__VERSION" value="" /&gt; &lt;environmentVariable name="CONTRAST__APPLICATION__TAGS" value="" /&gt; &lt;environmentVariable name="CONTRAST__APPLICATION__METADATA" value="" /&gt; &lt;environmentVariable name="CONTRAST__APPLICATION__SESSION_ID" value="" /&gt; &lt;environmentVariable name="CONTRAST__APPLICATION__SESSION_METADATA" value="" /&gt; &lt;environmentVariable name="CONTRAST__SERVER__NAME" value="localhost" /&gt; &lt;environmentVariable name="CONTRAST__SERVER__ENVIRONMENT" value="development" /&gt; &lt;environmentVariable name="CONTRAST__SERVER__TAGS" value="" /&gt; </pre> |

| Platform          | Variable set  |
|-------------------|---|
| Azure App Service | <pre>[   {     "name": "CONTRAST__API__URL",     "value": "https://app.contrastsecurity.com/Contrast/ "   },   {     "name": "CONTRAST__API__API_KEY",     "value": ""   },   {     "name": "CONTRAST__API__SERVICE_KEY",     "value": ""   },   {     "name": "CONTRAST__API__USER_NAME",     "value": ""   },   {     "name": "CONTRAST__INVENTORY__TAGS",     "value": ""   },   {     "name": "CONTRAST__ASSESS__TAGS",     "value": ""   },   {     "name": "CONTRAST__APPLICATION__NAME",     "value": ""   },   {     "name": "CONTRAST__APPLICATION__GROUP",     "value": ""   },   {     "name": "CONTRAST__APPLICATION__CODE",     "value": ""   },   {     "name": "CONTRAST__APPLICATION__VERSION",     "value": ""   },   {     "name": "CONTRAST__APPLICATION__TAGS",     "value": ""   },   {     "name": "CONTRAST__APPLICATION__METADATA",     "value": ""   },   {     "name": "CONTRAST__APPLICATION__SESSION_ID",     "value": ""   },   {     "name": "CONTRAST__APPLICATION__SESSION_METADATA",     "value": ""   },   {     "name": "CONTRAST__SERVER__NAME",     "value": "localhost"   },   {     "name": "CONTRAST__SERVER__ENVIRONMENT",     "value": "development"   },   {     "name": "CONTRAST__SERVER__TAGS",     "value": ""   } ]</pre> |

## Additional configuration values set by system properties

| Configuration value            | Languages   |
|--------------------------------|---|
| -Dcontrast.api.url             | Java, .NET Framework, .NET Core, Node.js, PHP, Python, Ruby, and Go |
| -Dcontrast.api.api_key         | Java, .NET Framework, .NET Core, Node.js, PHP, Python, Ruby, and Go |
| -Dcontrast.api.service_key     | Java, .NET Framework, .NET Core, Node.js, PHP, Python, Ruby, and Go |
| -Dcontrast.api.user_name       | Java, .NET Framework, .NET Core, Node.js, PHP, Python, Ruby, and Go |
| -Dcontrast.inventory.tags      | Java, .NET Framework, .NET Core, Node.js, PHP, Python, and Ruby     |
| -Dcontrast.assess.tags         | Java, .NET Framework, .NET Core, Node.js, PHP, Python, Ruby, and Go |
| -Dcontrast.application.name    | Java, .NET Framework, .NET Core, Node.js, PHP, Python, Ruby, and Go |
| -Dcontrast.application.group   | Java, .NET Framework, .NET Core, Node.js, PHP, Python, Ruby, and Go |
| -Dcontrast.application.code    | Java, .NET Framework, .NET Core, Node.js, PHP, Python, Ruby, and Go |
| -Dcontrast.application.version | Java, .NET Framework, .NET Core, Node.js, PHP, Python, Ruby, and Go |
| -Dcontrast.application.tags    | Java, .NET Framework, .NET Core, Node.js, PHP, Python, Ruby, and Go |
| -Dcontrast.server.name         | Java, .NET Framework, .NET Core, Node.js, PHP, Python, Ruby, and Go |
| -Dcontrast.server.environment  | Java, .NET Framework, .NET Core, Node.js, PHP, Python, Ruby, and Go |
| -Dcontrast.server.tags         | Java, .NET Framework, .NET Core, Node.js, PHP, Python, Ruby, and Go |

## Additional configuration values set in the YAML

Use the YAML to set these additional configuration values.

| Property                  | Description  | Languages   |
|---------------------------|--|---|
| contrast.api.url          | Set the URL for Contrast.  | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| contrast.api.api_key      | Set the API key needed to communicate with Contrast.   | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| contrast.api.service_key  | Set the service key needed to communicate with Contrast. It is used to calculate the Authorization header.   | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| contrast.api.user_name    | Set the user name used to communicate with Contrast. It is used to calculate the Authorization header.   | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| contrast.inventory.tags   | Apply a list of labels to libraries. Labels must be formatted as a comma-delimited list. Example: label1, label2, label3.  | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, and PHP     |
| contrast.assess.tags      | Apply a list of labels to vulnerabilities and preflight messages. Labels must be formatted as a comma-delimited list. Example: label1, label2, label3.   | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| contrast.application.name | Override the reported application name. Note: On Java systems where multiple, distinct applications may be served by a single process, this configuration causes the agent to report all discovered applications as one application with the given name. | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |

| Property                              | Description   | Languages   |
|---------------------------------------|---|---|
| contrast.application.group            | Add the name of the application group with which this application should be associated in Contrast.   | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| contrast.application.code             | Add the application code this application should use in Contrast.   | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| contrast.application.metadata         | Define a set of <code>key=value</code> pairs (which conforms to RFC 2253) for specifying user-defined metadata associated with the application. The set must be formatted as a comma-delimited list of <code>key=value</code> pairs. Example: <code>business-unit=accounting,office=Baltimore</code>                            | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| contrast.application.session_id       | Provide the ID of a session that already exists in Contrast. Vulnerabilities discovered by the agent are associated with this session. If an invalid ID is supplied, the agent will be disabled. This option and <code>application.session_metadata</code> are mutually exclusive; if both are set, the agent will be disabled. | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| contrast.application.session_metadata | Provide metadata that is used to create a new session ID in Contrast. Vulnerabilities discovered by the agent are associated with this new session. This value should be formatted as <code>key=value</code> pairs (conforming to RFC 2253).  | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| contrast.application.version          | Override the reported application version.  | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| contrast.application.tags             | Apply labels to an application. Labels must be formatted as a comma-delimited list. Example: <code>label1, label2, label3</code> .  | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| contrast.server.name                  | Override the reported server name.  | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| contrast.server.environment           | Override the reported server environment. Valid values include QA, PRODUCTION and DEVELOPMENT.  | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |
| contrast.server.tags                  | Apply a list of labels to the server. Labels must be formatted as a comma-delimited list. Example: <code>label1, label2, label3</code> .  | Java, .NET Framework, .NET Core, Node.js, Python, Ruby, PHP, and Go |

## Tags and data

### Tags

You may want or need to filter either Applications or Servers based on user-defined criteria. In this case, tags may be desired instead of or in addition to metadata. Tags can be applied to either an [application \(page 652\)](#), [server \(page 1193\)](#), [libraries \(page 1211\)](#), and/or [vulnerabilities \(page 1313\)](#). These tags can help better organize items and improve search in Contrast.

### Metadata

Application metadata can be created during agent configuration to help collect data from applications. You can set up fields to identify specific application owners, business units, locations, or other important pieces of information associated with an application.

## Session metadata

You may want or need to filter vulnerability data for specific fields of information. When supplied in the agent configuration, the session metadata can be used as a filter in the [Application Vulnerability \(page 1308\)](#) details (not the Vulnerability Tab).



### NOTE

Most Contrast agents now automatically create a unique fingerprint that is equal to that unique build of an agent and populates session metadata values. The key used for this is called `artifactHash`. [Session metadata \(page 656\)](#) lists the supported agent versions for this feature.

Commonly-used fields include:

| Name         | Value                    |
|--------------|--------------------------|
| Commit Hash  | <code>commitHash</code>  |
| Committer    | <code>committer</code>   |
| Branch Name  | <code>branchName</code>  |
| Git Tag      | <code>gitTag</code>      |
| Repository   | <code>repository</code>  |
| Test Run     | <code>testRun</code>     |
| Version      | <code>version</code>     |
| Build Number | <code>buildNumber</code> |

For more information see [session metadata \(page 656\)](#).

## Advanced agent deployment

The easiest and fastest method for deploying agents is to use the [Contrast agent wizards \(page 51\)](#).

If you are interested in additional deployment details and procedures, visit these topics:

| Agent language | Links  |
|----------------|--|
| Java           | <a href="#">Java advanced installation (page 122)</a>            |
|                | <a href="#">Java advanced configuration (page 151)</a>           |
| .NET Framework | <a href="#">.NET Framework advanced installation (page 213)</a>  |
|                | <a href="#">.NET Framework advanced configuration (page 230)</a> |
| .NET Core      | <a href="#">.NET Core advanced installation (page 270)</a>       |
|                | <a href="#">.NET Core advanced configuration (page 297)</a>      |
| Node.js        | <a href="#">Node.js advanced installation (page 336)</a>         |
|                | <a href="#">Node.js advanced configuration (page 357)</a>        |
| PHP            | <a href="#">PHP advanced installation (page 394)</a>             |
|                | <a href="#">PHP advanced configuration (page 399)</a>            |
| Python         | <a href="#">Python advanced installation (page 425)</a>          |
|                | <a href="#">Python advanced configuration (page 427)</a>         |
| Ruby           | <a href="#">Ruby advanced installation (page 507)</a>            |
|                | <a href="#">Ruby advanced configuration (page 510)</a>           |

| Agent language | Links   |
|----------------|---|
| Go             | <a href="#">Go advanced installation (page 567)</a><br><a href="#">Go advanced configuration (page 570)</a> |

## Java agent

The Contrast Java agent adds either Contrast Assess or Contrast Protect analysis to Java based applications. The agent analyzes Java web applications built on traditional application servers, and newer Java web applications such as those built with Netty, Play or Spring Boot. If there's a JVM, the Java agent can provide security insights.

As your application runs, the Java agent's sensors gather information about the application's security, architecture and libraries. You can see the results of the agent's analysis in Contrast.

To start analyzing an application, [install the Java agent \(page 54\)](#).

## Java advanced installation

The easiest way to deploy Java agents is to use the [Agent wizard \(page 54\)](#) in the Contrast web interface.

If you want additional information or methods related to the deployment of Java agents, visit these topics:

| Category                          | Topics  |
|-----------------------------------|---|
| Installation                      | <ul style="list-style-type: none"><li>• <a href="#">Install the Java agent (page 125)</a></li><li>• <a href="#">Java telemetry (page 123)</a></li><li>• <a href="#">Java vulnerability deduplication (page 123)</a></li><li>• <a href="#">Install with infrastructure as code tools (page 136)</a></li><li>• <a href="#">Install in an existing Gradle project (page 131)</a></li><li>• <a href="#">Install with VMware Tanzu (page 136)</a></li><li>• <a href="#">Install with AWS Elastic Beanstalk (page 134)</a></li><li>• <a href="#">Install with automatic updates on Linux (page 141)</a></li></ul> |
| Deployment on application servers | <ul style="list-style-type: none"><li>• <a href="#">JBoss/Wildfly (page 144)</a></li><li>• <a href="#">Jetty (page 145)</a></li><li>• <a href="#">Tomcat (page 146)</a></li><li>• <a href="#">WebLogic (page 147)</a></li><li>• <a href="#">WebSphere (page 148)</a></li></ul>  |

## See also

[Advanced configuration \(page 151\)](#)

## Kotlin

You can use the Contrast Java agent with Contrast Assess or Contrast SCA to analyze Kotlin-based applications.

The Java agent analyzes Kotlin web applications built on traditional application servers, and newer Kotlin server-side applications, such as SpringBoot.

If there's a JVM, the Kotlin agent can provide security insights. As your application runs, the Java agent's sensors gather information about the application's security, architecture and libraries. You can see the results of the agent's analysis in Contrast.

Run your application as you would with the Contrast Java agent. Kotlin support is automatic.

## Scala

You can use the Contrast Java agent with Contrast Assess or Contrast SCA to analyze Scala-based applications.

The Java agent analyzes Scala web applications built on traditional application servers, and newer Scala web applications such as those built with Play. If there's a JVM, the Scala agent can provide security insights.

As your application runs, the Java agent's sensors gather information about the application's security, architecture and libraries. You can see the results of the agent's analysis in Contrast.

The Scala agent supports these Contrast features:

- Route coverage
- Flow maps
- SCA library discovery

### Java agent telemetry

The Contrast Java agent use telemetry to collect usage data. Telemetry is collected when an instrumented application first loads the agent's sensors and then periodically (every few hours) afterwards.

[Your privacy is important to us \(page 1563\)](#). The telemetry feature doesn't collect application data. The data is anonymized before being sent securely to Contrast. Then the aggregated data is stored encrypted and under restricted access control. Any collected data will be deleted after one year.

The telemetry feature collects the following data (optional):

| Agent version  | Data collected   |
|----------------|--|
| Java 3.16.XXXX | <ul style="list-style-type: none"><li>• Operating system and version</li><li>• Whether the agent is running in a container</li><li>• Memory limits configured in the JVM</li><li>• Java version and vendor</li><li>• Physical memory available</li><li>• CPU count</li></ul> |



#### NOTE

To opt-out of the telemetry feature, set `CONTRAST_AGENT_TELEMETRY_OPTOUT` environment variable to `true` or `1`. Telemetry data is securely sent to `telemetry.java.contrastsecurity.com`. You can also opt out of telemetry by blocking communication at the network level.

### Java deduplication for middleware vulnerabilities

Starting with Java 6.11.1, the agent contains enhancements that reduce redundant or duplicate vulnerabilities that occur in applications using middleware components, such as filters. This update improves the accuracy and efficiency of Contrast vulnerability reporting by deduplicating findings that originate from these middleware layers.

Middleware components play an essential role in web applications by intercepting and processing requests before they reach servlets and controllers. They handle responses after servlets or controllers complete execution.

A filter is a component that intercepts requests before they are passed to a servlet and processes responses before they are returned to the client. Filters have access to the request's routing data, current controller, and other contextual information.

## Why is this update important?

Often, vulnerabilities tied to both routes and middleware result in duplicated findings, which inflate the number of vulnerabilities that security teams need to review. This situation causes wasted time, missed priorities, and inefficiency in remediation efforts. By enabling the new deduplication capability, Contrast reduces unnecessary noise and improves the overall security posture of applications.

## Features

- **Middleware Instrumentation:** The Java agent now recognizes filters and middleware as unique sources, allowing vulnerabilities identified within these layers to be appropriately categorized and reported.

The name of a vulnerability includes an indication that Contrast found it in a middleware component. For example, a vulnerability that Contrast discovers in a filter could look similar to the following example

```
Path Traversal from "param" Parameter in com.contrastsecurity.testapp.servlet24.route.coverage.Filters$ServletMappedFilter.doFilter(javax.servlet.ServletRequest,javax.servlet.ServletResponse,javax.servlet.FilterChain)
```

- **Deduplication Process:** Once the agent detects middleware vulnerabilities, Contrast automatically deduplicates them from the route-based vulnerabilities to which they are attached.
- **Auto-Verification Support:** Vulnerabilities that the agent discovers in middleware are eligible for time-based auto-verification (see [Vulnerability management policies \(page 1406\)](#)). This type of auto-verification streamlines the process of validating resolved vulnerabilities and reduces manual intervention.  
Route-based and session-based auto-verification are not currently supported.
- **Comprehensive Reporting:** Contrast displays middleware vulnerabilities in its vulnerability reporting and telemetry, providing clear visibility into the status and lifecycle of these findings.

## How it works

- **Filter handling:** The Java agent instruments filters to gather information on vulnerabilities that may be attached to them. This process involves identifying vulnerabilities in the context of the request lifecycle, specifically in the filters where these vulnerabilities originate.
- **Deduplication logic and vulnerability identification:** The agent treats middleware or filters and routes are treated as separate sources of vulnerabilities. The agent distinguishes between vulnerabilities originating from routes versus those originating from middleware components.
- **Auto-verification:** Contrast automatically includes middleware-based vulnerabilities in the auto-verification workflow. The recommended auto-verification method is a time-based auto-verification to ensure comprehensive coverage. [Set an auto-verification vulnerability policies \(page 1409\)](#) describes how to set time-based auto-verification.  
Session-based auto-verification(SBAV) and route-based auto-verification (RBAV)[ are not currently included in the workflow today.

## Upgrade considerations

- **On-premises customers:** Upgrade to Contrast version 3.11.8 or later before you upgrade the Java agent. If you upgrade the agent before upgrading your Contrast installation , you might see new middleware routes and a potentially significant change to your route coverage metrics.
- **Impact on existing vulnerabilities:** Upgrading the Java agent results in enhanced accuracy in vulnerability reporting.  
However, existing vulnerabilities that were duplicated before the update remain in the system. If you have not set up any auto-verification policies, consider manually deleting the outdated vulnerabilities. To identify potential duplicates, on the Vulnerabilities page in the Contrast web interface, select the **Group by sink option**.  
For additional assistance, contact your Customer Success Manager or Contrast Support.



## Install the Java agent

There are several ways to install the Java agent depending on your situation. You might want to consider where you want to use Contrast (for example, Assess in your development environment or Protect in your production environment), your existing build tools, and how your application is deployed.



### TIP

If you are using multiple agent-based technologies in parallel with the Contrast Java agent, ensure that you specify the Contrast Java agent as the first agent that loads at startup. For example:

```
java -javaagent:contrast.jar -javaagent:newrelic.jar
```

Loading the Contrast Java agent first helps to limit performance impacts.

## Contrast and hot deployments

A hot deployment is the process of adding new components (such as WAR files, servlets, and JSP files) to a running server without having to stop and restart the application server process.

The Contrast agent continues to work during hot deployments and hot reloads with these considerations:

- Contrast might not detect libraries that are added or removed dynamically during hot deployments.
- Contrast cannot update session metadata during a hot deployment.
- Some WebSphere users might experience issues.

If you encounter hot deployment issues, restart the application server.

## Contrast and OpenTelemetry agents

If you plan to use an OpenTelemetry agent in the same environment as the Contrast agent, consider suppressing OpenTelemetry instrumentation of Contrast classes. Doing so prevents possible conflicts with Contrast agents.

To suppress OpenTelemetry instrumentation, add this exclusion as an environment variable:

```
OTEL_JAVAAGENT_EXCLUDE_CLASSES="com.contrast*"
```

Or a JVM option:

```
-Dotel.javaagent.exclude-classes=com.contrast*
```

## Quick start

Just want to try out the Java agent and see how it works? Check out this [Java Quick Start Guide \(page 149\)](#).

## Basic installation

To install the Java agent in most situations (like in an application server like Tomcat, or a container like Docker), choose a repository and follow these instructions to download and install the agent:

- [Maven Central \(page 126\)](#)
- [Debian \(page 128\)](#)
- [RPM \(page 127\)](#)

## Build-integrated installation

If you are using Assess in a development environment, and you want to set the build outcome in an existing software project if vulnerabilities are found, install the agent with:

- [Maven plugin \(page 1384\)](#)
- [Gradle plugin \(page 1364\)](#)
- [Jenkins plugin \(page 1369\)](#)

## Install the Java agent using Maven Central

The Contrast Java agent is [available from Maven Central](#) using group ID `com.contrastsecurity` and artifact ID `contrast-agent`. To install the Java agent:

1. Get the `contrast-agent.jar` from Maven Central. (See [examples](#) of how to download from the Maven repository.)  
The latest Contrast Java agent is available for download directly from <https://download.java.contrastsecurity.com/latest>.
2. [Configure the agent \(page 151\)](#). You can create or download a [YAML configuration file \(page 112\)](#). You must provide Contrast connection parameters using [these agent keys \(page 109\)](#).
3. Tell the agent where to find the yaml configuration file (`contrast.yaml`). In the example below, substitute `<YourContrastJarPath>` with the path to your Contrast JAR (this may vary depending on your internal file structure and how you downloaded the file) and `<ApplicationJar>` with the name of your application JAR.

```
java -javaagent:<YourContrastJarPath>  
-Dcontrast.config.path=contrast.yaml -jar <ApplicationJar>.jar
```



### NOTE

If you are using system properties, environment variables to configure instead of YAML, or you have placed the YAML in a [standard location \(page 111\)](#) where the agent can find it automatically, set the JVM parameter to include the Java agent.

```
java -javaagent:<YourContrastJarPath> -jar <AppName>.jar
```

4. Use the application as you normally would (for example, click on the web interface, send API commands). Verify that Contrast sees your application (for example, view your application in the Contrast web interface, view logs).

Contrast artifacts deployed to Maven Central are signed with our GPG key hosted on <https://keyserver.ubuntu.com>. Contrast's public signing key has ID `1AAD9AFB3FC5CCA6940D021534D84B137E8F1053` and can be installed to a local keyring with the following command:

```
gpg --keyserver keyserver.ubuntu.com --recv-keys  
1AAD9AFB3FC5CCA6940D021534D84B137E8F1053
```

You can also provide security analysis for applications running in a test/QA or production environment, by installing the agent with an application server like:

- [Jetty \(page 145\)](#)
- [JBoss/Wildfly \(page 144\)](#)
- [Tomcat \(page 146\)](#)
- [WebLogic \(page 147\)](#)
- [WebSphere \(page 148\)](#)

You can also [install using a container \(page 129\)](#), like Docker.

**TIP**

Check the [Contrast Support Portal](#) for more information about other compatible ways to install the agent. If you are using VMware Tanzu, see the details in [Java installation with VMware Tanzu \(page 136\)](#).

**Install the Java agent with the RPM repository**

To install the Java agent with the RPM repository:

1. Use the following commands to configure your system to retrieve packages from the Contrast RPM repository:

```
OSREL=$(rpm -E "%{rhel}")
sudo -E tee /etc/yum.repos.d/contrast.repo << EOF
[contrast]
name=contrast repo
baseurl=https://pkg.contrastsecurity.com/rpm-public/centos-$OSREL/
gpgcheck=0
enabled=1
EOF
```

2. Once you've finished configuration, install the Contrast Java agent:

```
sudo yum install contrast-java-agent
```

3. The Contrast Java agent JAR is now installed at `/opt/contrast/contrast-agent.jar`.
4. [Configure the agent \(page 151\)](#). You can create or download a [YAML configuration file \(page 112\)](#). You must provide Contrast connection parameters using [these agent keys \(page 109\)](#).
5. Tell the agent where to find the yaml configuration file (`contrast.yaml`). In the example below, substitute `<YourContrastJarPath>` with the path to your Contrast JAR (this may vary depending on your internal file structure and how you downloaded the file) and `<ApplicationJar>` with the name of your application JAR.

```
java -javaagent:<YourContrastJarPath>
-Dcontrast.config.path=contrast.yaml -jar <ApplicationJar>.jar
```

**NOTE**

If you are using system properties, environment variables to configure instead of YAML, or you have placed the YAML in a [standard location \(page 111\)](#) where the agent can find it automatically, set the JVM parameter to include the Java agent.

```
java -javaagent:<YourContrastJarPath> -jar <AppName>.jar
```

6. Use the application as you normally would (for example, click on the web interface, send API commands). Verify that Contrast sees your application (for example, view your application in the Contrast web interface, view logs).

You can also provide security analysis for applications running in a test/QA or production environment, by installing the agent with an application server like:

- [Glassfish](#)
- [Jetty \(page 145\)](#)
- [JBoss/Wildfly \(page 144\)](#)

- [Tomcat \(page 146\)](#)
- [WebLogic \(page 147\)](#)
- [WebSphere \(page 148\)](#)

You can also [install using a container \(page 129\)](#), like Docker.

**TIP**

Check the [Contrast Support Portal](#) for more information about other compatible ways to install the agent. If you are using VMware Tanzu, see the details in [Java installation with VMware Tanzu \(page 136\)](#).

## Install the Java agent using the Debian repository

You can configure your system to retrieve and install the Java agent from the Contrast Debian repository. To do this:

1. Use the following commands to configure your system to receive packages from the repository:

```
curl https://pkg.contrastsecurity.com/api/gpg/key/public | sudo apt-key  
add -  
echo "deb https://pkg.contrastsecurity.com/debian-public/ all contrast"  
| sudo tee /etc/apt/sources.list.d/contrast-all.list
```

2. Install the Contrast Java agent:

```
sudo apt-get update && sudo apt-get install contrast-java-agent
```

3. You will now see the Contrast Java agent JAR file at `/opt/contrast/contrast-agent.jar`.
4. [Configure the agent \(page 151\)](#). You can create or download a [YAML configuration file \(page 112\)](#). You must provide Contrast connection parameters using [these agent keys \(page 109\)](#).
5. Tell the agent where to find the yaml configuration file (`contrast.yaml`). In the example below, substitute `<YourContrastJarPath>` with the path to your Contrast JAR (this may vary depending on your internal file structure and how you downloaded the file) and `<ApplicationJar>` with the name of your application JAR.

```
java -javaagent:<YourContrastJarPath>  
-Dcontrast.config.path=contrast.yaml -jar <ApplicationJar>.jar
```

**NOTE**

If you are using system properties, environment variables to configure instead of YAML, or you have placed the YAML in a [standard location \(page 111\)](#) where the agent can find it automatically, set the JVM parameter to include the Java agent.

```
java -javaagent:<YourContrastJarPath> -jar <AppName>.jar
```

6. Use the application as you normally would (for example, click on the web interface, send API commands). Verify that Contrast sees your application (for example, view your application in the Contrast web interface, view logs).

You can also provide security analysis for applications running in a test/QA or production environment, by installing the agent with an application server like:

- [Glassfish](#)
- [Jetty \(page 145\)](#)
- [JBoss/Wildfly \(page 144\)](#)
- [Tomcat \(page 146\)](#)
- [WebLogic \(page 147\)](#)
- [WebSphere \(page 148\)](#)

You can also [install using a container \(page 129\)](#), like Docker.

**TIP**

Check the [Contrast Support Portal](#) for more information about other compatible ways to install the agent. If you are using VMware Tanzu, see the details in [Java installation with VMware Tanzu \(page 136\)](#).

**Install the Java agent using a container**

This topic provides general guidance for installing the Contrast Java agent in a containerized application, with Docker as an example.

**NOTE**

If the agent takes a long time to start, [Java Agent Effects on Startup Performance](#) and [Java agent with Docker](#) provide details to help you resolve this issue.

**Before you begin**

You should have a basic understanding of how containers and related software work. You may need to adjust the instructions to meet your specific circumstances.

**ECS support**

Using this procedure, you can install the Contrast Java agent using a Docker container in an Amazon Elastic Container Service (ECS) environment.

**Step 1: Install the agent**

Contrast can be added either before or after the application is added to the container image. The recommended approach is with the use of named [multi-stage builds](#). For example:

```
FROM eclipse-temurin:17

# Hidden for brevity...

# Copy the required agent files from the official Contrast agent image.
COPY --from=contrast/agent-java:latest /contrast/contrast-agent.jar /opt/
contrast/contrast.jar
```

In this example, the latest Java agent is used. Check DockerHub for [available tags](#).

**Step 2: Configure the agent**

When installing the Java agent into a container:

- Use a **YAML configuration file** for common configuration settings so it can be placed in the base image. For example, a common configuration might include redirecting logging to console output, proxy configuration, or performance tuning.

The [Contrast agent configuration editor \(page 113\)](#) can help with configuring the agent correctly.

Create and copy the YAML file into the base image, then copy the file into the base image Dockerfile using:

```
COPY WORKSPACE/contrast_security.yaml /opt/contrast/contrast_security.yaml
```

- Use **Java system properties** or **environment variables** for application-specific configuration values so you can uniquely configure options for each application.

| Contrast configuration       | Function   | Java system property                    | Environment variable |
|------------------------------|--|---|----------------------|
| Application metadata         | Specify application-specific metadata<br><br><a href="#">Create application metadata (page 1456)</a> before you specify them in the configuration. | -Dcontrast.application.metadata         | CONTRAST__AP         |
| Application session metadata | Send application details like build number, version, GIT hash, and other <a href="#">session metadata (page 656)</a> .                             | -Dcontrast.application.session_metadata | CONTRAST__AP         |
| Application group            | Specify the application access group for this application during onboarding. <a href="#">Create these groups (page 1446)</a> in Contrast first.    | -Dcontrast.application.group            | CONTRAST__AP         |
| Server environment           | Specify in which environments the application is running: Development, QA and Production.  | -Dcontrast.server.environment           | CONTRAST__SE         |

### Step 3: Update JVM parameters

To attach any profiler to a Java application, you need to pass a `-javaagent` flag to the application by setting `JAVA_TOOL_OPTIONS` environment variables.

Pre-populate the Contrast common JVM parameters in a separate environment variable in the base image, so the application team can use it in `JAVA_TOOL_OPTIONS`. For example:

- For the base image Dockerfile:

```
ENV CONTRAST_OPTS "-javaagent:/opt/contrast/contrast.jar \  
-Dcontrast.config.path=/opt/contrast/contrast_security.yaml"
```

- For the application image Dockerfile:

```
ENV JAVA_TOOL_OPTIONS $CONTRAST_OPTS \  
-Dcontrast.application.metadata=bU=<value>,contactEmail=<value>,contactNam  
e=<value> \  
-Dcontrast.application.group=APP_GROUP
```

### Step 4: Run the application image

After you [add \(page 129\)](#) and [configure \(page 129\)](#) the agent in a base image, run the image.

For the agent to send data to Contrast, it needs [agent authentication keys \(page 109\)](#). To protect the agent credentials, you can use the Docker secret and pass them as environment variables during deployment time. Here is an example of the Docker run command:

```
docker run -e CONTRAST__API__URL=https://app.contrastsecurity.com -e  
CONTRAST__API__API_KEY=<value> -e CONTRAST__API__SERVICE_KEY=<value> -e  
CONTRAST__API__USER_NAME=<value> -e CONTRAST__SERVER__NAME=<value> -e  
CONTRAST__SERVER__ENVIRONMENT=<value> image_with_contrast
```

You can verify that Contrast is running by checking the container log. You should see messages like these:

```
2020-05-28 22:36:29,910 [main STDOUT] INFO - Copyright: 2019 Contrast  
Security, Inc  
2020-05-28 22:36:29,910 [main STDOUT] INFO - Contact:  
support@contrastsecurity.com  
2020-05-28 22:36:29,910 [main STDOUT] INFO - License: Commercial  
2020-05-28 22:36:29,910 [main STDOUT] INFO - NOTICE: This Software and the  
patented inventions embodied within may only be used as part of  
2020-05-28 22:36:29,910 [main STDOUT] INFO - Contrast Security's commercial  
offerings. Even though it is made available through public  
2020-05-28 22:36:29,910 [main STDOUT] INFO - repositories, use of this  
Software is subject to the applicable End User Licensing Agreement  
2020-05-28 22:36:29,910 [main STDOUT] INFO - found at https://  
www.contrastsecurity.com/enduser-terms-0317a or as otherwise agreed between  
2020-05-28 22:36:29,910 [main STDOUT] INFO - Contrast Security and the End  
User. The Software may not be reverse engineered, modified,  
2020-05-28 22:36:29,910 [main STDOUT] INFO - repackaged, sold,  
redistributed or otherwise used in a way not consistent with the End User  
2020-05-28 22:36:29,910 [main STDOUT] INFO - License Agreement.  
[Contrast] Thu May 28 22:36:30 EDT 2020 Effective instructions:  
Assess=false, Protect=true  
[Contrast] Thu May 28 22:36:30 EDT 2020 String Supporter has been disabled  
[Contrast] Thu May 28 22:36:30 EDT 2020 Logging security messages to /Users/  
usernamehere/.contrast/security.log  
[Contrast] Thu May 28 22:36:31 EDT 2020 Starting JVM [1862ms]
```

## See also

[Agent Operator \(Kubernetes operator\) \(page 592\)](#)

Contrast Support Portal [AWS Fargate and Contrast agents](#) and [Java agent with Docker](#)

## Install the Java agent in an existing Gradle project with Docker

This example uses a sample Gradle project, which includes the [Application Plugin](#) and the [Docker Plugin](#) to build a Java web application. It also runs JUnit 5 integration tests that verify the web application's behavior. As part of the process, you will include Contrast in the Docker image used for testing so that Contrast Assess analyzes your code during integration testing. See an [example of a Gradle project](#) in our Github repo.



### NOTE

Any part of the following procedures that refer to any form of packaging or distribution are meant for your organization's internal use. Do not distribute Contrast with your application or Docker container outside of your organization. See [Contrast's Terms of Service agreement](#) for more information.

To add the Contrast Java agent to an existing Gradle project with Docker:

1. Open a command prompt, and run the following command to clone Contrast's **examples** repository:

```
$ git clone https://github.com/Contrast-Security-OSS/contrast-java-examples.git
```

2. Enter the `gradle-docker` directory:

```
$ cd contrast-java-examples/gradle-docker
```

3. Run a test build to make sure everything is working:

```
$ ./gradlew build
```

```
BUILD SUCCESSFUL in 3s
```

```
4 actionable tasks: 3 executed, 1 up-to-date
```



#### NOTE

On Windows, run `gradlew.bat build` instead.

4. If the test build doesn't work, check to make sure you have Java 11 correctly installed (Java 11 or later is required to build the sample application. [Java supported technologies \(page 55\)](#) lists the versions of Java supported that the Contrast Java agent supports):

```
$ java -version
openjdk version "11.0.18" 2023-01-17
OpenJDK Runtime Environment Temurin-11.0.18+10 (build 11.0.18+10)
OpenJDK 64-Bit Server VM Temurin-11.0.18+10 (build 11.0.18+10, mixed mode)
```

5. If you've made changes, run the build again. If it still doesn't work, [open an issue](#) that explains the problem.
6. Use the [agent keys \(page 109\)](#) to configure the agent's communication with Contrast. In most cases, you'll use this key:

- **Agent Token:** This variable is a base64 encoded JSON object containing the `url`, `api_key`, `service_key`, and `user_name` configuration settings, allowing you to set them set in a single variable.

**Legacy settings:** For older agents, you'll need these keys:

- Contrast URL: This URL, `https://app.contrastsecurity.com/Contrast` or the URL of your on-premises or private cloud instance.
- Organization API key
- Agent username
- Agent service key

7. Add the key as Gradle properties to the `gradle.properties` file in your [Gradle user home directory](#). If this file does not exist, create it.

```
contrastToken=<contrast_api_token>
```

**Legacy settings:** If you are using an older agent version, add these keys to the `gradle.properties` file.

Be sure to replace `<contrast_url>`, `<your_api_key>`, `<agent_user_name>` and `<agent_user_service_key>` with the Contrast URL, API key, username and service key values you obtained from the Contrast:

```
contrastUrl=<contrast_url>
contrastAgentUserName=<agent_user_name>
```



```
contrastAgentServiceKey=<agent_user_service_key>
contrastApiKey=<your_api_key>
```

8. Add the Contrast agent and configure the application to use it by modifying the `createDockerfile` task in `build.gradle`:

```
task createDockerfile(type: Dockerfile) {
    // ... rest of block omitted

    copyFile(new Dockerfile.CopyFile("/contrast/contrast-agent.jar", "/
contrast.jar").withStage("contrast/agent-java:latest"))
    environmentVariable("JAVA_TOOL_OPTIONS", "-javaagent:/contrast.jar")
}
```

9. Pass the configuration variables into the container by adding the following commands to the `createContainer` task in `build.gradle`:

```
task createContainer(type: DockerCreateContainer) {
    // ... rest of the config omitted

    envVars = [
        CONTRAST__API__TOKEN: project.property("contrastToken"),
        CONTRAST__APPLICATION__NAME: "${project.name}-how-to"
    ]
}
```

If your agent configuration refers to both the legacy settings and the agent token, (in environment variables or the YAML file), the legacy settings take precedence. To use just the agent token value, make sure you remove references to the legacy settings

**Legacy settings:** If you are using an older agent version, add the following commands:

```
task createContainer(type: DockerCreateContainer) {
    // ... rest of the config omitted

    envVars = [
        CONTRAST__API__URL: project.property("contrastUrl"),
        CONTRAST__API__USER_NAME:
project.property("contrastAgentUserName"),
        CONTRAST__API__SERVICE_KEY:
project.property("contrastAgentServiceKey"),
        CONTRAST__API__API_KEY: project.property("contrastApiKey"),
        CONTRAST__APPLICATION__NAME: "${project.name}-how-to"
    ]
}
```

10. Run the build again:

```
./gradlew clean build
```



#### NOTE

On Windows, run `gradlew.bat clean build` instead.

The Docker container now runs the application with Contrast enabled. When the integration test runs, it detects the vulnerable endpoint and reports it to Contrast. To see the vulnerability report, log in to the Contrast web interface, navigate to the [Vulnerabilities list \(page 1307\)](#) and filter your view by the application name **gradle-application-how-to**.

## Install the Java agent with AWS Elastic Beanstalk

Use this procedure as a guide to configuring the Java agent to work with AWS Elastic Beanstalk. It describes how to create an `.ebextensions` file that downloads the Contrast Java agent and instruments your application.

Depending on your environment, you might need to customize the steps in this procedure.

This procedure is designed for users who are familiar with DevOps practices and how Beanstalk deployment works.

### Before you begin

- Verify that Contrast supports your [preferred tools and environments for Java](#). (page 55)
- Get the information needed to [connect the Java agent to Contrast](#) (page 125).
- Download and start the Contrast Java agent before running your applications.
- Verify that you have access to the Beanstalk environment to install customized `.ebextensions` configuration files.

### Step1: Specify settings to download the Contrast Java agent

The `.ebextensions` configuration file has a `files` section that downloads the agent from a remote URL. This example shows how to specify downloading the agent from a Maven repository.

```
files:
  "/opt/contrast/contrast.jar":
    mode: "000755"
    owner: rootCorporate rule
    group: root
    source: "https://repository.sonatype.org/service/local/artifact/maven/
redirect?r=central-proxy&g=com.contrastsecurity&a=contrast-agent&v=LATEST"
```

For Contrast agents, the recommended location is `/opt/contrast`, but you can use another location, if necessary. You can also change the URL to download agents from an internal repository. At build time, you can specify the agent version of your choice and download it from the [Maven repository](#).

### Step 2: Create an agent configuration file

There are different values you can use to configure Contrast agents, based on an [order of precedence](#) (page 111). Active configuration values are determined in this order:

1. Corporate rule (for example, expired licenses)
2. System property
3. Environment variable
4. YAML configuration file
5. Contrast web interface value
6. Contrast Security default value

The recommended approach to creating the configuration file is to use a common configuration and an application-specific configuration:

- **Common configuration:** Specifies core set of configurations in the YAML. For example:
  - Redirect logging to console output
  - Proxy configuration, if any
  - Performance tuning options to limit agent activity

This example shows how to create and configure the agent's YAML file at deployment time in an `.ebextensions` configuration file.

```
files:
  "/var/contrast/contrast_security.yaml" :
    mode: "000755"
    owner: root
    group: root
    content: |
      api:
        proxy:
          url: https://host:port
      agent:
        java:
          scan_all_classes: false
          scan_all_code_sources: false
        logger:
          stdout: true
```

- **Application-specific configuration:** This configuration lets you specify additional options, for each application. Use these environment variables:

- **Application metadata:** Specifies application-specific metadata

```
CONTRAST__APPLICATION__METADATA
```

- **Application name:** Specifies the application name reported to Contrast

```
CONTRAST__APPLICATION__NAME
```

- **Application session metadata:** Send application details such as, build number, version, and GIT hash,

```
CONTRAST__APPLICATION__SESSION__METADATA
```



#### NOTE

Learn about additional [session metadata options](#). (page 658)

- **Application group:** Specifies the application access group for this application when you add it to Contrast. You must create application access groups before you use this variable.

```
CONTRAST__APPLICATION__GROUP
```

- **Server environment:** specify in which environments the application is running. Valid values for this configuration are: Development, QA and Production.

```
CONTRAST__SERVER__ENVIRONMENT
```

**Example 1:** This example shows how to set environment variables when you create the environment:

```
eb create <environment name> --envvars CONTRAST__API__URL=https://
app.contrastsecurity.com/
Contrast,CONTRAST__API__API_KEY=<value>,CONTRAST__API__SERVICE_KEY=<value>
,CONTRAST__API__USER_NAME=<value>,CONTRAST__SERVER__NAME=<value>,CONTRAST__
SERVER__ENVIRONMENT=<value>
```

**Example 2:** This example shows how to set the environment variables after you create the environment:

```
eb setenv CONTRAST__API__URL=https://app.contrastsecurity.com/Contrast
CONTRAST__API__API_KEY=<value> CONTRAST__API__SERVICE_KEY=<value>
CONTRAST__API__USER_NAME=<value> CONTRAST__SERVER__NAME=<value>
CONTRAST__SERVER__ENVIRONMENT=<value>
```

### Step 3: Update JVM parameters

To attach any profiler to a Java application, you must pass a `-javaagent` flag to the application. To do this, set the `JAVA_TOOL_OPTIONS` environment variable.

Set these variables in the same way as you set application-specific environment variables. Use the paths for the agent's JAR and YAML configuration files, as shown in this example.

```
eb setenv JAVA_TOOL_OPTIONS="-javaagent:/opt/contrast/contrast.jar  
-Dcontrast.config.path=/var/contrast/contrast_security.yaml"
```

### Step 4: Deploy the agent using the `.ebextensions` configuration

AWS expects the Beanstalk customization configuration to be in the `.ebextensions` folder in the deployment folder root. This example shows a directory structure that includes the `.ebextensions` folder. It shows the location of the `contrast.config` file that includes the agent download and YAML configuration sections.

```
.ebextensions  
  contrast.config  
  application.jar
```

### Install Java with infrastructure as code tools

If you are using Ansible or Chef in your deployment environments, you can use either of them to deploy the Java agent.

[Ansible playbook \(page 585\)](#)

[Chef cookbook \(page 143\)](#)

### Java agent installation with VMware Tanzu Application Service

VMware Tanzu (Application Service formerly Pivotal Cloud Foundry) is a proprietary containerized Software as a Service (SaaS) environment. A Java buildpack that VMware releases makes the Contrast Java agent accessible. You install the buildpack in the container where you run your Java application.

### Contrast service

The existence of a single, bound Contrast service activates and downloads the Java agent. The `VCAP_SERVICES` payload, containing a service name, label or tag with `contrast-security` as a substring, defines the Contrast service. You can use either of these methods to create the Contrast service:

- **User-provided service:** A user-provided service is a simple way to bind a single application to the Java agent and configure authentication.
- **A service broker (Contrast tile):** Use the service broker to bind multiple applications, providing access to the Java agent and authentication.

When the Contrast service is bound to your application, it provides the strings needed to activate Contrast (puts the `javaagent` flag in the JVM) and provides authentication to the Contrast web interface.

### Java buildpacks

Java buildpacks contain the instructions and configuration information that the container needs to download and configure the Java agent. You can use an offline or online buildpack:

- An offline buildpack is typically forked from the GitHub repo where you have made customizations. These repos might contain older agent versions.
- An online buildpack is usually the latest version and pulled from GitHub when needed.

## Requirements

- Buildpacks  
To instrument an application in a VMware Tanzu Network environment, your application must use one of these buildpacks:
  - [Cloud Foundry Java Buildpack](#), version 3.19 and later or version 4.2 and later
  - [IBM Liberty Buildpack](#), version 2.7.0.2 and later
- Name or tag with `contrast-security` specified when you create the service
- The credential payload must contain the standard YAML properties.

For general information on configuring the buildpack, including how to specify configuration values through environment variables, refer to the [Configuration and Extension](#) section of the Cloud Foundry Java Buildpack documentation.

## Configuration options

You can configure the framework by modifying the `config/contrast_security_agent.yml` file in the buildpack fork. The framework uses the [Repository utility support](#) and supports the [version syntax](#) defined there.

| Name                         | Description   |
|------------------------------|---|
| <code>repository_root</code> | The URL of the Contrast Security <a href="#">repository index</a> |
| <code>version</code>         | The version of the Contrast agent to use                          |

To specify a version of the Java agent to use, set the `JBP_CONFIG_CONTRASTSECURITYAGENT` environment variable and specify a version listed in the [index](#). For example:

```
JBP_CONFIG_CONTRASTSECURITYAGENT='version: 4.13.1'
```

## Example

This example shows how to create a user-provided service and bind it to an application called `spring-petclinic`:

1. This command pushes an application to Cloud Foundry, providing the buildpack to be used: (otherwise the default buildpack is used in the environment)

```
cf push myApp -p target/spring-petclinic-2.4.2.jar \  
-b 'https://github.com/cloudfoundry/java-buildpack.git'
```

2. This command creates a user-provided service:

```
cf create-user-provided-service contrast-security-service -p  
"teamserver_url, username, api_key, service_key"
```

The value for `teamserver_url` should include only the protocol and hostname. Do not include `/contrast/` or `/contrast/api`.

3. This command binds the service to the application (this task is essential):

```
cf bind-service myApp contrast-security-service
```

4. This command restages the application so it can connect to Contrast (essentially, restarts the container):

```
cf restage myApp
```

## See also

[Add Contrast service broker tile for VMware Tanzu \(page 139\)](#)

[Add Contrast service broker for VMware Tanzu \(page 138\)](#)

[Configure a proxy for Contrast service broker \(page 140\)](#)

## Add Contrast service broker for VMware Tanzu

### Steps

1. Deploy the service broker application with a command similar to this example:

```
cf push contrast-security-service-broker
```

You should see the service broker in PCF.

2. Configure plans with the `CONTRAST_SERVICE_PLANS` environment variable (the service broker doesn't offer any plans by default).

You can also use the Pivotal Ops Manager to set the environment variables. If you are using IBM Cloud, you can select the application, select **Runtime** and then **Environment Variables** to set the value.

**Example:** This example shows how to set the value in the command line:

```
cf set-env contrast-security-service-broker CONTRAST_SERVICE_PLANS
" {
  "ServicePlan1": {
    "name": "ServicePlan1",
    "teamserver_url": "https://yourteamserverurl.com",
    "username": "your_username",
    "org_uuid": "00000000-1111-2222-3333-000000000000",
    "api_key": "your_api_key",
    "service_key": "your_service_key"
  },
  "AnotherServicePlan": {
    "name": "AnotherServicePlan",
    "teamserver_url": "https://yourteamserverurl.com",
    "username": "your_username",
    "org_uuid": "00000000-1111-2222-3333-000000000001",
    "api_key": "your_api_key",
    "service_key": "some_other_service_key"
  }
}
```

To run the agent on IBM Cloud, you must use single quotes to set the `CONTRAST_SERVICE_PLANS` environment variable, as shown in this example:

```
cf set-env contrast-security-service-broker CONTRAST_SERVICE_PLANS
" {
  'ServicePlan1': {
    'name': 'ServicePlan1',
    'teamserver_url': 'https://yourteamserverurl.com',
    'username': 'your_username',
    'org_uuid': '00000000-1111-2222-3333-000000000000',
    'api_key': 'your_api_key',
    'service_key': 'your_service_key'
  },
  'AnotherServicePlan': {
    'name': 'AnotherServicePlan',
    'teamserver_url': 'https://yourteamserverurl.com',
    'username': 'your_username',
    'org_uuid': '00000000-1111-2222-3333-000000000000',
    'api_key': 'your_api_key',
    'service_key': 'some_other_service_key'
  }
}
```

```
        'service_key': 'some_other_service_key'
      }
    } "
```

3. Restage your application using a command similar to this example:

```
cf restage contrast-security-service-broker
```

4. Set an environment variable for a username and a password:

```
cf set-env contrast-security-service-broker SECURITY_USER_NAME
aSecureUsername
cf set-env contrast-security-service-broker SECURITY_USER_PASSWORD
aSecurePassword
```

5. Create a service broker instance. Define at least one service plan for this. You must use the same username and password that you set in the previous step.

```
cf create-service-broker contrast-security-service-broker USER_NAME
PASSWORD
<URL of your application>
```

For IBM Cloud, add `--space-scoped` at the end of the command, as shown in this example:

```
cf create-service-broker contrast-security-service-broker USER_NAME
PASSWORD
<URL of your application> --space-scoped
```

6. All service brokers start as private. Make it public with a command similar to the following example:

```
cf enable-service-access contrast-security-service-broker
```

7. Once the service broker is working, create a service instance and bind it to the application. To create a service instance, run the following command:

```
cf create-service contrast-security-service-broker ServicePlan1
<name_of_service>
```

8. Bind the service broker it to your application using the following command:

```
cf bind-service <app_name> <name_of_service>
```

You should see the agent start up with your application. You also see your application in the Contrast web interface.

## See also

[Add Contrast service broker tile \(page 139\)](#)

[Configure a proxy for Contrast service broker \(page 140\)](#)

## Add the Contrast service broker tile for VMware Tanzu

To integrate Contrast with VMware Tanzu Network (formerly Pivotal Cloud Foundry), install the Contrast service broker tile.

### Steps

1. Download the Contrast service broker tile from [VMware Tanzu Network](#).
2. Store the file locally and navigate to your Pivotal Ops Manager instance.
3. Select **Import a Product** and then, select the `contrast-security-service-broker-#.#.#.pivotal` tile that you downloaded.  
If the file you downloaded has a ZIP extension, rename it to `contrast-security-service-broker-#.#.#.pivotal`.

4. The tile requires some configuration before you can deploy it. The service broker does not include service plans by default. Add at least one plan before you deploy the Contrast service broker tile. To add a service plan, select **Service Plans** in the Contrast service broker tile and select **Add**.
5. Set these configuration parameters in the service plan:
  - **TeamServer:** The URL for your Contrast application instance
  - **TeamServer Service Key:** [Organization service key \(page 109\)](#)
  - **TeamServer API Key:** [Organization API key \(page 109\)](#)
  - **Organization UUID:** [Organization ID \(page 109\)](#) to which the application will belong
  - **Username:** Your Contrast username
  - **Plan Name:** Name of the plan as it will appear in Apps Manager
  - **Proxy Host:** The hostname of a proxy for the service broker to communicate with Contrast
  - **Proxy Port:** The proxy port
  - **Proxy Username:** The proxy username, if it requires authentication
  - **Proxy Password:** The proxy password, if it required authentication

**NOTE**

In addition to the proxy settings for the tile, you also need to set up the [agent communication with the proxy. \(page 140\)](#)

6. Select **Save**.  
If you want some applications to belong to different organizations, define the other plans you will need.
7. In the dashboard, select **Apply Changes**.  
This process can take some time to finish.
8. After you successfully deploy the service broker, you can bind the credentials to an application. Go to the Marketplace to find the Contrast service broker option.
9. In the Pivotal Ops Manager, select the Contrast service broker option to see the available plans that you created.
10. To choose the plan you want to bind to an application, use **Select this Plan**.
11. Specify an instance name for the plan.  
This selection doesn't affect the service broker. You can use any name you want for the instance.
12. In the Bind to App drop-down, select the application to bind to this service. Then, restage the application.  
This action retrieves the latest agent from Contrast to instrument your application.
13. **Optional:** If you want to override agent properties, such as the application name, set environment variables in PCF using a command similar to the following example:

```
cf set-env APP-NAME JAVA_OPTS "-Dcontrast.agent.java.standalone_app_name=PivotalSpringApp"
```

**See also**

[Add Contrast service broker \(page 138\)](#)

[Configure a proxy for Contrast service broker \(page 140\)](#)

**Set up agent proxy communication for Contrast service broker**

If you are deploying a Java agent in VMWare Tanzu, you can choose to configure a proxy when you add the [Contrast service broker tile \(page 139\)](#). The Contrast service broker can use a proxy configuration set within the service plan to complete the binding with Contrast..



If you configure a proxy when you add the Contrast service broker tile, you also need to set up agent communication with the proxy, as described in this topic. You can do this for each application or set it at an organization level for all deployed applications to consume.

## Steps

1. To set up proxy communication for each application, use this command:

```
cf set-env $APP_NAME CONTRAST__API__PROXY__ENABLE "true"
cf set-env $APP_NAME CONTRAST__API__PROXY__URL "scheme://host:port"
```

Alternatively, you can use this command:

```
cf set-env $APP_NAME JAVA_OPTS "-Dcontrast.api.proxy.enable=true
-Dcontrast.api.proxy.url=scheme://host:port"
```

2. To set up proxy communication at an organization level, use this command:

```
cf ssevg '{"CONTRAST__API__PROXY__ENABLE": "true"}'
cf ssevg '{"CONTRAST__API__PROXY__URL": "scheme://host:port"}'
```

## See also

[Add Contrast service broker tile \(page 139\)](#)

[Add Contrast service broker \(page 138\)](#)

## Install the Java agent with automatic updates on Linux

Some users like to automatically update their Contrast Java agent software to the latest version. Linux users can schedule Java agent updates from Maven Central using common Linux tools `cron` and `curl`.

Here's how to configure a scheduled Java agent update job on an Ubuntu 18.04 Linux host:



### NOTE

Use your preferred editor to create a file with the following contents. The examples provided use `tee` to create the file.

1. If you want to perform each step as you follow along with this guide, you can use [Vagrant](#) and [VirtualBox](#) to create a new Ubuntu 18.04 virtual machine:

```
vagrant init ubuntu/bionic64
```

```
vagrant up
```

```
vagrant ssh
```

2. Create a shared directory for Contrast software:

```
sudo mkdir -p /opt/contrast
```

3. Create a script for installing the latest Java agent in the `/etc/cron.daily` directory. Scripts in this directory execute once daily; as a result, the host updates the latest Java agent each day.

4. Use `tee` to create this script. Press `CTRL+D` when you've finished typing all the lines:

```
$ sudo tee -a /etc/cron.daily/install-latest-contrast-agent > /dev/null
#!/bin/bash -u
```

```

CONTRAST_DIRECTORY=/opt/contrast
CONTRAST_FILE_NAME=contrast-agent.jar

CONTRAST_VERSION=$(curl --fail --silent 'https://search.maven.org/
solrsearch/select?q=g:com.contrastsecurity+a:contrast-agent' | sed -e 's/
[{}]'/'/'/g' | sed s/'/'/'/g | awk -v RS=',' -F: '$1=="latestVersion"{print
$2}' | grep -v -e '^$')
curl --fail --silent --
location "https://repo1.maven.org/maven2/com/contrastsecurity/contrast-
agent/${CONTRAST_VERSION}/contrast-agent-${CONTRAST_VERSION}.jar" -o
"contrast-agent-${CONTRAST_VERSION}.jar"
if [ $? -ne 0 ]; then
    echo "Failed to download Contrast Java agent" >&2
    exit 1
fi
mv /tmp/${CONTRAST_FILE_NAME} ${CONTRAST_DIRECTORY}/${CONTRAST_FILE_NAME}

```

5. Set the execute bit on the new script file:

```
sudo chmod +x /etc/cron.daily/install-latest-contrast-agent
```

6. To test the script, execute it and then verify that the file exists using `stat`:

```

$ sudo /etc/cron.daily/install-latest-contrast-agent
$ stat /opt/contrast/contrast-agent.jar
stat /opt/contrast/contrast-agent.jar
  File: /opt/contrast/contrast-agent.jar
  Size: 10568283      Blocks: 20648      IO Block: 4096   regular file
Device: 801h/2049d   Inode: 256034      Links: 1
Access: (0644/-rw-r--r--)  Uid: (   0/   root)   Gid: (   0/   root)
Access: 2019-04-11 02:02:01.265775928 +0000
Modify: 2019-04-11 02:24:47.849796936 +0000
Change: 2019-04-11 02:24:47.849796936 +0000
 Birth: -

```

7. The Contrast agent requires some configuration to communicate with Contrast. You can [find agent key information here \(page 109\)](#).
8. When Contrast is installed on a Linux host, users typically want Contrast-enabled web applications on the host to share basic configuration parameters, such as the ones required to connect to Contrast. By convention, Contrast look for configuration in a YAML file at path `/etc/contrast/java/contrast_security.yaml` on Linux hosts.
9. Create the `/etc/contrast/java` directory:

```
sudo mkdir -p /etc/contrast/java
```

10. Use `tee` to create the configuration file. Replace `<contrast_url>`, `<your_api_key>`, `<agent_user_name>` and `<agent_user_service_key>` with the values you obtained from Contrast in the previous step:

```

$ sudo tee -a /etc/contrast/java/contrast_security.yaml > /dev/null
api:
  url: <contrast_url>
  api_key: <your_api_key>
  user_name: <agent_user_name>
  service_key: <agent_user_service_key>

```

11. Press `CTRL+D` when you've finished typing all the lines.
12. Run a diagnostic test to verify that Contrast is installed and properly configured. The host must have Java installed to execute the diagnostic test:

```
sudo apt install --yes openjdk-11-jre-headless
```

13. Finally, execute the Java agent's diagnostic test to verify that the agent is installed correctly and can communicate with Contrast using the configuration parameters from `/etc/contrast/java/contrast_security.yaml`:

```
$ java -jar /opt/contrast/contrast-agent.jar diagnostic
*** Contrast Agent (version 3.6.3-SNAPSHOT)
[!] Attempting to connect to the Contrast TeamServer at https://
apptwo.contrastsecurity.com/Contrast (No proxy).
[!] Attempting to resolve domain: apptwo.contrastsecurity.com
    Resolved domain apptwo.contrastsecurity.com to IP Address
52.200.215.12
[+] Client successfully resolved the DNS of the Contrast TeamServer. No
proxy needed.
[!] Issuing HTTP request to Contrast...
    Executing request...
    Reading response [200]
    Response size = 4209
    Snippet: <!doctype html> <!--[if gt IE 8]><!--> <html class="no-
js" i
[+] Client can connect directly to the Contrast TeamServer. No proxy
needed.
```

## Chef cookbook for Contrast agents

The Contrast Chef cookbook automatically installs a Contrast agent in a specific directory under the ownership and permissions of a specified Contrast user.

The [Chef documentation](#) describes how to set up a Chef Server.

## Requirements

- A Chef Server
  - The [Contrast Chef cookbook](#) from the Chef Supermarket
  - **Optional:** Knife configured on your workstation
- The Chef `knife` command let you communicate with the Chef Server from your workstation

## Integration example


This example shows the steps you might take to add a Contrast recipe to. your run-list.

1. Open the Chef management console.
2. Select **Nodes**.
3. Select a node.
4. Select **Edit Run List**.
5. In the Edit Node Run List dialog box, drag the role or recipe from the Available Roles or Available Recipes lists to the current run-list.
6. Select **Save Run List**.

## Java application servers



### NOTE

This documentation provides content for supported content. Links indicated by the  icon take you to other documentation that may be helpful.

The following application servers are available:

- [Axis2](#)
- [Glassfish](#)
- [JBoss / Wildfly \(page 144\)](#)
- [Jetty \(page 145\)](#)
- [Tomcat \(page 146\)](#)
- [Weblogic \(page 147\)](#)
- [WebSphere \(page 148\)](#)

### See also

- [Install the Java agent \(page 125\)](#)
- [Supported technologies \(page 55\)](#)
- [Configure the Java agent \(page 151\)](#)

### Configure the Java agent for JBoss EAP, JBoss AS or WildFly



#### CAUTION

Be careful not to confuse version numbers. JBoss EAP prior to version 7 is based on JBoss AS. JBoss EAP 7.X is based on WildFly.

### Run JBoss with the Java agent

1. Download the Java agent JAR from one of these repositories:
  - [Maven Central \(page 126\)](#)
  - [Debian \(page 128\)](#)
  - [RPM \(page 127\)](#)
2. You can either run JBoss from in a standalone or domain mode.
  - **Standalone mode:** If you run JBoss from using: a *standalone.bat* file (Windows) or *standalone.sh* file (Unix), modify the configuration file, *standalone.conf.bat* (Windows) or *standalone.conf* (Unix) as follows:  
To do this, replace `<YourContrastJarPath>` with the path to your [Contrast JAR \(page 122\)](#) file, and use the JBoss server directory for your environment. Then add this line to the end of your *.conf.bat* file:
    - **Windows (*standalone.conf.bat*):**

```
set "JAVA_OPTS=-javaagent:<YourContrastJarPath> %JAVA_OPTS%"
```

- **Unix (*standalone.conf*):**

```
JAVA_OPTS="-javaagent:<YourContrastJarPath> $JAVA_OPTS"
```

- **Domain mode:** If you run JBoss 6 EAP or JBoss AS 7.X in Domain mode using *domain.bat* (Windows) or *domain.sh* (Unix), you must add the `-javaagent` switch to the JVM options in `$JBOSS_HOME/domain/configuration/domain.xml`.  
In this example, replace `<YourContrastJarPath>` with the path to your [Contrast JAR \(page 122\)](#) file:

```
<server-group ...>  
  <jvm name="default">
```

```
<jvm-options>
  <option value="-javaagent:<YourContrastJarPath>" />
</jvm-options>
</jvm>
...
</server-group>
```

## Use WildFly with Java 2 security manager

You can configure the Java agent when using WildFly with [Java 2 security \(page 212\)](#). WildFly versions 9 through 20 are supported. WildFly 8 is not supported.

To enable the Java 2 security manager in Wildfly:

1. Either pass a command-line argument `-secmgr`, or set an environment variable `SECMGR` to true:

```
SECMGR="true"
```

2. To enable permissions for the Java agent, append this Contrast policy to `$JAVA_HOME/jre/lib/security/java.policy` (for JDK 6-8), or `$JAVA_HOME/lib/security/default.policy` (for JDK 9 and later). Replace `<YourContrastJarPath>` with the path to your [Contrast JAR \(page 122\)](#) and use:

```
grant codeBase "file:<YourContrastJarPath>" {
  permission java.security.AllPermission;
};
```

3. To allow the agent to function with Wildfly's classloader system, modify the value of the environment variable `JBoss_MODULES_SYSTEM_PKGS` (originally `org.jboss.byteman`), to also include the Java agent base package: `com.contrastsecurity.agent,org.jboss.byteman`



### TIP

Learn more about using [Java EE 7 security manager with WildFly](#), or read the [default policy implementation and policy file syntax](#).

## Configure the Java agent for Jetty

To configure the Java agent with a Jetty distribution:

1. Download the Java agent JAR from one of these repositories:
  - [Maven Central \(page 126\)](#)
  - [Debian \(page 128\)](#)
  - [RPM \(page 127\)](#)
2. On your Jetty environment, replace `<YourContrastJarPath>` with the path to your [Contrast JAR \(page 122\)](#) file. Then add the following line to your `<JettyDirectory>/start.ini` file:

```
-javaagent:<YourContrastJarPath>
```

3. If you are using Java 2 security manager, create a `contrast.policy` file that contains this code. (Replace `<YourContrastJarPath>` with the path to your [Contrast JAR \(page 122\)](#) file.)

```
grant codeBase "file:<YourContrastJarPath>" {
  permission java.security.AllPermission;
};
```

Then complete these configurations:

- **Jetty 7-8:** Copy the file to the `JETTY_HOME/lib/policy` folder. Add `--secure` to the `JETTY_ARGS` environment variable.

- **Jetty 9:** Add the policy you created to your own configured policy. Replace `<YourPolicy>` with the name of your policy and enable the security manager with the standard environment variable settings:

```
-Djava.security.manager -Djava.security.policy=<YourPolicy>
```



### IMPORTANT

Jetty 9 and later do not officially support security management policies.



### TIP

See the [Jetty Policy](#) for more information about using Jetty with Java 2 security manager.

## Configure the Java agent for Tomcat

First, download the Java agent JAR from one of these repositories:

- [Maven Central \(page 126\)](#)
- [Debian \(page 128\)](#)
- [RPM \(page 127\)](#)

Use the guidelines below to configure the Java agent depending on how you run Contrast with Tomcat.

### Run from Windows or Unix

The `CATALINA_OPTS` environment variable is used to pass configuration flags and system properties to the JVM that runs the Tomcat server.

Tomcat recommends using a `setenv` script to specify environment variables. You can learn more about the `setenv` script, including how to find or create it as needed, by consulting `RUNNING.txt`, which is included with every distribution of Tomcat.

To enable Contrast add the `-javaagent` configuration to `CATALINA_OPTS` in either `setenv.sh`, if running on a Unix-like operating system, or `setenv.bat` if running on Windows. For example:

- **Windows:**

```
set "CATALINA_OPTS=%CATALINA_OPTS% -javaagent:<YourContrastJarPath>"
```

- **Unix:**

```
export CATALINA_OPTS="$CATALINA_OPTS -javaagent:<YourContrastJarPath>"
```

### Run on the Tomcat service in Windows

1. If you run Tomcat as a service, open the Tomcat service manager and change the JVM options to add the agent.
2. Double-click the Tomcat icon in the system tray (or right-click and select **Configure**). (If the icon isn't there, you might have to start it manually by running `tomcat9w.exe` in the Tomcat bin directory.)
3. Switch to the **Java** tab to see where you need to add the `-javaagent` flag.

## Run Tomcat with Java 2 security

1. Create a *contrast.policy* file that contains this code (or append it to the *catalina.policy* file). Replace `<YourContrastJarPath>` with the path to your [Contrast JAR \(page 122\)](#) file. For example:

```
grant codeBase "file:<YourContrastJarPath>" {  
    permission java.security.AllPermission;  
};
```

2. Append the *contrast.policy* file to the `$CATALINA_HOME/conf/catalina.policy` file. No additional configuration is needed. Run your Tomcat installation with command-line parameter `-security`.

## Configure the Java agent for WebLogic

First, download the Java agent JAR from one of these repositories:

- [Maven Central \(page 126\)](#)
- [Debian \(page 128\)](#)
- [RPM \(page 127\)](#)

Use the guidelines below to configure the Java agent depending on how you run Contrast with WebLogic.

### Unix

1. If you launch WebLogic yourself, you must add Contrast's JVM parameter to the *startWebLogic* file in your installation's *bin* directory. For UNIX-based operating systems, the path to this file looks like:

```
/path/to/appserver/userprojects/domains/base_domain/bin/startWebLogic.sh
```

2. In this file, add the Contrast engine as a `-javaagent` to the `JAVA_OPTIONS` environment variable before the Java execution step. Replace `<YourContrastJarPath>` with the path to your [Contrast JAR \(page 122\)](#) file. For example:

```
export JAVA_OPTIONS="$JAVA_OPTIONS -javaagent:<YourContrastJarPath>"
```

### Windows

1. For Windows systems, the path looks like:

```
C:\Oracle\Middleware\userprojects\domains\base_domain\bin\startWebLogic.bat
```

2. At the beginning of the file, add the Contrast engine as a `-javaagent` to the `JAVA_OPTIONS` environment variable. Replace `<YourContrastJarPath>` with the path to your [Contrast JAR \(page 122\)](#) file. Substitute the WebLogic server for your environment. For example:

```
set "JAVA_OPTIONS=%JAVA_OPTIONS% -javaagent:<YourContrastJarPath>"
```

## Use Java 2 with WebLogic

1. Create a *contrast.policy* file that contains this code (or append it to the *weblogic.policy* file). Replace `<YourContrastJarPath>` with the path to your [Contrast JAR \(page 122\)](#) file. For example:

```
grant codeBase "file:<YourContrastJarPath>" {  
    permission java.security.AllPermission;  
};
```

2. WebLogic includes a template file under `@WL_HOME/server/lib/weblogic.policy` which contains the suggested starting point for booting a WebLogic server with the security manager enabled. Older versions of WebLogic (10 and prior) will require `@WL_HOME` in the template file replaced with the actual path to the root directory of the WebLogic install.

- When the security manager is enabled, the policy `@WL_HOME/server/lib/weblogic.policy` file acts as the default. Otherwise, a custom policy file may be specified with `-Djava.security.policy==<YourPath>` where `<YourPath>` is the path to your custom file. The `==` is important as it overrides the default path setting that WebLogic boots with.

**TIP**

For more information read about [using Java Security to protect WebLogic resources](#).

## Configure the Java agent for WebSphere

First, download the Java agent JAR from one of these repositories:

- [Maven Central \(page 126\)](#)
- [Debian \(page 128\)](#)
- [RPM \(page 127\)](#)

Use the guidelines below to configure the Java agent, depending on how you run Contrast with WebSphere.

**NOTE**

IBM J9 doesn't allow the Java Instrumentation API to alter core Java classes when using the [Shared Classes](#) feature. You must disable this feature by specifying `-Xshareclasses:none` in your JVM parameters, as shown above.

Similarly, if `-Dcom.ibm.oti.shared.enabled=true` is set, you may also run into problems in older J9 JREs.

## WebSphere trust and key store

WebSphere maintains its own trust and key store, separate from the trust store included as part of the Java JRE. The agent starts before WebSphere is initialized and so the WebSphere specific trust store is not configured. Therefore, the agent uses the default trust store located in the Java `JRE/lib/security/cacerts` file, unless extra configuration is provided to the JVM.

However, in some scenarios, (like requiring a proxy server that uses internal only or self-signed certificates) specific extra steps are necessary. You can either:

- Install the required certs into both the JRE `cacerts` trust store and also the WebSphere specific trust store. This means the certificate chain can be validated by both the agent and also your web application.
- Provide Java with the standard trust store system properties to change the trust store to be the same as the WebSphere trust store. This has the advantage of only requiring the certificate to be installed in one location: the WebSphere trust store. For example:

```
-Djavax.net.ssl.trustStore=opt/IBM/WebSphere/AppServer/profiles/AppSrv01/
config/cells/DefaultCell01/nodes/DefaultNode01/trust.p12
-Djavax.net.ssl.trustStoreType=PKCS12
-Djavax.net.ssl.trustStorePassword=secret
```

WebSphere itself supports methods of encoding the password but these are not available when setting the trust store password for the agent, as it is executing before WebSphere starts.



## Add Contrast with Websphere

If you launch WebSphere yourself, add Contrast's JVM parameter to the *server.xml* file in your cell directory. Replace `<CellName>` and `<NodeName>` with the name of the cell and node. Replace `<YourContrastJarPath>` with the path to your [Contrast JAR \(page 122\)](#) file. For example:

```
<WebSphereDirectory>\AppServer\profiles\AppSrv01\config\cells\<CellName>\nodes\<NodeName>\servers\server1\server.xml

<jvmEntries genericJvmArguments="-javaagent:<YourContrastJarPath>
-Xshareclasses:none">
  ...
</jvmEntries>
```

## Add Contrast with the WebSphere Administration Console

You can also add Contrast through the WebSphere administration console by following instructions from the [WebSphere support site](#).

## Use Java 2 with WebSphere

1. Create a *contrast.policy* file that contains this code (or append it to the *server.policy* file). Replace `<YourContrastJarPath>` with the path to your [Contrast JAR \(page 122\)](#) file. For example:

```
grant codeBase "file:<YourContrastJarPath>" {
  permission java.security.AllPermission;
};
```

2. Append the *contrast.policy* file to the `$WEBSPPHERE_HOME/AppServer/profiles/AppSrv01/properties/server.policy`.
3. Enable the security manager with the wsadmin tool:
  - **Jacl:**`$AdminTask setAdminActiveSecuritySettings {-enforceJava2Security true}`
  - **Jython:**`AdminTask.setAdminActiveSecuritySettings('-enforceJava2Security true')`



### TIP

Learn more about [Java security manager](#) and [enabling and disabling Java 2 security manager using scripting](#).

## Java Quick Start Guide

Contrast uses agents to install sensors that monitor your code for vulnerabilities. Agents analyze for vulnerabilities in development environments and look for attacks in runtime production environments.

As your application runs, the agent analyzes information (such as HTTP requests, data flow, backend connections, and library dependencies) and sends vulnerabilities and attacks to Contrast where you can view, prioritize, and take immediate action on them.

This guide should get Contrast up and running on your application in just a few minutes, so you can see how it works.

**TIP**

For future installations, you may want to consider your organization's build tools and deployment pipeline, your security goals and the environments where you want to use Contrast. You can read about [other methods to install Contrast \(page 1331\)](#) that may better adapt to your situation.

**Prerequisites**

This guide assumes you use an application that meets these prerequisites:

- The application must have access to the internet without using a proxy.
- Your web application is packaged in a JAR file.
- It must use [supported versions, frameworks, and tools \(page 55\)](#).

You will also need access to a command line interface (with a chosen directory for downloading the agent) and your organization's instance of Contrast.

**Install**

1. Start the Java agent wizard:
  - a. In the Contrast web interface, select **Add new**.
  - b. Select the **Application** card.
  - c. Select **Java** as the language.
  - d. Select an operating system.
2. Under Select application deployment method, select **Install manually**.
3. Copy the displayed command to download the agent from [Maven Central \(page 126\)](#).
4. To configure the agent, under Configure the agent, select **Use Connection Token** and copy the displayed commands to set this environment variable:

```
CONTRAST__API__TOKEN
```

**Agent Token:** This variable is a base64 encoded JSON object containing the url, api\_key, service\_key, and user\_name configuration settings, allowing you to set them set in a single variable.

If your agent configuration refers to both the legacy settings and the agent token, (in environment variables or the YAML file), the legacy settings take precedence. To use just the agent token value, make sure you remove references to the legacy settings.

**Legacy settings:** If you are using a Java agent version earlier than 6.10.1, under Configure the agent, select **Use API configuration**, and copy the displayed commands to set these environment variables:

```
CONTRAST__API__URL  
CONTRAST__API__API_KEY  
CONTRAST__API__SERVICE_KEY  
CONTRAST__API__USER_NAME
```

5. Under Configure application server, select an application server,
6. Copy the displayed commands to complete the configuration.
7. To verify that Contrast is working, use your application as you normally would. For example, click on your application's web interface, or send some API commands.

Then in the Contrast web interface, select **Applications** in the header. You should see the name of your application.

You can also select **Server** in the header and you should see the hostname of your (local) server listed here.

## Java advanced configuration

The easiest way to deploy Java agents is to use the [Agent wizard \(page 54\)](#) in the Contrast web interface.

If you want additional information or methods related to the configuration of Java agents, visit these topics:

- [Java system properties \(page 151\)](#)
- [Java YAML template \(page 152\)](#)
- [Configure for standalone applications \(page 211\)](#)
- [TLS \(page 211\)](#)
- [Java 9 modules \(page 211\)](#)
- [Java 2 security \(page 212\)](#)

## Configure the Java agent

The [standard installation \(page 107\)](#) for all agents uses this [order of precedence \(page 111\)](#).

You can configure the Java agent using:

- Java system properties
- [Environment variables \(page 115\)](#)
- Java YAML template



### TIP

Use the [Contrast agent configuration editor \(page 113\)](#) to create or upload a YAML configuration file, validate YAML and get setting recommendations.

You may need to configure your application's Java environment to work effectively with the agent if your system uses:

- [Multi-tenant application configuration](#): If your JVM application server hosts multiple applications during a deployment, you can distinguish applications from each other and then apply individual configuration options.  
[Multi-tenant application configuration](#): If your JVM application server hosts multiple applications during a deployment, you can distinguish applications from each other and then apply individual configuration options.
- [TLS certificates \(page 211\)](#)
- [Java 9 Modules \(page 211\)](#)
- [Java 2 Security \(page 212\)](#)
- [Integrations: \(page 1331\)](#) The Contrast Java agent, can also be configured and run in conjunction with several third-party tools, plugins and integrations. Consult the remote product documentation for information about how other products work.

## Java system properties

Substitute `<YourContrastJarPath>` with the path to your [Contrast JAR \(page 122\)](#), and use these commands to learn more about system properties:

- To generate a list of general properties using the Contrast agent JAR, use:

```
java -jar <YourContrastJarPath> properties
```

- Use command line with tools to search for commands. For example, these commands display a list of proxy-related properties:

**Using the built-in filter:**

```
java -jar <YourContrastJarPath> properties --filter=proxy
```

## Java YAML configuration template

Use this template to configure the Java agent using a YAML configuration file. (Learn more about [YAML configuration \(page 112\)](#).)

Place your YAML file in the default location:

- **Unix:** /etc/contrast/java/contrast\_security.yaml
- **Windows:** C:/ProgramData/contrast/java/contrast\_security.yaml

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
# UI.
#
=====
==
api:

# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET
```

```
# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

# Set the timeout for communicating with TeamServer. This property will be
# respected over the deprecated legacy configuration *contrast.timeout*.
# timeout_ms: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate with
# the Contrast web interface over a proxy. Set value to
# `false` if you don't want to use the proxy. If no value is
# indicated, the presence of a valid **contrast.proxy.host**
# and **contrast.proxy.port** will enable the proxy.
# enable: NEEDS_TO_BE_SET

# Set the proxy host. It must be set with port and scheme.
# host: localhost

# Set the proxy port. It must be set with host and scheme.
# port: 1234

# Set the proxy scheme (e.g., `http` or
# `https`). It must be set with host and port.
# scheme: http

# Set this property as an alternate for `scheme://host:port`. It takes
# precedence over the other settings, if specified; however, an error
# will be thrown if both the URL and individual properties are set.
# url: NEEDS_TO_BE_SET

# Set the proxy user.
# user: NEEDS_TO_BE_SET

# Set the proxy password.
# pass: NEEDS_TO_BE_SET

# Set the proxy authentication type. Value
# options are `NTLM`, `Digest`, and `Basic`.
# auth_type: NEEDS_TO_BE_SET
```

```
#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.diagnostics
# Use the properties in this section to specify the information the agent
# should collect and report in order to diagnose problems in the agent.
#
#
=====
# diagnostics:

# Creates config and system info files
# at startup if true. True by default.
#
# The same thing can be achieved by setting the
# CONTRAST__AGENT__DIAGNOSTICS__ENABLE=[true/false] env variable.
#
# enable: true

#
=====
# agent.route_coverage
# Use the following properties for the route-based coverage feature.
#
=====
# route_coverage: {}

#
=====
# agent.reporting
# Use the following settings to configure reporting to the Contrast UI.
#
=====
# reporting:

# Set the grace period (in milliseconds) after
# agent shutdown to allow draining pending reports.
# shutdown_grace_period_ms: 120000

#
=====
# agent.effective_config
# None
#
```

```
=====
# effective_config:

#
=====
# agent.effective_config.reporting
# None
#
=====
# reporting:

# Defaults to `true`. Controls whether configuration
# setting reports are sent to the Contrast web interface.
# enable: true

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Set to `true` to redirect all logs to
# `stdout` instead of the file system.
# stdout: false

# Set to `true` to redirect all logs to `stderr` instead of
# the file system. May be combined with the corresponding
# `stdout` configuration to write to both streams.
# stderr: false

# Change the Contrast logger from a file-sized based rolling scheme
# to a date-based rolling scheme. At midnight server time, the
# previous day log is renamed to *file_name.yyyy-MM-dd*. Note -
# this scheme does not have a size limit; manual log pruning is
# required. You must set this flag to use the backups and size flags.
# roll_daily: false
```

```
# Set the roll size for log files in megabytes. The agent will
# attempt to prevent the log file from being larger than this size.
# roll_size: 100

# Set the number of backup files to keep. Set to `0` to disable.
# backups: 10

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the file to which the agent logs security events.
# path: ./contrast/security.log

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

# Change the Contrast security logger from a file-sized based rolling
# scheme to a date-based rolling scheme. At midnight server time,
# the log from the previous day is renamed to *file_name.yyyy-MM-dd*.
# Note - this scheme does not have a size limit; manual log
# pruning will be required. This flag must be set to use the
# backups and size flags. Value options are `true` or `false`.
# roll_daily: NEEDS_TO_BE_SET

# Specify the file size cap (in MB) of each log file.
# roll_size: NEEDS_TO_BE_SET

# Specify the number of backup logs that the agent will create before
# Contrast cleans up the oldest file. A value of `0` means that no
backups
# are created, and the log is truncated when it reaches its size cap.
#
# Note - this property must be used with
# `agent.security_logger.roll_daily=false`; otherwise,
# Contrast continues to log daily and disregard this limit.
#
# backups: NEEDS_TO_BE_SET

#
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
```



```
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

#
=====
# agent.security_logger.syslog.heartbeat
# Define the following properties to
# set the Syslog heartbeat properties.
#
=====
# heartbeat:

# Set to `true` to enable the Syslog heartbeat.
# The heartbeat will issue a Syslog message at
# the INFO level after every interval passes.
# enable: false

# Set the interval for sending heartbeat messages
# to the Syslog server (in milliseconds).
# interval_ms: 60000
```

```
#
=====
# agent.java
# The following properties apply to any Java agent-wide configurations.
#
=====
# java:

# Configure the Java agent to skip its application discovery
# algorithm, and instead associate all libraries, vulnerabilities,
# and web traffic to a single application with the name specified
# by this property. This configuration is preferred when deploying
# Java SE applications with embedded web servers (e.g., applications
# built with Spring Boot, Dropwizard, and embedded Jetty). When used
# with an application server, this configuration associates all
# web traffic with the single, standalone application, including
# web traffic handled by application server-hosted endpoints that
# would not be associated with a discovered application otherwise.
#
# Note - This settings takes preferences
# over the `application.name` setting.
#
# standalone_app_name: NEEDS_TO_BE_SET

# By default, the Java agent visits all classes at startup to look
# for vulnerabilities, which the agent may detect by scanning a
# class (e.g., hardcoded passwords). Set this property to `false`
# to disable the default behavior. If disabled, the agent will
# only visit classes which are likely to require sensors; this
# can improve application startup time, but may produce fewer
# findings (most likely findings that require static analysis).
#
# scan_all_classes: true

# By default, the Java agent deeply inspects all JAR and WAR files
loaded
# by the JVM to build a comprehensive understanding of the type
hierarchy.
# This understanding allows Contrast to instrument sensors into types
# that it might have overlooked. In most cases, this produces a slight
# increase in accuracy at the cost of increased application startup
# time. Set this property to `false` to disable this level of
inspection.
#
# scan_all_code_sources: true

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
```

```
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Define a list of directories where libraries are stored.
# Directories must be formatted as a semicolon-delimited
# list for Windows or a colon-delimited list for Linux.
#
# Define a list of directories where libraries are stored.
# Directories must be formatted as a semicolon-delimited list.
# Example - `path1;path2;path3`(Windows) or `path1:path2:path3`(Linux)
# Example - `path1:path2:path3`
#
# library_dirs: NEEDS_TO_BE_SET

# Set the maximum archive unpacking depth when analyzing libraries.
# library_depth: 10

# Set the boolean to more aggressively limit the
# manifest information reported for libraries. If true,
# the limit is 1,000 characters, otherwise it's 3,000.
# prune_package_details: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Control the values captured by Assess vulnerability events. `Full`
# captures most values by calling ToString on objects, which can
# provide more info but causes increased memory usage. `Minimal`
# has better performance as it only captures String type objects
# as strings and uses type name for other object type values.
# event_detail: minimal

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
```

```
#
# tags: NEEDS_TO_BE_SET

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10

# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# profile
# Set configuration values under a profile name to enable
# multi-tenant application configuration on web servers. See
# https://support.contrastsecurity.com/hc/en-us/articles/360052187171-Multi-Application-configuration-with-Contrast-Profiles
# for more details.
#
=====
==
# profile: {}
```

```
#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.rules
# Use the following properties to set simple rule configurations.
#
=====
# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====
# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====
# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====
# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====
# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
```

```
# mode: off

# Tell the agent to detect when semantic analysis of the query
# reveals tautologies used in exfiltration attacks (e.g., "or
# 1=1" or "or 2<>3"). The agent blocks if blocking is enabled.
# detect_tautologies: false

# Tell the agent to detect when semantic analysis of the query
# reveals the invocation of dangerous functions typically used in
# weaponized exploits. The agent blocks if blocking is enabled.
# detect_dangerous_functions: false

# Tell the agent to detect when semantic analysis of the query
# reveals chained queries, which is uncommon in normal usage but
# common in exploit. The agent blocks if blocking is enabled.
# detect_chained_queries: false

# Tell the agent to detect when semantic analysis of the query
# reveals database queries are being made for system tables and
# sensitive information. The agent blocks if blocking is enabled.
# detect_suspicious_unions: false

# Tell the agent to be more aggressive in detecting user
# inputs as SQL comments. This enables the agent to better
# detect SQL Injection input vectors that use comments to
# terminate queries. The agent blocks if blocking is enabled.
# aggressive_comment: false

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Detect when the agent sees user parameters being executed as
# system commands. The agent blocks if blocking is enabled.
# detect_parameter_command_backdoors: true

# Detect when a system command is issued which contains
# chained commands. The agent blocks if blocking is enabled.
# detect_chained_commands: true

# Detect when a system command is issued with an argument matching a
# known dangerous file path. The agent blocks if blocking is enabled.
```

```
# detect_dangerous_path_args: true

# Tell the agent to detect when commands come directly
# from input. The agent blocks if blocking is enabled.
# detect_phased_commands: true

#
=====
# protect.rules.cmd-injection-process-hardening
# Use the following settings to configure whether
# the agent blocks all attempts to start an external
# process. To enable blocking, set to 'true'.
#
=====
# cmd-injection-process-hardening:

# Set to `true` to enable the agent to block
# all attempts to start external processes.
# enable: false

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Detect when custom code attempts to access sensitive
# system files. The agent blocks if blocking is enabled.
# detect_custom_code_accessing_system_files: true

# Detect when users attempt to bypass filters by
# using "::$DATA" channels or null bytes in file
# names. The agent blocks if blocking is enabled.
# detect_common_file_exploits: true

#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:
```

```
# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.padding-oracle
# Use the following properties to configure
# how the padding-oracle rule works.
#
=====
# padding-oracle: {}

#
=====
==
# application
```



```
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
```

```
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Set to `false` to disable detection of cloud
# provider metadata such as resource identifiers.
# discover_cloud_resource: true

#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
```

```
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
# UI.
#
=====
==
api:

# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

# Set the timeout for communicating with TeamServer. This property will be
# respected over the deprecated legacy configuration *contrast.timeout*.
# timeout_ms: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
```

```
=====
# proxy:

# Set value to `true` for the agent to communicate with
# the Contrast web interface over a proxy. Set value to
# `false` if you don't want to use the proxy. If no value is
# indicated, the presence of a valid **contrast.proxy.host**
# and **contrast.proxy.port** will enable the proxy.
# enable: NEEDS_TO_BE_SET

# Set the proxy host. It must be set with port and scheme.
# host: localhost

# Set the proxy port. It must be set with host and scheme.
# port: 1234

# Set the proxy scheme (e.g., `http` or
# `https`). It must be set with host and port.
# scheme: http

# Set this property as an alternate for `scheme://host:port`. It takes
# precedence over the other settings, if specified; however, an error
# will be thrown if both the URL and individual properties are set.
# url: NEEDS_TO_BE_SET

# Set the proxy user.
# user: NEEDS_TO_BE_SET

# Set the proxy password.
# pass: NEEDS_TO_BE_SET

# Set the proxy authentication type. Value
# options are `NTLM`, `Digest`, and `Basic`.
# auth_type: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.diagnostics
# Use the properties in this section to specify the information the agent
# should collect and report in order to diagnose problems in the agent.
#
#
=====
# diagnostics:
```

```
# Creates config and system info files
# at startup if true. True by default.
#
# The same thing can be achieved by setting the
# CONTRAST__AGENT__DIAGNOSTICS__ENABLE=[true/false] env variable.
#
# enable: true

#
=====
# agent.route_coverage
# Use the following properties for the route-based coverage feature.
#
=====
# route_coverage: {}

#
=====
# agent.reporting
# Use the following settings to configure reporting to the Contrast UI.
#
=====
# reporting:

# Set the grace period (in milliseconds) after
# agent shutdown to allow draining pending reports.
# shutdown_grace_period_ms: 120000

#
=====
# agent.effective_config
# None
#
=====
# effective_config:

#
=====
# agent.effective_config.reporting
# None
#
=====
# reporting:

# Defaults to `true`. Controls whether configuration
# setting reports are sent to the Contrast web interface.
# enable: true

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
```

```
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Set to `true` to redirect all logs to
# `stdout` instead of the file system.
# stdout: false

# Set to `true` to redirect all logs to `stderr` instead of
# the file system. May be combined with the corresponding
# `stdout` configuration to write to both streams.
# stderr: false

# Change the Contrast logger from a file-sized based rolling scheme
# to a date-based rolling scheme. At midnight server time, the
# previous day log is renamed to *file_name.yyyy-MM-dd*. Note -
# this scheme does not have a size limit; manual log pruning is
# required. You must set this flag to use the backups and size flags.
# roll_daily: false

# Set the roll size for log files in megabytes. The agent will
# attempt to prevent the log file from being larger than this size.
# roll_size: 100

# Set the number of backup files to keep. Set to `0` to disable.
# backups: 10

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the file to which the agent logs security events.
# path: ./contrast/security.log
```

```
# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

# Change the Contrast security logger from a file-sized based rolling
# scheme to a date-based rolling scheme. At midnight server time,
# the log from the previous day is renamed to *file_name.yyyy-MM-dd*.
# Note - this scheme does not have a size limit; manual log
# pruning will be required. This flag must be set to use the
# backups and size flags. Value options are `true` or `false`.
# roll_daily: NEEDS_TO_BE_SET

# Specify the file size cap (in MB) of each log file.
# roll_size: NEEDS_TO_BE_SET

# Specify the number of backup logs that the agent will create before
# Contrast cleans up the oldest file. A value of `0` means that no
backups
# are created, and the log is truncated when it reaches its size cap.
#
# Note - this property must be used with
# `agent.security_logger.roll_daily=false`; otherwise,
# Contrast continues to log daily and disregard this limit.
#
# backups: NEEDS_TO_BE_SET

#
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT
```

```
# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

#
=====
# agent.security_logger.syslog.heartbeat
# Define the following properties to
# set the Syslog heartbeat properties.
#
=====
# heartbeat:

# Set to `true` to enable the Syslog heartbeat.
# The heartbeat will issue a Syslog message at
# the INFO level after every interval passes.
# enable: false

# Set the interval for sending heartbeat messages
# to the Syslog server (in milliseconds).
# interval_ms: 60000

#
=====
# agent.java
# The following properties apply to any Java agent-wide configurations.
#
=====
# java:

# Configure the Java agent to skip its application discovery
# algorithm, and instead associate all libraries, vulnerabilities,
# and web traffic to a single application with the name specified
# by this property. This configuration is preferred when deploying
# Java SE applications with embedded web servers (e.g., applications
# built with Spring Boot, Dropwizard, and embedded Jetty). When used
# with an application server, this configuration associates all
# web traffic with the single, standalone application, including
# web traffic handled by application server-hosted endpoints that
# would not be associated with a discovered application otherwise.
#
# Note - This settings takes preferences
```



```
# over the `application.name` setting.
#
# standalone_app_name: NEEDS_TO_BE_SET

# By default, the Java agent visits all classes at startup to look
# for vulnerabilities, which the agent may detect by scanning a
# class (e.g., hardcoded passwords). Set this property to `false`
# to disable the default behavior. If disabled, the agent will
# only visit classes which are likely to require sensors; this
# can improve application startup time, but may produce fewer
# findings (most likely findings that require static analysis).
#
# scan_all_classes: true

# By default, the Java agent deeply inspects all JAR and WAR files
loaded
# by the JVM to build a comprehensive understanding of the type
hierarchy.
# This understanding allows Contrast to instrument sensors into types
# that it might have overlooked. In most cases, this produces a slight
# increase in accuracy at the cost of increased application startup
# time. Set this property to `false` to disable this level of
inspection.
#
# scan_all_code_sources: true

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Define a list of directories where libraries are stored.
# Directories must be formatted as a semicolon-delimited
# list for Windows or a colon-delimited list for Linux.
#
# Define a list of directories where libraries are stored.
# Directories must be formatted as a semicolon-delimited list.
# Example - `path1;path2;path3` (Windows) or `path1:path2:path3` (Linux)
# Example - `path1:path2:path3`
#
# library_dirs: NEEDS_TO_BE_SET

# Set the maximum archive unpacking depth when analyzing libraries.
# library_depth: 10

# Set the boolean to more aggressively limit the
# manifest information reported for libraries. If true,
```

```
# the limit is 1,000 characters, otherwise it's 3,000.
# prune_package_details: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Control the values captured by Assess vulnerability events. `Full`
# captures most values by calling ToString on objects, which can
# provide more info but causes increased memory usage. `Minimal`
# has better performance as it only captures String type objects
# as strings and uses type name for other object type values.
# event_detail: minimal

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10
```

```
# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# profile
# Set configuration values under a profile name to enable
# multi-tenant application configuration on web servers. See
# https://support.contrastsecurity.com/hc/en-us/articles/360052187171-Multi-Application-configuration-with-Contrast-Profiles
# for more details.
#
=====
==
# profile: {}

#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.rules
# Use the following properties to set simple rule configurations.
#
```

```
=====
# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====
# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====
# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====
# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====
# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Tell the agent to detect when semantic analysis of the query
# reveals tautologies used in exfiltration attacks (e.g., "or
# 1=1" or "or 2<>3"). The agent blocks if blocking is enabled.
# detect_tautologies: false

# Tell the agent to detect when semantic analysis of the query
# reveals the invocation of dangerous functions typically used in
# weaponized exploits. The agent blocks if blocking is enabled.
# detect_dangerous_functions: false

# Tell the agent to detect when semantic analysis of the query
# reveals chained queries, which is uncommon in normal usage but
# common in exploit. The agent blocks if blocking is enabled.
# detect_chained_queries: false

# Tell the agent to detect when semantic analysis of the query
# reveals database queries are being made for system tables and
# sensitive information. The agent blocks if blocking is enabled.
# detect_suspicious_unions: false
```

```
# Tell the agent to be more aggressive in detecting user
# inputs as SQL comments. This enables the agent to better
# detect SQL Injection input vectors that use comments to
# terminate queries. The agent blocks if blocking is enabled.
# aggressive_comment: false

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Detect when the agent sees user parameters being executed as
# system commands. The agent blocks if blocking is enabled.
# detect_parameter_command_backdoors: true

# Detect when a system command is issued which contains
# chained commands. The agent blocks if blocking is enabled.
# detect_chained_commands: true

# Detect when a system command is issued with an argument matching a
# known dangerous file path. The agent blocks if blocking is enabled.
# detect_dangerous_path_args: true

# Tell the agent to detect when commands come directly
# from input. The agent blocks if blocking is enabled.
# detect_phased_commands: true

#
=====
# protect.rules.cmd-injection-process-hardening
# Use the following settings to configure whether
# the agent blocks all attempts to start an external
# process. To enable blocking, set to 'true'.
#
=====
# cmd-injection-process-hardening:

# Set to `true` to enable the agent to block
# all attempts to start external processes.
# enable: false

#
```

```
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Detect when custom code attempts to access sensitive
# system files. The agent blocks if blocking is enabled.
# detect_custom_code_accessing_system_files: true

# Detect when users attempt to bypass filters by
# using ":::$DATA" channels or null bytes in file
# names. The agent blocks if blocking is enabled.
# detect_common_file_exploits: true

#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
```

```
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.padding-oracle
# Use the following properties to configure
# how the padding-oracle rule works.
#
=====
# padding-oracle: {}

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
```

```
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
```



```
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Set to `false` to disable detection of cloud
# provider metadata such as resource identifiers.
# discover_cloud_resource: true
```

## Java system properties

Substitute `<YourContrastJarPath>` with the path to your [Contrast JAR \(page 122\)](#), and use these commands to learn more about system properties:

- To generate a list of general properties using the Contrast agent JAR, use:

```
java -jar <YourContrastJarPath> properties
```

- Use command line with tools to search for commands. For example, these commands display a list of proxy-related properties:

**Using the built-in filter:**

```
java -jar <YourContrastJarPath> properties --filter=proxy
```

## Java YAML configuration template

Use this template to configure the Java agent using a YAML configuration file. (Learn more about [YAML configuration \(page 112\)](#).)

Place your YAML file in the default location:

- Unix:** `/etc/contrast/java/contrast_security.yaml`
- Windows:** `C:/ProgramData/contrast/java/contrast_security.yaml`

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
```

```
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==

# api
# Use the properties in this section to connect the agent to the Contrast
UI.
#
=====
==

api:

# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

# Set the timeout for communicating with TeamServer. This property will be
# respected over the deprecated legacy configuration *contrast.timeout*.
# timeout_ms: NEEDS_TO_BE_SET

#
=====

# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
```

```
=====
# proxy:

# Set value to `true` for the agent to communicate with
# the Contrast web interface over a proxy. Set value to
# `false` if you don't want to use the proxy. If no value is
# indicated, the presence of a valid **contrast.proxy.host**
# and **contrast.proxy.port** will enable the proxy.
# enable: NEEDS_TO_BE_SET

# Set the proxy host. It must be set with port and scheme.
# host: localhost

# Set the proxy port. It must be set with host and scheme.
# port: 1234

# Set the proxy scheme (e.g., `http` or
# `https`). It must be set with host and port.
# scheme: http

# Set this property as an alternate for `scheme://host:port`. It takes
# precedence over the other settings, if specified; however, an error
# will be thrown if both the URL and individual properties are set.
# url: NEEDS_TO_BE_SET

# Set the proxy user.
# user: NEEDS_TO_BE_SET

# Set the proxy password.
# pass: NEEDS_TO_BE_SET

# Set the proxy authentication type. Value
# options are `NTLM`, `Digest`, and `Basic`.
# auth_type: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.diagnostics
# Use the properties in this section to specify the information the agent
# should collect and report in order to diagnose problems in the agent.
#
#
=====
# diagnostics:
```

```
# Creates config and system info files
# at startup if true. True by default.
#
# The same thing can be achieved by setting the
# CONTRAST__AGENT__DIAGNOSTICS__ENABLE=[true/false] env variable.
#
# enable: true

#
=====
# agent.route_coverage
# Use the following properties for the route-based coverage feature.
#
=====
# route_coverage: {}

#
=====
# agent.reporting
# Use the following settings to configure reporting to the Contrast UI.
#
=====
# reporting:

# Set the grace period (in milliseconds) after
# agent shutdown to allow draining pending reports.
# shutdown_grace_period_ms: 120000

#
=====
# agent.effective_config
# None
#
=====
# effective_config:

#
=====
# agent.effective_config.reporting
# None
#
=====
# reporting:

# Defaults to `true`. Controls whether configuration
# setting reports are sent to the Contrast web interface.
# enable: true

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
```

```
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Set to `true` to redirect all logs to
# `stdout` instead of the file system.
# stdout: false

# Set to `true` to redirect all logs to `stderr` instead of
# the file system. May be combined with the corresponding
# `stdout` configuration to write to both streams.
# stderr: false

# Change the Contrast logger from a file-sized based rolling scheme
# to a date-based rolling scheme. At midnight server time, the
# previous day log is renamed to *file_name.yyyy-MM-dd*. Note -
# this scheme does not have a size limit; manual log pruning is
# required. You must set this flag to use the backups and size flags.
# roll_daily: false

# Set the roll size for log files in megabytes. The agent will
# attempt to prevent the log file from being larger than this size.
# roll_size: 100

# Set the number of backup files to keep. Set to `0` to disable.
# backups: 10

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the file to which the agent logs security events.
# path: ./contrast/security.log
```

```
# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

# Change the Contrast security logger from a file-sized based rolling
# scheme to a date-based rolling scheme. At midnight server time,
# the log from the previous day is renamed to *file_name.yyyy-MM-dd*.
# Note - this scheme does not have a size limit; manual log
# pruning will be required. This flag must be set to use the
# backups and size flags. Value options are `true` or `false`.
# roll_daily: NEEDS_TO_BE_SET

# Specify the file size cap (in MB) of each log file.
# roll_size: NEEDS_TO_BE_SET

# Specify the number of backup logs that the agent will create before
# Contrast cleans up the oldest file. A value of `0` means that no
backups
# are created, and the log is truncated when it reaches its size cap.
#
# Note - this property must be used with
# `agent.security_logger.roll_daily=false`; otherwise,
# Contrast continues to log daily and disregard this limit.
#
# backups: NEEDS_TO_BE_SET

#
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT
```

```
# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

#
=====
# agent.security_logger.syslog.heartbeat
# Define the following properties to
# set the Syslog heartbeat properties.
#
=====
# heartbeat:

# Set to `true` to enable the Syslog heartbeat.
# The heartbeat will issue a Syslog message at
# the INFO level after every interval passes.
# enable: false

# Set the interval for sending heartbeat messages
# to the Syslog server (in milliseconds).
# interval_ms: 60000

#
=====
# agent.java
# The following properties apply to any Java agent-wide configurations.
#
=====
# java:

# Configure the Java agent to skip its application discovery
# algorithm, and instead associate all libraries, vulnerabilities,
# and web traffic to a single application with the name specified
# by this property. This configuration is preferred when deploying
# Java SE applications with embedded web servers (e.g., applications
# built with Spring Boot, Dropwizard, and embedded Jetty). When used
# with an application server, this configuration associates all
# web traffic with the single, standalone application, including
# web traffic handled by application server-hosted endpoints that
# would not be associated with a discovered application otherwise.
#
# Note - This settings takes preferences
```

```
# over the `application.name` setting.
#
# standalone_app_name: NEEDS_TO_BE_SET

# By default, the Java agent visits all classes at startup to look
# for vulnerabilities, which the agent may detect by scanning a
# class (e.g., hardcoded passwords). Set this property to `false`
# to disable the default behavior. If disabled, the agent will
# only visit classes which are likely to require sensors; this
# can improve application startup time, but may produce fewer
# findings (most likely findings that require static analysis).
#
# scan_all_classes: true

# By default, the Java agent deeply inspects all JAR and WAR files
loaded
# by the JVM to build a comprehensive understanding of the type
hierarchy.
# This understanding allows Contrast to instrument sensors into types
# that it might have overlooked. In most cases, this produces a slight
# increase in accuracy at the cost of increased application startup
# time. Set this property to `false` to disable this level of
inspection.
#
# scan_all_code_sources: true

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Define a list of directories where libraries are stored.
# Directories must be formatted as a semicolon-delimited
# list for Windows or a colon-delimited list for Linux.
#
# Define a list of directories where libraries are stored.
# Directories must be formatted as a semicolon-delimited list.
# Example - `path1;path2;path3` (Windows) or `path1:path2:path3` (Linux)
# Example - `path1:path2:path3`
#
# library_dirs: NEEDS_TO_BE_SET

# Set the maximum archive unpacking depth when analyzing libraries.
# library_depth: 10

# Set the boolean to more aggressively limit the
# manifest information reported for libraries. If true,
```



```
# the limit is 1,000 characters, otherwise it's 3,000.
# prune_package_details: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Control the values captured by Assess vulnerability events. `Full`
# captures most values by calling ToString on objects, which can
# provide more info but causes increased memory usage. `Minimal`
# has better performance as it only captures String type objects
# as strings and uses type name for other object type values.
# event_detail: minimal

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10
```

```
# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# profile
# Set configuration values under a profile name to enable
# multi-tenant application configuration on web servers. See
# https://support.contrastsecurity.com/hc/en-us/articles/360052187171-Multi-Application-configuration-with-Contrast-Profiles
# for more details.
#
=====
==
# profile: {}

#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.rules
# Use the following properties to set simple rule configurations.
#
```

```
=====
# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====
# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====
# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====
# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====
# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Tell the agent to detect when semantic analysis of the query
# reveals tautologies used in exfiltration attacks (e.g., "or
# 1=1" or "or 2<>3"). The agent blocks if blocking is enabled.
# detect_tautologies: false

# Tell the agent to detect when semantic analysis of the query
# reveals the invocation of dangerous functions typically used in
# weaponized exploits. The agent blocks if blocking is enabled.
# detect_dangerous_functions: false

# Tell the agent to detect when semantic analysis of the query
# reveals chained queries, which is uncommon in normal usage but
# common in exploit. The agent blocks if blocking is enabled.
# detect_chained_queries: false

# Tell the agent to detect when semantic analysis of the query
# reveals database queries are being made for system tables and
# sensitive information. The agent blocks if blocking is enabled.
# detect_suspicious_unions: false
```

```
# Tell the agent to be more aggressive in detecting user
# inputs as SQL comments. This enables the agent to better
# detect SQL Injection input vectors that use comments to
# terminate queries. The agent blocks if blocking is enabled.
# aggressive_comment: false

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Detect when the agent sees user parameters being executed as
# system commands. The agent blocks if blocking is enabled.
# detect_parameter_command_backdoors: true

# Detect when a system command is issued which contains
# chained commands. The agent blocks if blocking is enabled.
# detect_chained_commands: true

# Detect when a system command is issued with an argument matching a
# known dangerous file path. The agent blocks if blocking is enabled.
# detect_dangerous_path_args: true

# Tell the agent to detect when commands come directly
# from input. The agent blocks if blocking is enabled.
# detect_phased_commands: true

#
=====
# protect.rules.cmd-injection-process-hardening
# Use the following settings to configure whether
# the agent blocks all attempts to start an external
# process. To enable blocking, set to 'true'.
#
=====
# cmd-injection-process-hardening:

# Set to `true` to enable the agent to block
# all attempts to start external processes.
# enable: false

#
```

```
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Detect when custom code attempts to access sensitive
# system files. The agent blocks if blocking is enabled.
# detect_custom_code_accessing_system_files: true

# Detect when users attempt to bypass filters by
# using "::$DATA" channels or null bytes in file
# names. The agent blocks if blocking is enabled.
# detect_common_file_exploits: true

#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
```

```
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.padding-oracle
# Use the following properties to configure
# how the padding-oracle rule works.
#
=====
# padding-oracle: {}

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
```

```
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
```

```
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Set to `false` to disable detection of cloud
# provider metadata such as resource identifiers.
# discover_cloud_resource: true
```

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
# UI.
#
=====
==
api:
```



```
# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

# Set the timeout for communicating with TeamServer. This property will be
# respected over the deprecated legacy configuration *contrast.timeout*.
# timeout_ms: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate with
# the Contrast web interface over a proxy. Set value to
# `false` if you don't want to use the proxy. If no value is
# indicated, the presence of a valid **contrast.proxy.host**
# and **contrast.proxy.port** will enable the proxy.
# enable: NEEDS_TO_BE_SET

# Set the proxy host. It must be set with port and scheme.
# host: localhost

# Set the proxy port. It must be set with host and scheme.
# port: 1234

# Set the proxy scheme (e.g., `http` or
# `https`). It must be set with host and port.
# scheme: http

# Set this property as an alternate for `scheme://host:port`. It takes
```

```
# precedence over the other settings, if specified; however, an error
# will be thrown if both the URL and individual properties are set.
# url: NEEDS_TO_BE_SET

# Set the proxy user.
# user: NEEDS_TO_BE_SET

# Set the proxy password.
# pass: NEEDS_TO_BE_SET

# Set the proxy authentication type. Value
# options are `NTLM`, `Digest`, and `Basic`.
# auth_type: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.diagnostics
# Use the properties in this section to specify the information the agent
# should collect and report in order to diagnose problems in the agent.
#
#
=====
# diagnostics:

# Creates config and system info files
# at startup if true. True by default.
#
# The same thing can be achieved by setting the
# CONTRAST__AGENT__DIAGNOSTICS__ENABLE=[true/false] env variable.
#
# enable: true

#
=====
# agent.route_coverage
# Use the following properties for the route-based coverage feature.
#
=====
# route_coverage: {}

#
=====
# agent.reporting
# Use the following settings to configure reporting to the Contrast UI.
```

```
#
=====
# reporting:

# Set the grace period (in milliseconds) after
# agent shutdown to allow draining pending reports.
# shutdown_grace_period_ms: 120000

#
=====
# agent.effective_config
# None
#
=====
# effective_config:

#
=====
# agent.effective_config.reporting
# None
#
=====
# reporting:

# Defaults to `true`. Controls whether configuration
# setting reports are sent to the Contrast web interface.
# enable: true

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Set to `true` to redirect all logs to
# `stdout` instead of the file system.
```

```
# stdout: false

# Set to `true` to redirect all logs to `stderr` instead of
# the file system. May be combined with the corresponding
# `stdout` configuration to write to both streams.
# stderr: false

# Change the Contrast logger from a file-sized based rolling scheme
# to a date-based rolling scheme. At midnight server time, the
# previous day log is renamed to *file_name.yyyy-MM-dd*. Note -
# this scheme does not have a size limit; manual log pruning is
# required. You must set this flag to use the backups and size flags.
# roll_daily: false

# Set the roll size for log files in megabytes. The agent will
# attempt to prevent the log file from being larger than this size.
# roll_size: 100

# Set the number of backup files to keep. Set to `0` to disable.
# backups: 10

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the file to which the agent logs security events.
# path: ./contrast/security.log

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

# Change the Contrast security logger from a file-sized based rolling
# scheme to a date-based rolling scheme. At midnight server time,
# the log from the previous day is renamed to *file_name.yyyy-MM-dd*.
# Note - this scheme does not have a size limit; manual log
# pruning will be required. This flag must be set to use the
# backups and size flags. Value options are `true` or `false`.
# roll_daily: NEEDS_TO_BE_SET

# Specify the file size cap (in MB) of each log file.
# roll_size: NEEDS_TO_BE_SET

# Specify the number of backup logs that the agent will create before
# Contrast cleans up the oldest file. A value of `0` means that no
backups
# are created, and the log is truncated when it reaches its size cap.
#
# Note - this property must be used with
```

```
# `agent.security_logger.roll_daily=false`; otherwise,
# Contrast continues to log daily and disregard this limit.
#
# backups: NEEDS_TO_BE_SET

#
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

#
=====
# agent.security_logger.syslog.heartbeat
# Define the following properties to
```

```
# set the Syslog heartbeat properties.
#
=====
# heartbeat:

# Set to `true` to enable the Syslog heartbeat.
# The heartbeat will issue a Syslog message at
# the INFO level after every interval passes.
# enable: false

# Set the interval for sending heartbeat messages
# to the Syslog server (in milliseconds).
# interval_ms: 60000

#
=====
# agent.java
# The following properties apply to any Java agent-wide configurations.
#
=====
# java:

# Configure the Java agent to skip its application discovery
# algorithm, and instead associate all libraries, vulnerabilities,
# and web traffic to a single application with the name specified
# by this property. This configuration is preferred when deploying
# Java SE applications with embedded web servers (e.g., applications
# built with Spring Boot, Dropwizard, and embedded Jetty). When used
# with an application server, this configuration associates all
# web traffic with the single, standalone application, including
# web traffic handled by application server-hosted endpoints that
# would not be associated with a discovered application otherwise.
#
# Note - This settings takes preferences
# over the `application.name` setting.
#
# standalone_app_name: NEEDS_TO_BE_SET

# By default, the Java agent visits all classes at startup to look
# for vulnerabilities, which the agent may detect by scanning a
# class (e.g., hardcoded passwords). Set this property to `false`
# to disable the default behavior. If disabled, the agent will
# only visit classes which are likely to require sensors; this
# can improve application startup time, but may produce fewer
# findings (most likely findings that require static analysis).
#
# scan_all_classes: true

# By default, the Java agent deeply inspects all JAR and WAR files
loaded
# by the JVM to build a comprehensive understanding of the type
hierarchy.
# This understanding allows Contrast to instrument sensors into types
# that it might have overlooked. In most cases, this produces a slight
# increase in accuracy at the cost of increased application startup
```

```
# time. Set this property to `false` to disable this level of
inspection.
#
# scan_all_code_sources: true

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Define a list of directories where libraries are stored.
# Directories must be formatted as a semicolon-delimited
# list for Windows or a colon-delimited list for Linux.
#
# Define a list of directories where libraries are stored.
# Directories must be formatted as a semicolon-delimited list.
# Example - `path1;path2;path3` (Windows) or `path1:path2:path3` (Linux)
# Example - `path1;path2;path3`
#
# library_dirs: NEEDS_TO_BE_SET

# Set the maximum archive unpacking depth when analyzing libraries.
# library_depth: 10

# Set the boolean to more aggressively limit the
# manifest information reported for libraries. If true,
# the limit is 1,000 characters, otherwise it's 3,000.
# prune_package_details: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
```

```
# present, the decision is delegated to the Contrast UI.
# enable: false

# Control the values captured by Assess vulnerability events. `Full`
# captures most values by calling ToString on objects, which can
# provide more info but causes increased memory usage. `Minimal`
# has better performance as it only captures String type objects
# as strings and uses type name for other object type values.
# event_detail: minimal

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10

# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET
```



```
#
=====
==
# profile
# Set configuration values under a profile name to enable
# multi-tenant application configuration on web servers. See
# https://support.contrastsecurity.com/hc/en-us/articles/360052187171-Multi-Application-configuration-with-Contrast-Profiles
# for more details.
#
=====
==
# profile: {}

#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.rules
# Use the following properties to set simple rule configurations.
#
=====
# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====
# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====
# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
```

```
=====
# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====
# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Tell the agent to detect when semantic analysis of the query
# reveals tautologies used in exfiltration attacks (e.g., "or
# 1=1" or "or 2<>3"). The agent blocks if blocking is enabled.
# detect_tautologies: false

# Tell the agent to detect when semantic analysis of the query
# reveals the invocation of dangerous functions typically used in
# weaponized exploits. The agent blocks if blocking is enabled.
# detect_dangerous_functions: false

# Tell the agent to detect when semantic analysis of the query
# reveals chained queries, which is uncommon in normal usage but
# common in exploit. The agent blocks if blocking is enabled.
# detect_chained_queries: false

# Tell the agent to detect when semantic analysis of the query
# reveals database queries are being made for system tables and
# sensitive information. The agent blocks if blocking is enabled.
# detect_suspicious_unions: false

# Tell the agent to be more aggressive in detecting user
# inputs as SQL comments. This enables the agent to better
# detect SQL Injection input vectors that use comments to
# terminate queries. The agent blocks if blocking is enabled.
# aggressive_comment: false

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
```

```
#
# mode: off

# Detect when the agent sees user parameters being executed as
# system commands. The agent blocks if blocking is enabled.
# detect_parameter_command_backdoors: true

# Detect when a system command is issued which contains
# chained commands. The agent blocks if blocking is enabled.
# detect_chained_commands: true

# Detect when a system command is issued with an argument matching a
# known dangerous file path. The agent blocks if blocking is enabled.
# detect_dangerous_path_args: true

# Tell the agent to detect when commands come directly
# from input. The agent blocks if blocking is enabled.
# detect_phased_commands: true

#
=====
# protect.rules.cmd-injection-process-hardening
# Use the following settings to configure whether
# the agent blocks all attempts to start an external
# process. To enable blocking, set to 'true'.
#
=====
# cmd-injection-process-hardening:

# Set to `true` to enable the agent to block
# all attempts to start external processes.
# enable: false

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Detect when custom code attempts to access sensitive
# system files. The agent blocks if blocking is enabled.
# detect_custom_code_accessing_system_files: true

# Detect when users attempt to bypass filters by
```

```
# using "::$DATA" channels or null bytes in file
# names. The agent blocks if blocking is enabled.
# detect_common_file_exploits: true

#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off
```

```
#
=====
# protect.rules.padding-oracle
# Use the following properties to configure
# how the padding-oracle rule works.
#
=====
# padding-oracle: {}

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
```

```
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
```

```
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Set to `false` to disable detection of cloud
# provider metadata such as resource identifiers.
# discover_cloud_resource: true
```

## Configure the Java agent for standalone applications



### NOTE

Standalone application configuration is not needed with the Java agent 4.X.

## Transport Layer Security (TLS)

The Contrast Java agent uses a secure TLS connection to communicate with Contrast.

For hosted customers, Contrast uses strong TLSv1.2 connections and certificates signed by industry standard certificate authorities (CAs). However, on-premises customers may need to configure the Java agent to use enterprise CAs, and may want the Java agent to send client certificates in the TLS handshake.

The Contrast Java agent uses the standard [Java Cryptography Architecture](#) for configuring TLS. Specifically, the Java agent uses the system's "TLS" [javax.net.ssl.SSLContext](#). For most users, this means that you can adjust the certificates trusted by the agent using the standard `javax.net.ssl.trustStore` system properties. You can also adjust the certificate the agent sends when the TLS server requests a client certificate using the standard `javax.net.ssl.keyStore` system properties.

This example configures the Java agent to use a custom key store and trust store:

```
java \
  -javaagent:contrast.jar \
  -Djavax.net.ssl.trustStore=/etc/pki/tls/my-enterprise-truststore.p12 \
  -Djavax.net.ssl.trustStorePassword=changeit \
  -Djavax.net.ssl.trustStoreType=PKCS12 \
  -Djavax.net.ssl.keyStore=/etc/pki/tls/server-client-certificate.p12 \
  -Djavax.net.ssl.keyStorePassword=password \
  -Djavax.net.ssl.keyStoreType=PKCS12 \
  -jar my-server.jar
```

## Use the Java Agent with the Java Platform Module System (JPMS)

JPMS is a way to encapsulate code that is present in Java versions 9 and later. Contrast supports inspection of modules and launching of applications written with the JPMS.

The Java Agent requires that the `java.sql` package be required by the application's `module-info.java` files:

```
module mymodule {
    requires java.sql;
}
```

or supplied by the `--add-modules` command-line argument at runtime:

```
java -javaagent:/opt/contrast/contrast-agent.jar --add-modules java.sql --  
module-path libs --module mymodule/mycompany.App
```

## Java 2 security

The Java 2 security manager allows system administrators to enforce policies that dictate the permissions available to Java code within a JVM.

If you are using the Java 2 security manager with the Java agent, you will need to configure Java security policy files to apply permissions to Java code principals.

Java code principals are typically identified by a `CodeSource` (like, a JAR), and in rare cases, by the entity that signed the JAR.

For example, in Tomcat's [default catalina.policy file](#), the policy grants permissions to the JDBC driver JAR:

```
// The permission granted to your JDBC driver  
grant codeBase "jar:file:${catalina.base}/webapps/examples/WEB-INF/lib/  
driver.jar!/-" {  
    permission java.net.SocketPermission "dbhost.mycompany.com:5432",  
    "connect";  
};
```

The Java 2 security manager can be useful in situations where the system administrator can't fully trust the code deployed by users. For example, if you are hosting users' applications on multi-tenant Tomcat instances, you could use the Java 2 security manager to constrain users' applications from taking down their whole service (for example, by disallowing calls to `System.exit()`).

If you are using the Java 2 security manager with the Contrast Java agent, you should grant the Java agent the full set of permissions in your security policy file (*java.security.AllPermission*). To do this, replace `<YourContrastJarPath>` with the path to your [Contrast JAR \(page 122\)](#), and use:

```
grant codeBase "file:<YourContrastJarPath>" {  
    permission java.security.AllPermission;  
};
```

If you are using Java 2 security manager and one of these environments, you may also need to complete further configuration:

- [Glassfish](#)
- [Jetty \(page 145\)](#)
- [Tomcat \(page 146\)](#)
- [WebLogic \(page 147\)](#)
- [WebSphere \(page 148\)](#)
- [WildFly \(page 144\)](#)

## .NET Framework agent

The Contrast .NET Framework agent analyzes the behavior of .NET web applications as users interact with these applications.



### NOTE

The latest .NET Framework agent supports Assess (IAST), Protect (RASP), and SCA features.



Once installed, the .NET Framework agent automatically instruments ASP.NET applications deployed to IIS. Agent analysis is performed as applications are exercised by users (or by automated scripts or tests).

You can view the results of the agent's analysis in the Contrast application. The Contrast .NET Framework agent consists of several components:

- **Background Windows service:** (*DotnetAgentService.exe*) This service prepares the environment for instrumentation and manages communication between agent components. This is the main service that controls agent behavior. You can disable Contrast's instrumentation and analysis by stopping the agent's background Windows service.
- **The .NET Profiler:** This instruments applications to weave in method calls out to agent sensors.
- **Sensors:** These gather security, architecture and library information.
- **The .NET Agent Explorer (page 266):** This is a Windows system tray application that displays high-level information about the health of the agent.

As a next step, you can:

- [Install the .NET Framework agent \(page 63\)](#)
- [View supported technologies \(page 63\)](#)
- [View system requirements \(page 64\)](#)
- [Use application pools in IIS \(page 229\)](#)

## .NET Framework advanced installation

The easiest way to deploy .NET Framework agents is to use the [Agent wizard \(page 63\)](#) in the Contrast web interface.

If you want additional information or methods related to the deployment of .NET Framework agent, visit these topics:

- [.NET Framework telemetry \(page 213\)](#)
- [Install .NET Framework with Nuget \(page 224\)](#)
- [Agent upgrade service \(Windows only\) \(page 227\)](#)
- [Install with infrastructure as code tools \(page 285\)](#)
- [Update the .NET Framework agent \(page 229\)](#)

## See also

[Advanced configuration \(page 230\)](#)

## .NET Framework and .NET Core Telemetry

.NET Framework and .NET Core agents use telemetry to collect usage data. Telemetry is collected when an instrumented application first loads the agent's sensors and then periodically (every few hours) afterwards.

[Your privacy is important to us \(page 1563\)](#). The telemetry feature doesn't collect application data. The data is anonymized before being sent securely to Contrast. Then the aggregated data is stored encrypted and under restricted access control. Any collected data will be deleted after one year.

The telemetry feature collects the following data:

| Agent versions                     | Data  |
|------------------------------------|---|
| .NET Framework later than 2020.8.3 | Agent version                                     |
| .NET Core later than 1.5.15        | Operating system and version                      |
|                                    | Whether the agent is running in a container       |
|                                    | Whether the agent is running in Azure App Service |

| Agent versions                    | Data   |
|-----------------------------------|--|
|                                   | <p>Hashed Media Access Control (MAC) address: a cryptographically (SHA256) anonymous and unique ID for a machine</p> <p>Kernel version</p> <p>Process running time</p> <p>Whether Assess is enabled</p> <p>Whether Protect is enabled</p> <p>.NET Framework later than 2020.8.3</p> <p>.NET Framework runtime version</p> <p>.NET Core later than 1.5.15</p> <p>.NET Core runtime version</p>  |
| .NET Framework later than 20.9.1  | Hosted or on-premises Contrast instance  |
| .NET Core later than 1.5.17       |  |
| .NET Framework later than 20.9.3  | CLR Instrumentation Engine (CIE) usage   |
| .NET Core later than 1.5.19       | <p>Application framework</p> <p>Chained profiler vendor</p>  |
| .NET Framework later than 20.10.1 | Process hosting mode   |
| .NET Core later than 1.5.20       | CIE Raw Profiler Hook usage  |
| .NET Framework later than 20.10.2 | Names of configuration settings with non-default values  |
| .NET Core later than 1.5.21       | Names of disabled Assess rules   |
| .NET Framework later than 20.12.2 | Time elapsed for agent's profiler component to initialize  |
| .NET Core later than 1.7.2        | Time elapsed for agent's first request to the Contrast web interface   |
|                                   | Time elapsed for agent's profiler component to initialize  |
|                                   | Time elapsed between agent initialization and end of the first request   |
| .NET Framework later than 21.1.1  | <p>Metrics on IIS-hosted applications, including:</p> <ul style="list-style-type: none"> <li>Total application count</li> <li>Application count that will be analyzed (pass application allow list/deny list configuration)</li> <li>Count of apps hosted on CLR4 application pools</li> <li>Count of apps hosted on CLR2 application pools</li> </ul> <p>Metrics on IIS applications pools</p> <ul style="list-style-type: none"> <li>Total count</li> <li>Count with agent attached</li> <li>Count of CLR4</li> <li>Count of CLR2</li> </ul> <p>Minimum number of applications in a single app pool</p> <p>Maximum number of applications in a single app pool</p> <p>Median number of applications across all app pools</p> |
| .NET Framework later than 21.1.2  | Rule mode (i.e. Monitor vs. Block) for each Protect rule   |
| .NET Core later than 1.7.5        |  |
| .NET Framework later than 21.4.2  | Exceptions thrown and caught within agent sensor code, including log message, exception type, exception message, and stack trace frames for <code>System</code> and <code>Contrast</code> methods.   |
| .NET Core later than 1.8.4        |  |
| .NET Framework later than 21.7.1  | <ul style="list-style-type: none"> <li>Process Architecture (x86/x64)</li> </ul>   |
| .NET Core later than 1.9.7        | <p>OS Architecture (x86/x64)</p> <p>In Azure App Service, the values of the following environment variables:</p> <ul style="list-style-type: none"> <li>WEBSITE_PHYSICAL_MEMORY_MB</li> <li>WEBSITE_PLATFORM_VERSION</li> <li>WEBSITE_SKU</li> </ul>   |

| Agent versions                   | Data  |
|----------------------------------|---|
| .NET Framework later than 21.9.2 | Description of location where YAML config file was loaded from (i.e., path specified by environment variable, default location, application directory). |
| .NET Core later than 2.0.1       |   |

To opt-out of the telemetry feature, set the `CONTRAST_AGENT_TELEMETRY_OPTOUT` environment variable to `1` or `true`.

Telemetry data is securely sent to *telemetry.dotnet.contrastsecurity.com*. You can also opt out of telemetry by blocking communication at the network level.

## Install the .NET Framework agent

In most deployments, much of the installation is done automatically by the installer or site extension. A basic installation of the .NET Framework agent looks like this:

1. Download the installer and place it on the server.
2. Run the installer.
3. Use the application as you normally would and verify that Contrast sees your application.



### NOTE

If you are using Windows 2008, a version of .NET Framework prior to 4.7.1 or if your application targets CLR2, you should use the [Legacy .Net Framework agent installer](#).

Specifically, installation varies depending on how you want to install the .NET Framework agent:

- [.NET Framework Windows installer \(page 215\)](#)
- [Azure App Service \(page 218\)](#)
- [Into a container, like Docker \(page 221\)](#)
- [Web API-OWIN \(page 224\)](#)

To auto-upgrade your agent, enable this option with the [Agent Upgrade Service \(page 227\)](#).

## .NET Framework agent installer for Windows

The Contrast .NET Framework agent installer is a normal Windows application installer built using standard MSI technology. It validates that the target server satisfies several requirements (for example, that the server's operating system is a supported operating system). If all requirements are met, the installer:

- Registers the .NET Framework agent as a standard Windows program.
- Places the agent's files on a disk in the specified install location (for example, *C:\Program Files\Contrast\dotnet*). This includes several dynamic link libraries (DLLs) and executables, such as the background Windows service that drives agent behavior.
- Creates the specified data directory for the agent that's primarily used to store agent log files and configuration (for example, *C:\ProgramData\Contrast\dotnet*).
- Registers the agent's background Window service with the operating system.
- Adds the agent's Native Module to IIS. The Native Module registers the agent's profiler component with IIS through environment variables. This causes the CLR to load the agent's profiler, which is responsible for instrumenting analyzed applications.
- Starts the agent's background Windows service and [.NET Agent Explorer \(page 266\)](#) application. The background service is responsible for:

- Communication with profiler and sensor components through local named pipes.



## NOTE

- If you are using the agent with [self-hosted Web API and OWIN \(page 224\)](#) (outside of IIS), further configuration is needed.
- If you are using Windows 2008, a version of .NET Framework prior to 4.7.1 or if your application targets CLR2, you should use the [Legacy .NET Framework agent installer](#).

## Install the .NET Framework agent using Contrast

1. In the Contrast web application, select **Add new** in the top right.
2. Select the **Application** card.
3. Choose **.NET Framework** in the application language dropdown, then select **IIS hosted** and select the link to **Download the agent and YAML configuration file**.
4. Extract the downloaded ZIP archive on the web server, and run *ContrastSetup.exe*. This installs the .NET Framework agent.

The *contrast\_security.yaml* file is copied to the agent's data directory by the installer and placed in *C:\ProgramData\Contrast\dotnet\contrast\_security.yaml* by default. The installer does not copy the YAML file if it already exists at the destination.

  - You can [use the command line \(page 230\)](#) to access additional options supported by the .NET Framework agent installer for Windows.
  - If you are using another profiler in this environment, such as an APM like New Relic or AppDynamics, then you need to enable [Contrast profiler chaining \(page 265\)](#).
5. You can further configure the agent using the [.NET Framework YAML template \(page 232\)](#).
6. Use the application as you normally would and verify that Contrast sees your application.

If there are some applications you don't need to analyze, or if you are trying to be lean on performance, consider using [application pools \(page 229\)](#) to limit the number of applications instrumented.

## Install the .NET Framework agent using command line

You can use the command line to access additional options supported by the .NET Framework agent installer for Windows.

The .NET agent can be installed using the Windows UI, and uninstalled or repaired using standard Windows features (including the Programs and Features Control Panel and Powershell). However, you may want to use the .NET Framework agent installer for Windows to perform these actions instead for certain scenarios such as automated scripting.

Use these commands for attended mode:

- **Install:** `ContrastSetup.exe`
- **Uninstall:** `ContrastSetup.exe -uninstall`
- **Repair:** `ContrastSetup.exe -repair`

Use these commands for unattended or silent mode:

- **Install:** `ContrastSetup.exe -s -norestart`
- **Uninstall:** `ContrastSetup.exe -uninstall -s -norestart`

- **Repair:** ContrastSetup.exe -repair -s -norestart

The .NET Framework agent installer for Windows supports several additional options that are accessible when you use the command line for installation.

| Option  | Description   | Example   |
|---|---|---|
| INSTALLFOLDER   | This option specifies the install directory. Program files will be written to this directory. Defaults are dependent on OS variables.   | INSTALLFOLDER="D:\Programs\Contrast"  |
| AGENT_EXPLORER_INSTALLFOLDER  | This option specifies the directory for Agent Explorer files.   | AGENT_EXPLORER_INSTALLFOLDER="C:\Program Files\Contrast\agent-explorer"         |
| DATAFOLDER  | This option specifies the data directory. Logs and the <code>contrast_security.yaml</code> file will be written to this directory. Defaults are dependent on OS variables.  | DATAFOLDER = "D:\Data\Contrast"   |
| PathToYaml  | This option specifies a custom YAML configuration file. The default value is the <code>contrast_security.yaml</code> file located relative to the installer's location.   | PathToYaml=c:\contrast_security.yaml  |
| SERVICE_STARTUP_TYPE_MANUAL   | This option is required when you install, upgrade, and repair the agent. If you set the value to 1, this option sets the Contrast service startup type to Manual. The default value is 0 (Automatic Delayed Start). | SERVICE_STARTUP_TYPE_MANUAL=1   |
| SUPPRESS_SERVICE_START  | This option is required when you install, upgrade, and repair the agent. If you set the value to 1, this option automatically suppresses starting the service. The default value is 0.                              | SUPPRESS_SERVICE_START=1  |
| SUPPRESS_RESTARTING_IIS   | If you set the value of this option to 1, the installer does not restart IIS.<br><br>The default value is 0.  | SUPPRESS_RESTARTING_IIS=0   |
| <div>  <p><b>NOTE</b></p> <ul style="list-style-type: none"> <li>• Applications do not load the agent until IIS restarts.</li> <li>• Setting <code>SUPPRESS_RESTARTING_IIS</code> will prevent an auto-upgrade from running unless IIS does not have any active workers when the upgrade runs.</li> </ul> </div> |   |   |
| USE_VIRTUAL_SERVICE_ACCOUNT   | Run the agent service under a restricted virtual service account. Configures the service to run as the <code>NT Service\DotnetAgentSvc</code> virtual account instead of <code>SYSTEM</code> .                      | USE_VIRTUAL_SERVICE_ACCOUNT=0   |
| INSECURE_YAML_FILE  | Restrict edits to the <code>contrast_security.yaml</code> file of non-elevated users.   | INSECURE_YAML_FILE=0  |
| INSTALL_AGENT_EXPLORER  | If you don't want to install the Agent Explorer, set the value for this option to 0.<br><br>The default value is 1, which installs the Agent Explorer.  | INSTALL_AGENT_EXPLORER=1  |
| INSTALL_UPGRADE_SERVICE   | If you don't want to install the agent upgrade service, set the value of this option to 0. The default value is 1 which installs the agent upgrade service.   | INSTALL_UPGRADE_SERVICE=1   |
| UPGRADE_SERVICE_INSTALLFOLDER   | This option specifies the directory for the upgrade service files.  | UPGRADE_SERVICE_INSTALLFOLDER="C:\Program Files (x86)\Contrast\upgrade-service" |

**TIP**

To install the .NET agent using scripts, you can use this command:

```
ContrastSetup.exe -s PathToYaml=C:\Temp\custom.yaml
```

This command installs the .NET agent in silent and unattended mode and uses a custom path to the YAML configuration file.

**IMPORTANT**

Contrast automatically restarts IIS when you install the agent.

## Install the .NET Framework agent for Azure App Service

Use this procedure for an express installation of the .NET Framework agent using Azure Portal Extensions.

### Before you begin

Before you begin, check the [system requirements \(page 64\)](#) and [supported technologies \(page 63\)](#) to be sure installation will work and ensure best performance.

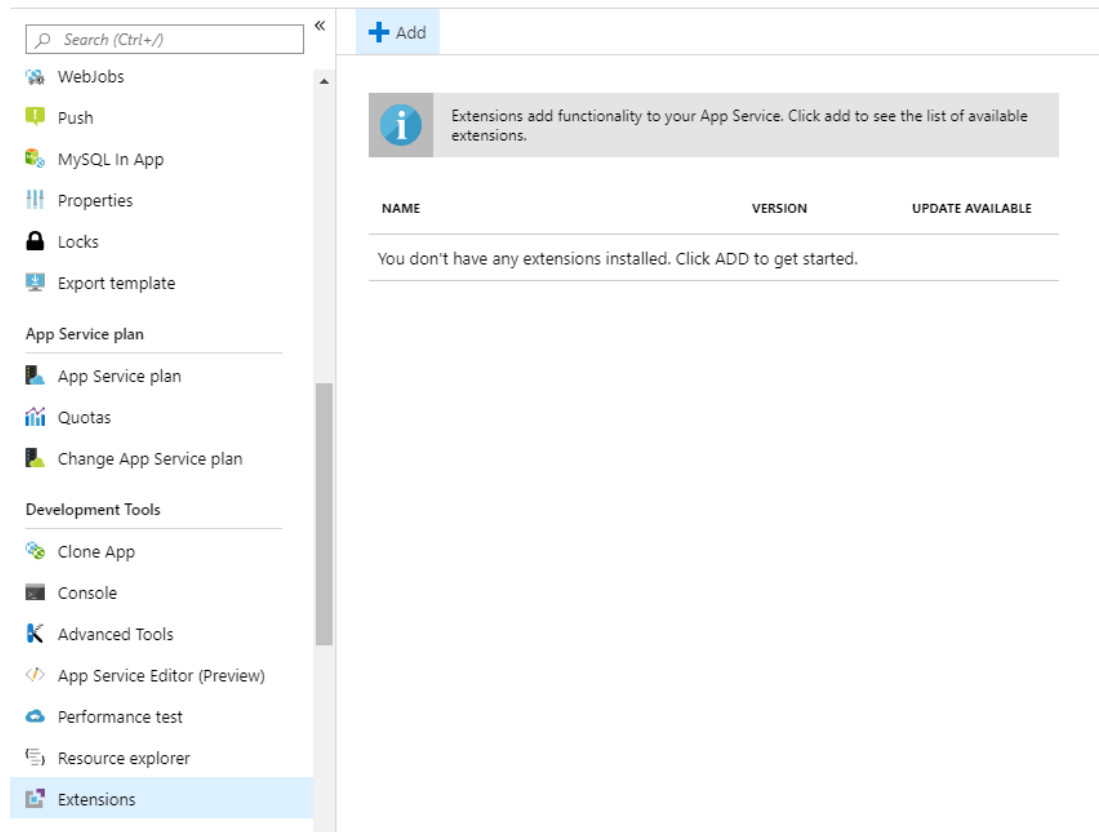
### Steps

1. Create an [Azure account](#), if you don't have one already.
2. Create a [.NET web application](#) and deploy it to Azure App Service.
3. Publish your application to Azure, and confirm that it works as expected without Contrast.
4. Ensure that your application is deployed using a Windows plan. (Linux plans do not support Site Extensions.)

**NOTE**

If you do not have access to the site extension, you can [install the .NET Framework agent manually with NuGet \(page 224\)](#).

5. Add the Contrast .NET Framework Agent Site Extension:
  - With the Azure portal
    - a. In the Azure Portal, select your hosted application.
    - b. Select **Extensions**.



- c. Select **Add**.
- d. Select the **Contrast .NET Framework Site Extension for Azure App Service**. This is the extension for .NET Framework applications.
- e. Select **OK**, and agree to the terms and conditions.
- f. Wait a few seconds and confirm the site extension installed correctly.

**NOTE**

The site extension sets a number of environment variables, including:

```
COR_ENABLE_PROFILING=1
COR_PROFILER={EFEB8EE0-6D39-4347-A5FE-4D0C88BC5BC1}
COR_PROFILER_PATH_32=D:\home\siteextensions\Contrast.Net.Azure.SiteExtension\ContrastAppService\runtimes\win-x86\native\ContrastProfiler.dll
COR_PROFILER_PATH_64=D:\home\siteextensions\Contrast.Net.Azure.SiteExtension\ContrastAppService\runtimes\win-x64\native\ContrastProfiler.dll
CONTRAST_INSTALL_DIRECTORY=D:\home\siteextensions\Contrast.Net.Azure.SiteExtension\ContrastAppService\
MicrosoftInstrumentationEngine_ConfigPath32_ContrastX86Config=D:\home\siteextensions\Contrast.Net.Azure.SiteExtension\runtimes\win-x86\ContrastCieProfiler.config
MicrosoftInstrumentationEngine_ConfigPath64_ContrastX64Config=D:\home\siteextensions\Contrast.Net.Azure.SiteExtension\runtimes\win-x64\ContrastCieProfiler.config
```

If the CLR instrumentation engine (CIE) is configured for the application (for example, because Application Insights is enabled), Azure should automatically overwrite the `CORECLR_PROFILER*` variables to point to the profiler of the CIE.

The CIE will then use the `MicrosoftInstrumentationEngine_*` variables to load the Contrast agent.

If the CIE is not configured for the application, the standard `CORECLR_PROFILER*` variables will be used to load the Contrast agent.

- With the Azure CLI
  - Use a command similar to this one for a .NET Framework Site Extension

```
az resource create --resource-group 'myResourceGroup' --resource-type Microsoft.Web/sites/siteextensions --name myAppService/siteextensions/Contrast.NET.Azure.SiteExtension --properties "{}"
```

In this example, the command adds a Contrast .NET Framework Site Extension to an App Service named "myAppService" in Resource Group "myResourceGroup".

After you add the extension, the Azure Portal displays a list of the installed agents with details similar to the following:

| Name  | Version | Update Available |
|---|---------|------------------|
| Contrast.NET Framework Site Extension for Azure App Service | 51.0.22 | No               |

**TIP**

You can also install the agent from the Site Extensions area of your application management SCM (Kudu) site.





## IMPORTANT

If a new version of the .NET Framework agent is available, it's indicated in the Azure Portal or Kudu dashboard. You must stop the site before starting the update; otherwise, the update may fail.

### 6. Add configuration options

- With the Azure Portal
  - a. In the Azure Portal, select your hosted application.
  - b. Select **Configuration** under **Settings** to configure settings that allow the agent to connect to Contrast.
  - c. Select **New application setting** and add the following values for your application:

| Key                        | Value   |
|----------------------------|---|
| CONTRAST__API__USER_NAME   | Replace with your <a href="#">agent username (page 109)</a> .   |
| CONTRAST__API__SERVICE_KEY | Replace with your <a href="#">agent service key (page 109)</a> .  |
| CONTRAST__API__API_KEY     | Replace with your agent <a href="#">API key (page 109)</a> .  |
| CONTRAST__API__URL         | Defaults to <a href="https://app.contrastsecurity.com">https://app.contrastsecurity.com</a> . Replace with another URL, if you're using a Contrast application that's hosted elsewhere. |

- With the Azure CLI
  - Enter a command similar to this one:

```
az webapp config appsettings set --resource-group 'myResourceGroup'
--name 'myAppService' --settings CONTRAST__API__URL=https://
app.contrastsecurity.com CONTRAST__API__API_KEY={Your API
KEY} CONTRAST__API__SERVICE_KEY={Your Service key}
CONTRAST__API__USER_NAME={Your agent user}
```

Get API values ([agent keys \(page 109\)](#)) from the Contrast web interface or by downloading a YAML file for the or .NET Framework agent.

- 7. In the Azure Portal, go to the application overview and **Restart** the application.  
Running the application automatically instruments any application that is running inside of the App Service. You should begin to see data in Contrast
- 8. Navigate to the application and confirm the application is reporting to Contrast.  
You can view log files to verify that Contrast is running:
  - a. In the Azure Portal, go to **Advanced Tools** for the app service.
  - b. Select **Go**.
  - c. In the Kudu Services window, select “Debug console” menu at the top and select “CMD”.
  - d. Select the `LogFiles` directory.
  - e. Select the `Contrast` directory.
  - f. Select the `dotnet` directory.  
You will see an agent log named `<PID>_Profiler_<App Service Name>_<XXX>.log`.
  - g. Verify that there are no ERROR log entries.

## Install the .NET Framework agent using a container

### Before you begin

This topic provides general guidance for installing the Contrast .NET Framework agent in a containerized application, with Docker as an example.

You should have a basic understanding of how containers and related software work. You may need to adjust the instructions to meet your specific circumstances.

## Step 1: Install the agent

In this example, the latest .NET Framework agent is copied. Check DockerHub for available tags.

```
FROM mcr.microsoft.com/dotnet/framework/sdk:4.8

# Hidden for brevity...

# Copy the required agent files from the official Contrast agent image.
COPY --from=contrast/agent-dotnet-framework:latest C:\Contrast C:\Contrast
```

## Step 2: Configure the agent

Contrast agents accept configuration from multiple sources, with order of precedence documented in the [order of precedence \(page 111\)](#) section.

A mixed approach is recommended:

- Use a YAML file so that you can share a common configuration between multiple applications.
- Use environment variables for application-specific configuration values, to override values specified in a YAML file, or for sensitive keys that are injected during runtime.

### YAML file configuration:

When you use a [YAML file to configure \(page 112\)](#) the agent, you can use the environment variable `CONTRAST_CONFIG_PATH` to indicate where the YAML file is located inside the container.

For example, given a YAML file called `contrast_security.yaml` that exists in the Docker build context:

```
agent:
  logger:
    path: /var/tmp
    level: WARN
```

You can use the `CONTRAST_CONFIG_PATH` environment variable to add the agent YAML file to the container image as follows:

```
FROM mcr.microsoft.com/dotnet/framework/sdk:4.8

# Hidden for brevity...

# Add the Contrast agent to the image.
COPY --from=contrast/agent-dotnet-framework:latest C:\Contrast C:\Contrast


# Copy the contrast_security.yaml file from Docker build context.
COPY ./contrast_security.yaml /contrast_security.yaml

# Finally configure the agent to use the YAML file previously copied.
ENV CONTRAST_CONFIG_PATH=/contrast_security.yaml
```

### Environment variable configuration:

To set an application-specific configuration, use [environment variables. \(page 115\)](#) This table contains some common configuration options.

| Title            | Usage  | Environment variable                     |
|------------------|--|--|
| Application name | Specify the application name reported to Contrast. | <code>CONTRAST__APPLICATION__NAME</code> |

| Title  | Usage  | Environment variable          |
|--|--|-------------------------------|
| Application group  | Specify the application access group for this application during onboarding.   | CONTRAST__APPLICATION__GROUP  |
| <div>  <b>NOTE</b><br/>           Create application access groups in Contrast before using this variable.         </div> |  |                               |
| Application tags   | Add labels to an application.  | CONTRAST__APPLICATION__TAGS   |
| Server name  | Specify the server name reported to Contrast.  | CONTRAST__SERVER__NAME        |
| Server environment   | Specify in which environment the application is running. Valid values for this configuration are: Development, QA, and Production. | CONTRAST__SERVER__ENVIRONMENT |
| Server tag   | Add labels to the server.  | CONTRAST__SERVER__TAG         |

### Step 3: Add profiler variables and authentication credentials

To enable instrumentation of your application, the .NET agent requires [additional environment variables \(page 115\)](#). The `COR_CLR` variables load the agent and the `CONTRAST_` variables are for agent authentication to the server.

Using the Dockerfile example in this topic:

```
FROM mcr.microsoft.com/dotnet/framework/sdk:4.8

COPY --from=contrast/agent-dotnet-framework:latest C:\Contrast C:\Contrast

ENV COR_ENABLE_PROFILING=1 \
    COR_PROFILER={EFEB8EE0-6D39-4347-A5FE-4D0C88BC5BC1} \
    COR_PROFILER_PATH_32=C:\Contrast\runtimes\win-x86\native\ContrastProfiler.dll \
    COR_PROFILER_PATH_64=C:\Contrast\runtimes\win-x64\native\ContrastProfiler.dll
```

Additionally, the [following environment variables \(page 109\)](#) are required for agent authentication to the server.

- **Agent Token:** This variable is a base64 encoded JSON object containing the url, api\_key, service\_key, and user\_name configuration settings, allowing you to set them set in a single variable.

If your agent configuration refers to both the legacy settings and the agent token, (in environment variables or the YAML file), the legacy settings take precedence. To use just the agent token value, make sure you remove references to the legacy settings.

```
set CONTRAST__API__TOKEN=<token-value
```

- **Legacy settings:** If you are using an agent version earlier than 51.0.40, set these variables:

```
CONTRAST__API__URL=https://app.contrastsecurity.com/Contrast
CONTRAST__API__API_KEY={Your API KEY here}
CONTRAST__API__SERVICE_KEY={Your Service key here}
```

Get the API values ([agent keys \(page 109\)](#)) from the Contrast web interface or by [downloading a YAML file \(page 232\)](#) for the .NET Framework agent.

## Examples

You can see examples of finished code in this [GitHub repository](#). In particular, these ASP.NET application use cases might be helpful:

- Default AppPool:
  - [Dockerfile](#)
  - [Entrypoint script](#)
- Custom AppPool:
  - [Dockerfile](#)
  - [Entrypoint script](#)

## See also

Contrast Support Portal [Kubernetes and Contrast](#)

Contrast Support Portal [AWS Fargate and Contrast agents](#)

## Install the .NET Framework agent manually with NuGet

In some instances, you may prefer to manually install the .NET Framework agent using NuGet. For example, this can be useful if you are unable to access the [Azure App Service site extension \(page 218\)](#) or if you prefer to include the .NET Framework agent as a dependency.

1. Add the Contrast NuGet package to your application.  
In Visual Studio, under the application project in the Solution Explorer, right-click on **References** and select **Manage NuGet Packages**.  
Search for the **Contrast.Net.Azure.AppService** package, select it and add it to your project.  
Build your application. Confirm that Contrast assemblies (for example, `ContrastProfiler.dll`) are in a new `contrastsecurity` folder that's created in the application's root directory.
2. Add application authentication settings for Contrast.  
You can either add the authentication settings through the App Service Settings window in Visual Studio's "Publish to Azure App Service", or directly through the Azure App Service Portal.  
Set the Contrast authentication keys that the agent needs to connect to Contrast, and select **Save**.  
You can [find your keys \(page 109\)](#) in your profile.
3. Follow the build process from the dotnet source code repository.
4. Go to the **Application settings** area of your application in the Azure Portal. Set the Contrast authentication keys that the agent needs to connect to Contrast, and select **Save**.
5. Using Visual Studio, publish the application to Azure.  
Once the application has loaded, use the application and then open Contrast to verify that the server and application are active, and that any expected vulnerabilities appear.

## Install the .NET Framework agent with Web API and Owin

The .NET agent supports analysis of Web API applications that are self-hosted with the Open Web Interface for .NET (OWIN). The Web Api can be deployed as a command line application and Windows service.



### NOTE

Web API applications hosted in the IIS integrated pipeline using the SystemWeb HttpModule and those deployed with an OWIN Host are **not supported**.

1. Install the .NET agent with [.NET Framework agent installer for Windows \(page 215\)](#).

2. Set the environment variables, depending on how you deploy your Web API hosted by OWIN.
  - **Deployed as a command line application:** Set these environment variables before running the command line application that is being used to self-host OWIN:

| Environment variable | Value   |
|----------------------|---|
| COR_ENABLE_PROFILING | 1   |
| COR_PROFILER         | {EFEB8EE0-6D39-4347-A5FE-4D0C88BC5BC1}  |
| COR_PROFILER_PATH_32 | C:\Program Files\Contrast\dotnet\runtimes\win-x86\native\ContrastProfiler.dll |
| COR_PROFILER_PATH_64 | C:\Program Files\Contrast\dotnet\runtimes\win-x64\native\ContrastProfiler.dll |

**NOTE**

COR\_PROFILER\_PATH\_32 / COR\_PROFILER\_PATH\_64 must match the installation directory chosen during the install of the .NET Framework agent.

- **Deployed as a Windows service:**

Install the service that contains the Web API application. Note the name of the service. Under the service's registry key, create a REG\_MULTI\_SZ value called `Environment`. If there is already an `Environment` value, add the new values below the existing values. Set the required environment variables. Each environment variable key/value pair must be separated by a new line. Environment variables that are unique for each service can be set under that service's registry key. The service's registry key can be found at: `HKLM\SYSTEM\CurrentControlSet\Services\YourServiceName`.

| Environment variable | Value   |
|----------------------|---|
| COR_ENABLE_PROFILING | 1   |
| COR_PROFILER         | {EFEB8EE0-6D39-4347-A5FE-4D0C88BC5BC1}  |
| COR_PROFILER_PATH_32 | C:\Program Files\Contrast\dotnet\runtimes\win-x86\native\ContrastProfiler.dll |
| COR_PROFILER_PATH_64 | C:\Program Files\Contrast\dotnet\runtimes\win-x64\native\ContrastProfiler.dll |
| CONTRAST_CONFIG_PATH | C:\ProgramData\contrast\dotnet\contrast_security.yaml                         |

**NOTE**

COR\_PROFILER\_PATH\_32 / COR\_PROFILER\_PATH\_64 must match the installation directory chosen during the install of the .NET Framework agent.

3. Restart the service so that new values are loaded. This PowerShell script can be used to set the required environment variables:

```
param (  
    # Name of the service that it was given at installation.  
    [Parameter(Mandatory=$true)]  
    [string]  
    $ServiceName,  
  
    # Path to the 64-bit Contrast profiler DLL.  
    # Defaults to: "C:\Program Files\Contrast\dotnet\runtimes\win-x64\native\ContrastProfiler.dll"  
    [string]  
    $ProfilerPath64 = "C:\Program Files\Contrast\dotnet\runtimes\win-
```

```
x64\native\ContrastProfiler.dll",

    # Path to the 32-bit Contrast profiler DLL.
    # Defaults to: "C:\Program Files\Contrast\dotnet\runtimes\win-
x86\native\ContrastProfiler.dll"
    [string]
    $ProfilerPath32 = "C:\Program Files\Contrast\dotnet\runtimes\win-
x86\native\ContrastProfiler.dll",

    # Path to the Contrast agent configuration YAML file.
    # Defaults to:
"C:\ProgramData\contrast\dotnet\contrast_security.yaml"
    [string]
    $ConfigYamlPath =
"C:\ProgramData\contrast\dotnet\contrast_security.yaml"
)

if (-Not (Test-Path -Path $ProfilerPath64 -PathType Leaf)) {
    Write-Host "Cannot find 64-bit profiler DLL at path
`"$ProfilerPath64`"."
    exit 1
}

if (-Not (Test-Path -Path $ConfigYamlPath -PathType Leaf)) {
    Write-Host "Cannot find configuration YAML file at path
`"$ConfigYamlPath`"."
    exit 1
}

if (-Not (Test-Path -Path $ProfilerPath32 -PathType Leaf)) {
    Write-Host "Cannot find 32-bit profiler DLL at path
`"$ProfilerPath32`"."
    exit 1
}

# Check if there is a service with the specified name installed.
$service = Get-Service -Name $ServiceName -ErrorAction Ignore

if ($null -Eq $service) {
    Write-Host "The service `"$ServiceName`" was not found."
    exit 2
}

# Create value for multiline registry string.
$values = @(
    "COR_ENABLE_PROFILING=1",
    "COR_PROFILER={EFEB8EE0-6D39-4347-A5FE-4D0C88BC5BC1}",
    "COR_PROFILER_PATH_64=$ProfilerPath64",
    "COR_PROFILER_PATH_32=$ProfilerPath32",
    "CONTRAST_CONFIG_PATH=$ConfigYamlPath"
)

$registryKey = "HKLM:\SYSTEM\CurrentControlSet\Services\$ServiceName"

# Check if the Environment value already exists.
```

```
$environmentValue = Get-ItemProperty -Path $registryKey -Name
"Environment" -ErrorAction Ignore

if ($null -Ne $environmentValue) {
    # Add the Contrast environment variables to the existing variables.
    $existingValues =
[System.Collections.ArrayList]@($environmentValue.Environment)
    foreach ($item in $values) {
        $idx = $existingValues.Add($item)
    }
    $values = $existingValues
}

# Set the environment variables for the service.
Set-ItemProperty -Path $registryKey -Type MultiString -Name
"Environment" -Value $values

# Restart the service so it picks up the new environment variables.
Restart-Service -Name $serviceName
```

### Agent upgrade service

The Agent Upgrade Service is a background Windows service that helps you keep the .NET Framework and .NET Core for IIS agents automatically updated to the most recent version on Windows. The Agent Upgrade Service is included with the .NET Framework Agent Installer and .NET Core Agent for IIS Installer; the agent installers install two products:

- the corresponding agent, and
- the Agent Upgrade Service.

By default, the Agent Upgrade Service checks for new agent versions released to NuGet when the service first starts up (when the Windows Server is restarted.) If a new agent version is found, the Upgrade Service will download the new agent version, verify the installer's signature, and then finally execute the installer.

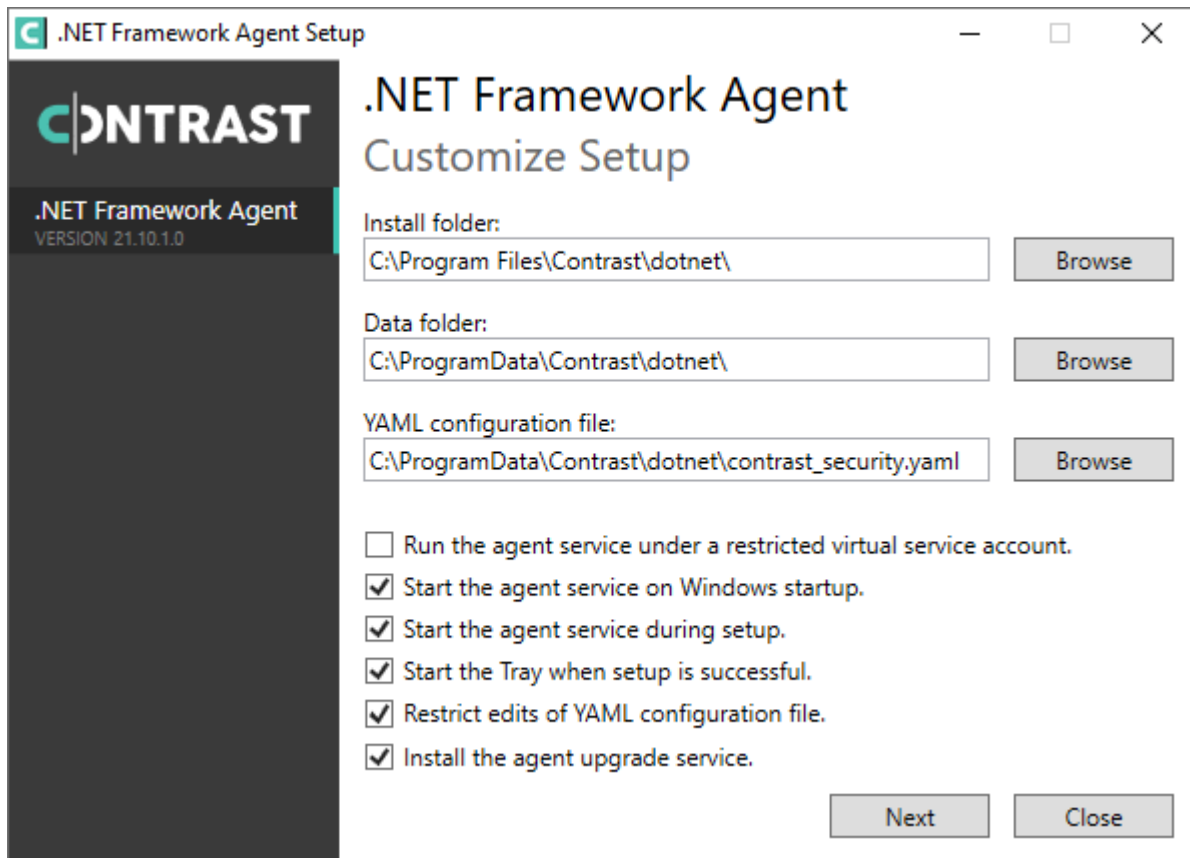


#### NOTE

When a new agent version installed, IIS will be restarted.

The Agent Upgrade Service is an optional component and is not required for agent Assess and Protect features.

- De-select the **Install the agent upgrade service** checkbox when installing the agent if you do not want to use the Agent Upgrade Service.
- If installing the agent via command line, add `INSTALL_UPGRADE_SERVICE=0` argument to not install the Agent Upgrade Service.



The behavior of the Agent Upgrade Service can be modified via an agent-specific configuration file in the Contrast data directory. The default location is `C:\ProgramData\Contrast\upgrade-service`.

The configuration for upgrading the .NET Core agent is located in the .NET Core YAML file.

```
enable: true # Set to `true` for the agent to automatically upgrade to
newer versions.
checks: Startup # Set the frequency with which the agent checks for
updates. Valid values are `daily` for every 24 hours and on startup, or
`startup` for *only* when service starts up.
timeout_ms: 60000 # Set the time allocated to execute the downloaded agent
installer before cancelling.
nuget_repository_url: https://api.nuget.org/v3/index.json # Set the URL of
the Nuget repository to be used for the .NET Core Agent for IIS Installer
nuget_package_name: Contrast.CoreIIS.Installer # Set the name of the .NET
Core Agent for IIS Nuget package.
installer_upgrade_code: 82468c04-dfc0-4a4c-9eb9-c4b314c67fdc # Used
internally to retrieve the current installed agent version from Windows.
enable_major_version_upgrade: false # Set to `true` to automatically
upgrade major versions.
```



#### NOTE

The Agent Upgrade Service is only included with the agent installer. It is not included with the manual .NET Core Agent, agent NuGet packages, or Azure App Service site extensions.



## Update the .NET Framework agent

Use either of these methods to update the .NET Framework agent:

- Automatically update the agent
- Use the Contrast API to download the agent and install with the command line

### Before you begin

- Confirm your .NET Framework application runs properly without the Contrast .NET Framework agent.
- Previously successfully installed the Contrast .NET Framework agent.
- Defined a policy for how and when to update the agent, based on your change management policy, workflow, and the environment where you deploy agents.
- Have some familiarity with Windows scripting methods, including PowerShell.

### Update the agent automatically

The agent automatically updates through the [Agent upgrade service \(page 227\)](#). Contrast supports and releases new versions of the agent, versions 20.5.1 and later. The agent does not auto-update if it detects an [unsupported environment \(page 63\)](#).

### Use the Contrast API to download the agent

1. Download the Contrast agent directly from the Contrast API. This step works for both hosted and on-premises instances of Contrast.  
You need an account (service or user) to access the API.
2. Use the silent installer to install the agent with the command line, after downloading the agent.  
You can find your credentials by [viewing your organization and personal keys \(page 638\)](#).

### See also

- [Agent upgrade service \(page 227\)](#)

### Use application pools in IIS

The .NET agent automatically instruments all ASP.NET applications deployed to IIS. If you install the .NET agent and ensure the background Windows service runs for the agent, Contrast will instrument all IIS-hosted applications.

You might want to exclude some applications from instrumentation because:

- You don't need to gather security, architecture and library information for these applications.
- The applications are on resource-constrained servers or need to avoid additional performance demands for Contrast instrumentation.

Web applications hosted in IIS run in application pools. If you need to disable the .NET agent for an application, you can [denylist the application pool \(page 230\)](#) where it runs.

There are three ways to find the application pool that runs a specific application:

- **Internet Information Services (IIS) Manager**

Start IIS Manager with the command: `%windir%\system32\inetsrv\InetMgr.exe`. Select the web application you want, and select **Basic Settings**. You will see a field that displays the application pool name.

- **AppCmd.exe**

If you Administrator privileges, run `cmd.exe`. Navigate to `C:\Windows\System32\inetsrv`. Enter `appcmd list apps` to see a list of applications and the application pools for each.

- **Contrast .NET logs**

Start the Contrast .NET agent. Browse to an application. In Windows, navigate to `C:\ProgramData\Contrast\dotnet\LOGS`. Open the most recent Profiler log (`XXXXXX_Profiler_[AppDomain]XXXXXX[XX].log`). The application pool name is on the line that starts with **ApplicationPool Name**.

### Denylist or allowlist an application pool

Denylists and allowlists are based on the application pool name. Application pool denylists and allowlists also accept `*` as a variable-length wildcard. (`AppPool*` will match `AppPool1`, `AppPool_arb`, etc.)

Allowlists take precedence over denylists. Application pools that satisfy both lists aren't analyzed.

To disable the agent for a specific application, populate `agent.dotnet.app_pool_denylist` with the appropriate application pool in `C:\ProgramData\Contrast\dotnet\contrast_security.yaml`:

```
# Comma-separated list of application pools ignored by Contrast
agent:
  dotnet:
    app_pool_denylist: ExampleAppPoolName
```

To only enable the agent for specific applications hosted by IIS, configure `agent.dotnet.app_pool_allowlist` to only analyze certain application pools. If an application pool is allowlisted, the agent analyzes the matching pools. There should be no performance impact for any other applications.

To enable the agent for only specific application pools, populate `agent.dotnet.app_pool_allowlist` with the appropriate application pool in `C:\ProgramData\Contrast\dotnet\contrast_security.yaml`:

```
# Comma-separated list of application pools exclusively profiled by Contrast
agent:
  dotnet:
    app_pool_allowlist: ExampleAppPoolName
```



#### TIP

Read more about [yaml configuration \(page 112\)](#).

### .NET Framework advanced configuration

The easiest way to deploy .NET Framework agents is to use the [Agent wizard \(page 63\)](#) in the Contrast web interface.

If you want additional information or methods related to the configuration of .NET Framework agents, visit these topics:

- [Configure the .NET Framework agent \(page 230\)](#)
- [Profiling chaining for the .NET Framework agent \(page 265\)](#)
- [.NET Agent Explorer \(page 266\)](#)
- [Use the .NET Framework agent with applications on Azure \(page 268\)](#)
- [Use Azure Service Fabric with the .NET Framework agent \(page 268\)](#)

### Configure the .NET Framework agent

The [standard configuration \(page 107\)](#) uses this [order of precedence \(page 111\)](#).

Configure the .NET Framework agent:

- [For Azure App Service \(page 231\)](#)
- [In the `web.config` file \(page 231\)](#)
- [With the .NET Framework YAML template \(page 232\)](#)

**TIP**

Use the [Contrast agent configuration editor \(page 113\)](#) to create or upload a YAML configuration file, validate YAML and get setting recommendations.

## .NET Framework agent-specific settings for Azure App Service

You can configure the .NET Framework agent for Azure App Service in the Azure Portal in three ways:

- Use the environment variable convention of agent configuration. Add all settings to the **Application Settings** section of the **Configuration** blade in the Azure Portal using [environment variable syntax \(page 115\)](#).
- Specify `application` configuration options in an application's `web.config` file. For the agent to pick up customized application settings, you must place these settings in the application `web.config` file's root configuration `appSettings` section. See [application-specific settings for Windows \(page 231\)](#) for more details.
- Instead of setting individual options in the Azure Portal, you may use a YAML configuration file containing Contrast settings. First, upload the file to your Azure web application by including it in your application deployment or using the Kudu console. Then add an application setting, `CONTRAST_CONFIG_PATH`, that points to this file.

For example, To use the `contrast_security.yaml` file in the root of your application, add an application setting with key `CONTRAST_CONFIG_PATH` and value `D:\Home\site\wwwroot\contrast_security.yaml`. Application files in Azure App Service are deployed to `D:\home\site\wwwroot`.

## Configure .NET Framework with `web.config` file

You can specify the configuration options in an application's `web.config` file or using YAML configuration. For the agent to pick up customized application settings with `web.config`, you must place these settings in the application `web.config` file's root configuration `appSettings` section.

For example, two applications hosted in the same application pool will report as different servers if you configure the `contrast.server.name` property in the `appSettings` in each application's `web.config` file. Or, you could use `web.config` to configure the `contrast.application.name`, like this:

```
<configuration>
  <appSettings>
    <add key="contrast.application.name" value="MyWebAppName" />
    <add key="contrast.application.version" value="1.2.3" />
  </appSettings>
  <system.web>
    ...
```

See the [.NET Framework YAML template \(page 232\)](#) for a description of other available properties.

If your agent version is earlier than 21.1.4, only some properties can be configured with `web.config` as listed here.

| Properties   | Introduced with this .NET Framework agent version |
|--|---|
| <code>contrast.application.code</code>             | 19.6.3  |
| <code>contrast.application.group</code>            | 19.1.3  |
| <code>contrast.application.metadata</code>         | 19.1.3  |
| <code>contrast.application.name</code>             | 19.1.3  |
| <code>contrast.application.session_id</code>       | 20.6.6  |
| <code>contrast.application.session_metadata</code> | 20.6.6  |
| <code>contrast.application.tags</code>             | 19.1.3  |
| <code>contrast.application.version</code>          | 19.1.3  |
| <code>contrast.assess.tags</code>                  | 19.1.3  |
| <code>contrast.inventory.tags</code>               | 19.1.3  |



## NOTE

If `contrast.application.name` is not specified, the .NET Framework agent will use the application's virtual path as an application name. If the application is hosted in the root of a site (meaning, the virtual path is `/`), the .NET Framework agent will use the site's name as the application name.



## IMPORTANT

Starting with agent version 21.1.4, users can set most agent configuration settings either with the application's `web.config` file or with a `contrast_security.yaml` file in the same directory as the application. For example, two applications hosted in the same application pool can now report as different servers by setting `contrast.server.name` in the `appSettings` in each application's `web.config` file.

The following configuration settings are applied at the *process* level and cannot be customized separately for each application. You cannot set these properties using *web.config* and must set these configurations another way (like with YAML).

- `agent.dotnet.app_pool_denylist`
- `agent.dotnet.app_pool_allowlist`
- `agent.dotnet.enable_instrumentation_optimizations`
- `agent.dotnet.enable_jit_inlining`
- `agent.dotnet.enable_transparency_checks`
- `agent.dotnet.enable_struct_dataflow`
- `assess.enable_control_detection`

Additionally, the agent's profiler component uses the process-level settings for the following keys, while the agent's sensor component will use the application-specific settings (if specified):

- `agent.logger.level`
- `agent.logger.stdout`

## .NET Framework YAML template

Configure the .NET Framework agent using a [YAML configuration \(page 112\)](#) file.

The *contrast\_security.yaml* file is copied to the agent's data directory by the installer (*C:\ProgramData\Contrast\dotnet\contrast\_security.yaml* by default). The installer does not copy the YAML file if it already exists at the destination.

The template below contains all valid YAML options for this agent. For example, you can use the file to set the server name reported by the .NET Framework agent. To do this, update the *contrast\_security.yaml* file, add a new line and the code below, and then continue the installation as normal.

```
server:
  name: MyServerName

#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
# UI.
#
=====
==
api:

# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET
```

```
# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

# Set the version of the TLS protocol the agent uses to communicate with
the
# Contrast UI. The .NET agent default behavior is
(SecurityProtocolType.Tls
# | SecurityProtocolType.Tls11 | SecurityProtocolType.Tls12).
# tls_versions: tls|tls11|tls12

#
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Determine the location from which the agent loads a client
# certificate. Value options include `File` or `Store`.
# certificate_location: NEEDS_TO_BE_SET

# Set the absolute path to the client certificate's
# .CER file for communication with Contrast UI. The
# `certificate_location` property must be set to `File`.
# cer_file: NEEDS_TO_BE_SET

# Specify the name of certificate store to open. The
# `certificate_location` property must be set to `Store`.
# Value options include `AuthRoot`, `CertificateAuthority`,
# `My`, `Root`, `TrustedPeople`, or `TrustedPublisher`.
# store_name: NEEDS_TO_BE_SET

# Specify the location of the certificate store. The
# `certificate_location` property must be set to `Store`.
# Value options include `CurrentUser` or `LocalMachine`.
# store_location: NEEDS_TO_BE_SET

# Specify the type of value the agent uses to find the certificate
# in the collection of certificates from the certificate store.
# The `certificate_location` property must be set to `Store`.
# Value options include `FindByIssuerDistinguishedName`,
# `FindByIssuerName`, `FindBySerialNumber`,
# `FindBySubjectDistinguishedName`, `FindBySubjectKeyIdentifier`,
# `FindBySubjectName`, or `FindByThumbprint`.
# find_type: NEEDS_TO_BE_SET

# Specify the value the agent uses in combination with
```

```
# `find_type` to find a certification in the certificate store.
#
# Note - The agent will use the first certificate from
# the certificate store that matches this search criteria.
#
# find_value: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate
# with the Contrast web interface over a proxy. Set
# value to `false` if you don't want to use the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
# url: NEEDS_TO_BE_SET

# Set the proxy user.
# user: NEEDS_TO_BE_SET

# Set the proxy password.
# pass: NEEDS_TO_BE_SET

# Set the proxy authentication type. Value
# options are `NTLM`, `Digest`, and `Basic`.
# auth_type: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.route_coverage
# Use the following properties for the route-based coverage feature.
#
=====
# route_coverage:

# Set to `false` to stop the agent from sending
```

```
# route-based coverage data to the Contrast UI when the
#
# application returns an error code indicating
# the request was not processed as expected.
#
# report_on_error: false

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Set to `true` to redirect all logs to
# `stdout` instead of the file system.
# stdout: false

# Set the roll size for log files in megabytes. The agent will
# attempt to prevent the log file from being larger than this size.
# roll_size: 100

# Set the number of backup files to keep. Set to `0` to disable.
# backups: 10

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

#
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
```



```
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

# Set the connection type used for Syslog messages.
# Value options are `UNENCRYPTED` and `ENCRYPTED`.
# connection_type: UNENCRYPTED

#
=====
# agent.dotnet
# The following properties apply to any .NET agent-wide configurations.
#
=====
# dotnet:

# Set a list of application pool names that the agent does not
# instrument or analyze. Names must be formatted as a comma-separated
# list. New after .NET Framework 19.1.3 and .NET Core 4.0.2.
# app_pool_denylist: NEEDS_TO_BE_SET

# Set a list of application pool names that the agent instruments or
```

```
# analyzes. If set, other application pools are ignored. Allowlist takes
# precedence over denylist. Names must be formatted as a comma-separated
# list. New after .NET Framework 19.1.3 and .NET Core 4.0.2.
# app_pool_allowlist: NEEDS_TO_BE_SET

# Set a list of application names that the agent does not
# analyze. (The applications are still instrumented).
# Names must be formatted as a comma-separated list.
# New after .NET Framework 19.1.3 and .NET Core 1.0.0.
# application_denylist: NEEDS_TO_BE_SET

# Set a list of application names that the agent analyzes.
# If set, other applications are not analyzed, but are
# still instrumented. Allowlist takes precedence over
# denylist. Names must be formatted as a comma-separated
# list. New after .NET Framework 19.1.3 and .NET Core 1.0.0.
# application_allowlist: NEEDS_TO_BE_SET

# Enable a profiler chaining feature to allow Contrast to
# work alongside other tools that use the CLR Profiling
# API. Defaults to `true`. New after .NET Framework 19.1.3
# (Installed Only) and .NET Core 1.9.3 (Installed Only).
# enable_chaining: true

# Indicate that the agent should produce a report that
# summarizes application hosting on the server (e.g.,
# CLR versions, bitness or pipeline modes). Defaults to
# `true`. New after .NET Framework 19.1.3 (Installed Only).
# enable_dvnr: true

# Indicate that the agent should monitor configuration files for
# changes. New after .NET Framework 50.0.15 and .NET Core 2.1.14.
# enable_file_watching: true

# Indicate that the agent should allow CLR optimizations
# of JIT-compiled methods. Defaults to `true`. New
# after .NET Framework 19.1.3 and .NET Core 1.0.0.
# enable_instrumentation_optimizations: true

# Indicate that the agent should allow the CLR to inline
# methods that are not instrumented by Contrast. Defaults to
# `true`. New after .NET Framework 19.1.3 and .NET Core 1.0.0.
# enable_jit_inlining: true

# Indicate that the agent should allow the CLR to perform
# transparency checks under full trust. Defaults to `false`.
# New after .NET Framework 19.1.3 and .NET Core 1.0.0.
# enable_transparency_checks: false

# Indicate that the agent should report the full file path for
# vulnerabilities discovered via file analysis. Note that this may
# lead to duplicate reports if an application is deployed on multiple
# servers with different paths. New after .NET Framework 50.1.9.
# file_analysis_report_full_path: false
```

```
# Responses for request paths (e.g., HttpRequest.Path)
# that match this regex are not analyzed. Defaults to
# `WebResource.axd`. New after .NET Framework 19.1.3.
# web_module_allowlist: WebResource.axd

# Set to display ASCII art to std::out on agent startup. Defaults
# to `true`. New after .NET Framework 20.6.3 and .NET Core 1.0.0.
# enable_cat: true

# Sets the maximum amount of time a Protect regular expression
# is allowed to run before being cancelled. Set to -1 to never
# cancel regular expression execution. Defaults to `20_000`.
# New after .NET Framework 20.4.3 and .NET Core 1.5.0.
# protect_searchers_single_pattern_deadline_ms: 20_000

# Sets the maximum amount of time a 'Probe Analysis' Protect
# regular expression is allowed to run before being cancelled. Set
# to -1 to never cancel regular expression execution. Defaults to
# `5_000`. New after .NET Framework 20.7.3 and .NET Core 1.5.11.
# protect_searchers_probe_analysis_single_pattern_deadline_ms: 5_000

# Sets the maximum amount of time a Protect rule is
# allowed to run before being cancelled. Set to -1 to never
# cancel Protect rule execution. Defaults to `60_000`.
# New after .NET Framework 20.4.3 and .NET Core 1.5.0.
# protect_searchers_total_rule_deadline_ms: 60_000

# Sets the maximum amount of time a 'Probe Analysis' Protect
# rule is allowed to run before being cancelled. Set to -1 to
# never cancel Protect rule execution. Defaults to `10_000`.
# New after .NET Framework 20.7.3 and .NET Core 1.5.11.
# protect_searchers_probe_analysis_total_rule_deadline_ms: 10_000

# Sets the maximum duration of time agent log files should be kept
# since last write before being deleted by the agent. Defaults to
# `604_800_000`. New after .NET Framework 20.6.1 and .NET Core 1.5.5.
# log_cleanup_maximum_age_ms: 604_800_000

# Suppresses gathering process-level metrics (process level metrics are
# gathered by default), used to identify performance problems. Metric
# counters may further decrease the stability of already unstable
# systems and can be disabled (set to true) if issues occur. Defaults
# to `false`. New after .NET Framework 20.6.6 and .NET Core 1.5.10.
# suppress_metric_counters: false

# Enable file based application watching. Set to false if
# file watching is causing locking issues. Defaults to `true`.
# New after .NET Framework 20.7.3 and .NET Core 1.5.11.
# enable_file_based_app_watching: true

# Enables HttpClient isolation using AppDomain remoting. This can be
used
# to workaround .NET TLS version limitations at the cost of performance
# and stability. Enabled by default on applications targeting .NET
# Framework < 4.7.0, else disabled. New after .NET Framework 21.5.1.
```

```
# enable_http_client_app_domain_isolation: false

# Enables LINQ optimizations to improve performance
# at the cost of possible false negatives. Defaults
# to `true`. New after .NET Framework 50.0.1.
# enable_linq_optimizations: true

#
=====
# agent.dotnet.file_analysis_time_ms
# Controls the interval in milliseconds to perform file
# analysis for supported rules. Setting a value > 0 will
# result in the job running at that interval and not just when
# the application loads. If set to `-1`, the job just runs
# once. Defaults to `-1`. New after .NET Framework 50.0.15.
#
=====
# file_analysis_time_ms: {}

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Control the values captured by Assess vulnerability events. `Full`
# captures most values by calling ToString on objects, which can
```

```
# provide more info but causes increased memory usage. `Minimal`
# has better performance as it only captures String type objects
# as strings and uses type name for other object type values.
# event_detail: minimal

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10

# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
```

```
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.probe_analysis
# Use the settings in this section to
# control the behavior of probe analysis.
#
=====
# probe_analysis:

# Set to `false` to disable probe analysis.
# enable: true

#
=====
# protect.rules
# Use the following properties to set simple rule configurations.
#
=====
# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====
# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====
# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====
# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
```

```
=====
# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.sql-injection-semantic-chaining
# Use the following properties to configure how the
# sql injection semantic analysis chaining rule works.
#
=====
# sql-injection-semantic-chaining:

# Set the mode of the rule. Value options
# are `monitor`, `block` or `off`.
# mode: off

#
=====
# protect.rules.sql-injection-semantic-dangerous-functions
# Use the following properties to configure how the sql
# injection semantic analysis dangerous functions rule works.
#
=====
# sql-injection-semantic-dangerous-functions:

# Set the mode of the rule. Value options
# are `monitor`, `block` or `off`.
# mode: off

#
=====
# protect.rules.sql-injection-semantic-suspicious-unions
# Use the following properties to configure how the sql
# injection semantic analysis suspicious unions rule works.
#
=====
# sql-injection-semantic-suspicious-unions:

# Set the mode of the rule. Value options
# are `monitor`, `block` or `off`.
# mode: off

#
=====
# protect.rules.sql-injection-semantic-tautologies
# Use the following properties to configure how the sql
# injection semantic analysis tautologies rule works.
```

```
#
=====
# sql-injection-semantic-tautologies:

# Set the mode of the rule. Value options
# are `monitor`, `block` or `off`.
# mode: off

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Tell the agent to detect when commands come directly
# from input. The agent blocks if blocking is enabled.
# detect_phased_commands: true

#
=====
# protect.rules.cmd-injection-semantic-chained-commands
# Use the following properties to configure how the
# 'command injection - chained commands' rule works
#
=====
# cmd-injection-semantic-chained-commands:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.cmd-injection-semantic-dangerous-paths
# Use the following properties to configure how the
# 'command injection - dangerous paths' rule works
#
=====
# cmd-injection-semantic-dangerous-paths:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off
```



```
#
=====
# protect.rules.cmd-injection-command-backdoors
# Use the following properties to configure how the
# 'command injection - command backdoors' rule works
#
=====
# cmd-injection-command-backdoors:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.path-traversal-semantic-file-security-bypass
# Use the following properties to configure how the
# 'path traversal - file security bypass' rule works
#
=====
# path-traversal-semantic-file-security-bypass:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
```

```
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.unsafe-file-upload
# Use the following properties to configure
# how the unsafe file upload rule works.
#
=====
# unsafe-file-upload:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off
```

```
#
=====
# protect.rules.untrusted-deserialization
# Use the following properties to configure
# how the untrusted deserialization rule works.
#
=====
# untrusted-deserialization:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
```

```
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
```

```
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Override the reported server path. New after
# .NET Framework v21.3.1 and .NET Core v1.8.0.
# path: NEEDS_TO_BE_SET
```

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
UI.
#
=====
==
api:

# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
```

```
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

# Set the version of the TLS protocol the agent uses to communicate with
the
# Contrast UI. The .NET agent default behavior is
(SecurityProtocolType.Tls
# | SecurityProtocolType.Tls11 | SecurityProtocolType.Tls12).
# tls_versions: tls|tls11|tls12

#
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Determine the location from which the agent loads a client
# certificate. Value options include `File` or `Store`.
# certificate_location: NEEDS_TO_BE_SET

# Set the absolute path to the client certificate's
# .CER file for communication with Contrast UI. The
# `certificate_location` property must be set to `File`.
# cer_file: NEEDS_TO_BE_SET

# Specify the name of certificate store to open. The
# `certificate_location` property must be set to `Store`.
# Value options include `AuthRoot`, `CertificateAuthority`,
# `My`, `Root`, `TrustedPeople`, or `TrustedPublisher`.
# store_name: NEEDS_TO_BE_SET

# Specify the location of the certificate store. The
# `certificate_location` property must be set to `Store`.
# Value options include `CurrentUser` or `LocalMachine`.
# store_location: NEEDS_TO_BE_SET

# Specify the type of value the agent uses to find the certificate
# in the collection of certificates from the certificate store.
# The `certificate_location` property must be set to `Store`.
# Value options include `FindByIssuerDistinguishedName`,
# `FindByIssuerName`, `FindBySerialNumber`,
# `FindBySubjectDistinguishedName`, `FindBySubjectKeyIdentifier`,
# `FindBySubjectName`, or `FindByThumbprint`.
# find_type: NEEDS_TO_BE_SET

# Specify the value the agent uses in combination with
# `find_type` to find a certification in the certificate store.
#
```

```
# Note - The agent will use the first certificate from
# the certificate store that matches this search criteria.
#
# find_value: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate
# with the Contrast web interface over a proxy. Set
# value to `false` if you don't want to use the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
# url: NEEDS_TO_BE_SET

# Set the proxy user.
# user: NEEDS_TO_BE_SET

# Set the proxy password.
# pass: NEEDS_TO_BE_SET

# Set the proxy authentication type. Value
# options are `NTLM`, `Digest`, and `Basic`.
# auth_type: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.route_coverage
# Use the following properties for the route-based coverage feature.
#
=====
# route_coverage:

# Set to `false` to stop the agent from sending
# route-based coverage data to the Contrast UI when the
#
```

```
# application returns an error code indicating
# the request was not processed as expected.
#
# report_on_error: false

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Set to `true` to redirect all logs to
# `stdout` instead of the file system.
# stdout: false

# Set the roll size for log files in megabytes. The agent will
# attempt to prevent the log file from being larger than this size.
# roll_size: 100

# Set the number of backup files to keep. Set to `0` to disable.
# backups: 10

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

#
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:
```



```
# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

# Set the connection type used for Syslog messages.
# Value options are `UNENCRYPTED` and `ENCRYPTED`.
# connection_type: UNENCRYPTED

#
=====
# agent.dotnet
# The following properties apply to any .NET agent-wide configurations.
#
=====
# dotnet:

# Set a list of application pool names that the agent does not
# instrument or analyze. Names must be formatted as a comma-separated
# list. New after .NET Framework 19.1.3 and .NET Core 4.0.2.
# app_pool_denylist: NEEDS_TO_BE_SET

# Set a list of application pool names that the agent instruments or
# analyzes. If set, other application pools are ignored. Allowlist takes
# precedence over denylist. Names must be formatted as a comma-separated
```

```
# list. New after .NET Framework 19.1.3 and .NET Core 4.0.2.
# app_pool_allowlist: NEEDS_TO_BE_SET

# Set a list of application names that the agent does not
# analyze. (The applications are still instrumented).
# Names must be formatted as a comma-separated list.
# New after .NET Framework 19.1.3 and .NET Core 1.0.0.
# application_denylist: NEEDS_TO_BE_SET

# Set a list of application names that the agent analyzes.
# If set, other applications are not analyzed, but are
# still instrumented. Allowlist takes precedence over
# denylist. Names must be formatted as a comma-separated
# list. New after .NET Framework 19.1.3 and .NET Core 1.0.0.
# application_allowlist: NEEDS_TO_BE_SET

# Enable a profiler chaining feature to allow Contrast to
# work alongside other tools that use the CLR Profiling
# API. Defaults to `true`. New after .NET Framework 19.1.3
# (Installed Only) and .NET Core 1.9.3 (Installed Only).
# enable_chaining: true

# Indicate that the agent should produce a report that
# summarizes application hosting on the server (e.g.,
# CLR versions, bitness or pipeline modes). Defaults to
# `true`. New after .NET Framework 19.1.3 (Installed Only).
# enable_dvnr: true

# Indicate that the agent should monitor configuration files for
# changes. New after .NET Framework 50.0.15 and .NET Core 2.1.14.
# enable_file_watching: true

# Indicate that the agent should allow CLR optimizations
# of JIT-compiled methods. Defaults to `true`. New
# after .NET Framework 19.1.3 and .NET Core 1.0.0.
# enable_instrumentation_optimizations: true

# Indicate that the agent should allow the CLR to inline
# methods that are not instrumented by Contrast. Defaults to
# `true`. New after .NET Framework 19.1.3 and .NET Core 1.0.0.
# enable_jit_inlining: true

# Indicate that the agent should allow the CLR to perform
# transparency checks under full trust. Defaults to `false`.
# New after .NET Framework 19.1.3 and .NET Core 1.0.0.
# enable_transparency_checks: false

# Indicate that the agent should report the full file path for
# vulnerabilities discovered via file analysis. Note that this may
# lead to duplicate reports if an application is deployed on multiple
# servers with different paths. New after .NET Framework 50.1.9.
# file_analysis_report_full_path: false

# Responses for request paths (e.g., HttpRequest.Path)
# that match this regex are not analyzed. Defaults to
```

```
# `WebResource.axd`. New after .NET Framework 19.1.3.
# web_module_allowlist: WebResource.axd

# Set to display ASCII art to std::out on agent startup. Defaults
# to `true`. New after .NET Framework 20.6.3 and .NET Core 1.0.0.
# enable_cat: true

# Sets the maximum amount of time a Protect regular expression
# is allowed to run before being cancelled. Set to -1 to never
# cancel regular expression execution. Defaults to `20_000`.
# New after .NET Framework 20.4.3 and .NET Core 1.5.0.
# protect_searchers_single_pattern_deadline_ms: 20_000

# Sets the maximum amount of time a 'Probe Analysis' Protect
# regular expression is allowed to run before being cancelled. Set
# to -1 to never cancel regular expression execution. Defaults to
# `5_000`. New after .NET Framework 20.7.3 and .NET Core 1.5.11.
# protect_searchers_probe_analysis_single_pattern_deadline_ms: 5_000

# Sets the maximum amount of time a Protect rule is
# allowed to run before being cancelled. Set to -1 to never
# cancel Protect rule execution. Defaults to `60_000`.
# New after .NET Framework 20.4.3 and .NET Core 1.5.0.
# protect_searchers_total_rule_deadline_ms: 60_000

# Sets the maximum amount of time a 'Probe Analysis' Protect
# rule is allowed to run before being cancelled. Set to -1 to
# never cancel Protect rule execution. Defaults to `10_000`.
# New after .NET Framework 20.7.3 and .NET Core 1.5.11.
# protect_searchers_probe_analysis_total_rule_deadline_ms: 10_000

# Sets the maximum duration of time agent log files should be kept
# since last write before being deleted by the agent. Defaults to
# `604_800_000`. New after .NET Framework 20.6.1 and .NET Core 1.5.5.
# log_cleanup_maximum_age_ms: 604_800_000

# Suppresses gathering process-level metrics (process level metrics are
# gathered by default), used to identify performance problems. Metric
# counters may further decrease the stability of already unstable
# systems and can be disabled (set to true) if issues occur. Defaults
# to `false`. New after .NET Framework 20.6.6 and .NET Core 1.5.10.
# suppress_metric_counters: false

# Enable file based application watching. Set to false if
# file watching is causing locking issues. Defaults to `true`.
# New after .NET Framework 20.7.3 and .NET Core 1.5.11.
# enable_file_based_app_watching: true

# Enables HttpClient isolation using AppDomain remoting. This can be
used
# to workaround .NET TLS version limitations at the cost of performance
# and stability. Enabled by default on applications targeting .NET
# Framework < 4.7.0, else disabled. New after .NET Framework 21.5.1.
# enable_http_client_app_domain_isolation: false
```

```
# Enables LINQ optimizations to improve performance
# at the cost of possible false negatives. Defaults
# to `true`. New after .NET Framework 50.0.1.
# enable_linq_optimizations: true

#
=====
# agent.dotnet.file_analysis_time_ms
# Controls the interval in milliseconds to perform file
# analysis for supported rules. Setting a value > 0 will
# result in the job running at that interval and not just when
# the application loads. If set to `-1`, the job just runs
# once. Defaults to `-1`. New after .NET Framework 50.0.15.
#
=====
# file_analysis_time_ms: {}

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Control the values captured by Assess vulnerability events. `Full`
# captures most values by calling ToString on objects, which can
# provide more info but causes increased memory usage. `Minimal`
# has better performance as it only captures String type objects
```

```
# as strings and uses type name for other object type values.
# event_detail: minimal

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10

# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# protect
```

```
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====

# protect.probe_analysis
# Use the settings in this section to
# control the behavior of probe analysis.
#
=====

# probe_analysis:

# Set to `false` to disable probe analysis.
# enable: true

#
=====

# protect.rules
# Use the following properties to set simple rule configurations.
#
=====

# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====

# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====

# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====

# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====

# sql-injection:
```

```
# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.sql-injection-semantic-chaining
# Use the following properties to configure how the
# sql injection semantic analysis chaining rule works.
#
=====
# sql-injection-semantic-chaining:

# Set the mode of the rule. Value options
# are `monitor`, `block` or `off`.
# mode: off

#
=====
# protect.rules.sql-injection-semantic-dangerous-functions
# Use the following properties to configure how the sql
# injection semantic analysis dangerous functions rule works.
#
=====
# sql-injection-semantic-dangerous-functions:

# Set the mode of the rule. Value options
# are `monitor`, `block` or `off`.
# mode: off

#
=====
# protect.rules.sql-injection-semantic-suspicious-unions
# Use the following properties to configure how the sql
# injection semantic analysis suspicious unions rule works.
#
=====
# sql-injection-semantic-suspicious-unions:

# Set the mode of the rule. Value options
# are `monitor`, `block` or `off`.
# mode: off

#
=====
# protect.rules.sql-injection-semantic-tautologies
# Use the following properties to configure how the sql
# injection semantic analysis tautologies rule works.
#
=====
```

```
# sql-injection-semantic-tautologies:

# Set the mode of the rule. Value options
# are `monitor`, `block` or `off`.
# mode: off

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Tell the agent to detect when commands come directly
# from input. The agent blocks if blocking is enabled.
# detect_phased_commands: true

#
=====
# protect.rules.cmd-injection-semantic-chained-commands
# Use the following properties to configure how the
# 'command injection - chained commands' rule works
#
=====
# cmd-injection-semantic-chained-commands:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.cmd-injection-semantic-dangerous-paths
# Use the following properties to configure how the
# 'command injection - dangerous paths' rule works
#
=====
# cmd-injection-semantic-dangerous-paths:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
```



```
# protect.rules.cmd-injection-command-backdoors
# Use the following properties to configure how the
# 'command injection - command backdoors' rule works
#
=====
# cmd-injection-command-backdoors:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.path-traversal-semantic-file-security-bypass
# Use the following properties to configure how the
# 'path traversal - file security bypass' rule works
#
=====
# path-traversal-semantic-file-security-bypass:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
```

```
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.unsafe-file-upload
# Use the following properties to configure
# how the unsafe file upload rule works.
#
=====
# unsafe-file-upload:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
```

```
=====
# protect.rules.untrusted-deserialization
# Use the following properties to configure
# how the untrusted deserialization rule works.
#
=====
# untrusted-deserialization:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET
```

```
# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
```

```
#
# tags: NEEDS_TO_BE_SET

# Override the reported server path. New after
# .NET Framework v21.3.1 and .NET Core v1.8.0.
# path: NEEDS_TO_BE_SET
```

## Certificate exceptions

If you see certificate exception messages and feel that it's safe to ignore them, add this setting to the YAML configuration file:

```
api:
  certificate:
    ignore_cert_errors: true
```

🔗 [Learn more](#) about managing certificate issues.

## Profiler chaining for the .NET Framework agent

You can use profiler chaining to run the .NET Framework agent alongside other .NET profiler agents, such as performance or APM tools.

The Contrast .NET Framework agent is tested and proven to be compatible with these profiling tools:

| Profiling tool                     | Versions tested |
|------------------------------------|-----------------|
| AppDynamics                        | 4.5.18.1        |
| Dynatrace One Agent                | 1.253.245       |
| New Relic                          | 8.23.107        |
| Riverbed SteelCentral Aternity APM | 12.9.0          |
| Datadog                            | 2.35.0          |



### NOTE

The agent may also be compatible with other profiling tools if those tools follow the conventions of the CLR Profiling API and do not make assumptions about the profiling environment.

Profiler chaining is enabled by default. To disable profiler chaining, [configure the .NET Framework agent \(page 230\)](#) so that the `agent.dotnet.enable_chaining` setting is set to `false`. For example, you could use this YAML configuration:

```
agent:
  dotnet:
    enable_chaining: false
```

Once configured, you must restart the agent. On restart, the Contrast .NET Framework agent automatically detects the presence of other profiling tools registered with IIS and configures the environment to load both the Contrast .NET Framework agent profiler and the third-party profiler.



## IMPORTANT

If you are using profiler chaining with:

- **IIS:**

Install the third-party agent, then the Contrast .NET Framework agent.  
(If you install the Contrast .NET Framework agent before the third-party agent, you need to restart the Contrast.NET Main Service under **Windows Services**.)

- **Outside of IIS:**

The `agent.dotnet.enable_chaining` configuration flag will not work if you are using profiler chaining for applications:

- hosted outside of IIS, or
- that use the third-party agent's Nuget package (rather than the installed agent).

If this applies to you, replace the CLR environment variables for the profiling tool with `CONTRAST_CCC_COR` versions. Any of these names should be transformed:

| Change this                       | To this  |
|-----------------------------------|--|
| <code>COR_PROFILER</code>         | <code>CONTRAST_CCC_COR_PROFILER</code>         |
| <code>COR_PROFILER_PATH</code>    | <code>CONTRAST_CCC_COR_PROFILER_PATH</code>    |
| <code>COR_PROFILER_PATH_32</code> | <code>CONTRAST_CCC_COR_PROFILER_PATH_32</code> |
| <code>COR_PROFILER_PATH_64</code> | <code>CONTRAST_CCC_COR_PROFILER_PATH_64</code> |

Then follow the usual setup instructions for your environment and application.

- **AppInsights in Azure App Service:**

As of version 20.9.3, the Contrast .NET Framework Site Extension now supports compatibility with Application Insights (using the CLR Instrumentation Engine (CIE)). There is no further action required to use AppInsights with the Contrast .NET Framework Site Extension. The .NET Framework agent's profiler will be loaded by the CIE if it is registered as the profiling tool in the Azure AppService instance (for example because AppInsights is enabled).

## .NET Agent Explorer




## IMPORTANT

Starting with .NET Core agent 4.0.0 and .NET Framework agent 51.0.0, Agent Explorer replaces the Contrast Tray application.

The .NET Agent Explorer is an application that displays high-level information about the health of the .NET Core and .NET Framework agents. Use this application to verify that the agent is working as expected, especially after you initially install the agent.

Installing an agent also installs this application. If you install both types of agents, only one instance of Agent Explorer is installed.

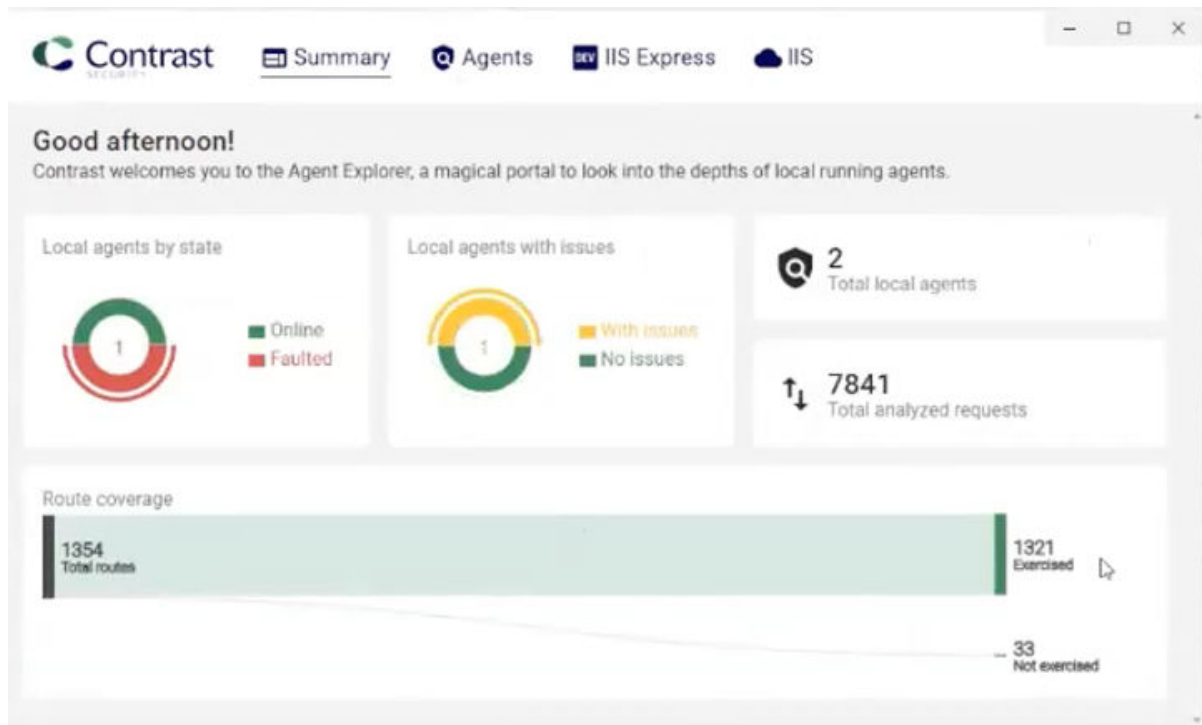
### Agent Explorer access

After you install a .NET Core or .NET Framework agent, the Agent Explorer icon () displays in the tray. Right-click the icon to open the application.

## Agent Explorer details

The Agent Explorer displays these details:

- **Summary**



This dashboard shows high level details about your agents, including their stage, whether any of them have issues, and route coverage.

- **Agents**

The Agents tab provides detailed information about a specific agent, including its configuration and health status.

**Agent Details:**

| Property         | Value                      |
|------------------|----------------------------|
| Application name | DotnetCore5                |
| Agent language   | .NET Core                  |
| Runtime version  | .NET 5.0.17                |
| Total requests   | 5152                       |
| Running since    | 19 minutes ago             |
| Application PID  | 532188                     |
| Agent version    | 19.9.0.0                   |
| Runtime bitness  | x64                        |
| Exercised routes | 1321/1354                  |
| Agent modes      | assess, protect, inventory |

**YAML file path:** [D:\Development\dotnet\dotnet-agent\tests\integration-tests\DotnetCore5\localAgent.yaml](#)

**Logs directory:** [C:\ProgramData\contrast\dotnet-core\logs](#)

**Configuration:**

| Name    | Value   |
|---------|---|
| enable  | true  |
| api.url | https://teamserver- <span style="background-color: #ccc; color: #000;">                    </span> .com |

This tab provides details about the health of your .NET Core and .NET Framework agents. The Configuration section displays a message if Agent Explorer discovers a specific issue that is occurring.

You can access the agent's configuration (YAML) file directly from the link in the Overview section. Scroll down to see information about the agent's configuration, advanced information, and session metadata.

- **IIS Express**

This tab shows details for web applications running on IIS Express.

- **IIS**

This tab shows details for the web applications running on the IIS server.

## Use the .NET Framework agent with applications on Azure

Use the Contrast .NET Framework agent to analyze ASP.NET applications running on Azure Virtual Machines (VMs), Azure Cloud Services, Mobile Services or Azure App Service (formerly Azure Web Sites).

To install the .NET Framework agent on Azure Virtual Machines:

1. Set up the Azure VM or the Azure Cloud Services as you would normally, and deploy the ASP.NET applications to be analyzed.
2. Log in to Contrast, and download the ZIP file for the .NET Framework agent.
3. Access the Remote Desktop [Azure VM](#) or [Azure Cloud Service](#) instance.
4. Copy the .NET Framework agent ZIP file to the Azure VM or to the Azure Cloud Services instance, and extract the archive.
5. Run the .NET Framework agent installer (*ContrastSetup.exe*).
6. Exercise the application so that Contrast can analyze it.



### TIP

To install with Azure App Service (formerly Azure Web Apps), install with [NuGet \(page 224\)](#) or [Azure Portal Extension \(page 218\)](#).

## Use Azure Service Fabric with the .NET Framework or .NET Core agent

If you are using a container image, follow the instructions to [install in containers \(page 221\)](#). Otherwise, to add the Contrast .NET Framework or .NET Core agent to an Azure Service Fabric service:



### TIP

For Standalone Executable services, the `ServiceManifest.xml` file is located in the top-level Azure Service Fabric project (for example, the `sfproj` file).

1. Install the appropriate NuGet package to the main project for the service.
  - **.NET Framework:** Install `Contrast.NET.Azure.AppService`. All files in the `contrastsecurity` folder must have Copy to Output Directory set to Copy if newer.
  - **.NET Core:** Install `Contrast.SensorsNetCore`. All files in the `contrast` folder have Copy to Output Directory set to Copy if newer.
2. Set `ServiceManifest/CodePackage/EntryPoint/ExeHost/WorkingDirectory` in `ServiceManifest.xml` to `CodePackage`.



```
<CodePackage Name="Code" Version="1.0.0">
  <EntryPoint>
    <ExeHost>
      <Program>DemoNetFxStatelessService.exe</Program>
      <WorkingFolder>CodePackage</WorkingFolder>
```

3. Set environment variables in ServiceManifest.xml to configure the profiler.

- **.NET Framework:**

```
<CodePackage>
  <EnvironmentVariables>
    <EnvironmentVariable Name="COR_ENABLE_PROFILING"
Value="1" />
    <EnvironmentVariable Name="COR_PROFILER"
Value="{EFEB8EE0-6D39-4347-A5FE-4D0C88BC5BC1}" />
    <EnvironmentVariable
Name="COR_PROFILER_PATH_32" Value=".\contrastsecurity\runtimes\win-
x86\native\ContrastProfiler.dll" />
    <EnvironmentVariable
Name="COR_PROFILER_PATH_64" Value=".\contrastsecurity\runtimes\win-
x64\native\ContrastProfiler.dll" />
    <EnvironmentVariable Name="CONTRAST_CONFIG_PATH"
Value="contrast_security.yaml" />
```

- **.NET Core:**

```
<CodePackage>
  <EnvironmentVariables>
    <EnvironmentVariable Name="CORECLR_ENABLE_PROFILING"
Value="1" />
    <EnvironmentVariable Name="CORECLR_PROFILER"
Value="{8B2CE134-0948-48CA-A4B2-80DDAD9F5791}" />
    <EnvironmentVariable Name="CORECLR_PROFILER_PATH_32"
Value="contrast\runtimes\win-x86\native\ContrastProfiler.dll" />
    <EnvironmentVariable Name="CORECLR_PROFILER_PATH_64"
Value="contrast\runtimes\win-x64\native\ContrastProfiler.dll" />
    <EnvironmentVariable Name="CONTRAST_CONFIG_PATH"
Value="contrast_security.yaml" />
```

4. Configure the agent with either:

- **A YAML file:** Add it to the main project for the service. Make sure Copy to Output Directory for the file is set to Copy if newer. Add an environment variable to ServiceManifest.xml specifying the location of the file, like this:

```
<CodePackage>
  <EnvironmentVariables>
    <EnvironmentVariable Name="CONTRAST_CONFIG_PATH"
Value="contrast_security.yaml" />
```

- **Environment variables:** Add them to ServiceManifest.xml, like this:

```
<CodePackage>
  <EnvironmentVariables>
    <EnvironmentVariable Name="CONTRAST__API__URL"
Value="https://teamserver-staging.contsec.com" />
    <EnvironmentVariable Name="CONTRAST__API__API_KEY"
Value="aBcD0123" />
    <EnvironmentVariable Name="CONTRAST__API__SERVICE_KEY"
Value="ABCD0123" />
```

```
<EnvironmentVariable Name="CONTRAST__API__USER_NAME "  
Value="agent_123@Team" />
```

5. Deploy the Azure Service Fabric application as usual.

## .NET Core agent

The Contrast .NET Core agent analyzes the behavior of .NET Core web applications as users interact with them.



### NOTE

The latest .NET Core agent supports Assess (IAST), Protect (RASP), and SCA features.

The agent automatically instruments the ASP.NET Core application when the host process is set up with profiling environment variables or an application launch profile.

The Contrast .NET Core agent consists of two components that run within the same process as your application:

- The **.NET Profiler** instruments applications by adding calls to Contrast sensor code in security relevant APIs used by the application and its dependencies (also known as IL weaving).
- **Sensors** gather security, architecture and library information.

Once you [install the .NET Core agent \(page 70\)](#), its sensors will gather information about the application's security, architecture and libraries as users exercise the applications. You can view the results of the agent's analysis in Contrast. The agent uses these [supported technologies \(page 70\)](#) and these [system requirements \(page 72\)](#).

## .NET Core advanced installation

The easiest way to deploy .NET Core agents is to use the [Agent wizard \(page 70\)](#) in the Contrast web interface.

If you want additional information or methods related to the deployment of .NET Core agents, visit these topics:

- [Manual installation \(page 272\)](#)
- [.NET telemetry \(page 213\)](#)
- [Install .NET Core with Nuget \(page 278\)](#)
- [Install with Azure App Service \(page 280\)](#)
- [Install the .NET Core agent with the .NET Core agent for IIS installer \(page 276\)](#)
- [Install the .NET Core agent in a container \(page 283\)](#)
- [Agent upgrade service \(Windows only\) \(page 227\)](#)
- [Install with infrastructure as code tools \(page 285\)](#)
- [Update the .NET Core agent \(page 295\)](#)

### See also

[Advanced configuration \(page 297\)](#)

## .NET Framework and .NET Core Telemetry

.NET Framework and .NET Core agents use telemetry to collect usage data. Telemetry is collected when an instrumented application first loads the agent's sensors and then periodically (every few hours) afterwards.

Your privacy is important to us (page 1563). The telemetry feature doesn't collect application data. The data is anonymized before being sent securely to Contrast. Then the aggregated data is stored encrypted and under restricted access control. Any collected data will be deleted after one year.

The telemetry feature collects the following data:

| Agent versions                     | Data   |
|------------------------------------|--|
| .NET Framework later than 2020.8.3 | Agent version  |
| .NET Core later than 1.5.15        | Operating system and version   |
|                                    | Whether the agent is running in a container  |
|                                    | Whether the agent is running in Azure App Service  |
|                                    | Hashed Media Access Control (MAC) address: a cryptographically (SHA256) anonymous and unique ID for a machine  |
|                                    | Kernel version   |
|                                    | Process running time   |
|                                    | Whether Assess is enabled  |
|                                    | Whether Protect is enabled   |
|                                    | .NET Framework later than 2020.8.3   |
|                                    | .NET Framework runtime version   |
|                                    | .NET Core later than 1.5.15  |
|                                    | .NET Core runtime version  |
| .NET Framework later than 20.9.1   | Hosted or on-premises Contrast instance  |
| .NET Core later than 1.5.17        |  |
| .NET Framework later than 20.9.3   | CLR Instrumentation Engine (CIE) usage   |
| .NET Core later than 1.5.19        | Application framework  |
|                                    | Chained profiler vendor  |
| .NET Framework later than 20.10.1  | Process hosting mode   |
| .NET Core later than 1.5.20        | CIE Raw Profiler Hook usage  |
| .NET Framework later than 20.10.2  | Names of configuration settings with non-default values  |
| .NET Core later than 1.5.21        | Names of disabled Assess rules   |
| .NET Framework later than 20.12.2  | Time elapsed for agent's profiler component to initialize  |
| .NET Core later than 1.7.2         | Time elapsed for agent's first request to the Contrast web interface   |
|                                    | Time elapsed for agent's profiler component to initialize  |
|                                    | Time elapsed between agent initialization and end of the first request   |
| .NET Framework later than 21.1.1   | Metrics on IIS-hosted applications, including:   |
|                                    | <ul style="list-style-type: none"> <li>Total application count</li> <li>Application count that will be analyzed (pass application allow list/deny list configuration)</li> <li>Count of apps hosted on CLR4 application pools</li> <li>Count of apps hosted on CLR2 application pools</li> </ul> |
|                                    | Metrics on IIS applications pools  |
|                                    | <ul style="list-style-type: none"> <li>Total count</li> <li>Count with agent attached</li> <li>Count of CLR4</li> <li>Count of CLR2</li> </ul>   |
|                                    | Minimum number of applications in a single app pool  |
|                                    | Maximum number of applications in a single app pool  |
|                                    | Median number of applications across all app pools   |
| .NET Framework later than 21.1.2   | Rule mode (i.e. Monitor vs. Block) for each Protect rule   |
| .NET Core later than 1.7.5         |  |

| Agent versions                   | Data   |
|----------------------------------|--|
| .NET Framework later than 21.4.2 | Exceptions thrown and caught within agent sensor code, including log message, exception type, exception message, and stack trace frames for <code>System</code> and <code>Contrast</code> methods.   |
| .NET Core later than 1.8.4       |  |
| .NET Framework later than 21.7.1 | <ul style="list-style-type: none"> <li>Process Architecture (x86/x64)</li> </ul>   |
| .NET Core later than 1.9.7       | OS Architecture (x86/x64)<br><br>In Azure App Service, the values of the following environment variables: <ul style="list-style-type: none"> <li><code>WEBSITE_PHYSICAL_MEMORY_MB</code></li> <li><code>WEBSITE_PLATFORM_VERSION</code></li> <li><code>WEBSITE_SKU</code></li> </ul> |
| .NET Framework later than 21.9.2 | Description of location where YAML config file was loaded from (i.e., path specified by environment variable, default location, application directory).  |
| .NET Core later than 2.0.1       |  |

To opt-out of the telemetry feature, set the `CONTRAST_AGENT_TELEMETRY_OPTOUT` environment variable to `1` or `true`.

Telemetry data is securely sent to [telemetry.dotnet.contrastsecurity.com](https://telemetry.dotnet.contrastsecurity.com). You can also opt out of telemetry by blocking communication at the network level.

## Install the .NET Core agent

To install the .NET Core agent:

1. Place the agent's components on the server's file system.
2. Set environment variables so that the .NET runtime loads the agent's profiler component.
3. Use the application as you normally would and verify that Contrast sees your application.

Depending on your situation, use one of these installation methods:

- [Manual installation \(page 272\)](#) (if you are using self-hosted web application running on Windows, Linux or Docker)
- [.NET Core agent for IIS installer \(page 276\)](#) (if you are using IIS)
- [Azure App Service \(page 280\)](#)
- [NuGet \(page 278\)](#)

To auto-upgrade your agent, enable this option with the [Agent Upgrade Service \(page 227\)](#).

## Install the .NET Core agent manually

Use this method to install the .NET Core agent if you are using a web application hosted on IIS, or running a self-hosted application on Windows, Linux or Docker.



### NOTE

Installing within containers can be complex, and these steps might not work for your situation. Read more about [installing with Docker](#).

## Before you begin

Check the [system requirements \(page 72\)](#) and [supported technologies \(page 70\)](#) to be sure installation will work and ensure best performance.

## Steps

1. Download the agent:
  - a. At the top right of the Contrast web interface, select **Add new**.
  - b. Select the **Application** card.
  - c. Select the operating system you are using.
  - d. Select a method to install the agent.
  - e. Download the agent configuration file.



### TIP

Use the [Contrast agent configuration editor \(page 113\)](#) to make the agent configuration easier.

- f. Download the agent.
2. On the web server, extract the downloaded ZIP archive (for example, *Contrast.NET.Core\_1.0.1.zip*) to a directory that your applications have sufficient permissions to access.
  3. Set the following environment variables on your application's process. Use the appropriate CORECLR\_PROFILER\_PATH settings for your operating system. Replace `<UnzippedDirectoryRoot>` with your archive directory.

- **Windows**

| Environment variable     | Value  |
|--------------------------|--|
| CORECLR_PROFILER_PATH_64 | <UnzippedDirectoryRoot>\runtimes\win-x64\native\ContrastProfiler.dll |
| CORECLR_PROFILER_PATH_32 | <UnzippedDirectoryRoot>\runtimes\win-x86\native\ContrastProfiler.dll |
| CORECLR_PROFILER         | {8B2CE134-0948-48CA-A4B2-80DDAD9F5791}                               |
| CORECLR_ENABLE_PROFILING | 1  |
| CONTRAST_CONFIG_PATH     | <path_to_contrast_security.yaml>                                     |



### IMPORTANT

If you are running the .NET Core agent and the .NET Framework agent on the same server, the CONTRAST\_CONFIG\_PATH option applies to the [load path \(page 111\)](#) for both agents. To apply distinct paths for each agent, use these options to set the data directory:

- CONTRAST\_CORECLR\_DATA\_DIRECTORY
- CONTRAST\_DATA\_DIRECTORY

- **Linux x64**

| Environment variable     | Value   |
|--------------------------|---|
| CORECLR_PROFILER_PATH_64 | <UnzippedDirectoryRoot>/runtimes/linux-x64/native/ContrastProfiler.so |
| CORECLR_PROFILER         | {8B2CE134-0948-48CA-A4B2-80DDAD9F5791}                                |
| CORECLR_ENABLE_PROFILING | 1   |
| CONTRAST_CONFIG_PATH     | <path_to_contrast_security.yaml>                                      |

- **Linux ARM64**

| Environment variable     | Value   |
|--------------------------|---|
| CORECLR_PROFILER_PATH_64 | <UnzippedDirectoryRoot>/runtimes/linux-arm64/native/ContrastProfiler.so |
| CORECLR_PROFILER         | {8B2CE134-0948-48CA-A4B2-80DDAD9F5791}                                  |
| CORECLR_ENABLE_PROFILING | 1   |
| CONTRAST_CONFIG_PATH     | <path_to_contrast_security.yaml>  |

4. Ensure the following paths are accessible by the runtime user of the application.

| Path  | Usage   | Customizable  | Permissions                                      |
|---|---|---|--|
| The path to <a href="#">.NET Core YAML (page 299)</a>   | Configures the agent  | Yes; set the environment variable CONTRAST_CONFIG_PATH            | Read   |
| <UnzippedDirectoryRoot>   | The root "installation" directory; stores the agent binaries                    | No  | Read   |
| <ul style="list-style-type: none"> <li><b>Windows:</b> %ProgramData%\Contrast\dotnet-core\logs</li> <li><b>Linux:</b> /var/tmp/contrast/dotnet-core/logs</li> </ul> | Directory for Contrast agent logs.<br>If missing, the directory will be created | Yes; set the environment variable CONTRAST_CORECLR_LOGS_DIRECTORY | Read/Write(or inherited from a parent directory) |



## NOTE

When running in IIS, make sure that the application pool can access these paths.

For example, given an application pool called `Default Web Site` using the default identity `ApplicationPoolIdentity`, ensure that the user `IIS AppPool\Default Web Site` has effective permissions to read the unzipped directory root.

5. [Configure the agent \(page 297\)](#) with authentication credentials and proxy settings to connect to Contrast.
6. Once the application has loaded, use the application and then verify that the server and application are active in Contrast, and that any expected vulnerabilities appear.



## TIP

To [update the agent \(page 295\)](#), replace the agent files in the agent directory and restart your application. As the agent is running alongside your application, it can't update itself.

The agent automatically starts with your application as long as the environment is properly set up.

To stop the agent, stop the application and remove agent from its environment. Alternatively, you may change the `CORECLR_ENABLE_PROFILING` setting to 0.

Follow any of these examples to set environment variables using:

- [IIS \(page 275\)](#)
- [Bash \(Linux\) \(page 275\)](#)
- [Powershell or Powershell Core \(Windows\) \(page 275\)](#)
- [Launch profile \(dotnet.exe\) \(page 276\)](#)

## IIS and IIS Express

Set the environment variables with either:

- The `environmentVariables` section in the application `web.config`

```
<?xml version="1.0" encoding="utf-8"?>
<configuration>
  <system.webServer>
    <!-- ... -->
    <aspNetCore processPath="dotnet"
arguments=".\ExampleNetCoreApp.dll" stdoutLogEnabled="false"
stdoutLogFile=".\logs\stdout">
      <environmentVariables>
        <environmentVariable name="CORECLR_PROFILER_PATH_64"
value="C:\contrast\dotnetcore\runtimes\win-
x64\native\ContrastProfiler.dll" />
        <environmentVariable name="CORECLR_PROFILER_PATH_32"
value="C:\contrast\dotnetcore\runtimes\win-
x86\native\ContrastProfiler.dll" />
        <environmentVariable name="CORECLR_ENABLE_PROFILING"
value="1" />
        <environmentVariable name="CORECLR_PROFILER"
value="{8B2CE134-0948-48CA-A4B2-80DDAD9F5791}" />
        <environmentVariable name="CONTRAST_CONFIG_PATH"
value="C:\contrast\dotnet-core\contrast_security.yaml" />
      </environmentVariables>
    </aspNetCore>
  </system.webServer>
</configuration>
```

- The `application pool setting` on the server

## Bash (Linux)

### Linux x64:

```
export CORECLR_PROFILER_PATH_64=/usr/local/contrast/runtimes/linux-x64/
native/ContrastProfiler.so
export CORECLR_ENABLE_PROFILING=1
export CORECLR_PROFILER={8B2CE134-0948-48CA-A4B2-80DDAD9F5791}
export CONTRAST_CONFIG_PATH=/etc/contrast/contrast_security.yaml
```

### Linux ARM64:

```
export CORECLR_PROFILER_PATH_64=/usr/local/contrast/runtimes/linux-arm64/
native/ContrastProfiler.so
export CORECLR_ENABLE_PROFILING=1
export CORECLR_PROFILER={8B2CE134-0948-48CA-A4B2-80DDAD9F5791}
export CONTRAST_CONFIG_PATH=/etc/contrast/contrast_security.yaml
```

Then run the application:

```
dotnet ./MyAppWithContrastAgent.dll
```

## Powershell or Powershell Core (Windows)

```
$env:CORECLR_PROFILER_PATH_64 = 'C:\contrast\dotnetcore\runtimes\win-
x64\native\ContrastProfiler.dll'
$env:CORECLR_PROFILER_PATH_32 = 'C:\contrast\dotnetcore\runtimes\win-
```

```
x86\native\ContrastProfiler.dll'  
$env:CORECLR_ENABLE_PROFILING = '1'  
$env:CORECLR_PROFILER = '{8B2CE134-0948-48CA-A4B2-80DDAD9F5791}'  
$env:CONTRAST_CONFIG_PATH = 'C:\contrast\dotnet-core\contrast_security.yaml'
```

Then run the application:

```
dotnet .\MyAppWithContrastAgent.dll
```

### Launch profile (dotnet.exe)

```
{  
  "MyAppWithContrastAgent": {  
    "environmentVariables": {  
      "CORECLR_PROFILER_PATH_64": "C:\\contrast\\dotnetcore\\runtimes\\  
\\win-x64\\native\\ContrastProfiler.dll",  
      "CORECLR_PROFILER_PATH_32": "C:\\contrast\\dotnetcore\\runtimes\\  
\\win-x86\\native\\ContrastProfiler.dll",  
      "CORECLR_ENABLE_PROFILING": "1",  
      "CORECLR_PROFILER": "{8B2CE134-0948-48CA-A4B2-80DDAD9F5791}",  
      "CONTRAST_CONFIG_PATH": "c:\\contrast\\config\\MyApp\\  
\\contrast_security.yaml"  
    }  
  }  
}
```

Then run the application:

```
dotnet run --launch-profile MyAppWithContrastAgent
```

### Install the .NET Core agent with the .NET Core agent for IIS installer

The .NET Core agent for IIS installer is a normal Windows application installer built using standard MSI technology. It validates that the target server and satisfies several requirements (for example, that the server's operating system is a supported operating system). If all requirements are met, the installer:

- Registers the .NET Core agent for IIS as a standard Windows program.
- Places the agent's files on a disk in the specified install location (for example, C:\Program Files\Contrast\dotnet-core). This includes several dynamic link libraries (DLLs) and executables.
- Creates the specified data directory for the agent that's primarily used to store agent log files and configuration (for example, C:\ProgramData\Contrast\dotnet-core).
- Adds the .NET Core agent's native modules to IIS.

### Before you begin

Before you begin, check the [system requirements \(page 72\)](#) and [supported technologies \(page 70\)](#) to be sure installation will work and ensure best performance.

### Install the agent using Contrast

1. In the Contrast web application, select **Add new**.
2. Choose .NET Core in the **Choose an agent** dropdown menu.
3. Select the link [.NET Core IIS agent installer](#) under **Install with IIS**. A ZIP archive downloads.
4. Extract the downloaded ZIP archive on the web server, and run `contrast-dotnet-core-agent-for-iis-installer.exe`. This installs the .NET Core agent for IIS.



**TIP**

You can use the command line to access additional options supported by the .NET Core agent for IIS installer.

5. [Configure the .NET Core agent with a YAML configuration file \(page 299\)](#) to set the [authentication keys \(page 109\)](#) and any application-specific configuration.
6. Copy the yaml file to `C:\ProgramData\Contrast\dotnet-core` if not already there.
7. Restart IIS to pick up the changes.
8. Use the application as you normally would and verify that Contrast sees your application.

### Install the agent using command line

Use the command line to access additional options supported by the .NET Core agent for IIS installer.

The .NET Core for IIS agent can be installed using the Windows interface, and uninstalled or repaired using standard Windows features (including the Programs and Features Control Panel and Powershell). However, you may want to use the Contrast Windows installer to perform these actions instead for certain scenarios such as automated scripting.

Use these commands for attended mode:


- **Install:**`contrast-dotnet-core-agent-for-iis-installer.exe`
- **Uninstall:**`contrast-dotnet-core-agent-for-iis-installer.exe -uninstall`
- **Repair:**`contrast-dotnet-core-agent-for-iis-installer.exe -repair`

Use these commands for unattended or silent mode:

- **Install:**`contrast-dotnet-core-agent-for-iis-installer.exe -s  
SUPPRESS_RESTARTING_IIS=1`
- **Uninstall:**`contrast-dotnet-core-agent-for-iis-installer.exe -uninstall -s  
SUPPRESS_RESTARTING_IIS=1`
- **Repair:**`contrast-dotnet-core-agent-for-iis-installer.exe -repair -s  
SUPPRESS_RESTARTING_IIS=1`

The .NET Core agent for IIS installer supports several additional options that are accessible when you use the command line for installation.

| Option                       | Description  | Example  |
|------------------------------|--|--|
| INSTALLFOLDER                | This option specifies the install directory for the agent files.   | <code>INSTALLFOLDER=C:\Program Files\Contrast\dotnet-core</code>                     |
| AGENT_EXPLORER_INSTALLFOLDER | This option specifies the directory for Agent Explorer files.  | <code>AGENT_EXPLORER_INSTALLFOLDER="C:\Program Files\Contrast\agent-explorer"</code> |
| INSTALL_AGENT_EXPLORER       | If you don't want to install the Agent Explorer, set the value for this option to 0.<br><br>The default value is 1, which installs the Agent Explorer. | <code>INSTALL_AGENT_EXPLORER=1</code>  |
| DATAFOLDER                   | This option specifies the default location for agent log and configuration files.  | <code>DATAFOLDER=C:\ProgramData\Contrast\dotnet-core</code>                          |

| Option  | Description  | Example   |
|---|--|---|
| SUPPRESS_RESTARTING_IIS   | <p>If you set the value of this option to 1, the installer does not restart IIS.</p> <p>The default value is 0.</p>  | SUPPRESS_RESTARTING_IIS=0   |
| <div><b>NOTE</b><ul style="list-style-type: none"><li>• Applications do not load the agent until IIS restarts.</li><li>• Setting <code>SUPPRESS_RESTARTING_IIS</code> will prevent an auto-upgrade from running unless IIS does not have any active workers when the upgrade runs.</li></ul></div> |  |   |
| SKIP_IIS_MODULES  | <p>If you don't want to install the agent IIS modules, set the value of this option to 1.</p> <p>The default value is 0, which installs the IIS modules.</p>               | SKIP_IIS_MODULES=1  |
| INSTALL_UPGRADE_SERVICE   | <p>If you don't want to install the agent upgrade service, set the value of this option to 0.</p> <p>The default value is 1, which installs the agent upgrade service.</p> | INSTALL_UPGRADE_SERVICE=1   |
| UPGRADE_SERVICE_INSTALLFOLDER   | This option specifies the directory for the upgrade service files.   | UPGRADE_SERVICE_INSTALLFOLDER="C:\Program Files (x86)\Contrast\upgrade-service" |



## IMPORTANT

The .NET Core agent for IIS installer automatically restarts IIS when you install the agent for the first time. You may want to change the configuration of any web server monitoring tools that raise alarms when IIS restarts.

The .NET Profiling API requires that profiled processes be started with a profiler. Therefore, the .NET Core agent must restart IIS (and any IIS worker processes) to attach the Contrast profiler. This process is similar to how other profiling products (for example, memory or performance profilers) behave.

## Install the .NET Core agent manually with NuGet

In some instances, you may prefer to manually install the .NET Core agent using NuGet. For example, this can be useful if you are unable to access the [Azure App Service site extension \(page 280\)](#) or if you prefer to include the .NET Core agent as a dependency.

## Before you begin

[Single-file deployments](#) are not supported when you install the .NET Core agent manually with NuGet.



## IMPORTANT

When redeploying a web application that has Contrast agent running, you may run into an error that says "Files in use" on *ContrastProfiler.dll*. This happens because the agent DLL files are locked by .NET, and can't be overwritten while the application is still running.

## Steps

1. Add the Contrast NuGet package to your application.  
Using dotnet command line:

```
dotnet add package Contrast.SensorsNetCore
```

Using Visual Studio:

- Under the application project in the Solution Explorer, right-click on **References** and select **Manage NuGet Packages**.
  - Search for the **Contrast.SensorsNetCore** package, select it and add it to your project.
  - Build your application. Confirm that a *contrast* folder appears in your project. When the application is published, this folder also appears in the build output directory.
2. Set environment variables so that the .NET runtime loads the agent's profiler component.:

### Windows:

```
CORECLR_ENABLE_PROFILING: 1
CORECLR_PROFILER: {8B2CE134-0948-48CA-A4B2-80DDAD9F5791}
CORECLR_PROFILER_PATH_32: <application directory>\contrast\runtimes\win-x86\native\ContrastProfiler.dll
CORECLR_PROFILER_PATH_64: <application directory>\contrast\runtimes\win-x64\native\ContrastProfiler.dll
```

### Linux x64:

```
CORECLR_ENABLE_PROFILING: 1
CORECLR_PROFILER: {8B2CE134-0948-48CA-A4B2-80DDAD9F5791}
CORECLR_PROFILER_PATH: <application directory>/contrast/runtimes/linux-x64/native/ContrastProfiler.so
```

### Linux ARM64:

```
CORECLR_ENABLE_PROFILING: 1
CORECLR_PROFILER: {8B2CE134-0948-48CA-A4B2-80DDAD9F5791}
CORECLR_PROFILER_PATH: <application directory>/contrast/runtimes/linux-arm64/native/ContrastProfiler.so
```

3. Set the basic configuration either with the [YAML configuration file \(page 299\)](#) or with [environment variables \(page 298\)](#). For example:

```
CONTRAST_CONFIG_PATH: [Path to yaml config file]
```

At minimum, the following environment variables are required:

```
CONTRAST__API__URL: [IF USING ANOTHER SERVER THAN THE DEFAULT: https://app.contrastsecurity.com]
CONTRAST__API__USER_NAME: [REPLACE WITH YOUR AGENT USERNAME]
CONTRAST__API__SERVICE_KEY: [REPLACE WITH YOUR AGENT SERVICE KEY]
CONTRAST__API__API_KEY: [REPLACE WITH YOUR AGENT API KEY]
```

4. Deploy your application with the environment variables from the previous step.
5. Once the application has loaded, use the application and then verify that the server and application are active in Contrast, and that any expected vulnerabilities appear.

## Install the .NET Core agent with Azure App Service

Use this procedure for an express installation of the .NET Core agent using Azure Portal Extensions.

### Before you begin

Before you begin, check the [system requirements \(page 72\)](#) and [supported technologies \(page 70\)](#) to be sure installation will work and ensure best performance.

### Steps

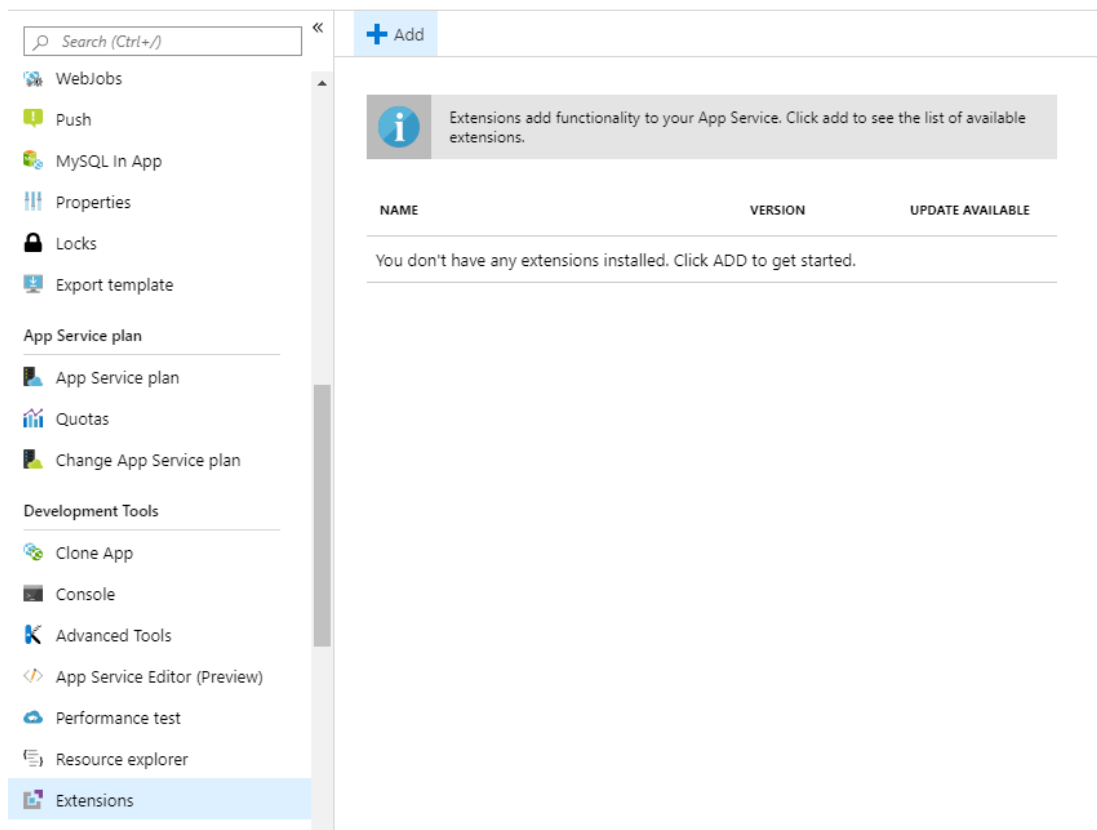
1. Create an [Azure account](#), if you don't have one already.
2. Create a [.NET web application](#) and deploy it to Azure App Service.
3. Publish your application to Azure, and confirm that it works as expected without Contrast.
4. Ensure that your application is deployed using a Windows plan. (Linux plans do not support Site Extensions.)



#### NOTE

If you do not have access to the site extension, you can [install the .NET Core agent manually with NuGet \(page 278\)](#).

5. Add the Contrast .NET Core Site Extension:
  - With the Azure portal
    - a. In the Azure Portal, select your hosted application.
    - b. Select **Extensions**.



- c. Select **Add**.
- d. Select the **Contrast .NET Core Site Extension for Azure App Service**. This is the extension for .NET Core applications.
- e. Select **OK**, and agree to the terms and conditions.
- f. Wait a few seconds and confirm the site extension installed correctly.

**NOTE**

The site extension sets a number of environment variables, including:

```
CORECLR_ENABLE_PROFILING=1
CORECLR_PROFILER={8B2CE134-0948-48CA-A4B2-80DDAD9F5791}
CORECLR_PROFILER_PATH_32=D:\Home\siteextensions\Contrast.NetCore.Azure.SiteExtension\ContrastNetCoreAppService\runtimes\win-x86\native\ContrastProfiler.dll
CORECLR_PROFILER_PATH_64=D:\Home\siteextensions\Contrast.NetCore.Azure.SiteExtension\ContrastNetCoreAppService\runtimes\win-x64\native\ContrastProfiler.dll
CONTRAST_INSTALL_DIRECTORY=D:\Home\siteextensions\Contrast.NetCore.Azure.SiteExtension\ContrastNetCoreAppService\MicrosoftInstrumentationEngine_ConfigPath32_ContrastCoreX86
Config=D:\Home\siteextensions\Contrast.NetCore.Azure.SiteExtension\ContrastCieCoreClrProfiler-32.config
MicrosoftInstrumentationEngine_ConfigPath64_ContrastCoreX64
Config=D:\Home\siteextensions\Contrast.NetCore.Azure.SiteExtension\ContrastCieCoreClrProfiler-64.config
```

If the CLR instrumentation engine (CIE) is configured for the application (for example, because Application Insights is enabled), Azure should automatically overwrite the CORECLR\_PROFILER\* variables to point to the profiler of the CIE.

The CIE will then use the MicrosoftInstrumentationEngine\_\* variables to load the Contrast agent.

If the CIE is not configured for the application, the standard CORECLR\_PROFILER\* variables will be used to load the Contrast agent.

- With the Azure CLI
  - Use a command similar to this one for a .NET Core Site Extension:

```
az resource create --resource-group 'myResourceGroup' --resource-type Microsoft.Web/sites/siteextensions --name myAppService/siteextensions/Contrast.NetCore.Azure.SiteExtension --properties "{}"
```

In this example, the command adds a Contrast .NET Core Site Extension to an App Service named "myAppService" in Resource Group "myResourceGroup"

After you add the extension, the Azure Portal displays a list of the installed agents with details similar to the following:

| Name   | Version | Update Available |
|--|---------|------------------|
| Contrast.NET Core Site Extension for Azure App Service | 4.2.4   | No               |

**TIP**

You can also install the agent from the Site Extensions area of your application management SCM (Kudu) site.

**IMPORTANT**

If a new version of the .NET Core agent is available, it's indicated in the Azure Portal or Kudu dashboard. You must stop the site before starting the update; otherwise, the update may fail.

6. Add configuration options

- With the Azure Portal
  - a. In the Azure Portal, select your hosted application.
  - b. Select **Configuration** under **Settings** to configure settings that allow the agent to connect to Contrast.
  - c. Select **New application setting** and add the following values for your application:

| Key                        | Value   |
|----------------------------|---|
| CONTRAST__API__USER_NAME   | Replace with your <a href="#">agent username (page 109)</a> .   |
| CONTRAST__API__SERVICE_KEY | Replace with your <a href="#">agent service key (page 109)</a> .  |
| CONTRAST__API__API_KEY     | Replace with your agent <a href="#">API key (page 109)</a> .  |
| CONTRAST__API__URL         | Defaults to <a href="https://app.contrastsecurity.com">https://app.contrastsecurity.com</a> . Replace with another URL, if you're using a Contrast application that's hosted elsewhere. |

- With the Azure CLI
  - Enter a command similar to this one:

```
az webapp config appsettings set --resource-group 'myResourceGroup'
--name 'myAppService' --settings CONTRAST__API__URL=https://
app.contrastsecurity.com CONTRAST__API__API_KEY={Your API
KEY} CONTRAST__API__SERVICE_KEY={Your Service key}
CONTRAST__API__USER_NAME={Your agent user}
```

Get API values ([agent keys \(page 109\)](#)) from the Contrast web interface or by downloading a YAML file for the .NET Core agent.

7. In the Azure Portal, go to the application overview and **Restart** the application.  
Running the application automatically instruments any application that is running inside of the App Service. You should begin to see data in Contrast
8. Navigate to the application and confirm the application is reporting to Contrast.  
You can view log files to verify that Contrast is running:
  - a. In the Azure Portal, go to **Advanced Tools** for the app service.
  - b. Select **Go**.
  - c. In the Kudu Services window, select “Debug console” menu at the top and select “CMD”.
  - d. Select the `LogFiles` directory.
  - e. Select the `Contrast` directory.
  - f. Select the `dotnet` directory.  
You will see an agent log named `<PID>_Profiler_<App Service Name>_<XXX>.log`.
  - g. Verify that there are no ERROR log entries.

## Install the .NET Core agent in a container

### Before you begin

- This topic provides general guidance for installing the Contrast .NET Core agent in a containerized application, with Docker as an example.
- You should have a basic understanding of how containers and related software work. You may need to adjust the instructions to meet your specific circumstances.
- If you are using Kubernetes, consider using the [Agent Operator \(page 592\)](#) to configure the agent.

### Step 1: Install the agent

Contrast can be added either before or after the application is added to the container image. The recommended approach is with the use of named [multi-stage builds](#). For example:

```
FROM mcr.microsoft.com/dotnet/aspnet:6.0

# Hidden for brevity...

# Copy the required agent files from the official Contrast agent image.
COPY --from=contrast/agent-dotnet-core:latest /contrast /contrast
```

Where in this example, the latest .NET Core agent is used (check DockerHub for available tags).

### Step 2: Configure the agent

Contrast agents accept configuration from multiple sources, with order of precedence documented in the [order of precedence \(page 111\)](#) section.

A mixed approach is recommended:

- Use a YAML file so that common configuration may be shared between many applications.
- Use environment variables for application-specific configuration values, to override values provided by a YAML file, or for sensitive keys that are injected during runtime.

#### YAML file configuration:

When using a [YAML file to configure the agent \(page 112\)](#), the environment variable `CONTRAST_CONFIG_PATH` can also be used to indicate where the YAML file is located inside the container.

For example, given a YAML file called `contrast_security.yaml` that exists in the Docker build context:

The environment variable `CONTRAST_CONFIG_PATH` can also be used to indicate where the YAML file is located.

```
agent:
  logger:
    path: /var/tmp
    level: WARN
```

The YAML file can be added to the container image as follows:

```
FROM mcr.microsoft.com/dotnet/aspnet:6.0

# Hidden for brevity...


# Add the Contrast agent to the image.
COPY --from=contrast/agent-dotnet-core:latest /contrast /contrast
```

```
# Copy the contrast_security.yaml file from Docker build context.
COPY ./contrast_security.yaml /contrast_security.yaml

# Finally configure the agent to use the YAML file previously copied.
ENV CONTRAST_CONFIG_PATH=/contrast_security.yaml
```

### Environment variable configuration:

To set an application-specific configuration, use [environment variables \(page 115\)](#). Below are some common configuration options.

| Title  | Usage  | Environment variable          |
|--|--|-------------------------------|
| <b>Application name</b>  | Specify the application name reported to Contrast.   | CONTRAST__APPLICATION__NAME   |
| <b>Application group</b>   | Specify the application access group for this application during onboarding.   | CONTRAST__APPLICATION__GROUP  |
| <div> <b>NOTE</b><br/>Application access groups have to be created first in Contrast.</div> |  |                               |
| <b>Application tags</b>  | Add labels to an application.  | CONTRAST__APPLICATION__TAGS   |
| <b>Server name</b>   | Specify the server name reported to Contrast.  | CONTRAST__SERVER__NAME        |
| <b>Server environment</b>  | Specify in which environment the application is running. Valid values for this configuration are: Development, QA and Production | CONTRAST__SERVER__ENVIRONMENT |
| <b>Server tag</b>  | Add labels to the server.  | CONTRAST__SERVER__TAG         |

### Step 3: Add profiler variables and authentication credentials

To enable instrumentation of your application, the .NET agent requires [additional environment variables \(page 272\)](#). The `CORECLR_` variables load the agent and the `CONTRAST_` variables are for agent authentication to the server.

Using the Dockerfile example from before:

#### x64

```
FROM mcr.microsoft.com/dotnet/aspnet:6.0

# Hidden for brevity...

COPY --from=contrast/agent-dotnet-core:latest /contrast /contrast

# Required variables to load the agent.
ENV CORECLR_PROFILER_PATH_64=/contrast/runtimes/linux-x64/native/ContrastProfiler.so \
    CORECLR_ENABLE_PROFILING=1 \
    CORECLR_PROFILER={8B2CE134-0948-48CA-A4B2-80DDAD9F5791}
```

#### ARM64

```
FROM mcr.microsoft.com/dotnet/aspnet:6.0

# Hidden for brevity...

COPY --from=contrast/agent-dotnet-core:latest /contrast /contrast
```



```
# Required variables to load the agent.
ENV CORECLR_PROFILER_PATH_64=/contrast/runtimes/linux-arm64

                                                                    /native/ContrastProfiler.so \
CORECLR_ENABLE_PROFILING=1 \
CORECLR_PROFILER={8B2CE134-0948-48CA-A4B2-80DDAD9F5791}
```

Additionally, the [following environment variables \(page 109\)](#) are required for agent authentication to the server.

```
CONTRAST__API__URL=https://app.contrastsecurity.com/Contrast
CONTRAST__API__API_KEY={Your API KEY here}
CONTRAST__API__SERVICE_KEY={Your Service key here}
CONTRAST__API__USER_NAME={Your agent username here}
```

You can get API values ([agent keys \(page 109\)](#)) from Contrast or by downloading a YAML file for the .NET Core agent.



### IMPORTANT

The `API_KEY`, `SERVICE_KEY` and `USER_NAME` keys should be considered sensitive data and handled accordingly. Contrast recommends injecting these during runtime from your secrets store (e.g. Kubernetes Secrets).

## Step 4: Instrument your application

You can now run the application image with Contrast enabled. Contrast will instrument your application during startup and begin reporting security vulnerabilities to Contrast. You can verify that Contrast is running by checking the container.

### Install .NET agents with infrastructure as code tools

You can use any of these infrastructure tools for .NET Core and .NET Framework agents.

- [Ansible playbook \(page 585\)](#)
- [Terraform \(page 290\)](#)
- [Azure Resource Manager \(ARM\) \(page 286\)](#)

## Install .NET agents with Azure Resource Manager

This topic describes the most popular methods for instrumenting .NET Framework and .NET Core applications through automation with Azure Resource Manager (ARM) templates and Azure.

You can only configure site extensions either directly through the Azure Portal with an ARM policy or through Azure's REST API. All methods described in this topic use one of these methods. Only REST API and Azure ARM policies allow for automated deployments.

### Before you begin

- Verify that Contrast supports your preferred OS and runtime stack for the .NET Framework and .NET Core agents
  - [Supported technologies for .NET Core \(page 70\)](#)
  - [Supported technologies for .NET Framework \(page 63\)](#)
- Ensure you have login access to Contrast.
- Only configure a Contrast site extension with backend HTTP services and not WebJobs or UI app services.
- The methods in this topic do not work if you are deploying an App service using Docker.

### Step 1: Download an agent configuration file

1. Download a configuration file from Contrast.
  - a. In the Contrast web interface, select **Add New**.
  - b. Select the Application card.
  - c. Follow the displayed instructions to get the required values and download a YAML configuration file.
2. To automate your ARM templates more fully, get your Contrast API credentials, either from the `contrast_security.yml` file that you downloaded or from the Contrast web interface (**user menu > Organization Settings > Agent**). These credentials are:

| Configuration setting      | Contrast label          |
|----------------------------|-------------------------|
| CONTRAST__API__API_KEY     | API Key                 |
| CONTRAST__API__URL         | Contrast Agent URL      |
| CONTRAST__API__USER_NAME   | Contrast Agent Username |
| CONTRAST__API__SERVICE_KEY | Agent Service Key       |

### Step 2: Edit the ARM template

Add the highlighted Contrast configuration values to the ARM template, as shown in the following examples.

[.NET Core-specific configuration \(page 297\)](#) and [.NET Framework-specific configuration \(page 230\)](#) provide additional configuration details.

- .NET Core

```
{
  "$schema": "https://schema.management.azure.com/schemas/2015-01-01/
deploymentTemplate.json#",
  "contentVersion": "1.0.0.0",
  "parameters": {
    "sites_name": {
      "defaultValue": "APP_NAME",
      "type": "String"
    }
  }
}
```

```
},
"variables": {
},
"resources": [
  {
    "type": "Microsoft.Web/sites",
    "apiVersion": "2018-11-01",
    "name": "[parameters('sites_name')]",
    "location": "East US",
    "kind": "app",
    "properties": {
      "siteConfig": {
        "appSettings": [
          {
            "name": "CONTRAST_API_API_KEY",
            "value": "<CONTRAST_API_API_KEY>",
            "slotSetting": false
          },
          {
            "name": "CONTRAST_API_SERVICE_KEY",
            "value": "<CONTRAST_API_SERVICE_KEY>",
            "slotSetting": false
          },
          {
            "name": "CONTRAST_API_URL",
            "value": "<CONTRAST_API_URL>",
            "slotSetting": false
          },
          {
            "name": "CONTRAST_API_USER_NAME",
            "value": "<CONTRAST_API_USER_NAME>",
            "slotSetting": false
          },
          {
            "name": "CORECLR_ENABLE_PROFILING",
            "value": "1",
            "slotSetting": false
          },
          {
            "name": "CORECLR_PROFILER",
            "value": "{8B2CE134-0948-48CA-
A4B2-80DDAD9F5791}",
            "slotSetting": false
          },
          {
            "name": "CORECLR_PROFILER_PATH_32",
            "value": "D:\\home\\SiteExtensions\\
\\Contrast.NetCore.Azure.SiteExtension\\ContrastNetCoreAppService\\
\\contrast\\runtimes\\win-x86\\native\\ContrastProfiler.dll",
            "slotSetting": false
          },
          {
            "name": "CORECLR_PROFILER_PATH_64",
            "value": "D:\\home\\SiteExtensions\\
\\Contrast.NetCore.Azure.SiteExtension\\ContrastNetCoreAppService\\
```

```
\contrast\\runtimes\\win-x64\\native\\ContrastProfiler.dll",
    "slotSetting": false
  }
]
},
"resources": [
  {
    "name": "Contrast.NetCore.Azure.SiteExtension",
    "type": "siteextensions",
    "apiVersion": "2018-02-01",
    "dependsOn": [
      "[resourceId('Microsoft.Web/Sites',
parameters('sites_name'))]"
    ]
  }
]
}
```

- .NET Framework

```
{
  "$schema": "https://schema.management.azure.com/schemas/2015-01-01/
deploymentTemplate.json#",
  "contentVersion": "1.0.0.0",
  "parameters": {
    "sites_name": {
      "defaultValue": "APP_NAME",
      "type": "String"
    }
  },
  "variables": {
  },
  "resources": [
    {
      "type": "Microsoft.Web/sites",
      "apiVersion": "2018-11-01",
      "name": "[parameters('sites_name')]",
      "location": "East US",
      "kind": "app",
      "properties": {
        "siteConfig": {
          "appSettings": [
            {
              "name": "CONTRAST_API_API_KEY",
              "value": "<CONTRAST_API_API_KEY>",
              "slotSetting": false
            },
            {
              "name": "CONTRAST_API_SERVICE_KEY",
              "value": "<CONTRAST_API_SERVICE_KEY>",
              "slotSetting": false
            },
            {
              "name": "CONTRAST_API_URL",
```

```

        "value": "<CONTRAST_API_URL>",
        "slotSetting": false
      },
      {
        "name": "CONTRAST_API_USER_NAME",
        "value": "<CONTRAST_API_USER_NAME>",
        "slotSetting": false
      },
      {
        "name": "COR_ENABLE_PROFILING",
        "value": "1",
        "slotSetting": false
      },
      {
        "name": "COR_PROFILER",
        "value": "{EFEB8EE0-6D39-4347-
A5FE-4D0C88BC5BC1}",
        "slotSetting": false
      },
      {
        "name": "COR_PROFILER_PATH_32",
        "value": "D:\\home\\SiteExtensions\\Contrast.NET.Azure.SiteExtension\\
\\ContrastAppService\\ContrastProfiler-32.dll",
        "slotSetting": false
      },
      {
        "name": "COR_PROFILER_PATH_64",
        "value": "D:\\home\\SiteExtensions\\Contrast.NET.Azure.SiteExtension\\
\\ContrastAppService\\ContrastProfiler-64.dll",
        "slotSetting": false
      }
    ]
  },
  "resources": [
    {
      "name": "Contrast.NET.Azure.SiteExtension",
      "type": "siteextensions",
      "apiVersion": "2018-02-01",
      "dependsOn": [
        "[resourceId('Microsoft.Web/Sites',
parameters('sites_name'))]"
      ]
    }
  ]
}

```

### Step 3: Deploy the application from the ARM template

Use one of these methods in the Azure documentation:

- Command line or CLI: [Use ARM deployment templates with Azure CLI.](#)

- Azure Portal: [Edit and deploy ARM templates](#).

## Install .NET agents with Terraform

Use this procedure to install .NET Framework and .NET Core agents when using Terraform to deploy to Azure. You might need to customize this procedure for your environment.

Site extensions are the best way to deploy the Contrast agent to an Azure app service. You can only do this using the Azure Portal, an ARM policy, or the Azure API. The Terraform method described in this procedure uses the latter two methods directly or indirectly.

### Before you begin

- Verify that Contrast supports your preferred OS and runtime stack for the .NET Framework and .NET Core agents running in an Azure App Service:
  - [Supported technologies for .NET Core \(page 70\)](#)
  - [Supported technologies for .NET Framework \(page 63\)](#)
- Ensure you have met these requirements:
  - Login access to Contrast
  - Console access to a system where Terraform and the Azure CLI are installed
  - Login access to Azure Portal, including `az` login from the Azure CLI
  - Python is installed on the system where these commands are run
  - Included the Contrast agent as a part of [Azure App Service \(page 280\)](#)

### Step 1: Configure the agent

1. Download a configuration file from Contrast:
  - a. In the Contrast web interface, select **Add New**.
  - b. Select the Application card.
  - c. Follow the displayed instructions to get the required values and download a YAML configuration file.
2. In the YAML configuration file, set the following values:
  - .NET Core agent

```
CORECLR_ENABLE_PROFILING:1
CORECLR_PROFILER:{8B2CE134-0948-48CA-A4B2-80DDAD9F5791}
CORECLR_PROFILER_PATH_32:
  D:\\home\\SiteExtensions\\Contrast.NetCore.Azure.SiteExtension\\
  ContrastNetCoreAppService\\contrast\\runtimes\\win-x86\\native\\
  ContrastProfiler.dll
CORECLR_PROFILER_PATH_64:
  D:\\home\\SiteExtensions\\Contrast.NetCore.Azure.SiteExtension\\
  ContrastNetCoreAppService\\contrast\\runtimes\\win-x64\\native\\
  ContrastProfiler.dll
```

- .NET Framework agent

```
COR_ENABLE_PROFILING: 1
COR_PROFILER: {EFEB8EE0-6D39-4347-A5FE-4D0C88BC5BC1}
COR_PROFILER_PATH_32: D:\\home\\
  SiteExtensions\\Contrast.NET.Azure.SiteExtension\\ContrastAppService\\
  ContrastProfiler-32.dll
COR_PROFILER_PATH_64: D:\\home\\
  SiteExtensions\\Contrast.NET.Azure.SiteExtension\\ContrastAppService\\
  ContrastProfiler-64.dll
```

## Step 2: Configure site extensions with Terraform

Because site extension deployment is only natively supported using the Azure portal, Azure ARM policies, and Azure API, Terraform is a convenient command line method to add or remove site extensions. It uses an ARM policy to set up the extension as shown in the examples.

Use this procedure to instrument your application.

1. Verify that the YAML configuration file you prepared in step 1 is named `contrast_security.yaml`.
2. Install Terraform from here: <https://www.terraform.io/downloads.html>.
3. Install PyYAML using this command:

```
pip install PyYAML
```

4. Install the Azure CLI tools from this location: <https://docs.microsoft.com/en-us/cli/azure/install-azure-cli>
5. Log in to Azure to make sure you cache your credentials using `az login`
6. Use this parsing script `parseyaml.py` to pull values out of the Contrast YAML file and add them to the provisioned Azure App Service with this command:

```
import yaml,
    jsonwith open('./contrast_security.yaml') as f:
        config = yaml.load(f)
        print(json.dumps(config['api']))
```

7. Modify the Terraform document called `main.tf` as follows:

```
provider "azurerm" {
  features {}
}
# Create a resource group
resource "azurerm_resource_group" "personal" {
  name       = <name>
  location   = <location>
}
# Create an app service plan
resource "azurerm_app_service_plan" "app_service-plan" {
  name                          = <name>
  resource_group_name           = azurerm_resource_group.personal.name
  location                      = <location>
}
# Create an app service
resource "azurerm_app_service" "app_service" {
  name                          = <name>
  location                      = <location>
  resource_group_name           = azurerm_resource_group.personal.name
  app_service_plan_id           = azurerm_app_service_plan.app_service-plan.id
  site_config {
    dotnet_framework_version = "v4.0"
    default_documents         = ["Default.aspx"]
  }
}
# CONTRAST .NET FRAMEWORK AGENT SETUP
# Contrast env vars will be passed to the app service here.
app_settings = {
  "COR_ENABLE_PROFILING"           = "1"
  "COR_PROFILER"                   = "{EFEB8EE0-6D39-4347-A5FE-4D0C88BC5BC1}"
  "COR_PROFILER_PATH_32"           =
```

```

    = "D:\\home\\SiteExtensions\\Contrast.NET.Azure.SiteExtension\\
\\ContrastAppService\\ContrastProfiler-32.dll"
    "COR_PROFILER_PATH_64"
    = "D:\\home\\SiteExtensions\\Contrast.NET.Azure.SiteExtension\\
\\ContrastAppService\\ContrastProfiler-64.dll"
    "CONTRAST_INSTALL_DIRECTORY" = "D:\\home\\
\\SiteExtensions\\Contrast.NET.Azure.SiteExtension\\ContrastAppService\\"
    "CONTRAST_API_URL" =
data.external.yaml.result.url
    "CONTRAST_API_USER_NAME" =
data.external.yaml.result.user_name
    "CONTRAST_API_SERVICE_KEY" =
data.external.yaml.result.service_key
    "CONTRAST_API_API_KEY" =
data.external.yaml.result.api_key
    # USE THESE SETTING FOR .NET CORE AGENT
    #"CORECLR_ENABLE_PROFILING" = 1
    #"CORECLR_PROFILER" = {8B2CE134-0948-48CA-A4B2-80DDAD9F5791}
    #"CORECLR_PROFILER_PATH_32" = D:\\home\\SiteExtensions\\
\\Contrast.NetCore.Azure.SiteExtension\\ContrastNetCoreAppService\\
\\contrast\\runtimes\\win-x86\\native\\ContrastProfiler.dll
    #"CORECLR_PROFILER_PATH_64" = D:\\home\\SiteExtensions\\
\\Contrast.NetCore.Azure.SiteExtension\\ContrastNetCoreAppService\\
\\contrast\\runtimes\\win-x64\\native\\ContrastProfiler.dll
  }
}
#Extract the connection from the normal yaml
file to pass to the app container
data "external" "yaml" {
  program = [var.python_binary, "${path.module}/parseyaml.py"]
}
# Deploy the extension template
resource "azurerm_template_deployment" "extension" {
  name = <name>
  resource_group_name = <resource_group_name>
  template_body = <<BODY
{
  "$schema": "https://schema.management.azure.com/schemas/
2015-01-01/deploymentTemplate.json#",
  "contentVersion": "1.0.0.0",
  "parameters": {
    "siteName": {
      "type": "string",
      "metadata": {
        "description": "The Azure App Service Name"
      }
    },
    "extensionName": {
      "type": "string",
      "metadata": {
        "description": "The Site Extension Name."
      }
    }
  },
  "resources": [

```



```
{
  "type": "Microsoft.Web/sites/siteextensions",
  "name": "[concat(parameters('siteName'),
'/', parameters('extensionName'))]",
  "apiVersion": "2019-08-01",
  "location": "[resourceGroup().location]"
}
]
}
BODY parameters = {
  "siteName"          = azurerm_app_service.<app_service>.name
  #.NET Framework
  "extensionName"     = "Contrast.NET.Azure.SiteExtension"
  #.NET Core
  # "extensionName"    = "Contrast.NetCore.Azure.SiteExtension"
}
deployment_mode      = "Incremental"
}
```

### Agent upgrade service

The Agent Upgrade Service is a background Windows service that helps you keep the .NET Framework and .NET Core for IIS agents automatically updated to the most recent version on Windows. The Agent Upgrade Service is included with the .NET Framework Agent Installer and .NET Core Agent for IIS Installer; the agent installers install two products:

- the corresponding agent, and
- the Agent Upgrade Service.

By default, the Agent Upgrade Service checks for new agent versions released to NuGet when the service first starts up (when the Windows Server is restarted.) If a new agent version is found, the Upgrade Service will download the new agent version, verify the installer's signature, and then finally execute the installer.

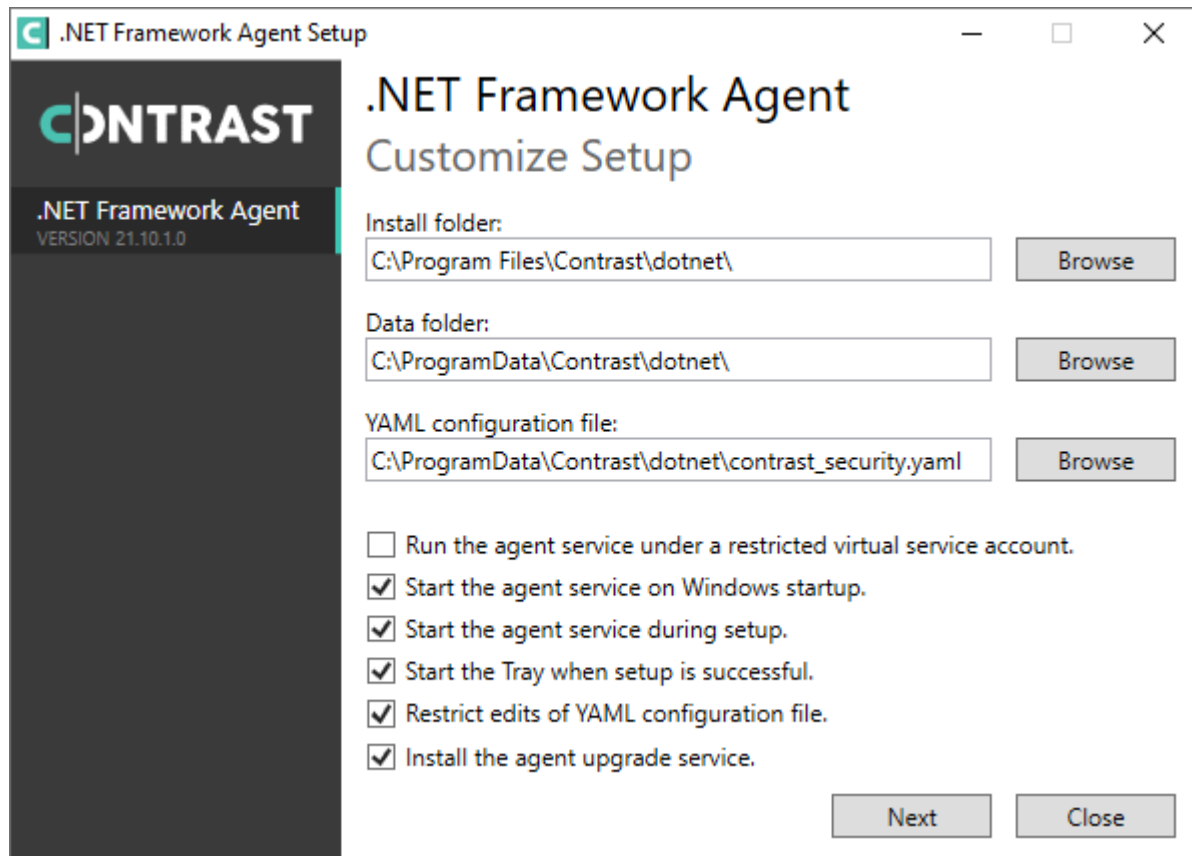


#### NOTE

When a new agent version installed, IIS will be restarted.

The Agent Upgrade Service is an optional component and is not required for agent Assess and Protect features.

- De-select the **Install the agent upgrade service** checkbox when installing the agent if you do not want to use the Agent Upgrade Service.
- If installing the agent via command line, add `INSTALL_UPGRADE_SERVICE=0` argument to not install the Agent Upgrade Service.



The behavior of the Agent Upgrade Service can be modified via an agent-specific configuration file in the Contrast data directory. The default location is `C:\ProgramData\Contrast\upgrade-service`.

The configuration for upgrading the .NET Core agent is located in the .NET Core YAML file.

```
enable: true # Set to `true` for the agent to automatically upgrade to
newer versions.
checks: Startup # Set the frequency with which the agent checks for
updates. Valid values are `daily` for every 24 hours and on startup, or
`startup` for *only* when service starts up.
timeout_ms: 60000 # Set the time allocated to execute the downloaded agent
installer before cancelling.
nuget_repository_url: https://api.nuget.org/v3/index.json # Set the URL of
the Nuget repository to be used for the .NET Core Agent for IIS Installer
nuget_package_name: Contrast.CoreIIS.Installer # Set the name of the .NET
Core Agent for IIS Nuget package.
installer_upgrade_code: 82468c04-dfc0-4a4c-9eb9-c4b314c67fdc # Used
internally to retrieve the current installed agent version from Windows.
enable_major_version_upgrade: false # Set to `true` to automatically
upgrade major versions.
```



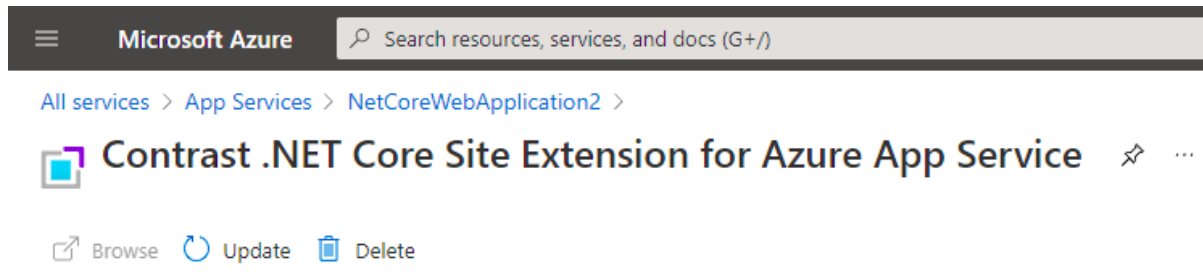
#### NOTE

The Agent Upgrade Service is only included with the agent installer. It is not included with the manual .NET Core Agent, agent NuGet packages, or Azure App Service site extensions.

## Update the .NET Core agent

Contrast frequently releases new versions of agents, these steps show you how to easily update the NuGet package or the manual .NET Core agent and keep it updated. To update the agent by installation:

- **.NET Core agent agent for IIS installer:** use the [Agent upgrade service \(page 227\)](#).
- **Azure App Service:** Use the Azure portal.



- **Manual installation:** use the instructions below to set up your own automation.

## Before you begin

- Confirmed your .NET Core application runs properly without the Contrast .NET Core agent.
- Previously installed the Contrast .NET Core agent.
- Defined a policy for how and when to update the agent, based on your change management policy and the environment where you deploy agents.
- An existing workflow to manage and keep application dependencies updated.

## Steps

1. Download the Contrast .NET Core agent to the same installation location by using the Contrast repository:
  - Hosted: Contrast synchronizes .NET Core agent releases with public NuGet repositories.
  - On-premises: Contrast does not recommend using newer versions of Contrast agents than those available from your Contrast instance. Use the same version of the .NET Core agent version you would otherwise download directly from the Contrast web interface.
2. Get the following API information

```
CONTRAST_URL=<TeamServer URL e.g. https://app.contrastsecurity.com >  
ORG_ID=<YOUR TEAMSERVER ORGANIZATION ID>  
AUTH_TOKEN=<YOUR TEAMSERVER AUTHENTICATION TOKEN>  
API_KEY=<YOUR TEAMSERVER API KEY>
```

3. Use one of the following scripts to download Contrast .NET Core agent. Include the script in the application startup script, automated deployment pipeline, or add the script as a cron job to automatically update the agent.
  - Bash script

```
CONTRAST_URL=https://app.contrastsecurity.com  
ORG_ID=xxxx  
AUTH_TOKEN=xxxx  
API_KEY=xxxx  
curl -X GET $CONTRAST_URL/Contrast/api/ng/$ORG_ID/agents/default/
```

```
DOTNET_CORE /-o ./Contrast.NET.Core.zip -H 'Authorization:
$AUTH_TOKEN' -H 'API-Key: $API_KEY' /-H 'Accept: application/json' -OJ
```

- Powershell

```
$ContrastUrl = "https://app.contrastsecurity.com/Contrast"
$UserId = ""
$ServiceKey = ""
$ApiKey = ""
$OrganizationId = ""
$InstallPath = ".\dotnet-core"

# Needed if the OS defaults to Tls1.1.
[Net.ServicePointManager]::SecurityProtocol =
[Net.SecurityProtocolType]::Tls12

New-Item -ItemType Directory $InstallPath

Invoke-WebRequest `
    -Uri "$ContrastUrl/api/ng/$OrganizationId/agents/default/
DOTNET_CORE" `
    -Headers @{
        "API-Key"          = $ApiKey
        "Authorization"
= [Convert]::ToBase64String([System.Text.Encoding]::UTF8.GetBytes("$
{UserId}:{ServiceKey}"))
    } `
    -OutFile "$InstallPath\Contrast.zip"

Invoke-WebRequest -Uri `
    "$ContrastUrl/api/ng/$OrganizationId/agents/external/default/
DOTNET_CORE" `
    -Headers @{
        "Accept"          = "text/yaml"
        "API-Key"          = $ApiKey
        "Authorization"
= [Convert]::ToBase64String([System.Text.Encoding]::UTF8.GetBytes("$
{UserId}:{ServiceKey}"))
    } `
    -OutFile "$InstallPath\contrast_security.yaml"

Expand-Archive "$InstallPath\Contrast.zip" -DestinationPath
$InstallPath
Remove-Item "$InstallPath\Contrast.zip"
```

4. Unzip the downloaded file and save the contents to the current Contrast agent location. If you do not know the location, you can look up the environment variables using the command for your system.

- Windows (64-bit)

```
echo %CORECLR_PROFILER_PATH_64%CORECLR_PROFILER_PATH_64
```

- Windows (32-bit)

```
CORECLR_PROFILER_PATH_32
```

- Linux (64-bit)

```
CORECLR_PROFILER_PATH_64
```

- Powershell

```
printenv CORECLR_PROFILER_PATH_64
```

## .NET Core advanced configuration

The easiest way to deploy .NET Core agents is to use the [Agent wizard \(page 70\)](#) in the Contrast web interface.

If you want additional information or methods related to the configuration of .NET Core agents, visit these topics:

- [.NET Core configuration \(page 297\)](#)
- [.NET Agent Explorer \(page 266\)](#)
- [Profile chaining \(page 333\)](#)
- [Azure functions \(page 331\)](#)

## Configure the .NET Core agent

The [standard configuration \(page 107\)](#) for all agents uses this [order of precedence \(page 111\)](#).

Depending on your situation, you can configure the .NET Core agent with:

- [Azure App Service \(page 298\)](#)
- [Environment variables \(page 298\)](#)
- [A YAML configuration file \(page 299\)](#)
- [Integrations \(page 1331\)](#)



### TIP

Use the [Contrast agent configuration editor \(page 113\)](#) to create or upload a YAML configuration file, validate YAML and get setting recommendations.

## .NET profiling and diagnostics variables

For .NET 8 and later, setting the `DOTNET_EnableDiagnostics` environment variable to 0 disables all diagnostics for the process, including profiling. This setting prevents the Contrast agent from working with your applications. Setting the `DOTNET_EnableDiagnostics_Profiler` environment variable to 0 disables profiling only, however, it also prevents the Contrast agent from working with your .NET 8 applications.

This behavior is different from the behavior in .NET 7 and earlier applications.



### NOTE

`COMPlus_EnableDiagnostics` is an alias of `DOTNET_EnableDiagnostics`, so setting this variable to 0 has the same effect on the Contrast agent.

To turn off the diagnostics port only and keep profiling on, set these environment variables:

```
DOTNET_EnableDiagnostics=1
```

`DOTNET_EnableDiagnostics_IPC=0`

[.NET Environment variables](#) provides additional information about these environment variables.

## Configure the .NET Core agent for Azure App Service

When using Azure App Service, you can configure the .NET Core agent with:

- **The Azure Portal:** Configure the .NET Core agent using [environment variables \(page 298\)](#). Add all settings to the **Application Settings** section of the **Configuration** blade using environment variable syntax.
- **Environment variables in a web.config file:** Place your overrides using the environment variable convention in the `<environmentVariables>` section of `<aspNetCore>` element.
- **A YAML configuration file (page 299):** Upload the file to your Azure web application by including it in your application deployment or using the Kudu console.  
In the **Configuration\Application Settings** blade, add a new application setting called `CONTRAST_CONFIG_PATH` with a value that points to this file.  
For example, to use the `contrast_security.yaml` file in the root of your application, add a new application setting with the key `CONTRAST_CONFIG_PATH` and value of `D:\Home\site\wwwroot\contrast_security.yaml` in **Configuration\Application Settings**. Application files in Azure App Service are deployed to `D:\home\site\wwwroot`.

### See also

- [Install the .NET Core agent with Azure App Service \(page 280\)](#)

## Configure .NET Core agent with environment variables

You can configure environment variables in several ways:

- Under IIS, [the web.config file can be used to configure application environment variables](#)
- Under Azure App services, the Azure platform provides a UI to configure the web site's environment variables.
- When developing, the `launchSettings.json` file can be used to configure the environment variables on launched applications.



### TIP

You can convert any of the properties in the [.NET Core YAML template \(page 299\)](#) to environment variables.

- To change the agent's logging level (`agent.logger.level`) to "TRACE", add a setting with key `CONTRAST__AGENT__LOGGER__LEVEL` and value "TRACE".
- To change the agent's server name (`server.name`) to "MyServer", add a setting with key `CONTRAST__SERVER__NAME` and value "MyServer".

Here are some of the most common settings:

| Environment variable                      | Purpose  |
|---|--|
| <code>CONTRAST__APPLICATION__NAME</code>  | Specify the application name reported to Contrast.   |
| <code>CONTRAST__APPLICATION__GROUP</code> | Specify the access group for this application. (You must have already created <a href="#">access groups (page 1446)</a> .) |

| Environment variable                    | Purpose  |
|---|--|
| CONTRAST__APPLICATION__SESSION_METADATA | Provide metadata which is used to create a new session ID in the Contrast web interface. Vulnerabilities discovered by the agent are associated with this new session. |
| CONTRAST__SERVER__NAME                  | Specify the server name reported to Contrast.  |
| CONTRAST__SERVER__ENVIRONMENT           | Specify in which environment the application is running (Development, QA and Production).  |

See the [.NET Core YAML template \(page 299\)](#) for a description of other available properties.

## .NET Core YAML configuration template

Use this template to configure the .NET Core agent using a YAML configuration file. (Learn more about [YAML configuration \(page 112\)](#).)

Place your YAML file in the default location:

- **Windows:** C:/ProgramData/contrast/dotnet-core/contrast\_security.yaml
- **Unix:** /etc/contrast/dotnet-core/contrast\_security.yaml

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
# UI.
#
=====
==
api:

  # ***** REQUIRED *****
  # Set the URL for the Contrast UI.
  url: https://app.contrastsecurity.com/Contrast

  # ***** REQUIRED *****
  # Set the API key needed to communicate with the Contrast UI.
  api_key: NEEDS_TO_BE_SET

  # ***** REQUIRED *****
  # Set the service key needed to communicate with the Contrast
  # UI. It is used to calculate the Authorization header.
```

```
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

# Set the version of the TLS protocol the agent uses to communicate with
the
# Contrast UI. The .NET agent default behavior is
(SecurityProtocolType.Tls
# | SecurityProtocolType.Tls11 | SecurityProtocolType.Tls12).
# tls_versions: tls|tls11|tls12

#
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Determine the location from which the agent loads a client
# certificate. Value options include `File` or `Store`.
# certificate_location: NEEDS_TO_BE_SET

# Set the absolute path to the client certificate's
# .CER file for communication with Contrast UI. The
# `certificate_location` property must be set to `File`.
# cer_file: NEEDS_TO_BE_SET

# Specify the name of certificate store to open. The
# `certificate_location` property must be set to `Store`.
# Value options include `AuthRoot`, `CertificateAuthority`,
# `My`, `Root`, `TrustedPeople`, or `TrustedPublisher`.
# store_name: NEEDS_TO_BE_SET

# Specify the location of the certificate store. The
# `certificate_location` property must be set to `Store`.
# Value options include `CurrentUser` or `LocalMachine`.
# store_location: NEEDS_TO_BE_SET

# Specify the type of value the agent uses to find the certificate
# in the collection of certificates from the certificate store.
# The `certificate_location` property must be set to `Store`.
```



```
# Value options include `FindByIssuerDistinguishedName`,
# `FindByIssuerName`, `FindBySerialNumber`,
# `FindBySubjectDistinguishedName`, `FindBySubjectKeyIdentifier`,
# `FindBySubjectName`, or `FindByThumbprint`.
# find_type: NEEDS_TO_BE_SET

# Specify the value the agent uses in combination with
# `find_type` to find a certification in the certificate store.
#
# Note - The agent will use the first certificate from
# the certificate store that matches this search criteria.
#
# find_value: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate
# with the Contrast web interface over a proxy. Set
# value to `false` if you don't want to use the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
# url: NEEDS_TO_BE_SET

# Set the proxy user.
# user: NEEDS_TO_BE_SET

# Set the proxy password.
# pass: NEEDS_TO_BE_SET

# Set the proxy authentication type. Value
# options are `NTLM`, `Digest`, and `Basic`.
# auth_type: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
```

```
# agent.route_coverage
# Use the following properties for the route-based coverage feature.
#
=====
# route_coverage:

# Set to `false` to stop the agent from sending
# route-based coverage data to the Contrast UI when the
#
# application returns an error code indicating
# the request was not processed as expected.
#
# report_on_error: false

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Set to `true` to redirect all logs to
# `stdout` instead of the file system.
# stdout: false

# Set the roll size for log files in megabytes. The agent will
# attempt to prevent the log file from being larger than this size.
# roll_size: 100

# Set the number of backup files to keep. Set to `0` to disable.
# backups: 10

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

#
=====
```

```
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

# Set the connection type used for Syslog messages.
# Value options are `UNENCRYPTED` and `ENCRYPTED`.
# connection_type: UNENCRYPTED

#
=====
# agent.dotnet
# The following properties apply to any .NET agent-wide configurations.
#
=====
# dotnet:
```

```
# Set a list of application pool names that the agent does not
# instrument or analyze. Names must be formatted as a comma-separated
# list. New after .NET Framework 19.1.3 and .NET Core 4.0.2.
# app_pool_denylist: NEEDS_TO_BE_SET

# Set a list of application pool names that the agent instruments or
# analyzes. If set, other application pools are ignored. Allowlist takes
# precedence over denylist. Names must be formatted as a comma-separated
# list. New after .NET Framework 19.1.3 and .NET Core 4.0.2.
# app_pool_allowlist: NEEDS_TO_BE_SET

# Set a list of application names that the agent does not
# analyze. (The applications are still instrumented).
# Names must be formatted as a comma-separated list.
# New after .NET Framework 19.1.3 and .NET Core 1.0.0.
# application_denylist: NEEDS_TO_BE_SET

# Set a list of application names that the agent analyzes.
# If set, other applications are not analyzed, but are
# still instrumented. Allowlist takes precedence over
# denylist. Names must be formatted as a comma-separated
# list. New after .NET Framework 19.1.3 and .NET Core 1.0.0.
# application_allowlist: NEEDS_TO_BE_SET

# Enable a profiler chaining feature to allow Contrast to
# work alongside other tools that use the CLR Profiling
# API. Defaults to `true`. New after .NET Framework 19.1.3
# (Installed Only) and .NET Core 1.9.3 (Installed Only).
# enable_chaining: true

# Indicate that the agent should monitor configuration files for
# changes. New after .NET Framework 50.0.15 and .NET Core 2.1.14.
# enable_file_watching: true

# Indicate that the agent should allow CLR optimizations
# of JIT-compiled methods. Defaults to `true`. New
# after .NET Framework 19.1.3 and .NET Core 1.0.0.
# enable_instrumentation_optimizations: true

# Indicate that the agent should allow the CLR to inline
# methods that are not instrumented by Contrast. Defaults to
# `true`. New after .NET Framework 19.1.3 and .NET Core 1.0.0.
# enable_jit_inlining: true

# Indicate that the agent should allow the CLR to perform
# transparency checks under full trust. Defaults to `false`.
# New after .NET Framework 19.1.3 and .NET Core 1.0.0.
# enable_transparency_checks: false

# Set to display ASCII art to std::out on agent startup. Defaults
# to `true`. New after .NET Framework 20.6.3 and .NET Core 1.0.0.
# enable_cat: true

# Sets the maximum amount of time a Protect regular expression
```

```
# is allowed to run before being cancelled. Set to -1 to never
# cancel regular expression execution. Defaults to `20_000`.
# New after .NET Framework 20.4.3 and .NET Core 1.5.0.
# protect_searchers_single_pattern_deadline_ms: 20_000

# Sets the maximum amount of time a 'Probe Analysis' Protect
# regular expression is allowed to run before being cancelled. Set
# to -1 to never cancel regular expression execution. Defaults to
# `5_000`. New after .NET Framework 20.7.3 and .NET Core 1.5.11.
# protect_searchers_probe_analysis_single_pattern_deadline_ms: 5_000

# Sets the maximum amount of time a Protect rule is
# allowed to run before being cancelled. Set to -1 to never
# cancel Protect rule execution. Defaults to `60_000`.
# New after .NET Framework 20.4.3 and .NET Core 1.5.0.
# protect_searchers_total_rule_deadline_ms: 60_000

# Sets the maximum amount of time a 'Probe Analysis' Protect
# rule is allowed to run before being cancelled. Set to -1 to
# never cancel Protect rule execution. Defaults to `10_000`.
# New after .NET Framework 20.7.3 and .NET Core 1.5.11.
# protect_searchers_probe_analysis_total_rule_deadline_ms: 10_000

# Sets the maximum duration of time agent log files should be kept
# since last write before being deleted by the agent. Defaults to
# `604_800_000`. New after .NET Framework 20.6.1 and .NET Core 1.5.5.
# log_cleanup_maximum_age_ms: 604_800_000

# Suppresses gathering process-level metrics (process level metrics are
# gathered by default), used to identify performance problems. Metric
# counters may further decrease the stability of already unstable
# systems and can be disabled (set to true) if issues occur. Defaults
# to `false`. New after .NET Framework 20.6.6 and .NET Core 1.5.10.
# suppress_metric_counters: false

# Enable file based application watching. Set to false if
# file watching is causing locking issues. Defaults to `true`.
# New after .NET Framework 20.7.3 and .NET Core 1.5.11.
# enable_file_based_app_watching: true

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
```

```
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Control the values captured by Assess vulnerability events. `Full`
# captures most values by calling ToString on objects, which can
# provide more info but causes increased memory usage. `Minimal`
# has better performance as it only captures String type objects
# as strings and uses type name for other object type values.
# event_detail: minimal

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10

# This property indicates the duration for which a sample set is valid.
```

```
# window_ms: 180_000

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.probe_analysis
# Use the settings in this section to
# control the behavior of probe analysis.
#
=====
# probe_analysis:

# Set to `false` to disable probe analysis.
# enable: true

#
=====
# protect.rules
# Use the following properties to set simple rule configurations.
#
=====
# rules:

# Define a list of Protect rules to disable in the agent. To view a
```

```
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====
# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====
# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====
# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====
# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.sql-injection-semantic-chaining
# Use the following properties to configure how the
# sql injection semantic analysis chaining rule works.
#
=====
# sql-injection-semantic-chaining:

# Set the mode of the rule. Value options
# are `monitor`, `block` or `off`.
# mode: off

#
=====
# protect.rules.sql-injection-semantic-dangerous-functions
# Use the following properties to configure how the sql
# injection semantic analysis dangerous functions rule works.
#
=====
# sql-injection-semantic-dangerous-functions:

# Set the mode of the rule. Value options
```



```
# are `monitor`, `block` or `off`.
# mode: off

#
=====
# protect.rules.sql-injection-semantic-suspicious-unions
# Use the following properties to configure how the sql
# injection semantic analysis suspicious unions rule works.
#
=====
# sql-injection-semantic-suspicious-unions:

# Set the mode of the rule. Value options
# are `monitor`, `block` or `off`.
# mode: off

#
=====
# protect.rules.sql-injection-semantic-tautologies
# Use the following properties to configure how the sql
# injection semantic analysis tautologies rule works.
#
=====
# sql-injection-semantic-tautologies:

# Set the mode of the rule. Value options
# are `monitor`, `block` or `off`.
# mode: off

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Tell the agent to detect when commands come directly
# from input. The agent blocks if blocking is enabled.
# detect_phased_commands: true

#
=====
# protect.rules.cmd-injection-semantic-chained-commands
# Use the following properties to configure how the
# 'command injection - chained commands' rule works
```

```
#
=====
# cmd-injection-semantic-chained-commands:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.cmd-injection-semantic-dangerous-paths
# Use the following properties to configure how the
# 'command injection - dangerous paths' rule works
#
=====
# cmd-injection-semantic-dangerous-paths:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.cmd-injection-command-backdoors
# Use the following properties to configure how the
# 'command injection - command backdoors' rule works
#
=====
# cmd-injection-command-backdoors:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.path-traversal-semantic-file-security-bypass
# Use the following properties to configure how the
# 'path traversal - file security bypass' rule works
#
=====
# path-traversal-semantic-file-security-bypass:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:
```

```
# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.unsafe-file-upload
# Use the following properties to configure
# how the unsafe file upload rule works.
#
=====
# unsafe-file-upload:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
```

```
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.untrusted-deserialization
# Use the following properties to configure
# how the untrusted deserialization rule works.
#
=====
# untrusted-deserialization:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
```

```
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
```

```
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Override the reported server path. New after
# .NET Framework v21.3.1 and .NET Core v1.8.0.
# path: NEEDS_TO_BE_SET

#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
# UI.
#
=====
==
api:
```

```
# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

# Set the version of the TLS protocol the agent uses to communicate with
the
# Contrast UI. The .NET agent default behavior is
(SecurityProtocolType.Tls
# | SecurityProtocolType.Tls11 | SecurityProtocolType.Tls12).
# tls_versions: tls|tls11|tls12

#
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Determine the location from which the agent loads a client
# certificate. Value options include `File` or `Store`.
# certificate_location: NEEDS_TO_BE_SET

# Set the absolute path to the client certificate's
# .CER file for communication with Contrast UI. The
# `certificate_location` property must be set to `File`.
# cer_file: NEEDS_TO_BE_SET

# Specify the name of certificate store to open. The
# `certificate_location` property must be set to `Store`.
```

```
# Value options include `AuthRoot`, `CertificateAuthority`,
# `My`, `Root`, `TrustedPeople`, or `TrustedPublisher`.
# store_name: NEEDS_TO_BE_SET

# Specify the location of the certificate store. The
# `certificate_location` property must be set to `Store`.
# Value options include `CurrentUser` or `LocalMachine`.
# store_location: NEEDS_TO_BE_SET

# Specify the type of value the agent uses to find the certificate
# in the collection of certificates from the certificate store.
# The `certificate_location` property must be set to `Store`.
# Value options include `FindByIssuerDistinguishedName`,
# `FindByIssuerName`, `FindBySerialNumber`,
# `FindBySubjectDistinguishedName`, `FindBySubjectKeyIdentifier`,
# `FindBySubjectName`, or `FindByThumbprint`.
# find_type: NEEDS_TO_BE_SET

# Specify the value the agent uses in combination with
# `find_type` to find a certification in the certificate store.
#
# Note - The agent will use the first certificate from
# the certificate store that matches this search criteria.
#
# find_value: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate
# with the Contrast web interface over a proxy. Set
# value to `false` if you don't want to use the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
# url: NEEDS_TO_BE_SET

# Set the proxy user.
# user: NEEDS_TO_BE_SET

# Set the proxy password.
# pass: NEEDS_TO_BE_SET

# Set the proxy authentication type. Value
# options are `NTLM`, `Digest`, and `Basic`.
# auth_type: NEEDS_TO_BE_SET

#
```



```
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.route_coverage
# Use the following properties for the route-based coverage feature.
#
=====
# route_coverage:

# Set to `false` to stop the agent from sending
# route-based coverage data to the Contrast UI when the
#
# application returns an error code indicating
# the request was not processed as expected.
#
# report_on_error: false

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Set to `true` to redirect all logs to
# `stdout` instead of the file system.
# stdout: false

# Set the roll size for log files in megabytes. The agent will
# attempt to prevent the log file from being larger than this size.
# roll_size: 100

# Set the number of backup files to keep. Set to `0` to disable.
# backups: 10

#
=====
# agent.security_logger
# Define the following properties to set security logging
```

```
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

#
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING
```

```
# Set the connection type used for Syslog messages.
# Value options are `UNENCRYPTED` and `ENCRYPTED`.
# connection_type: UNENCRYPTED

#
=====
# agent.dotnet
# The following properties apply to any .NET agent-wide configurations.
#
=====
# dotnet:

# Set a list of application pool names that the agent does not
# instrument or analyze. Names must be formatted as a comma-separated
# list. New after .NET Framework 19.1.3 and .NET Core 4.0.2.
# app_pool_denylist: NEEDS_TO_BE_SET

# Set a list of application pool names that the agent instruments or
# analyzes. If set, other application pools are ignored. Allowlist takes
# precedence over denylist. Names must be formatted as a comma-separated
# list. New after .NET Framework 19.1.3 and .NET Core 4.0.2.
# app_pool_allowlist: NEEDS_TO_BE_SET

# Set a list of application names that the agent does not
# analyze. (The applications are still instrumented).
# Names must be formatted as a comma-separated list.
# New after .NET Framework 19.1.3 and .NET Core 1.0.0.
# application_denylist: NEEDS_TO_BE_SET

# Set a list of application names that the agent analyzes.
# If set, other applications are not analyzed, but are
# still instrumented. Allowlist takes precedence over
# denylist. Names must be formatted as a comma-separated
# list. New after .NET Framework 19.1.3 and .NET Core 1.0.0.
# application_allowlist: NEEDS_TO_BE_SET

# Enable a profiler chaining feature to allow Contrast to
# work alongside other tools that use the CLR Profiling
# API. Defaults to `true`. New after .NET Framework 19.1.3
# (Installed Only) and .NET Core 1.9.3 (Installed Only).
# enable_chaining: true

# Indicate that the agent should monitor configuration files for
# changes. New after .NET Framework 50.0.15 and .NET Core 2.1.14.
# enable_file_watching: true

# Indicate that the agent should allow CLR optimizations
# of JIT-compiled methods. Defaults to `true`. New
# after .NET Framework 19.1.3 and .NET Core 1.0.0.
# enable_instrumentation_optimizations: true

# Indicate that the agent should allow the CLR to inline
# methods that are not instrumented by Contrast. Defaults to
# `true`. New after .NET Framework 19.1.3 and .NET Core 1.0.0.
```

```
# enable_jit_inlining: true

# Indicate that the agent should allow the CLR to perform
# transparency checks under full trust. Defaults to `false`.
# New after .NET Framework 19.1.3 and .NET Core 1.0.0.
# enable_transparency_checks: false

# Set to display ASCII art to std::out on agent startup. Defaults
# to `true`. New after .NET Framework 20.6.3 and .NET Core 1.0.0.
# enable_cat: true

# Sets the maximum amount of time a Protect regular expression
# is allowed to run before being cancelled. Set to -1 to never
# cancel regular expression execution. Defaults to `20_000`.
# New after .NET Framework 20.4.3 and .NET Core 1.5.0.
# protect_searchers_single_pattern_deadline_ms: 20_000

# Sets the maximum amount of time a 'Probe Analysis' Protect
# regular expression is allowed to run before being cancelled. Set
# to -1 to never cancel regular expression execution. Defaults to
# `5_000`. New after .NET Framework 20.7.3 and .NET Core 1.5.11.
# protect_searchers_probe_analysis_single_pattern_deadline_ms: 5_000

# Sets the maximum amount of time a Protect rule is
# allowed to run before being cancelled. Set to -1 to never
# cancel Protect rule execution. Defaults to `60_000`.
# New after .NET Framework 20.4.3 and .NET Core 1.5.0.
# protect_searchers_total_rule_deadline_ms: 60_000

# Sets the maximum amount of time a 'Probe Analysis' Protect
# rule is allowed to run before being cancelled. Set to -1 to
# never cancel Protect rule execution. Defaults to `10_000`.
# New after .NET Framework 20.7.3 and .NET Core 1.5.11.
# protect_searchers_probe_analysis_total_rule_deadline_ms: 10_000

# Sets the maximum duration of time agent log files should be kept
# since last write before being deleted by the agent. Defaults to
# `604_800_000`. New after .NET Framework 20.6.1 and .NET Core 1.5.5.
# log_cleanup_maximum_age_ms: 604_800_000

# Suppresses gathering process-level metrics (process level metrics are
# gathered by default), used to identify performance problems. Metric
# counters may further decrease the stability of already unstable
# systems and can be disabled (set to true) if issues occur. Defaults
# to `false`. New after .NET Framework 20.6.6 and .NET Core 1.5.10.
# suppress_metric_counters: false

# Enable file based application watching. Set to false if
# file watching is causing locking issues. Defaults to `true`.
# New after .NET Framework 20.7.3 and .NET Core 1.5.11.
# enable_file_based_app_watching: true

#
=====
==
```

```
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Control the values captured by Assess vulnerability events. `Full`
# captures most values by calling ToString on objects, which can
# provide more info but causes increased memory usage. `Minimal`
# has better performance as it only captures String type objects
# as strings and uses type name for other object type values.
# event_detail: minimal

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:
```

```
# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10

# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.probe_analysis
# Use the settings in this section to
# control the behavior of probe analysis.
#
=====
# probe_analysis:
```

```
# Set to `false` to disable probe analysis.
# enable: true

#
=====
# protect.rules
# Use the following properties to set simple rule configurations.
#
=====
# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====
# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====
# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====
# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====
# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.sql-injection-semantic-chaining
# Use the following properties to configure how the
# sql injection semantic analysis chaining rule works.
#
=====
# sql-injection-semantic-chaining:

# Set the mode of the rule. Value options
# are `monitor`, `block` or `off`.
```

```
# mode: off

#
=====
# protect.rules.sql-injection-semantic-dangerous-functions
# Use the following properties to configure how the sql
# injection semantic analysis dangerous functions rule works.
#
=====
# sql-injection-semantic-dangerous-functions:

# Set the mode of the rule. Value options
# are `monitor`, `block` or `off`.
# mode: off

#
=====
# protect.rules.sql-injection-semantic-suspicious-unions
# Use the following properties to configure how the sql
# injection semantic analysis suspicious unions rule works.
#
=====
# sql-injection-semantic-suspicious-unions:

# Set the mode of the rule. Value options
# are `monitor`, `block` or `off`.
# mode: off

#
=====
# protect.rules.sql-injection-semantic-tautologies
# Use the following properties to configure how the sql
# injection semantic analysis tautologies rule works.
#
=====
# sql-injection-semantic-tautologies:

# Set the mode of the rule. Value options
# are `monitor`, `block` or `off`.
# mode: off

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
```



```
#
# mode: off

# Tell the agent to detect when commands come directly
# from input. The agent blocks if blocking is enabled.
# detect_phased_commands: true

#
=====
# protect.rules.cmd-injection-semantic-chained-commands
# Use the following properties to configure how the
# 'command injection - chained commands' rule works
#
=====
# cmd-injection-semantic-chained-commands:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.cmd-injection-semantic-dangerous-paths
# Use the following properties to configure how the
# 'command injection - dangerous paths' rule works
#
=====
# cmd-injection-semantic-dangerous-paths:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.cmd-injection-command-backdoors
# Use the following properties to configure how the
# 'command injection - command backdoors' rule works
#
=====
# cmd-injection-command-backdoors:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.path-traversal-semantic-file-security-bypass
# Use the following properties to configure how the
# 'path traversal - file security bypass' rule works
#
=====
# path-traversal-semantic-file-security-bypass:
```

```
# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off
```

```
#
=====
# protect.rules.unsafe-file-upload
# Use the following properties to configure
# how the unsafe file upload rule works.
#
=====
# unsafe-file-upload:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.untrusted-deserialization
# Use the following properties to configure
# how the untrusted deserialization rule works.
#
=====
# untrusted-deserialization:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
==
# application
```

```
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
```

```
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Override the reported server path. New after
# .NET Framework v21.3.1 and .NET Core v1.8.0.
# path: NEEDS_TO_BE_SET
```

## .NET Agent Explorer



### IMPORTANT

Starting with .NET Core agent 4.0.0 and .NET Framework agent 51.0.0, Agent Explorer replaces the Contrast Tray application.

The .NET Agent Explorer is an application that displays high-level information about the health of the .NET Core and .NET Framework agents. Use this application to verify that the agent is working as expected, especially after you initially install the agent.

Installing an agent also installs this application. If you install both types of agents, only one instance of Agent Explorer is installed.

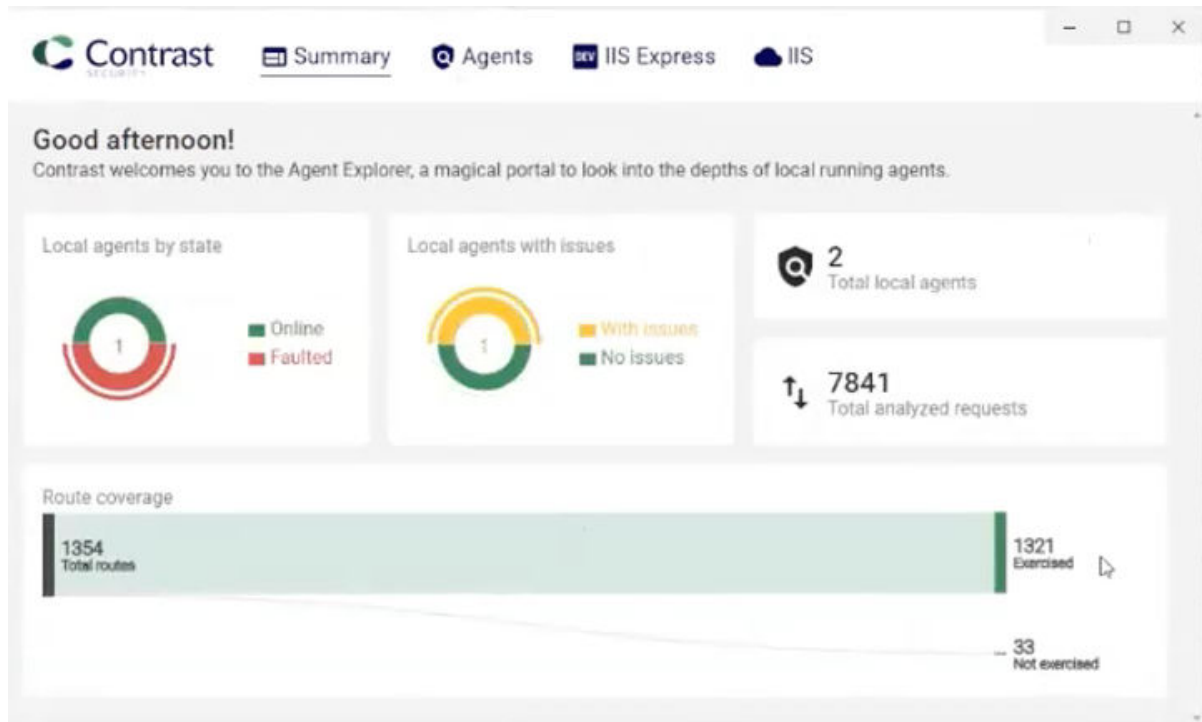
## Agent Explorer access

After you install a .NET Core or .NET Framework agent, the Agent Explorer icon (🔍) displays in the tray. Right-click the icon to open the application.

## Agent Explorer details

The Agent Explorer displays these details:

- **Summary**



This dashboard shows high level details about your agents, including their stage, whether any of them have issues, and route coverage.

- **Agents**

The screenshot shows the Contrast Security web interface. At the top, there's a navigation bar with 'Summary', 'Agents', 'IIS Express', and 'IIS'. Below this, a breadcrumb trail shows 'Return', 'Overview', 'Configuration', 'Advanced information', and 'Agent specific metadata'. The main content area is titled '.NET' and displays various agent details:

- Application name:** DotnetCore5
- Agent language:** .NET Core
- Runtime version:** .NET 5.0.17
- Total requests:** 5152
- Running since:** 19 minutes ago
- Application PID:** 532188
- Agent version:** 19.9.0.0
- Runtime bitness:** x64
- Exercised routes:** 1321/1354
- Agent modes:** assess, protect, inventory
- YAML file path:** [D:\Development\dotnet\dotnet-agent\tests\integration-tests\DotnetCore5\localAgent.yaml](#)
- Logs directory:** [C:\ProgramData\contrast\dotnet-core\logs](#)

Below this, the 'Configuration' section shows a table of settings:

| Name    | Value                     |             |
|---------|---------------------------|-------------|
| enable  | true                      | yaml-config |
| api.url | https://teamserver-...com | yaml-config |

This tab provides details about the health of your .NET Core and .NET Framework agents. The Configuration section displays a message if Agent Explorer discovers a specific issue that is occurring.

You can access the agent's configuration (YAML) file directly from the link in the Overview section. Scroll down to see information about the agent's configuration, advanced information, and session metadata.

- **IIS Express**

This tab shows details for web applications running on IIS Express.

- **IIS**

This tab shows details for the web applications running on the IIS server.

## Supported Azure functions

### Versions

| Runtime version | Language version   | Supported   | Not supported   |
|-----------------|--------------------|---|---|
| 1.x             | .NET Framework 4.8 | <ul style="list-style-type: none"> <li>Windows application: supported with Azure .NET Framework Site Extension</li> </ul>   | <ul style="list-style-type: none"> <li>Docker Linux image</li> <li>Linux application</li> </ul> |
| 3.x             | .NET 5             | <ul style="list-style-type: none"> <li>Windows Application: Supported locally and in Azure with the .NET Core Site Extension</li> <li>Docker Linux Image: Supported locally and in Azure</li> </ul> | <ul style="list-style-type: none"> <li>Linux application</li> </ul>                             |
| 4.x             | .NET 6             | <ul style="list-style-type: none"> <li>Windows Application: Supported locally and in Azure with the .NET Core Site Extension</li> <li>Docker Linux Image: Supported locally and in Azure</li> </ul> | <ul style="list-style-type: none"> <li>Linux application</li> </ul>                             |



### NOTE

For all versions, running the Azure Functions application in isolated mode is not supported by the .NET agent.

## Supported triggers

- HTTP
- Service Bus

## Configuration

Azure Functions supports three deployment scenarios: Windows applications, Linux applications, and Docker Linux images. Of those three, only Windows applications and Docker Linux images are compatible with the agent. Linux application deployment is not supported by the .NET agent.

### Windows Application

The Windows application deployment option is fully supported for Azure Functions versions 1, 3, and 4. Locally, the application can reference the Contrast .NET Core Agent NuGet package. On Azure, you must install the Contrast .NET Core Site Extension. When you deploy the Azure Function application using a tool (for example, Visual Studio or Core Tools), in a CI/CD pipeline or using the Azure Functions portal editor, the site extension will **not** automatically set the required application settings. You must specify the application settings manually.

To do this, set the following application settings (Settings > Configuration > Application settings) to enable the agent to attach:

```
CORECLR_ENABLE_PROFILING=1
CORECLR_PROFILER={8B2CE134-0948-48CA-A4B2-80DDAD9F5791}
CORECLR_PROFILER_PATH_32=C:\home\SiteExtensions\Contrast.NetCore.Azure.SiteExtension\ContrastNetCoreAppService-<version>\runtimes\win-x86\native\ContrastProfiler.dll
CORECLR_PROFILER_PATH_64=C:\home\SiteExtensions\Contrast.NetCore.Azure.SiteExtension\ContrastNetCoreAppService-<version>\runtimes\win-x64\native\ContrastProfiler.dll
```

Where <version> is the version of the agent in the form "0.0.0.0". For example, if the agent version is "2.1.8" the path would be:

```
C:\home\SiteExtensions\Contrast.NetCore.Azure.SiteExtension\ContrastNetCoreAppService-2.1.8.0\runtimes\win-x64\native\ContrastProfiler.dll.
```

Connection information for Contrast server can be supplied either using application settings or in a configuration file that is pointed to by an application setting.

#### Application settings

```
CONTRAST_API_USER_NAME=my_username
CONTRAST_API_SERVICE_KEY=my_service_key
CONTRAST_API_API_KEY=my_api_key
CONTRAST_API_URL=my_api_url
```

If Contrast server connection information is supplied via configuration file, the following application setting must be set:

```
CONTRAST_CONFIG_PATH=C:\home\site\wwwroot\contrast_security.yaml
```

### Docker Linux image

The custom Linux image deployment option is supported for Azure Functions versions 3 and 4. A custom Linux image is required and it must contain the application and the Contrast .NET Core Agent NuGet package. Note that Linux applications, when not run from a custom Linux image, are not supported by the .NET agent.

The following application settings must be set in order for the agent to attach. These can either be in the image itself (as environment variables) or set as application settings (Settings > Configuration > Application settings).



```
CORECLR_ENABLE_PROFILING=1
CORECLR_PROFILER={8B2CE134-0948-48CA-A4B2-80DDAD9F5791}
CORECLR_PROFILER_PATH=/home/site/wwwroot/contrast/runtimes/linux-x64/native/
ContrastProfiler.so
CORECLR_PROFILER_PATH_64=/home/site/wwwroot/contrast/runtimes/linux-x64/
native/ContrastProfiler.so
CONTRAST_CORECLR_INSTALL_DIRECTORY=/home/site/wwwroot/bin/contrast/
```

Connection information for Contrast server can be supplied either using application settings/environment variables or in a configuration file that is pointed to by an application setting/environment variable.

Application setting/environment variables:

```
CONTRAST__API__USER_NAME=my_username
CONTRAST__API__SERVICE_KEY=my_service_key
CONTRAST__API__API_KEY=my_api_key
CONTRAST__API__URL=my_api_url
```

If the Contrast server connection information is supplied via configuration file, the following application setting/environment variable must be set: `CONTRAST_CONFIG_PATH=/home/site/wwwroot/contrast_security.yaml`

## Profiler chaining for the .NET Core agent

You can use profiler chaining to run the .NET Core agent alongside another .NET Core APM profiler.

The Contrast .NET Core agent is tested and proven to be compatible with the following profiling tools, given the combination of runtime, deployment type, and OS:

| Profiling tool                     | Versions tested | .NET Core runtime | Third-party profiler deployment type | OS             |
|------------------------------------|-----------------|-------------------|--------------------------------------|----------------|
| AppDynamics                        | 21.8.1          | 6.0               | Installed, NuGet Package             | Windows        |
| Dynatrace One Agent                | 1.253.245       | 6.0               | Installed                            | Windows, Linux |
| New Relic                          | 8.23.107        | 6.0               | NuGet Package                        | Windows, Linux |
| Riverbed SteelCentral Aternity APM | 12.9.0          | 6.0               | Installed                            | Windows        |
| Datadog                            | 2.35.0          | 6.0               | Installed, NuGet Package             | Windows, Linux |



### NOTE

The agent is likely compatible with other profiling tools if those tools follow the conventions of the CoreCLR Profiling API and do not make assumptions about the profiling environment.

Chaining is enabled by default and can be disabled by setting `agent.dotnet.enable_chaining` to `false`.

```
agent:
  dotnet:
    enable_chaining: false
```

## Automatic (Windows and IIS)

When using the .NET Core installer for IIS, the installer configures chaining automatically for all hosted .NET Core applications.

1. Install the third-party agent first (recommended), then the Contrast .NET Core agent.
2. Restart the IIS workers (by default, this is done automatically by the agent installer). On restart, the Contrast .NET Core agent automatically detects the presence of other profiling tools registered with IIS and configures the environment to load both the Contrast .NET Core agent profiler and the third-party profiler.

### Automatic (Linux)

Under Linux, automatic chaining may be configured by setting the `LD_PRELOAD` environment variable:

```
LD_PRELOAD=<path to the extracted Contrast files>/runtimes/linux-x64/native/  
ContrastChainLoader.so
```

For example, if the Contrast agent was extracted to `/contrast`, then the following would setup chaining automatically.

```
LD_PRELOAD=/contrast/runtimes/linux-x64/native/ContrastChainLoader.so  
dotnet ./HelloWorld
```

Some APM profilers already set `LD_PRELOAD` (e.g. Dynatrace). In this case, ensure the Contrast module is loaded first - separate `LD_PRELOAD` are delimited by colons `:`. For example:

```
LD_PRELOAD=/contrast/runtimes/linux-x64/native/ContrastChainLoader.so:  
<path to Dynatrace>/liboneagentproc.so dotnet ./HelloWorld
```



#### NOTE

When running under Kubernetes, the [Contrast Agent Operator \(page 611\)](#) will automatically setup chaining and is the preferred route to add agents to existing Kubernetes workloads.

### Manual

Chaining may need to be manually setup, for example, in the following environments:

- Hosted outside of IIS.
- Environments that use the third-party agent's Nuget package (rather than the installed agent).



#### NOTE

Chaining with the Dynatrace agent is only supported using the automatic options above.

1. Replace the CLR environment variables for the profiling tool with `CONTRAST_CCC_CORECLR` versions. Any of these names should be transformed:

| Change this                           | To this  |
|---------------------------------------|--|
| <code>CORECLR_PROFILER</code>         | <code>CONTRAST_CCC_CORECLR_PROFILER</code>         |
| <code>CORECLR_PROFILER_PATH</code>    | <code>CONTRAST_CCC_CORECLR_PROFILER_PATH</code>    |
| <code>CORECLR_PROFILER_PATH_32</code> | <code>CONTRAST_CCC_CORECLR_PROFILER_PATH_32</code> |

| Change this              | To this                               |
|--------------------------|---------------------------------------|
| CORECLR_PROFILER_PATH_64 | CONTRAST_CCC_CORECLR_PROFILER_PATH_64 |

2. Then add the agent [manually \(page 272\)](#).

## Node.js agent

The Contrast Node.js agent analyzes the behavior of Node.js web applications using established techniques, such as source-to-source compilation, to add Contrast sensors to an application before execution.



### NOTE

The latest Node.js agent supports Assess (IAST), Protect (RASP), and SCA features.

The Contrast Node.js agent follows semantic versioning (major.minor.patch). The agent works best with these [supported technologies \(page 80\)](#) and these [system requirements \(page 83\)](#).

The Node.js agent rewrites the application code before startup using the Babel compiler. After starting up the agent patches the required functions for the [supported frameworks and modules \(page 80\)](#).

Once you [install the Node.js agent \(page 79\)](#), there are two primary source code transformations that it uses to monitor the behavior of your application:

- **AST transformation** is the process by which the agent creates an abstract syntax tree of a body of code, manipulates the tree and then creates new source code based on this syntax tree. The agent goes through this process to handle scenarios in which function hooks won't work. For example, rewrites allow Contrast to add operator overloading to JavaScript so that it can properly track the flow of untrusted data.
- **Function hooks** take over the execution of a given function like `child_process.exec`, to collect data about its arguments and its return value, and send this data to the parts of the agent responsible for analysis. As a result, the agent enables certain functions to be self-reporting.

## Contrast service



### NOTE

Contrast service is only required for the Node.js agent version 4.X.X and earlier.

The [Contrast service \(page 589\)](#) is an executable which is packaged within the Node.js agent and runs in a separate process. With versions 4.X.X of the agent the Contrast service starts up automatically with the agent.

The service enables communication between the Node.js agent and Contrast. Like the agent, it can be [configured \(page 590\)](#) with [environment variables \(page 115\)](#) or a [YAML configuration file \(page 112\)](#). The Contrast service uses port 30555 as the default for HTTP communication between the agent and the service.

You can configure the port and communication protocol between the agent and service. Available protocols include HTTP, Linux socket (file descriptor), and gRPC. The service can be deployed one-for-one with the agent, or shared across a group of agents on a single server hosting multiple containers.

## Node.js advanced installation

The easiest way to deploy Node.js agents is to use the [Agent wizard \(page 79\)](#) in the Contrast web interface.

The topics in this section are for users who want additional information or methods related to deploying Node.js agents.

| Category     | Topics   |
|--------------|--|
| Installation | <ul style="list-style-type: none"><li>• <a href="#">Install the Node.js agent (page 336)</a></li><li>• <a href="#">Node.js telemetry (page 336)</a></li><li>• <a href="#">Install Node.js with IBM Cloud (page 337)</a></li><li>• <a href="#">Install Node.js with VMware Tanzu (page 338)</a></li><li>• <a href="#">Update the Node.js agent (page 343)</a></li><li>• <a href="#">Reduce container startup time (page 354)</a></li><li>• <a href="#">Use the Node.js agent with ESM (page 356)</a></li><li>• <a href="#">Transpilers, compilers, source maps and the Node.js agent (page 356)</a></li></ul> |
| Playbook     | <ul style="list-style-type: none"><li>• <a href="#">Ansible playbook for Contrast agents (page 585)</a></li></ul>  |

### See also

[Advanced configuration \(page 357\)](#)

### Install the Node.js agent

There are several ways to install the agent depending on your situation, but generally, this is the process:

1. Install the Node.js agent from npm by running the `npm install @contrast/agent` command in the application's root directory.
2. Set [authentication keys \(page 109\)](#).
3. Add a command to the `package.json` file to enable your application to run with the agent. Depending on the method of installation, one of the following commands can be added to the `package.json` file.
  - For Node LTS 18.19.0 and later, use the `--import` command to run the agent.

```
node --import @contrast/agent app-main.js [app arguments]
```

- For Node LTS versions greater than or equal to 16.17.0 and less than 18.19.0, use `--loader` to start the application.

```
node --loader @contrast/agent app-main.js [app arguments]
```

- For Node LTS versions less than 16.17.0 use the legacy method for starting the application. This is also applicable to applications not using the ESM syntax.

```
node -r @contrast/agent app-main.js [app arguments]
```

4. Use your application as you normally would and verify that Contrast sees the application.
5. To avoid errors, follow these specific instructions depending on how your application is deployed:
  - [Install manually \(page 353\)](#)
  - [Install in a container \(page 345\)](#)
  - [Install with IBM Cloud \(page 337\)](#)

### Node.js telemetry

The Node.js agent uses telemetry to collect usage data. Telemetry is collected when an instrumented application first loads the agent's sensors. Currently, data is only sent at startup. In the future, the agent will be able to send errors and metrics when the instrumented app is running and being exercised.

[Your privacy is important to us \(page 1563\)](#). The telemetry feature does not collect application data. The data is anonymized before being sent securely to Contrast. Then the aggregated data is stored encrypted and under restricted access control. Any collected data will be deleted after one year.

The telemetry feature collects the following data:

| Agent versions                   | Data                                    |
|----------------------------------|---|
| @contrast/agent 4.12.0 and later | Agent version                           |
|                                  | Operating system and version            |
|                                  | Node.js version                         |
|                                  | Is the app running in a container (Y/N) |

To opt-out of the telemetry feature, set the `CONTRAST_AGENT_TELEMETRY_OPTOUT` environment variable to 1 or true.

Telemetry data is securely sent to <http://telemetry.nodejs.contrastsecurity.com>. You can also opt-out of telemetry by blocking communication at the network level.

## Install Node.js with IBM Cloud

1. Install the latest LTS (Long Term Support) version of Node.js.
2. To install from npm, run this command from the app root directory:

```
npm install @contrast/agent
```

Alternatively, if you use yarn, run this command to install the agent:

```
yarn add @contrast/agent
```

3. Configure the Node.js (page 357) using a YAML configuration file to set the authentication keys (page 109) and any application-specific configuration. You can use this sample `contrast_security.yaml` file, but replace `<URL>`, `<UserName>`, `<APIKey>` and `<ServiceKey>` with your values, and set `<ServerName>` to the name of the IBM cloud server to which this application will report. (This way you will be able to identify the server when you view it in Contrast.)

```
contrast:
  url: <URL>
  user_name: <UserName>
  api_key: <APIKey>
  service_key: <ServiceKey>
server:
  name: <ServerName>
```

4. Copy your Contrast YAML file to your application's root directory or use environmental variables to set the required Contrast API credentials and configuration settings.
5. Add this command to the "scripts": section of your application's `package.json` file:

```
"ibmcloud-with-contrast": "CONTRAST_CONFIG_PATH=[the full path location of your YAML file] node --import @contrast/agent index.js",
```

6. Since IBM Cloud runs the start script by default, you must change the start command to point to the `ibmcloud-with-contrast` line given in the previous step. Run the agent using:

```
"start": "npm run ibmcloud-with-contrast"
```

Now the scripts section of the `package.json` should look like the following:

```
"scripts": {
  "bluemix-with-contrast": "CONTRAST_CONFIG_PATH=[the full path location of your YAML file] node --import @contrast/agent index.js",
  "start": "npm run bluemix-with-contrast"
},
```

7. Push the application to IBM Cloud using:

```
cf push <application-name> -t 180
```

8. Run the agent with:

```
npm start
```

9. Exercise your application by performing either manual or automated testing to ensure your application is functioning correctly with the agent installed.
10. Verify that your server is registered in Contrast and reports an instance of your application.

### Install Node.js agent with VMware Tanzu

You can access a variety of VMware Tanzu (formerly Pivotal Cloud Foundry) integrations for your applications using the default Node.js buildpack.

To use the buildpack on its own as a low-level integration, you can create a user-provided service and bind it to your application. With the service broker, you can define multiple service plans and generate service instances you can bind to your applications.

Use the [Contrast service broker tile \(page 339\)](#) to automate the BOSH deployment and configuration of the [Contrast service broker \(page 341\)](#).



#### IMPORTANT

The Contrast VMware Tanzu integration does not download the Node.js agent and modify your application startup. You must still download and [install the Node.js agent manually \(page 353\)](#).

You can configure the agent through the Contrast service broker tile provided with the integration or you can use automatic configuration through user-provided services.

### Buildpacks

To install the Node.js agent in a VMware Tanzu environment, your application must use one of these buildpacks:

- **For tile support:** [NodeJS Buildpack](#) version 1.6.52 and later
- **For user-provided service support:** [NodeJS Buildpack](#) version 1.6.56 and later

If you are using a buildpack that does not include Contrast Security framework support, you can add it. To do this, you must make changes to your forked buildpack. If you are using the offline version of the buildpack, you cannot override the version of the agent currently in use by an application. The buildpack bundles the dependencies.

The Contrast Security agent framework downloads the latest Contrast agent and creates a configuration file. The buildpack's detect script prints tags to standard output.

### Configuration

The detect script confirms the existence of a single, bound Contrast service. A Contrast service exists if the `VCAP_SERVICES` payload contains a service name, label, or tag with `contrast-security` as a substring.

To bind Contrast with a user-provided service, you must have a name or tag with `contrast-security` in it. The credential payload must also contain the [standard YAML properties \(page 112\)](#).

This example creates a user-provided service and binds it to an application:

```
cf create-user-provided-service contrast-security-service -p
"teamserver_url, username, api_key, service_key"
cf bind-service spring-music contrast-security-service
cf restage spring-music
```

**NOTE**

The `teamserver_url` should be only protocol and hostname. Do not include `/` `Contrast/` or `/Contrast/api`.

**See also**

[Add Contrast service broker tile for VMware Tanzu \(page 339\)](#)

[Add Contrast service broker for VMware Tanzu \(page 341\)](#) to use the service broker without the tile.

**Add the Contrast service broker tile for Node.js**

With a service broker, VMware Tanzu (formerly Pivotal Cloud Foundry) applications can easily bind to and consume services from the Apps Manager or the command line. You can deploy the Contrast service broker as a Node.js application on VMware Tanzu, and use one or more Contrast accounts. The broker exposes the Contrast service on the VMware Tanzu marketplace so you can create a service instance.

When you add a tile, it creates one organization: the **contrast-security-service-broker-org**. Use this organization to deploy the Contrast service broker application. This requires 512MB of memory.

**Before you begin**

Before you add the Contrast service broker tile, you must have:

- Pivotal Apps Manager and Ops Manager
- An active Contrast account
- The default Node.js buildpack for any application using Contrast. If you have a custom buildpack, you must copy the Contrast framework support and configuration into it.

**Steps**

To add the Contrast service broker tile for Node.js:

1. Download the Contrast service broker tile from the [VMware Tanzu Network](#).
2. Select **Import a Product** and then select the *contrast-security-service-broker-#.#.#.pivotal* tile you downloaded.

**NOTE**

If the file you downloaded has a ZIP extension rename it to *contrast-security-service-broker-#.#.#.pivotal*.

3. To add a service plan select **Service Plans** in the Contrast service broker tile and select **Add**. The tile requires some configuration before you can deploy it. The service broker does not include service plans by default. You must add at least one before you can deploy the Contrast service broker tile.
4. Complete these configuration parameters in the service plan:
  - **TeamServer:** The URL for your Contrast application instance

- **TeamServer Service Key:** [Organization service key \(page 109\)](#)
  - **TeamServer API Key:** [Organization API key \(page 109\)](#)
  - **Organization UUID:** [Organization ID \(page 109\)](#) to which the application will belong
  - **Username:** Your Contrast username
  - **Plan Name:** Name of the plan as it will appear in Apps Manager
  - **Proxy Host:** The hostname of a proxy for the service broker to communicate with Contrast
  - **Proxy Port:** The proxy port
  - **Proxy Username:** The proxy username if it requires authentication
  - **Plan Password:** The proxy password
5. After you define the service plan, select **Save**. If you want some applications to belong to different organizations, define the other plans you will need.
  6. Select **Apply Changes** in the dashboard. This may take some time to finish.
  7. Now, use the Cloud Foundry CLI to bind your application.
  8. Clone the project to a local directory. For example: `Node/pcf/node-hello-world`.
  9. Update the applications `package.json` to add the Contrast Node agent as a dependency. For example: `"@contrast/agent": "^5"`.
  10. Update the start script in `package.json` to instrument with the agent. For example: `"start": "node --import @contrast/agent app.js"`.
  11. Push the application to VMware Tanzu. For example, from the `Node/pcf` directory, run:

```
cf push myAppNodeBroker -p node-hello-world \
  -b 'https://github.com/cloudfoundry/nodejs-buildpack.git' \
  -t 180
```

12. Then run the following:

```
cf service-access
```

Example output:

```
Getting service access as admin...
broker: contrast-security-service-broker
  service      plan      access  orgs
  contrast-security  apptwo  all
```

13. Then run the following:

```
cf create-service contrast-security apptwo contrast
```

Example output:

```
Creating service instance contrast in org system / space apps as admin...
OK
```

14. Then run the following:

```
cf services
```

Example output (notice there are currently no bound apps):

```
Getting services in org system / space apps as admin...

name      service      plan      bound apps  last operation
broker
contrast  contrast-security  apptwo
contrast-security-service-broker
                                upgrade available
                                create succeeded
```

15. Run the following to bind the sample app to the service:



```
cf bind-service myAppNodeBroker contrast
```

Example output:

```
Binding service contrast to app myAppNodeBroker in org system / space
apps as admin...
OK
```

- Run the following again to confirm the app is now bound to the service:

```
cf services
```

Example output:

```
Getting services in org system / space apps as admin...

name          service          plan      bound apps      last
operation      broker              upgrade available
contrast      contrast-security  apptwo    myAppNodeBroker create
succeeded     contrast-security-service-broker
```

- Run the following command to restage the application now that it is bound to the service:

```
cf restage myAppNodeBroker
```

- Go to Contrast to view the application.

## See also

[Add Contrast service broker \(page 341\)](#)

## Add the Contrast service broker for Node.js

Use the Contrast service broker to easily bind services to an application in VMware Tanzu (Pivotal Cloud Foundry) and use the Contrast Node.js agent.

## Steps

To set up VMware Tanzu:

- [Contact Support](#).
- Once you have a service broker source code, deploy the service broker application:

```
cf push contrast-security-service-broker
```

The service broker now appears in PCF.

- Configure plans with the `CONTRAST_SERVICE_PLANS` environment variable (the service broker does not offer any plans by default).

You can also use the **Pivotal Ops Manager** to set the environment variables. If you are using IBM Cloud, you can select the application, select **Runtime** and then **Environment Variables** to set the value.

**Example:** This example shows how to set the value in the command line.

```
cf set-env contrast-security-service-broker CONTRAST_SERVICE_PLANS
" {
  "ServicePlan1": {
    "name": "ServicePlan1",
    "teamserver_url": "https://yourteamserverurl.com",
    "username": "your_username",
    "org_uuid": "00000000-1111-2222-3333-000000000000",
    "api_key": "your_api_key",
    "service_key": "your_service_key"
  },
}
```

```
"AnotherServicePlan":{
  "name":"AnotherServicePlan",
  "teamserver_url":"https://yourteamserverurl.com",
  "username":"your_username",
  "org_uuid":"00000000-1111-2222-3333-000000000001",
  "api_key":"your_api_key",
  "service_key":"some_other_service_key"
}
}
```

To run the agent on IBM Cloud, you must use single quotes to set the `CONTRAST_SERVICE_PLANS` environment variable. Example:

```
cf set-env contrast-security-service-broker CONTRAST_SERVICE_PLANS
" {
  'ServicePlan1': {
    'name':'ServicePlan1',
    'teamserver_url':'https://yourteamserverurl.com',
    'username':'your_username',
    'org_uuid':'00000000-1111-2222-3333-000000000000',
    'api_key':'your_api_key',
    'service_key':'your_service_key'
  },
  'AnotherServicePlan':{
    'name':'AnotherServicePlan',
    'teamserver_url':'https://yourteamserverurl.com',
    'username':'your_username',
    'org_uuid':'00000000-1111-2222-3333-000000000000',
    'api_key':'your_api_key',
    'service_key':'some_other_service_key'
  }
}
```

4. Restage your application with a command similar to this example:

```
cf restage contrast-security-service-broker
```

5. Set an environment variable for a username and a password:

```
cf set-env contrast-security-service-broker SECURITY_USER_NAME
aSecureUsername
cf set-env contrast-security-service-broker SECURITY_USER_PASSWORD
aSecurePassword
```

6. Create a service broker instance. Define at least one service plan for this. You must use the same username and password created in the previous step.

```
cf create-service-broker contrast-security-service-broker USER_NAME
PASSWORD
<URL of your application>
```

On IBM Cloud, add `--space-scoped` at the end of the command. For example:

```
cf create-service-broker contrast-security-service-broker USER_NAME
PASSWORD
<URL of your application> --space-scoped
```

7. All service brokers start as private. Make it public with:

```
cf enable-service-access contrast-security-service-broker
```

8. Once the service broker is working, create a service instance and bind it to the application. To create a service instance, run the following command:

```
cf create-service contrast-security-service-broker ServicePlan1  
<name_of_service>
```

9. Bind the service broker to your application by running the following command:

```
cf bind-service <app_name> <name_of_service>
```

You should now see the agent start up with your application. You will also see your application in Contrast.

## See also

[Add Contrast service broker tile \(page 339\)](#)

## Update the Node.js agent

The most reliable and effective way to automatically update the Contrast Node.js agent is to use the Node.js npm package manager to install and download the latest version available.

Because npm manages all dependencies for your Node.js application, it should already be available and part of your build environment. How frequently you update the Contrast Node.js agent and where you get updates depends on your organization's preferences and your Contrast implementation: hosted (SaaS) or on-premises (EOP).

You can either update the agent automatically or manually.

## Before you begin

Before you begin, you should have:

- Some familiarity with DevOps practices and Node's npm package manager.
- Access to the npm repository for the Contrast agent.
- Confirmed that your Node.js application runs properly without the Contrast Node.js agent.
- Previously successfully installed the Contrast Node.js agent.
- Defined a policy for how and when to update the agent, based on your change management policy and the environment where you deploy agents.



### IMPORTANT

Unless Contrast Support advises you to do so, do not use a version of the Contrast Node.js agent that is ahead of the version available from your Contrast instance.

## Steps

1. You will install the Node.js agent from the **npm** public or private repository. Depending on your Contrast installation, you can use one or both sources to get the latest Contrast Node.js agent:
  - **Hosted (SaaS) installations:** You can get the latest version of the agent from npm. If your organization prefers to validate agents before using them, you can also use a private npm repository with approved versions only.
  - **On-premises (EOP) installations:** Many organizations that use on-premises installations do not immediately update core software or agents when Contrast releases new software. Public repositories (like npm) typically host new versions of the agent that are not designed or tested to work with older versions of Contrast. On-premises users should source agent updates from a

private npm repository where you only store versions of the agent that match your on-premises Contrast installation.

2. Install the agent and use scripts for automatic updates using the best method for you:
  - **Use `package.json`:** This file specifies which dependencies will automatically resolve every time your Node.js application builds with artifacts from npm (public or private). Include the Contrast Node.js agent here to easily keep every new build of your application aligned with the latest version of the agent. For example:

```
{
  "name": "sample_application",
  "version": "1.0.0",
  "description": "",
  "main": "index.js",
  "scripts": {
    "start": "nodemon",
    "contrast": "node --import @contrast/agent index.js"
  },
  "keywords": [],
  "author": "",
  "license": "ISC",
  "dependencies": {
    "express": "^4.17.1",
    "@contrast/agent": "latest",
  },
  "devDependencies": {
    "nodemon": "^1.19.2"
  }
}
```

Then use the `$ npm update` command whenever you build your application. This will automatically download, and add or update, the Contrast Node.js agent from npm to the Node.js application.

- **Install and update manually using command line:** For some organizations, the `package.json` file must be consistent across environments, or they do not plan to install the Contrast Node.js agent into all environments. In these cases, install the agent manually. You can manually update agents as part of a Node.js build process.  
Use this command to manually retrieve and add or update the Contrast Node.js agent from npm (public or private) to the Node.js application:

```
$ npm install @contrast/agent
```

3. To check whether the installation/update succeeded, run the following command and look for output similar to the following example:

```
npm ls --all | grep contrast
@contrast/agent@5.11.0
@contrast/agentify@1.28.0
@contrast/common@1.22.0
@contrast/config@1.29.0
@contrast/common@1.22.0 deduped
@contrast/core@1.33.0
@contrast/common@1.22.0 deduped
@contrast/find-package-json@1.2.0 deduped
@contrast/fn-inspect@4.2.0 deduped
@contrast/deadzones@1.3.0
@contrast/common@1.22.0 deduped
```

## See also

- [Node.js supported technologies \(page 81\)](#)
- [Install Node.js \(page 336\)](#)

## Install the Node.js agent using a container

Installing the Node.js agent in a container is essentially the same as the standard installation procedure, except that the installation occurs in a container. To follow best practices, you should use environment variables to configure the Contrast credentials.

Using environment variables is the most secure method for installing the Node.js agent in a container. Since containers often migrate through QA and production systems, it's a best practice to avoid hard-coding credentials in the container definition.

## Before you begin

This topic provides general guidance for installing the Node.js agent in a containerized application, with Docker as an example.

You should have a basic understanding of how containers and related software work. You may need to adjust the instructions to meet your specific circumstances.

## Install the agent

Install the Node.js agent using one of these options:

- **Add the agent to the application during development.** (recommended)

This way, the agent will be included with your application's `package.json`.

Use this command to populate the agent into your pipelines and container images.

```
npm install @contrast/agent
```

- **Add the agent to the Dockerfile.**

Add the agent at container build time if you prefer to maintain separate images for the application (with and without the Contrast agent).

Use this command to add the agent to your existing Dockerfile or into a new Dockerfile that uses your application's image as a base image.

```
npm install @contrast/agent
```

## Configure the agent

Follow these instructions when configuring the Node.js agent for an application deployed into a container like Docker (otherwise, see more general information on [configuring the Node.js agent \(page 357\)](#)). Configuration for the Node.js agent follows this [order of precedence \(page 111\)](#).

## With agent token

This variable is a base64 encoded JSON object containing the `url`, `api_key`, `service_key`, and `user_name` configuration settings, allowing you to set them in a single variable

1. Use the agent token:

```
CONTRAST__API__TOKEN
```

2. Use environment variables to set application-specific configuration. These can be ENV statements in the Dockerfile or they can be passed to the Docker run command with the `-e` option. See a [list of environment variables \(page 358\)](#) commonly used to set application-specific values. You can also refer to the [Contrast agent configuration editor \(page 113\)](#) to view a full list of variables. For example, you could use this command to build your container:

```
docker build -t my-app-image
```

And then, use these commands when you run the container:

```
docker run -p 3000:3000 --name my-app-instance \
-e "CONTRAST__API__TOKEN=your-api-token" \
My-app-image
```

The process to set environment variables when using a cloud provider typically involves using a secrets manager and then linking the values of those secrets to the environment variable.

### With legacy settings

If your agent configuration refers to both the legacy settings and the agent token, (in environment variables or the YAML file), the legacy settings take precedence. Remove references to the legacy settings to use just the agent token value.

1. If you are using a Node.js agent version earlier than 5.15.0, the required variables are:

```
export CONTRAST__API__URL
export CONTRAST__API__API_KEY
export CONTRAST__API__SERVICE_KEY
export CONTRAST__API__USER_NAME
```

2. Use environment variables to set application-specific configuration. These can be ENV statements in the Dockerfile or they can be passed to the Docker run command with the `-e` option. See a [list of environment variables \(page 358\)](#) commonly used to set application-specific values. You can also refer to the [Contrast agent configuration editor \(page 113\)](#) to view a full list of variables.

For example, you could use this command to build your container:

```
docker build -t my-app-image
```

And then, use these commands when you run the container:

```
docker run -p 3000:3000 --name my-app-instance \
-e "CONTRAST__API__URL=your-ts-url" \
-e "CONTRAST__API__API_KEY=your-api-key" \
-e "CONTRAST__API__SERVICE_KEY=your-service-key" \
-e "CONTRAST__API__USER_NAME=your-user-name" \
My-app-image
```

The process to set environment variables when using a cloud provider typically involves using a secrets manager and then linking the values of those secrets to the environment variable.

### Run and verify

1. If you want to use the Node.js agent rewriter CLI, see the [agent rewriter CLI \(page 354\)](#) instructions.
2. You must preload the Contrast agent when you launch your application. Normally, you do this in the Dockerfile's CMD statement, but you can also use an npm script defined in the `package.json`. For example, if you normally start your application with:

```
CMD [ "node", "app" ]
```

Then you can use this command to run the application with Contrast:

```
CMD [ "node", "--import", "@contrast/agent", "app" ]
```

3. When the agent starts, it will try to connect to Contrast with [authentication keys \(page 109\)](#).

**TIP**

To protect the agent credentials, use the Docker secret and pass them as environment variables during deployment time. For example:

```
docker run
-e CONTRAST__API__
-e CONTRAST__API__API_KEY=<value>
-e CONTRAST__API__SERVICE_KEY=<value>
-e CONTRAST__API__USER_NAME=<value>
-e CONTRAST__SERVER__ENVIRONMENT=<value> image_with_contrast
```

4. Verify that Contrast is running by checking the activity in the container log.

For example, log activity might look like this:

```
2025-01-02 10:54:46
{"level":30,"time":1735833286319,"tid":0,"pid":1,"hostname":"5d9ee61ac84f",
,"name":"contrast","msg":"Starting @contrast/agent v5.23.0"}
2025-01-02 10:54:46
{"level":30,"time":1735833286319,"tid":0,"pid":1,"hostname":"5d9ee61ac84f",
,"name":"contrast","config":{"_errors":[],"enable":"true","api":
{"enable":"true","url":"https://teamserver-darpa-agents.contsec.com/
Contrast","api_key":"contrast-redacted-
api.api_key","service_key":"contrast-redacted-
api.service_key","user_name":"agent_b47d608e-1971-4560-961c-
a55bd4111b61@Alexstestorg","token":"contrast-redacted-api.token","proxy":
{"enable":"false","url":"undefined"}}, "agent":
{"stack_trace_limit":"10","stack_trace_filters":"agent-,@contrast,node-
agent","diagnostics":{"enable":"true","report_path":"/juice-
shop"},"route_coverage":{"enable":"true"},"reporters":
{"file":"undefined"},"heap_dump":
{"enable":"false","path":"contrast_heap_dumps","delay_ms":"10000","window
_ms":"10000","count":"5"},"polling":
{"app_activity_ms":"30000","app_settings_ms":"30000","app_update_ms":"300
00","server_settings_ms":"30000"},"logger":{"path":"/juice-shop/
contrast.log","level":"info","append":"true","stdout":"true"},"security_l
ogger":{"path":"/juice-shop/
security.log","level":"error","stdout":"false","syslog":
{"enable":"false","ip":"127.0.0.1","port":"514","facility":"19","severity
_exploited":"alert","severity_blocked":"notice","severity_blocked_perimit
er":"notice","severity_probed":"warning","severity_suspicious":"warning"}
},"node":{"app_root":"/juice-
shop","cmd_ignore_list":"","exclusive_entrypoint":"undefined","rewrite":
{"enable":"true","cache":{"enable":"true","path":"/juice-
shop/.contrast"}},"source_maps":{"enable":"true"},"library_usage":
{"reporting":{"enable":"true","interval_ms":"100"}}, "metrics":
{"enable":"true","warn_ms":"5000"},"npm_path":"npm"},"inventory":
{"analyze_libraries":"true","gather_metadata_via":"undefined"},"assess":
{"enable":"false","probabilistic_sampling":
{"enable":"false","base_probability":"0.1","route_monitor":
{"enable":"true","ttl_ms":"1800000"}}, "tags":"undefined","stacktraces":"A
LL","max_context_source_events":"150","max_propagation_events":"500","saf
e_positives":
{"enable":"false"},"trust_custom_validators":"false"},"protect":
{"enable":"false","probe_analysis":{"enable":"true"},"rules":
```

```
{
  "disabled_rules": "",
  "cmd-injection": { "mode": "off" },
  "cmd-injection-command-backdoors": { "mode": "off" },
  "cmd-injection-semantic-chained-commands": { "mode": "off" },
  "cmd-injection-semantic-dangerous-paths": { "mode": "off" },
  "crypto-bad-mac": { "mode": "off" },
  "crypto-bad-ciphers": { "mode": "off" },
  "crypto-weak-randomness": { "mode": "off" },
  "method-tampering": { "mode": "off" },
  "nosql-injection": { "mode": "off" },
  "nosql-injection-mongo": { "mode": "off" },
  "path-traversal": { "mode": "off" },
  "path-traversal-semantic-file-security-bypass": { "mode": "off" },
  "reflected-xss": { "mode": "off" },
  "sql-injection": { "mode": "off" },
  "ssjs-injection": { "mode": "off" },
  "ssrf": { "mode": "off" },
  "unsafe-code-execution": { "mode": "off" },
  "unsafe-file-upload": { "mode": "off" },
  "untrusted-deserialization": { "mode": "off" },
  "xxe": { "mode": "off" },
  "unvalidated-redirect": { "mode": "off" }
},
  "application": { "name": "mw-juice-slim", "path": "/", "group": "undefined", "code": "undefined", "version": "undefined", "tags": "undefined", "metadata": "undefined", "session_id": "undefined", "session_metadata": "undefined" },
  "server": {
    "name": "5d9ee61ac84f",
    "type": "Node.js v20.15.0",
    "environment": "undefined",
    "tags": "undefined",
    "version": "undefined",
    "discover_cloud_resource": "true"
  },
  "msg": "Agent configuration"
}
2025-01-02 10:54:46
{"level": 30, "time": 1735833286328, "tid": 0, "pid": 1, "hostname": "5d9ee61ac84f", "name": "contrast", "strategy": 1, "msg": "updating assess sampler"}
2025-01-02 10:54:48
{"level": 30, "time": 1735833287906, "tid": 0, "pid": 1, "hostname": "5d9ee61ac84f", "name": "contrast", "msg": "Received new log level: debug from server-features"}
2025-01-02 10:54:48
{"level": 30, "time": 1735833287907, "tid": 0, "pid": 1, "hostname": "5d9ee61ac84f", "name": "contrast", "msg": "assess sampling disabled"}
2025-01-02 10:54:48
{"level": 30, "time": 1735833287907, "tid": 0, "pid": 1, "hostname": "5d9ee61ac84f", "name": "contrast", "enabledRules": [
  "bot-blocker",
  "cmd-injection",
  "cmd-injection-command-backdoors",
  "cmd-injection-semantic-chained-commands",
  "cmd-injection-semantic-dangerous-paths",
  "crypto-bad-mac",
  "crypto-bad-ciphers",
  "crypto-weak-randomness",
  "ip-denylist",
  "method-tampering",
  "nosql-injection",
  "nosql-injection-mongo",
  "path-traversal",
  "path-traversal-semantic-file-security-bypass",
  "reflected-xss",
  "sql-injection",
  "ssjs-injection",
  "ssrf",
  "unsafe-code-execution",
  "unsafe-file-upload",
  "untrusted-deserialization",
  "virtual-patch",
  "xxe",
  "unvalidated-redirect",
  "autocomplete-missing",
  "cache-controls-missing",
  "clickjacking-control-missing",
  "parameter-pollution",
  "csp-header-missing",
  "csp-header-insecure",
  "hsts-header-missing",
  "x-powered-by-header",
  "xcontenttype-header-missing",
  "xxssprotection-header-disabled",
  "httponly",
  "secure-flag-missing"
], "msg": "Assess policy enabled rules updated"}
2025-01-02 10:54:48
{"level": 30, "time": 1735833287907, "tid": 0, "pid": 1, "hostname": "5d9ee61ac84f", "name": "contrast", "policy": {
  "exclusions": {
    "url": [],
    "querystring": [],
    "header": [],
    "body": [],
    "cookie": [],
    "parameter": []
  },
  "bot-blocker": "block_at_perimeter",
  "cmd-injection": "monitor",
  "cmd-injection-command-backdoors": "monitor",
  "cmd-injection-semantic-chained-commands": "monitor",
  "cmd-injection-semantic-dangerous-paths": "monitor",
  "crypto-bad-mac": "off",
  "crypto-bad-ciphers": "off",
  "crypto-weak-randomness": "off",
  "ip-denylist": "off",
  "method-tampering": "monitor",
  "nosql-
```



```
injection":"monitor","nosql-injection-mongo":"monitor","path-  
traversal":"monitor","path-traversal-semantic-file-security-  
bypass":"monitor","reflected-xss":"monitor","sql-  
injection":"monitor","ssjs-injection":"monitor","ssrf":"off","unsafe-  
code-execution":"off","unsafe-file-upload":"off","untrusted-  
deserialization":"monitor","virtual-  
patch":"off","xxe":"monitor","unvalidated-  
redirect":"off","rulesMask":510},"msg":"Protect policy updated"}  
2025-01-02 10:54:53  
{ "level":30,"time":1735833293571,"tid":2,"pid":1,"hostname":"5d9ee61ac84f  
","name":"contrast","msg":"Received new log level: debug from server-  
features"}  
2025-01-02 10:54:53  
{ "level":30,"time":1735833293437,"tid":0,"pid":1,"hostname":"5d9ee61ac84f  
","name":"contrast","msg":"The Contrast Node Agent collects usage data  
in order to help us improve compatibility and security coverage.\n\nThe  
data is anonymous and does not contain application data. It is collected  
by Contrast and is never shared.\n\nYou can opt-out of telemetry by  
setting the CONTRAST_AGENT_TELEMETRY_OPTOUT environment variable to '1'  
or 'true'.\n"}  
2025-01-02 10:54:53  
{ "level":20,"time":1735833293504,"tid":0,"pid":1,"hostname":"5d9ee61ac84f  
","name":"contrast","msg":"deploying function toString patch"}  
2025-01-02 10:55:00 info: Detected Node.js version v20.15.0 (OK)  
2025-01-02 10:55:00 info: Detected OS linux (OK)  
2025-01-02 10:55:00 info: Detected CPU arm64 (OK)  
....
```

**NOTE**

You can also [install the agent when creating the Docker image \(page 349\) \(page 351\)](#) or [install a distroless Node.js container \(page 352\)](#) in containers

**See also**

Contrast Support Portal [Node.js agent with Kubernetes](#)

Contrast Support Portal [AWS Fargate and Contrast agents](#)

**Install the agent when creating the Docker image****NOTE**

This procedure applies to version 5 and later of the Node.js agent.

Another option for installing the Contrast agent for a Node.js app is to run the `npm install` command as part of the Docker image creation instead of changing the `package.json` file in the source code repository.

This may be more desirable if you only want to modify the Docker file to be able to run a security test with the agent.

This procedure uses the [OWASP JuiceShop](#) vulnerable web app as an example.

**Example:**

```
FROM node:20-buster as installer
COPY . /juice-shop
WORKDIR /juice-shop
RUN npm i -g typescript ts-node
RUN npm install --omit=dev --unsafe-perm

# Install the latest Contrast agent and the cli rewriter
RUN npm install @contrast/agent@latest
RUN npm install --save-dev @contrast/cli

# Environment variables for the Contrast agent
ENV CONTRAST__AGENT__LOGGER__STDOUT=true
ENV CONTRAST__AGENT__LOGGER__PATH=/dev/null

# Take note that the following is optional and the var name has changed
# from what was used by the v4 agent
ENV CONTRAST__AGENT__NODE__REWRITE__CACHE__PATH="/juice-shop/rewrite_cache"

# Assumes this project is rewriting for Assess only
ENV CONTRAST__ASSESS__ENABLE=true

# If no environment setting is specified the rewriter rewrites Protect
# only. See the documentation to other settings.
RUN npx -p @contrast/cli rewrite build/app.js

RUN npm dedupe --omit=dev
RUN rm -rf frontend/node_modules
RUN rm -rf frontend/.angular
RUN rm -rf frontend/src/assets
RUN mkdir logs
RUN chown -R 65532 logs
RUN chgrp -R 0 ftp/ frontend/dist/ logs/ data/ il8n/
RUN chmod -R g=u ftp/ frontend/dist/ logs/ data/ il8n/
RUN rm data/chatbot/botDefaultTrainingData.json || true
RUN rm ftp/legal.md || true
RUN rm il8n/*.json || true

ARG CYCLONEDX_NPM_VERSION=latest
RUN npm install -g @cyclonedx/cyclonedx-npm@$CYCLONEDX_NPM_VERSION
RUN npm run sbom

# workaround for libxmljs startup error
FROM node:20-buster as libxmljs-builder
WORKDIR /juice-shop
RUN apt-get update && apt-get install -y build-essential python3
COPY --from=installer /juice-shop/node_modules ./node_modules
RUN rm -rf node_modules/libxmljs/build && \
  cd node_modules/libxmljs && \
  npm run build
```

```
FROM node:20-buster-slim
ARG BUILD_DATE
ARG VCS_REF

WORKDIR /juice-shop
COPY --from=installer /juice-shop .
COPY --from=libxmljs-builder /juice-shop/node_modules/libxmljs ./
node_modules/libxmljs
EXPOSE 3000

# Contrast logs will be written to the container
# This sets the rewrite cache path to match what was specified in
# previously created image. Also take note that the following is optional
# (either do not set on both places or set in both places) and the var name
# has changed from what is used by the v4.x agent
ENV CONTRAST__AGENT__NODE__REWRITE__CACHE__PATH="/juice-shop/rewrite_cache"

# The following explicitly turns on Assess mode
ENV CONTRAST__ASSESS__ENABLE=true

# The start command has been modified to load and run the agent
CMD ["node", "--import", "@contrast/agent", "build/app.js"]
```

## Install the agent when creating the Docker image (Legacy)



### NOTE

This procedure applies to version 4 and earlier of the Node.js agent.

Another option for installing the Contrast agent for a Node.js app is to run the `npm install` command as part of the Docker image creation instead of changing the `package.json` file in the source code repository.

This may be more desirable if you only want to modify the Docker file to be able to run a security test with the agent.

Example:

```
FROM node:18 as installer
COPY . /juice-shop
WORKDIR /juice-shop
RUN npm i -g typescript ts-node
RUN npm install --omit=dev --unsafe-perm
RUN npm install @contrast/agent@4.x
RUN npm dedupe

# Need to explicitly set Assess mode
ENV CONTRAST__APPLICATION__NAME=juice-assess-docker-slim
ENV CONTRAST__ASSESS__ENABLE=true
ENV CONTRAST__AGENT__LOGGER__STDOUT=true
ENV CONTRAST__AGENT__LOGGER__PATH=/dev/null
ENV DEBUG="contrast:*"
```

```

ENV CONTRAST__AGENT__NODE__REWRITE_CACHE__PATH="/juice-shop/rewrite_cache"

RUN npx contrast-transpile build/app.js

RUN rm -rf frontend/node_modules
RUN rm -rf frontend/.angular
RUN rm -rf frontend/src/assets
RUN mkdir logs
RUN chgrp -R 0 ftp/ frontend/dist/ logs/ data/ il8n/
RUN chmod -R g=u ftp/ frontend/dist/ logs/ data/ il8n/
#RUN rm data/chatbot/botDefaultTrainingData.json || true
#RUN rm ftp/legal.md || true
#RUN rm il8n/*.json || true

FROM node:18-slim
ARG BUILD_DATE
ARG VCS_REF

WORKDIR /juice-shop
COPY --from=installer /juice-shop .

EXPOSE 3000
# The following environment variables were added
ENV CONTRAST__APPLICATION__NAME=juice-assess-docker-slim
ENV CONTRAST__AGENT__SERVICE__GRPC=true
ENV CONTRAST__AGENT__LOGGER__STDOUT=true
ENV CONTRAST__AGENT__LOGGER__PATH=/dev/null
ENV DEBUG="contrast:*"

ENV CONTRAST__AGENT__NODE__REWRITE_CACHE__PATH="/juice-shop/rewrite_cache"

# This explicitly turns on Assess mode
ENV CONTRAST__ASSESS__ENABLE=true
ENV CONTRAST__ASSESS__ENABLE__LAZY_TRACKING=false
ENV CONTRAST__AGENT__NODE__APP_ROOT=/juice-shop

CMD ["node", "-r", "@contrast/agent", "build/app.js"]

```

## Distroless containers

If using a *distroless* Node.js container then there is no **npm** or **shell** installed in the container image. You must use the `NODE_OPTIONS` environment variable to run the agent as a required module.

However, be careful when using `NODE_OPTIONS` since this will run the agent with all **node** or **npm** commands and may result in unintended execution resulting in longer start-up times.



### NOTE

The latest Contrast Node.js agent reports libraries and findings even when installed in an application that runs in a distroless container image.

Example:

```
FROM node:18 as installer
COPY . /juice-shop
WORKDIR /juice-shop
RUN npm i -g typescript ts-node
RUN npm install --omit=dev --unsafe-perm
# install the latest agent
RUN npm install @contrast/agent

RUN npm dedupe

RUN rm -rf frontend/node_modules
RUN rm -rf frontend/.angular
RUN rm -rf frontend/src/assets
RUN mkdir logs
RUN chown -R 65532 logs
RUN chgrp -R 0 ftp/ frontend/dist/ logs/ data/ i18n/
RUN chmod -R g=u ftp/ frontend/dist/ logs/ data/ i18n/
RUN rm data/chatbot/botDefaultTrainingData.json || true
RUN rm ftp/legal.md || true
RUN rm i18n/*.json || true

FROM gcr.io/distroless/nodejs:18
ARG BUILD_DATE
ARG VCS_REF
LABEL maintainer="Bjoern Kimminich <bjoern.kimminich@owasp.org>" \
    org.opencontainers.image.title="OWASP Juice Shop" \
    org.opencontainers.image.description="Probably the most modern and
sophisticated insecure web application" \
    org.opencontainers.image.authors="Bjoern Kimminich
<bjoern.kimminich@owasp.org>" \
    org.opencontainers.image.vendor="Open Web Application Security Project"
\
    org.opencontainers.image.documentation="https://help.owasp-juice.shop" \
    org.opencontainers.image.licenses="MIT" \
    org.opencontainers.image.version="14.5.1" \
    org.opencontainers.image.url="https://owasp-juice.shop" \
    org.opencontainers.image.source="https://github.com/juice-shop/juice-
shop" \
    org.opencontainers.image.revision=$VCS_REF \
    org.opencontainers.image.created=$BUILD_DATE
WORKDIR /juice-shop
COPY --from=installer --chown=65532:0 /juice-shop .
USER 65532
EXPOSE 3000

ENV NODE_OPTIONS "--import @contrast/agent"
CMD ["/juice-shop/build/app.js"]
```

## Install Node.js agent manually

To install or update the agent manually:

1. Install the latest version of the agent from [npm](#) by running this command from the application's root directory:

```
npm install @contrast/agent
```

Alternatively, if you use yarn, run this command to install the agent:

```
yarn add @contrast/agent
```

2. Set [authentication keys \(page 109\)](#) with [environment variables \(page 115\)](#). Make sure your Node.js application has access to the environment variables at runtime. Alternatively, set the configuration with [YAML configuration \(page 112\)](#) using this [template \(page 359\)](#). Make sure the `contrast_security.yaml` is in the applications root directory.
3. Add this command to the scripts section of your application's `package.json` file:

```
"scripts": {  
  "contrast": "node --import @contrast/agent app-main.js [app  
arguments]",  
  "start": "...",  
  "test": "...  
}
```

4. Run your application with the agent:

```
npm run contrast
```

**TIP**

You can change this npm script to include, [other runtime configurations \(page 357\)](#) such as an alternate configuration file location.

5. Exercise your application by performing either manual or automated testing to ensure your application is functioning correctly with the agent installed.
6. Verify that your server is registered in Contrast and reports an instance of your application.

## Reduce container startup time

When you start your instrumented application, Contrast applies source transformations to both your application and the dependency code your application loads. This code rewriting increases startup time when running applications with the agent.

Starting with version 4.X, the Node.js agent includes a command line utility you can use to pre-compile applications before starting them. When started with Contrast, the pre-compiled application loads the rewritten files from disk and significantly improves startup time. Starting with version 5, its utilities do not support command line arguments like `--agent.logger.path /dev/null`.

## Use the rewriter

1. In the Node.js agent's configuration file (`contrast_security.yaml`):
  - (Optional) Enable rewrite caching and specify the path of the cache location.
    - By default, the cache is enabled and will be written to the `.contrast` folder under the application directory.
    - If either `agent.node.rewrite.enable` or `agent.node.rewrite.cache.enable` are false, the CLI will throw an error.
  - (Optional) Specify the logging level.
    - The rewriter provides minimal logging at the default INFO level to inform the user which mode it is running under. At the DEBUG level, it will inform the user about failures in the rewriting process. At the TRACE level, it will log information about each file that is rewritten.
  - Enable `assess` or `protect` to specify the mode under which to run the rewriter. If both modes are enabled then the rewriter is in `assess` mode, since `assess` includes all of the transforms from `protect`.

**NOTE**

You can also specify modes at runtime with the `-a, --assess` or `-p, --protect` flags.

For example:

```
// example config
agent:
  logger:
    level: TRACE // Default: INFO
  node:
    rewrite:
      enable: true // default: true
    cache:
      enable: true // default: true
      path: ./path/relative/to/app/root // default: .contrast/
assess:
  enable: true
```

2. (Optional) Install the `@contrast/cli` package:

- This can be a devDependency since it is not used by the agent at runtime.
- **npm** will ask you to install the package when performing step 3 if you do not install it beforehand. This is fine, but installing it manually (and including `@contrast/cli` as a dependency in your `package.json`) will ensure you are using the specified version.

```
npm install --save-dev @contrast/cli
```

3. Invoke the executable and provide it with your application's entry point (for example `index.js`).

```
npx -p @contrast/cli rewrite index.js
# or
npx -p @contrast/cli rewrite -a index.js # force assess mode
npx -p @contrast/cli rewrite -p index.js # force protect mode
```

4. You can verify that the precompilation has occurred by checking the cache directory (`.contrast` by default). You should see several nested folders like `.contrast/PACKAGE_NAME/CONTRAST_REWRITER_VERSION_NUMBER/MODE`, for example, `.contrast/my-package/1.7.0/assess`. The contents of the `_` directory in this path should match the structure of your application directory.

## Known Limitations

A few scenarios cannot currently be handled by the rewriter CLI.

The rewriter CLI uses static analysis to determine the files to rewrite, so it cannot handle dynamic imports or requires. If a file is included in any of the following ways, the agent will instead rewrite that file when it is included at runtime.

```
// dynamic imports or requires
const name = 'foo.js';
await import(name);require(name);

// direct calls to createRequire
createRequire(import.meta.url)('foo.js');
// this should work, however:
const require = createRequire(import.meta.url);
require('foo.js');
```

```
// renamed require functions
const r = createRequire('...');
r('foo.js');
const myRequire = require;
myRequire('bar.js');
```

## Use the Node.js agent with ESM

The Contrast Node.js agent provides full support for using ECMAScript modules (ESM) in Node.js server-side applications. ESM is the [official standard format](#) to package JavaScript client-side code.

There are two ways to run the Contrast Node.js agent if you are using ESM server-side applications.

- To explicitly assert that the code you're running is ESM and should be run as such, use the MJS file extension. Learn more about [determining a module system wiith file extensions](#) in the Node.js documentation.

When you use an MJS extension, Node.js knows that you've written ESM and will parse your JavaScript as such. The same is true for CJS; Node.js knows that a CJS file extension should run as CommonJS, and will parse your JavaScript as CommonJS.

- Otherwise, you can get your Node.js applications to run as ESM rather than CommonJS by including "type": "module" in your package.json, like this:

```
"main": "index.js",
"type": "module",
```

This specifically tells Node.js to parse your JS files under this `package.json` as ESM. Otherwise, by default (or when you use "type": "commonjs"), Node.js will parse your JS files as CommonJS.

When instrumenting an application that uses ESM (or a combination of both ESM and CJS), the way to start the application with the agent depends on the Node.js engine version and if your application is using ESM code or modules.

- **For Node LTS versions greater than or equal to 18.19.0**

Use `--import` to start the application:

```
node --import @contrast/agent app-main.mjs [app arguments]
```

- **For Node LTS versions greater than or equal to 16.17.0 and less than 18.19.0.**

Use `--loader` to start the application:

```
node --loader @contrast/agent app-main.mjs [app arguments]
```

- **For Node LTS versions less than 16.17.0. This is also applicable to applications not using the ESM syntax.**

Use the legacy method for starting the application:

```
node -r @contrast/agent app-main.js [app arguments]
```

## Transpilers, compilers, source maps and the Node.js agent

The Node.js agent supports applications written in languages that compile JavaScript, such as TypeScript. Although the Node.js agent only instruments JavaScript, you can also use TypeScript if you configure the transpiler to compile your application into JavaScript.



### NOTE

The source may not correspond directly with the resulting JavaScript. As a result, reported metadata (like `vulnerability line-of-code` and `filename`) references the compiled result, not the source.



Some languages, like TypeScript, require you to pre-compile your code before runtime. In these cases, the Node.js agent must point to the compiled entry point for your application.

To do this, set up the Node.js agent using the `--import` option:

```
scripts: {
  "test": "...",
  "start": "...",
  "contrast": "node --import @contrast/agent /path/to/transpiled/
entrypoint.js"
}
```

## Source maps

With a source map, you can see the corresponding line numbers between the TypeScript source and the transpiled JavaScript.

To use source maps, you must enable the Babel re-writer and rewrite caching in your YAML configuration:

```
agent:
  node:
    rewrite_cache:
      enable: true
      path: ./cache
    enable_babel: true
```

When enabled, the agent looks for source maps (MAP files) in the same directory as the source that's being loaded (for example, if the file `/home/app/index.js` is loaded, then Contrast looks for `/home/app/index.js.map`).

If you do not already have source maps then it needs to be recompiled using the necessary flags to produce source maps. This is different for every transpiler, so check the options for your transpiler. For example, for TypeScript, append the `--source-map` flag to the TypeScript compiler (tsc) or add the `"sourceMap": true` entry to the `"compilerOptions"` section in `tsconfig.json`.

## Node.js advanced configuration

The easiest way to deploy Node.js agents is to use the [Agent wizard \(page 79\)](#) in the Contrast web interface.

The topics in this section are for users who want additional information or methods related to the configuration of Node.js agents.

- [Node.js environment variables \(page 358\)](#)
- [Node.js YAML template \(page 359\)](#)

## Configure the Node.js agent

The [standard configuration \(page 51\)](#) for all agents uses this [order of precedence \(page 111\)](#).

There are several ways to configure the Node.js agent, but generally, you should:

- Use [environment variables \(page 358\)](#) for agent authentication keys and application-specific configuration values. Learn more about [environment variables in general \(page 115\)](#).
- Use a YAML configuration file to set common configuration values for all applications in an organization or container (for example, to redirect logging or proxy configuration). This [template \(page 359\)](#) shows all valid configuration options for the Node.js agent. Learn more about [YAML configuration \(page 112\)](#) in general.

**TIP**

Use the [Contrast agent configuration editor \(page 113\)](#) to create or upload a YAML configuration file, validate YAML, and get setting recommendations. The editor also provides the correct environment variables, if desired.

## Environment variables

Use environment variables for application-specific configuration values (like configuring server environment, application names or agent logging). You can also use environment variables to set any other valid properties for the Node.js agent.

You can see a full list of valid properties in the [Node.js YAML template \(page 359\)](#), but here are some common examples as environment variables:

**Agent Token:** This variable is a base64 encoded JSON object containing the url, api\_key, service\_key, and user\_name configuration settings, allowing you to set them in a single variable.

- `CONTRAST__API__TOKEN`

If your agent configuration refers to both the legacy settings and the agent token, (in environment variables or the YAML file), the legacy settings take precedence. To use just the agent token value, remove references to the legacy settings.

**Legacy settings:** If you are using a Node.js agent version earlier than 5.15.0, the required variables are:

| Environment variable                    | Description  |
|---|--|
| <code>CONTRAST__API__SERVICE_KEY</code> | Set the service key needed to communicate with Contrast. |
| <code>CONTRAST__API__API_KEY</code>     | Set the API key needed to communicate with Contrast.     |
| <code>CONTRAST__API__USER_NAME</code>   | Set the user name needed to communicate with Contrast.   |
| <code>CONTRAST__API__URL</code>         | Set the URL for the Contrast web interface.              |

Optional variables include:

| Environment variable                             | Description  |
|--|--|
| <code>CONTRAST__APPLICATION_NAME</code>          | Override the reported application name.  |
| <code>CONTRAST_CONFIG_PATH</code>                | When set, supersedes the default location of the YAML configuration file. (Unlike other environment variables, this one cannot be set as a YAML property, and contains only single underscores.) |
| <code>CONTRAST__SERVER_PATH</code>               | Override the reported server path.   |
| <code>CONTRAST__SERVER_NAME</code>               | Provides a consistent server name for cases where containerized apps generate many server records. This could be the microservice name or app name.  |
| <code>CONTRAST__AGENT_DIAGNOSTICS__ENABLE</code> | Creates configuration and system files at startup to help track diagnostic and troubleshooting information. Default is <code>true</code> .   |
| <code>CONTRAST__AGENT_LOGGER__APPEND</code>      | When set to <code>false</code> , creates a new log file on startup instead of appending and rolling daily. Default is <code>true</code> .  |
| <code>CONTRAST__AGENT_LOGGER__LEVEL</code>       | Logging level: <code>FATAL</code> , <code>ERROR</code> , <code>WARN</code> , <code>INFO</code> , <code>DEBUG</code> or <code>TRACE</code> . Default is <code>ERROR</code> .                      |
| <code>CONTRAST__AGENT_LOGGER__PATH</code>        | Where Contrast will put its debug log. Default is <code>node-contrast.log</code> .   |

| Environment variable            | Description  |
|---------------------------------|--|
| CONTRAST__AGENT__LOGGER__STDOUT | When set to <code>false</code> , suppresses output to <code>stdout</code> . Default is <code>true</code> . |

If you want to redirect logging for the Node.js, [contact Support](#) for assistance.



## NOTE

### For legacy v4 of the agent:

For the Node.js agent you must manually configure DEBUG. INFO-level statements aren't logged to the console unless the environment variable DEBUG is set to include the Contrast namespace: `DEBUG=contrast:*`. This could be useful in environments where you don't have access to the file system (like Docker or ECS).

If you want to redirect logging for the Node.js, see more examples on the [npm site](#) or [contact Support](#) for assistance.

## Node.js YAML template

Use this template to configure the Node.js agent using a YAML configuration file. (Learn more about [YAML configuration \(page 112\)](#).)

Place your YAML file in the default location: `/etc/contrast/contrast_security.yaml`

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
UI.
#
=====
==
api:

  # ***** REQUIRED *****
  # Set the URL for the Contrast UI.
  url: https://app.contrastsecurity.com/Contrast
```

```
# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

# Set the default request timeout.
# timeout_ms: NEEDS_TO_BE_SET

#
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Set the absolute or relative path to a CA for communication
# with the Contrast UI using a self-signed certificate.
# ca_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Certificate
# PEM file for communication with the Contrast UI.
# cert_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Key PEM
# file for communication with the Contrast UI.
# key_file: NEEDS_TO_BE_SET

# If the Key file requires a password, it can be set here or in
# the matching ENV value (`CONTRAST__CERTIFICATE__KEY_PASSWORD`).
# key_password: NEEDS_TO_BE_SET

#
=====
# api.proxy
```

```
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate
# with the Contrast web interface over a proxy. Set
# value to `false` if you don't want to use the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
# url: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

# Set to limit the length of Error stack traces to a specified number.
# Larger limits will improve accuracy but increase memory usage.
# stack_trace_limit: 10

#
=====
# agent.diagnostics
# Use the properties in this section to specify the information the agent
# should collect and report in order to diagnose problems in the agent.
#
#
=====
# diagnostics:

# Creates config and system info files
# at startup if true. True by default.
#
# The same thing can be achieved by setting the
# CONTRAST__AGENT__DIAGNOSTICS__ENABLE=[true/false] env variable.
#
# enable: true

# Set the directory in which to write diagnostic files.
# Defaults to the application's current working directory.
# report_path: ./

#
=====
# agent.route_coverage
```

```
# Use the following properties for the route-based coverage feature.
#
=====
# route_coverage: {}
#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Set to `false` for the agent to always create a
# new log file instead of appending and rolling.
# append: true

# Set to `false` to suppress log output to `stdout`.
# stdout: true

# Set the roll size for log files in megabytes. The agent will
# attempt to prevent the log file from being larger than this size.
# This feature is only available in agent version >=4.0.0
# roll_size: 100M

# Set the number of backup files to keep. Set to `0` to disable.
# This feature is only available in agent version >=4.0.0
# backups: 10

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:
```

```
# Set the file to which the agent logs security events.
# path: ./contrast/security.log

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

# Set to `true` to log output to `stdout` as well as the configured
file.
# stdout: false

#
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
```

```
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

#
=====
# agent.service
# The following properties are used by the Contrast Service.
#
=====
# service:

# Set to `false` to disallow the service to be started, and
# effectively disable the agent, if read by the service. If the
# agent reads this property, it disallows service auto-start.
# enable: true

# Set to `true` to enable listening for gRPC connections.
# The `socket`, `host` and `port` fields will be used for
# configuring the gRPC server in place of the legacy RPC server.
# grpc: false

# If this property is defined, the service is
# listening on a Unix socket at the defined path.
# socket: /tmp/service.sock

# ***** REQUIRED *****
# Set the the hostname or IP address of the Contrast
# service to which the Contrast agent should report.
host: localhost

# ***** REQUIRED *****
# Set the the port of the Contrast service
# to which the Contrast agent should report.
port: 30555

#
=====
# agent.service.teamserver_retry
# The following properties are used by the Teamserver HTTP client
# to configure failed request retrying in the Contrast service.
#
=====
# teamserver_retry:

# Enable retrying HTTP requests to the Teamserver endpoint.
# enable: true

# How long to wait between retries in milliseconds.
# interval_ms: 5000

# How many times to retry HTTP requests to Teamserver before giving
up.
# max_attempts: 3

#
```



```
=====
# agent.service.logger
# The following properties are used by the logger in the
# Contrast service. If the properties are not defined, the
# service uses the logging values from the Contrast UI.
#
=====
# logger:

# Set the location to which the Contrast service saves log output.
# If no log file exists at this location, the service creates one.
#
# Example - `/opt/Contrast/contrast_service.log` will
# create a log in the `/opt/Contrast` directory.
#
# path: ./contrast_service.log

# Set the the log output level. Options are `OFF`, `FATAL`,
# `ERROR`, `WARN`, `INFO`, `DEBUG`, `TRACE`, and `ALL`.
# level: ERROR

# Override the name of the process used in logs.
# progname: Contrast Service

# Set to `true` to send log output to `stdout`.
# stdout: false

#
=====
# agent.heap_dump
# The following properties are used to trigger heap dumps from within
# the agent to snapshot the behavior of instrumented applications.
#
=====
# heap_dump:

# Set to `true` for the agent to automatically
# take heap dumps of the instrumented application.
# enable: false

# Set the location to which to save the heap dump files. If relative,
# the path is determined based on the process' working directory.
# path: contrast_heap_dumps

# Set the amount of time to wait, in milliseconds,
# after agent startup to begin taking heap dumps.
# delay_ms: 10_000

# Set the amount of time to wait, in milliseconds, between each heap
dump.
# window_ms: 10_000

# Set the number of heap dumps to take before disabling this feature.
# count: 5
```

```
#
=====
# agent.node
# The following properties apply to any Node configurations.
#
=====
# node:

# Set the directory containing the application's `package.json` file.
# app_root: NEEDS_TO_BE_SET

#
=====
# agent.node.rewrite
# Use the following properties to set up source code rewriting.
#
=====
# rewrite:

#
=====
# agent.node.rewrite.cache
# Use the following properties to set up rewrite caching.
#
=====
# cache:

# Set to `false` to disable caching rewritten source code files.
# enable: true

# Set the directory in which to cache rewritten
# source code files. Defaults to `.contrast/` in
# the application's current working directory.
# path: .contrast

#
=====
# agent.node.source_maps
# Use the following properties to set up
# source map generation when rewriting.
#
=====
# source_maps:

# Set to `false` to disable source map generation when rewriting.
# enable: true

#
=====
# agent.node.library_usage
# Configuration for Node.js library usage reporting
#
=====
# library_usage:
```

```
#
=====
# agent.node.library_usage.reporting
# Use the following properties to set
# up enhanced library usage reporting.
#
=====
# reporting:

# Set to `false` to disable enhanced library usage features, i.e.
# scanning for composition of dependencies, reporting library usage.
# enable: true

# Set the interval (in milliseconds) for
# collecting code events for library usage.
# interval_ms: 1

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable library analysis.
# analyze_libraries: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Control the values captured by Assess vulnerability events. `Full`
# captures most values by calling ToString on objects, which can
# provide more info but causes increased memory usage. `Minimal`
# has better performance as it only captures String type objects
```

```
# as strings and uses type name for other object type values.
# event_detail: minimal

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

# Set to `true` to trust incoming strings when they pass custom
# validators (Mongoose, Joi, validator, fastify-static).
# This feature is only available in agent version 4.10.0 and later
# trust_custom_validators: false

# Enables the serve-static module as a path-traversal
# sanitizer. Express uses serve-static in a safe way
# but manual setup of serve-static can be vulnerable.
#
# Even with Express there is a possibility for "traversing-down" the
served
# folder or user misconfiguration if not configured with an absolute path
#
# This feature is only available in agent version 4.31.0 and later
# enable_sanitizer_serve_static: false

# When set to `true`, string tracking will occur lazily as user-controlled
# values are accessed by application code. When `false`, tracking will
# occur at the time of input parsing and will be limited to 250 values.
# This feature is only available in agent version 4.18.0 and later
# enable_lazy_tracking: true

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

#
=====
# assess.probabilistic_sampling
# Use the following properties to control
# probabilistic sampling in the agent.
#
```

```
=====
# probabilistic_sampling:

# Set to `true` to enable probabilistic sampling.
# enable: false

# The probability that a request will be analyzed. Each
# request will independently share this same probability
# of being sampled. Value needs to be within range [0, 1].
# base_probability: 0.10

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.probe_analysis
# Use the settings in this section to
# control the behavior of probe analysis.
# Support for this option is limited to Node agent versions >= 5
#
=====
# probe_analysis:

# Set to `false` to disable probe analysis.
# enable: true

#
=====
# protect.rules
# Use the following properties to set simple rule configurations.
#
=====
# rules:

# Define a list of Protect rules to disable in the agent. To view a
```

```
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====
# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====
# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====
# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====
# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.cmd-injection-semantic-chained-commands
# Use the following properties to configure how the
# 'command injection - chained commands' rule works
#
```

```
=====
# cmd-injection-semantic-chained-commands:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.cmd-injection-semantic-dangerous-paths
# Use the following properties to configure how the
# 'command injection - dangerous paths' rule works
#
=====
# cmd-injection-semantic-dangerous-paths:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.cmd-injection-command-backdoors
# Use the following properties to configure how the
# 'command injection - command backdoors' rule works
#
=====
# cmd-injection-command-backdoors:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.path-traversal-semantic-file-security-bypass
# Use the following properties to configure how the
# 'path traversal - file security bypass' rule works
#
=====
# path-traversal-semantic-file-security-bypass:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:
```

```
# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.unsafe-file-upload
# Use the following properties to configure
# how the unsafe file upload rule works.
#
=====
# unsafe-file-upload:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
```



```
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.untrusted-deserialization
# Use the following properties to configure
# how the untrusted deserialization rule works.
#
=====
# untrusted-deserialization:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.ssjs-injection
# Use the following properties to configure
# how the SSJS Injection rule works.
#
=====
# ssjs-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off
```

```
#
=====
# protect.rules.nosql-injection
# Use the following properties to configure
# how the NOSQL Injection rule works.
#
=====
# nosql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.nosql-injection-mongo
# Use the following properties to configure
# how the NOSQL Injection rule works.
#
=====
# nosql-injection-mongo:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
```

```
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Pass arguments to the underlying application.
# args: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
```

```
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Set to `false` to disable detection of cloud
# provider metadata such as resource identifiers.
# discover_cloud_resource: true

#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
```

```
# api
# Use the properties in this section to connect the agent to the Contrast
UI.
#
=====
==
api:

# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

# Set the default request timeout.
# timeout_ms: NEEDS_TO_BE_SET

#
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Set the absolute or relative path to a CA for communication
# with the Contrast UI using a self-signed certificate.
# ca_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Certificate
# PEM file for communication with the Contrast UI.
# cert_file: NEEDS_TO_BE_SET
```

```
# Set the absolute or relative path to the Key PEM
# file for communication with the Contrast UI.
# key_file: NEEDS_TO_BE_SET

# If the Key file requires a password, it can be set here or in
# the matching ENV value (`CONTRAST__CERTIFICATE__KEY_PASSWORD`).
# key_password: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate
# with the Contrast web interface over a proxy. Set
# value to `false` if you don't want to use the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
# url: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

# Set to limit the length of Error stack traces to a specified number.
# Larger limits will improve accuracy but increase memory usage.
# stack_trace_limit: 10

#
=====
# agent.diagnostics
# Use the properties in this section to specify the information the agent
# should collect and report in order to diagnose problems in the agent.
#
#
=====
# diagnostics:

# Creates config and system info files
# at startup if true. True by default.
#
# The same thing can be achieved by setting the
```

```
# CONTRAST__AGENT__DIAGNOSTICS__ENABLE=[true/false] env variable.
#
# enable: true

# Set the directory in which to write diagnostic files.
# Defaults to the application's current working directory.
# report_path: ./

#
=====
# agent.route_coverage
# Use the following properties for the route-based coverage feature.
#
=====
# route_coverage: {}

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Set to `false` for the agent to always create a
# new log file instead of appending and rolling.
# append: true

# Set to `false` to suppress log output to `stdout`.
# stdout: true

# Set the roll size for log files in megabytes. The agent will
# attempt to prevent the log file from being larger than this size.
# This feature is only available in agent version >=4.0.0
# roll_size: 100M

# Set the number of backup files to keep. Set to `0` to disable.
# This feature is only available in agent version >=4.0.0
```

```
# backups: 10

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the file to which the agent logs security events.
# path: ./contrast/security.log

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

# Set to `true` to log output to `stdout` as well as the configured
file.
# stdout: false

#
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE
```



```
# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

#
=====
# agent.service
# The following properties are used by the Contrast Service.
#
=====
# service:

# Set to `false` to disallow the service to be started, and
# effectively disable the agent, if read by the service. If the
# agent reads this property, it disallows service auto-start.
# enable: true

# Set to `true` to enable listening for gRPC connections.
# The `socket`, `host` and `port` fields will be used for
# configuring the gRPC server in place of the legacy RPC server.
# grpc: false

# If this property is defined, the service is
# listening on a Unix socket at the defined path.
# socket: /tmp/service.sock

# ***** REQUIRED *****
# Set the the hostname or IP address of the Contrast
# service to which the Contrast agent should report.
host: localhost

# ***** REQUIRED *****
# Set the the port of the Contrast service
# to which the Contrast agent should report.
port: 30555

#
=====
# agent.service.teamserver_retry
# The following properties are used by the Teamserver HTTP client
# to configure failed request retrying in the Contrast service.
#
=====
# teamserver_retry:
```

```
# Enable retrying HTTP requests to the Teamserver endpoint.
# enable: true

# How long to wait between retries in milliseconds.
# interval_ms: 5000

# How many times to retry HTTP requests to Teamserver before giving
up.
# max_attempts: 3

#
=====
# agent.service.logger
# The following properties are used by the logger in the
# Contrast service. If the properties are not defined, the
# service uses the logging values from the Contrast UI.
#
=====
# logger:

# Set the location to which the Contrast service saves log output.
# If no log file exists at this location, the service creates one.
#
# Example - `/opt/Contrast/contrast_service.log` will
# create a log in the `/opt/Contrast` directory.
#
# path: ./contrast_service.log

# Set the the log output level. Options are `OFF`, `FATAL`,
# `ERROR`, `WARN`, `INFO`, `DEBUG`, `TRACE`, and `ALL`.
# level: ERROR

# Override the name of the process used in logs.
# progname: Contrast Service

# Set to `true` to send log output to `stdout`.
# stdout: false

#
=====
# agent.heap_dump
# The following properties are used to trigger heap dumps from within
# the agent to snapshot the behavior of instrumented applications.
#
=====
# heap_dump:

# Set to `true` for the agent to automatically
# take heap dumps of the instrumented application.
# enable: false

# Set the location to which to save the heap dump files. If relative,
# the path is determined based on the process' working directory.
# path: contrast_heap_dumps
```

```
# Set the amount of time to wait, in milliseconds,
# after agent startup to begin taking heap dumps.
# delay_ms: 10_000

# Set the amount of time to wait, in milliseconds, between each heap
dump.
# window_ms: 10_000

# Set the number of heap dumps to take before disabling this feature.
# count: 5

#
=====
# agent.node
# The following properties apply to any Node configurations.
#
=====
# node:

# Set the directory containing the application's `package.json` file.
# app_root: NEEDS_TO_BE_SET

#
=====
# agent.node.rewrite
# Use the following properties to set up source code rewriting.
#
=====
# rewrite:

#
=====
# agent.node.rewrite.cache
# Use the following properties to set up rewrite caching.
#
=====
# cache:

# Set to `false` to disable caching rewritten source code files.
# enable: true

# Set the directory in which to cache rewritten
# source code files. Defaults to `.contrast/` in
# the application's current working directory.
# path: .contrast

#
=====
# agent.node.source_maps
# Use the following properties to set up
# source map generation when rewriting.
#
=====
# source_maps:
```

```
# Set to `false` to disable source map generation when rewriting.
# enable: true

#
=====
# agent.node.library_usage
# Configuration for Node.js library usage reporting
#
=====
# library_usage:

#
=====
# agent.node.library_usage.reporting
# Use the following properties to set
# up enhanced library usage reporting.
#
=====
# reporting:

# Set to `false` to disable enhanced library usage features, i.e.
# scanning for composition of dependencies, reporting library usage.
# enable: true

# Set the interval (in milliseconds) for
# collecting code events for library usage.
# interval_ms: 1

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable library analysis.
# analyze_libraries: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
```

```
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Control the values captured by Assess vulnerability events. `Full`
# captures most values by calling ToString on objects, which can
# provide more info but causes increased memory usage. `Minimal`
# has better performance as it only captures String type objects
# as strings and uses type name for other object type values.
# event_detail: minimal

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

# Set to `true` to trust incoming strings when they pass custom
# validators (Mongoose, Joi, validator, fastify-static).
# This feature is only available in agent version 4.10.0 and later
# trust_custom_validators: false

# Enables the serve-static module as a path-traversal
# sanitizer. Express uses serve-static in a safe way
# but manual setup of serve-static can be vulnerable.
#
# Even with Express there is a possibility for "traversing-down" the
served
# folder or user misconfiguration if not configured with an absolute path
#
# This feature is only available in agent version 4.31.0 and later
# enable_sanitizer_serve_static: false

# When set to `true`, string tracking will occur lazily as user-controlled
# values are accessed by application code. When `false`, tracking will
# occur at the time of input parsing and will be limited to 250 values.
# This feature is only available in agent version 4.18.0 and later
# enable_lazy_tracking: true

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false
```

```
# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

#
=====
# assess.probabilistic_sampling
# Use the following properties to control
# probabilistic sampling in the agent.
#
=====
# probabilistic_sampling:

# Set to `true` to enable probabilistic sampling.
# enable: false

# The probability that a request will be analyzed. Each
# request will independently share this same probability
# of being sampled. Value needs to be within range [0, 1].
# base_probability: 0.10

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.probe_analysis
# Use the settings in this section to
# control the behavior of probe analysis.
# Support for this option is limited to Node agent versions >= 5
#
=====
# probe_analysis:

# Set to `false` to disable probe analysis.
```

```
# enable: true

#
=====
# protect.rules
# Use the following properties to set simple rule configurations.
#
=====
# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====
# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====
# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====
# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====
# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
```

```
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.cmd-injection-semantic-chained-commands
# Use the following properties to configure how the
# 'command injection - chained commands' rule works
#
=====
# cmd-injection-semantic-chained-commands:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.cmd-injection-semantic-dangerous-paths
# Use the following properties to configure how the
# 'command injection - dangerous paths' rule works
#
=====
# cmd-injection-semantic-dangerous-paths:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.cmd-injection-command-backdoors
# Use the following properties to configure how the
# 'command injection - command backdoors' rule works
#
=====
# cmd-injection-command-backdoors:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
# mode: off

#
=====
# protect.rules.path-traversal-semantic-file-security-bypass
# Use the following properties to configure how the
# 'path traversal - file security bypass' rule works
#
=====
# path-traversal-semantic-file-security-bypass:

# Set the mode of the rule. Value options
# are `monitor`, `block`, or `off`.
```



```
# mode: off

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
```

```
# protect.rules.unsafe-file-upload
# Use the following properties to configure
# how the unsafe file upload rule works.
#
=====
# unsafe-file-upload:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.untrusted-deserialization
# Use the following properties to configure
# how the untrusted deserialization rule works.
#
=====
# untrusted-deserialization:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.ssjs-injection
# Use the following properties to configure
# how the SSJS Injection rule works.
#
```

```
=====
# ssjs-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====

# protect.rules.nosql-injection
# Use the following properties to configure
# how the NOSQL Injection rule works.
#
=====

# nosql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====

# protect.rules.nosql-injection-mongo
# Use the following properties to configure
# how the NOSQL Injection rule works.
#
=====

# nosql-injection-mongo:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:
```

```
# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Pass arguments to the underlying application.
# args: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
```

```
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Set to `false` to disable detection of cloud
# provider metadata such as resource identifiers.
# discover_cloud_resource: true
```

## PHP agent

The Contrast PHP agent analyzes PHP web applications at runtime for library usage and vulnerability detection. The PHP agent is implemented as a PHP extension.

**NOTE**

The PHP agent supports Assess, Protect, and SCA.

As a next step, you can:

- [Install the PHP agent \(page 89\)](#)
- [View PHP agent supported technologies \(page 89\)](#)
- [View PHP agent system requirements \(page 89\)](#)

## PHP advanced installation

The easiest way to deploy PHP agents is to use the [Agent wizard \(page 89\)](#) in the Contrast web interface.

The topics in this section are for users who want additional information or methods related to deploying PHP agents.

| Category     | Topics   |
|--------------|--|
| Installation | <ul style="list-style-type: none"><li>• <a href="#">Install PHP agent with Debian (page 398)</a></li><li>• <a href="#">Install PHP agent with Red Hat Package Manager (RPM) or Amazon Linux 2023 (page 396)</a></li><li>• <a href="#">Install PHP agent on a Lando application server (page 394)</a></li></ul> |

### See also

[Advanced configuration \(page 399\)](#)

### Install the PHP agent

A basic installation of the PHP agent looks like this:

1. Install the agent package.
2. Download the `contrast_security.yaml` and place it in the proper path.
3. Configure the PHP interpreter to enable the Contrast agent extension.
4. Exercise and test your application.
5. Verify that Contrast sees your application.

For specific installation instructions, select one of the following options:

- [Install PHP with Debian \(page 398\)](#)
- [Install PHP with RPM or Amazon Linux 2023 \(page 396\)](#)
- [Install PHP with Lando \(page 394\)](#)

### Install PHP agent on a Lando application server

#### Before you begin

- [Install Lando.](#)
- Create a working application and `.lando.yaml` file using [supported technologies \(page 89\)](#).

## Steps



### IMPORTANT

Never place the `contrast.env` file in the application's webroot directory.

1. In your project's root directory, under the `appserver` service section of the `.lando.yaml` file, install the Contrast agent in the default service by adding this configuration:

```
services:
  appserver:
    build_as_root:
      - curl https://pkg.contrastsecurity.com/api/gpg/key/public | apt-
key add -
      - echo "deb https://pkg.contrastsecurity.com/debian-public/ $
(sed -rne 's/^VERSION_CODENAME=(.*)$/\1/p' /etc/*ease) contrast" \ |
tee /etc/apt/sources.list.d/contrast.list
      - echo "deb https://pkg.contrastsecurity.com/debian-public/ all
contrast" | tee -a /etc/apt/sources.list.d/contrast.list
      - apt-get update && apt-get install contrast-php-agent
      - contrast-php-util enable-agent
env_file:
  - /path/to/contrast.env
```

2. The environment variables are set in the `contrast.env` file for either an agent token or a legacy configuration. The following variables you can set are proposed changes for your reference.

- **Agent Token:** In a `contrast.env` file outside the webroot of your project, enable the connection to Contrast by adding the minimum agent configuration:

```
CONTRAST__API__TOKEN={token value}
CONTRAST__ASSESS__ENABLE=true
CONTRAST__SERVER__NAME={yourServerName}
CONTRAST__AGENT__LOGGER__PATH=stdout
```

If your agent configuration refers to both the legacy settings and the agent token, (in environment variables or the YAML file), the legacy settings take precedence. Remove references to the legacy settings to use just the agent token value.

- **Legacy settings:** If you are using a PHP agent version earlier than 1.34.0, set these variables:

```
CONTRAST__API__URL={contrastURL}
CONTRAST__API__API_KEY={apiKey}
CONTRAST__API__SERVICE_KEY={serviceKey}
CONTRAST__API__USER_NAME={contrastAgentUserName}
CONTRAST__ASSESS__ENABLE=true
CONTRAST__SERVER__NAME={yourServerName}
CONTRAST__AGENT__LOGGER__PATH=stdout
```



## NOTES

- Configuring a name for the `server.name` property prevents the agent from creating a new server entry in the Contrast web interface when the server restarts.
- The `agent.logger.path` property is set to `stdout` to avoid printing agent logs to the `webroot` directory. The Contrast agent logs are available using this configuration by running the `lando logs -s appserver` command.
- You can use the [Contrast agent configuration editor \(page 113\)](#) to verify and export the agent configuration as environment variables.

3. To enable the Contrast agent, run the `lando start` command (if not used previously) or the `lando rebuild -y` command.

## Install PHP agent with Red Hat Package Manager (RPM) or Amazon Linux 2023

### Steps

#### To install the PHP agent:

1. Install the agent package from <https://pkg.contrastsecurity.com>. Use this script in your shell to configure your RPM-based system for our package repository. You may need `sudo` permissions.

For RPM:

```
tee /etc/yum.repos.d/contrast.repo <<-"EOF"
[contrast]
name=Contrast redhat-$releasever repo
baseurl=https://pkg.contrastsecurity.com/rpm-public/redhat-
$releasever/
gpgcheck=0
enabled=1
EOF
```

For Amazon Linux 2023:

```
tee /etc/yum.repos.d/contrast.repo <<-"EOF"

[contrast]
name=Contrast AL2023 repo
baseurl=https://pkg.contrastsecurity.com/rpm-public/redhat-9/
gpgcheck=0
enabled=1
EOF
```

2. Once complete, use one of these commands to install the agent and service. The command used depends on which platform you are installing the agent:

```
yum install contrast-php-agent yum
```

OR

```
dnf install contrast-php-agent
```

3. Continue with configuration.

#### To configure the PHP agent:

There are two ways to configure the agent to work in your environment.



1. Use the `contrast-php-util enable-agent` command. This command installs along with the PHP agent and can be used from the command line to enable the agent in your environment.

```
contrast-php-util enable-agent
```

This will create an `ini` file in the scan directory used by PHP to manage extensions  
**OR**

2. Edit the PHP configuration file, called `php.ini`. On many systems it can be found under `/usr/local/etc/php/`.

If the `php-config` command is available, it can be used to find the configuration file path using `php-config --ini-path`. If no configuration file yet exists under that path, it will need to be created.

```
echo "extension=/usr/local/lib/contrast/php/contrast.so" >> php-config --ini-path/php.ini
```

On systems in which the `php-config` command is not available PHP itself can be used to tell you where the `ini` file is located:

```
php -i | grep php.ini
```

The Configuration File (`php.ini`) Path line will tell you which `ini` file is active. You can then edit that file to add this to the end of the file:

```
extension=/usr/local/lib/contrast/php/contrast.so
```

Note that in certain environments, the `ini` file used by the command line instance of PHP might be different from that loaded in the server environment. FPM will use an `ini` file often located in the `/etc/php/<php version>/fpm/` directory. Please ensure that you are operating on the proper PHP instance.

3. Continue with the final setup.

#### To finalize setup:

1. Ensure that the necessary extensions are enabled.  
The PHP agent requires that the `mbstring`, `json`, and `curl` PHP extensions be installed and enabled. If they are not, edit the `php.ini` config file as above and ensure that these lines are present in the configuration file:

```
extension=curl
extension=mbstring
extension=json
```

2. [Configure the PHP agent \(page 399\)](#) using the [PHP YAML template \(page 400\)](#) or environment variables (if not already done).
3. Start your application in the normal way.
4. Exercise and test your application.
5. Verify that the PHP agent is running by checking the Contrast web interface and/or looking for the PHP agent log output (depending on configuration).

#### Notes

- Library analysis and route discovery are currently performed on the first request to the application. For this reason, we expect the first request to be considerably slower than subsequent requests.
- The agent has not been tested with third-party PHP extensions. The behavior of the agent with any other third-party extensions (including APMs, etc.) is undefined. The agent is known to be incompatible with `xdebug` and should not be used concurrently.

- The agent may not work properly when preloading is enabled. Disabling preloading when using the agent is recommended.
- By default, the agent assumes that the server's working directory when it runs the PHP application is the same as the top-level directory of the application source tree. The agent uses this path to perform library analysis and route discovery. If this is not the case, you will need to use the `application.path` setting in the configuration to set the top-level working directory of your application.

## Install PHP agent with Debian

### Steps

#### To install the PHP agent:

1. Install the agent package from <https://pkg.contrastsecurity.com>. This command registers our package repository in your system:

```
curl \
  https://pkg.contrastsecurity.com/api/gpg/key/public | sudo apt-key add -

echo "deb https://pkg.contrastsecurity.com/debian-public/ $(sed -rne 's/^VERSION_CODENAME=(.*)$/\1/p' /etc/*ease) contrast" \
  | sudo tee /etc/apt/sources.list.d/contrast.list

echo "deb https://pkg.contrastsecurity.com/debian-public/ all contrast" \
  | sudo tee -a /etc/apt/sources.list.d/contrast.list
```

2. Once complete, use this command to install the agent. You may need to use the `sudo` command depending on the permissions in your environment:

```
apt-get update && apt-get install contrast-php-agent
```

3. Continue with configuration.

#### To configure the PHP agent:

There are two ways to configure the agent to work in your environment.

1. Use the `contrast-php-util` command. This command installs along with the PHP agent and can be used from the command line to enable the agent in your environment.

```
contrast-php-util enable-agent
```

This will create an `ini` file in the scan directory used by PHP to manage extensions.

OR

2. Edit the PHP configuration file, called `php.ini`. It can be found on many systems under `/usr/local/etc/php/`.

If the `php-config` command is available, it can be used to find the configuration file path using `php-config --ini-path`. If no configuration file yet exists under that path, it will need to be created.

```
echo "extension=/usr/local/lib/contrast/php/contrast.so" >> php-config --ini-path/php.ini
```

On systems in which the `php-config` command is not available PHP itself can be used to tell you where the `ini` file is located:

```
php -i | grep php.ini
```

The Configuration File (php.ini) Path line will tell you which `ini` file is active. You can then edit that file to add this to the end of the file:

```
extension=/usr/local/lib/contrast/php/contrast.so
```

Note that in certain environments, the `ini` file used by the command line instance of PHP might be different from that loaded in the server environment. FPM will use an `ini` file often located in the `/etc/php/<php version>/fpm/` directory. Please ensure that you are operating on the proper PHP instance.

3. Continue with the final setup.

#### To finalize setup:

1. Ensure that the necessary extensions are enabled.

The PHP agent requires that the `mbstring`, `json`, and `curl` PHP extensions be installed and enabled. If they are not, edit the `php.ini` config file as above and ensure that these lines are present in the configuration file:

```
extension=curl
extension=mbstring
extension=json
```

2. [Configure the PHP agent \(page 399\)](#) using the [PHP YAML template \(page 400\)](#) or environment variables (if not already done).
3. Start your application in the normal way.
4. Exercise and test your application.
5. Verify that the PHP agent is running by checking the Contrast web interface and/or looking for the PHP agent log output (depending on configuration).

#### Notes

- Library analysis and route discovery are currently performed on the first request to the application. For this reason, we expect the first request to be considerably slower than subsequent requests.
- The agent has not been tested with third-party PHP extensions. The behavior of the agent with any other third-party extensions (including APMs, etc.) is undefined. The agent is known to be incompatible with `xdebug` and should not be used concurrently.
- The agent may not work properly when preloading is enabled. Disabling preloading when using the agent is recommended.
- By default, the agent assumes that the server's working directory when it runs the PHP application is the same as the top-level directory of the application source tree. The agent uses this path to perform library analysis and route discovery. If this is not the case, you will need to use the `application.path` setting in the configuration to set the top-level working directory of your application.

### PHP advanced configuration

The easiest way to deploy PHP agents is to use the [Agent wizard \(page 89\)](#) in the Contrast web interface.

The topics in this section are for users who want additional information or methods related to the configuration of PHP agents.

- [Configure the PHP agent \(page 399\)](#)
- [PHP YAML template \(page 400\)](#)

#### Configure the PHP agent

The [standard configuration \(page 107\)](#) for all agents uses this [order of precedence \(page 111\)](#).

You may use a YAML configuration file or environment variables to configure the agent when running your application:

- You can use [environment variables \(page 115\)](#) to configure your build
- You can create your own YAML configuration file or use this [YAML template \(page 400\)](#) that contains all valid properties for the PHP agent

**TIP**

Use the [Contrast agent configuration editor \(page 113\)](#) to create or upload a YAML configuration file, validate YAML and get setting recommendations.

## PHP YAML template

Use this template to configure the PHP agent using a YAML configuration file. (Learn more about [YAML configuration \(page 112\)](#).)

Place your YAML file in the default location: `/etc/contrast/php/contrast_security.yaml`  
or `/etc/contrast/contrast_security.yaml`.

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
# UI.
#
=====
==
api:

  # ***** REQUIRED *****
  # Set the URL for the Contrast UI.
  url: https://app.contrastsecurity.com/Contrast

  # ***** REQUIRED *****
  # Set the API key needed to communicate with the Contrast UI.
  api_key: NEEDS_TO_BE_SET
```

```
# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

#
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Set the absolute or relative path to the Certificate
# PEM file for communication with the Contrast UI.
# cert_file: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate
# with the Contrast web interface over a proxy. Set
# value to `false` if you don't want to use the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`,
# or scheme://username:password@host:port, if you need to
# specify a username and password to connect through the proxy.
# url: NEEDS_TO_BE_SET

#
=====
```

```
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====

# agent.diagnostics
# Use the properties in this section to specify the information the agent
# should collect and report in order to diagnose problems in the agent.
#
#
=====

# diagnostics:

# Creates config and system info files
# at startup if true. True by default.
#
# The same thing can be achieved by setting the
# CONTRAST__AGENT__DIAGNOSTICS__ENABLE=[true/false] env variable.
#
# enable: true

# Set the directory in which to write diagnostic files.
# Defaults to the application's current working directory.
# report_path: ./

#
=====

# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====

# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO
```

```
# Override the name of the process the agents uses in logs.
# progame: Contrast Agent

# Set the roll size for log files in megabytes. The agent will
# attempt to prevent the log file from being larger than this size.
# roll_size: 100

#
=====
# agent.php
# The following properties apply to any PHP agent-wide configurations.
#
=====
# php:

# Specify the path to the PHP executable you want to use.
# cli_executable: NEEDS_TO_BE_SET

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Set to `false` to disable library analysis.
# analyze_libraries: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false
```

```
# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
```



```
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
```

```
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Set to `false` to disable detection of cloud
# provider metadata such as resource identifiers.
# discover_cloud_resource: true
```

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
# UI.
#
=====
==
api:

# ***** REQUIRED *****
# Set the URL for the Contrast UI.
```

```
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

#
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Set the absolute or relative path to the Certificate
# PEM file for communication with the Contrast UI.
# cert_file: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate
# with the Contrast web interface over a proxy. Set
# value to `false` if you don't want to use the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`,
# or scheme://username:password@host:port, if you need to
```

```
# specify a username and password to connect through the proxy.
# url: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.diagnostics
# Use the properties in this section to specify the information the agent
# should collect and report in order to diagnose problems in the agent.
#
#
=====
# diagnostics:

# Creates config and system info files
# at startup if true. True by default.
#
# The same thing can be achieved by setting the
# CONTRAST__AGENT__DIAGNOSTICS__ENABLE=[true/false] env variable.
#
# enable: true

# Set the directory in which to write diagnostic files.
# Defaults to the application's current working directory.
# report_path: ./

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
```

```
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Override the name of the process the agents uses in logs.
# progame: Contrast Agent

# Set the roll size for log files in megabytes. The agent will
# attempt to prevent the log file from being larger than this size.
# roll_size: 100

#
=====
# agent.php
# The following properties apply to any PHP agent-wide configurations.
#
=====
# php:

# Specify the path to the PHP executable you want to use.
# cli_executable: NEEDS_TO_BE_SET

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Set to `false` to disable library analysis.
# analyze_libraries: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:
```

```
# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET
```

```
# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:
```

```
# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Set to `false` to disable detection of cloud
# provider metadata such as resource identifiers.
# discover_cloud_resource: true
```

## PHP YAML template

Use this template to configure the PHP agent using a YAML configuration file. (Learn more about [YAML configuration \(page 112\)](#).)

Place your YAML file in the default location: `/etc/contrast/php/contrast_security.yaml`  
or `/etc/contrast/contrast_security.yaml`.

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
```



```
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
UI.
#
=====
==
api:

# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

#
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Set the absolute or relative path to the Certificate
# PEM file for communication with the Contrast UI.
# cert_file: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
```

```
#
=====
# proxy:

# Set value to `true` for the agent to communicate
# with the Contrast web interface over a proxy. Set
# value to `false` if you don't want to use the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`,
# or scheme://username:password@host:port, if you need to
# specify a username and password to connect through the proxy.
# url: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.diagnostics
# Use the properties in this section to specify the information the agent
# should collect and report in order to diagnose problems in the agent.
#
#
=====
# diagnostics:

# Creates config and system info files
# at startup if true. True by default.
#
# The same thing can be achieved by setting the
# CONTRAST__AGENT__DIAGNOSTICS__ENABLE=[true/false] env variable.
#
# enable: true

# Set the directory in which to write diagnostic files.
# Defaults to the application's current working directory.
# report_path: ./

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
```

```
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Override the name of the process the agents uses in logs.
# progname: Contrast Agent

# Set the roll size for log files in megabytes. The agent will
# attempt to prevent the log file from being larger than this size.
# roll_size: 100

#
=====
# agent.php
# The following properties apply to any PHP agent-wide configurations.
#
=====
# php:

# Specify the path to the PHP executable you want to use.
# cli_executable: NEEDS_TO_BE_SET

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Set to `false` to disable library analysis.
# analyze_libraries: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
```

```
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:
```

```
# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET
```

```
#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Set to `false` to disable detection of cloud
# provider metadata such as resource identifiers.
# discover_cloud_resource: true
```

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==
```

```
# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true
```

```
#
```

```
=====
==
```

```
# api
# Use the properties in this section to connect the agent to the Contrast
# UI.
#
```

```
=====
==
```

```
api:
```

```
# ***** REQUIRED *****
```

```
# Set the URL for the Contrast UI.
```

```
url: https://app.contrastsecurity.com/Contrast
```

```
# ***** REQUIRED *****
```

```
# Set the API key needed to communicate with the Contrast UI.
```

```
api_key: NEEDS_TO_BE_SET
```

```
# ***** REQUIRED *****
```

```
# Set the service key needed to communicate with the Contrast
```

```
# UI. It is used to calculate the Authorization header.
```

```
service_key: NEEDS_TO_BE_SET
```

```
# ***** REQUIRED *****
```

```
# Set the user name used to communicate with the Contrast
```

```
# UI. It is used to calculate the Authorization header.
```

```
user_name: NEEDS_TO_BE_SET
```

```
# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
```

```
# token: NEEDS_TO_BE_SET
```

```
#
```

```
=====
```

```
# api.certificate
```

```
# Use the following properties for communication
```

```
# with the Contrast UI using certificates.
```

```
#
```

```
=====
```

```
# certificate:
```

```
# If set to `false`, the agent will ignore the
```

```
# certificate configuration in this section.
```

```
# enable: true
```

```
# Set the absolute or relative path to the Certificate
```

```
# PEM file for communication with the Contrast UI.
```

```
# cert_file: NEEDS_TO_BE_SET
```

```
#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate
# with the Contrast web interface over a proxy. Set
# value to `false` if you don't want to use the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`,
# or scheme://username:password@host:port, if you need to
# specify a username and password to connect through the proxy.
# url: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.diagnostics
# Use the properties in this section to specify the information the agent
# should collect and report in order to diagnose problems in the agent.
#
#
=====
# diagnostics:

# Creates config and system info files
# at startup if true. True by default.
#
# The same thing can be achieved by setting the
# CONTRAST__AGENT__DIAGNOSTICS__ENABLE=[true/false] env variable.
#
# enable: true

# Set the directory in which to write diagnostic files.
# Defaults to the application's current working directory.
# report_path: ./

#
=====
```



```
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Override the name of the process the agents uses in logs.
# progname: Contrast Agent

# Set the roll size for log files in megabytes. The agent will
# attempt to prevent the log file from being larger than this size.
# roll_size: 100

#
=====
# agent.php
# The following properties apply to any PHP agent-wide configurations.
#
=====
# php:

# Specify the path to the PHP executable you want to use.
# cli_executable: NEEDS_TO_BE_SET

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Set to `false` to disable library analysis.
```

```
# analyze_libraries: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
```

```
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
```

```
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Set to `false` to disable detection of cloud
# provider metadata such as resource identifiers.
# discover_cloud_resource: true
```

## Python agent

The Python agent enables interactive application security testing (IAST) and runtime application self-protection (RASP) for Python applications. It provides support for the most popular Python web application frameworks and also strives to be compatible with any other Python application or framework that conforms to either the [WSGI](#) or [ASGI](#) standards.

In Assess (IAST), the agent identifies vulnerable dataflow paths and other issues during the normal execution of your application. It reports these findings to your organization in Contrast where you can remediate the vulnerabilities before deploying the application in a live environment.

In Protect (RASP), the Python agent inspects HTTP requests to identify potentially harmful input vectors. During the request, the agent inspects database queries, file writes, and other potentially damaging actions resulting from the request. At the end of the request, the agent inspects the rendered output for successful attacks and can block a successful attack from being forwarded to the application user. Instead, the agent natively processes all the analysis internally, reaping many benefits including performance gains.

**NOTE**

The Python agent supports Assess, Protect, and SCA.

As a next step, you can:

- [Install the agent \(page 425\)](#)
- [View supported technologies for the Python agent \(page 94\)](#)

## Python advanced installation

The easiest way to deploy Python agents is to use the [Agent wizard \(page 94\)](#) in the Contrast web interface.

The topics in this section are for users who want additional information or methods related to deploying Python agents.

| Category        | Topics   |
|-----------------|--|
| Installation    | <ul style="list-style-type: none"><li>• <a href="#">Install the Python agent with PyPI (page 425)</a></li><li>• <a href="#">Python update agent (page 426)</a></li></ul> |
| Telemetry       | <ul style="list-style-type: none"><li>• <a href="#">Python telemetry (page 506)</a></li></ul>  |
| Contrast Runner | <ul style="list-style-type: none"><li>• <a href="#">Contrast Runner (page 505)</a></li></ul>   |

### See also

[Advanced configuration \(page 427\)](#)

### Install the Python agent

The Python agent is installed as a standard Python package.

[Install the agent with PyPi \(page 425\)](#) or [update the Python agent \(page 426\)](#).

### Install the Python agent with PyPI

To install the Python agent with [PyPI](#):

1. Verify that a C compiler and C standard library headers are available on the system where you are installing the agent. Package names may differ across platforms.
2. Install the agent using pip.

```
pip install -U contrast-agent
```

**TIP**

If you have a `requirements.txt` file, you can add `contrast-agent` to that file, and install with `pip install -r requirements.txt`.

3. [Configure the agent. \(page 450\)](#)
4. Start and exercise your application using the [Contrast Runner \(page 505\)](#).
5. Verify that your server is registered in Contrast and that it reports an instance of your application.

**Python update agent**

The most reliable and effective way to automatically update the Contrast Python agent is to use the Python `pip` package installer to install and download the latest version available. Because `pip` manages all dependencies for your Python application, it should already be available and part of your build environment. How frequently you update the Contrast Python agent and where you get updates depends on your organization's preferences and your Contrast implementation: hosted or on-premises.

The main steps are:

1. Choose a source for the Contrast Python agent.
2. Install the agent.
3. Use scripts for automatic updates.

**Before you begin**

- Access to the PyPI repository for the Contrast agent.
- Confirmed that your Python application runs properly without the Contrast Python agent.
- Previously successfully installed the Contrast Python agent.
- Defined a policy for how and when to update the agent, based on your change management policy and the environment where you deploy agents.

**Install the agent and use scripts for automatic updates**

1. Choose a source for the Python agent:
  - PyPI public (or private) repository
2. Specify the Contrast Python agent as a dependency in `requirements.txt`.  
`requirements.txt` is the file where you specify which dependencies you want to automatically resolve every time your Python application builds with artifacts from PyPI (public or private). Include the Contrast Python agent here to easily keep every new build of your application aligned with the latest version of the agent. Do not specify a version for `contrast-agent`, and it will retrieve the latest version.
3. After you update `requirements.txt`, use the following command when you build your application. This will automatically download and add or update the Contrast Python agent from PyPI to the Python application:

```
$ pip install -U -r requirements.txt
```

**Install and update manually**

For some organizations, the `requirements.txt` file must be consistent across environments, or they do not plan to install the Contrast Python agent into all environments. In these cases, install the agent manually. You can manually update agents as part of a Python build process.

1. Choose a source for the Python agent:
  - PyPI public (or private) repository
2. Use the following command to manually retrieve and add or update the Contrast Python agent from PyPI (public or private) to the Python application:

```
$ pip install -U contrast-agent
```

## See also

- [Python supported technologies \(page 94\)](#)
- [Install Python \(page 425\)](#)

## Python advanced configuration

The easiest way to deploy Python agents is to use the [Agent wizard \(page 94\)](#) in the Contrast web interface.

The [standard configuration \(page 107\)](#) for all agents uses this [order of precedence \(page 111\)](#).

As of version 5.24.0 of the agent, the [Contrast Runner \(page 505\)](#) is the recommended way to use the Python Agent for most supported frameworks. Manual [middleware configuration \(page 474\)](#) is still supported for backward compatibility and may continue to be necessary for certain frameworks and applications.



### TIP

Use the [Contrast agent configuration editor \(page 113\)](#) to create or upload a YAML configuration file, validate YAML, and get setting recommendations.

## Python YAML template

Use this template to configure the Python agent using a YAML configuration file. (Learn more about [YAML configuration \(page 112\)](#).)

Place your YAML file in the default location: `/etc/contrast/contrast_security.yaml`

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
UI.
#
=====
```

```
==
api:

# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

#
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Set the absolute or relative path to a CA for communication
# with the Contrast UI using a self-signed certificate.
# ca_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Certificate
# PEM file for communication with the Contrast UI.
# cert_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Key PEM
# file for communication with the Contrast UI.
# key_file: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
```



```
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate with
# the Contrast web interface over a proxy. Set value to
# `false` if you don't want to use the proxy. If no value is
# indicated, the presence of a valid **contrast.proxy.host**
# and **contrast.proxy.port** will enable the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
# url: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.route_coverage
# Use the following properties for the route-based coverage feature.
#
=====
# route_coverage:

# Set to `false` to stop the agent from sending
# route-based coverage data to the Contrast UI when the
#
# application returns an error code indicating
# the request was not processed as expected.
#
# report_on_error: false

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
```

```
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Override the name of the process the agents uses in logs.
# progname: Contrast Agent

# Set to `true` to redirect all logs to
# `stdout` instead of the file system.
# stdout: false

# Set to `true` to redirect all logs to `stderr` instead
# of the file system. Overriden by `stdout` configuration.
# stderr: false

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the file to which the agent logs security events.
# path: ./contrast/security.log

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

# Change the Contrast security logger from a file-sized based rolling
# scheme to a date-based rolling scheme. At midnight server time,
# the log from the previous day is renamed to *file_name.yyyy-MM-dd*.
# Note - this scheme does not have a size limit; manual log
# pruning will be required. This flag must be set to use the
# backups and size flags. Value options are `true` or `false`.
# roll_daily: NEEDS_TO_BE_SET

# Specify the file size cap (in MB) of each log file.
# roll_size: NEEDS_TO_BE_SET

# Specify the number of backup logs that the agent will create before
# Contrast cleans up the oldest file. A value of `0` means that no
backups
```

```
# are created, and the log is truncated when it reaches its size cap.
#
# Note - this property must be used with
# `agent.security_logger.roll_daily=false`; otherwise,
# Contrast continues to log daily and disregard this limit.
#
# backups: NEEDS_TO_BE_SET

#
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

#
```

```
=====
# agent.python
# The following properties apply to any Python agent-wide configurations.
#
=====
# python:
#
=====
# agent.python.profiler
# Use the following properties to set up profiler settings.
#
=====
# profiler:
#
# Allow the agent to dump `cProfile` data to file for each request.
# enable: false
#
=====
# agent.python.tracer
# Use the following properties to set up tracer settings.
#
=====
# tracer:
#
# Allow the agent to dump `viztracer` data to file for each request.
# enable: true
#
# Set the minimum duration (in milliseconds)
# for an event to be included in the trace.
# min_duration_ms: 0.010
#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:
#
# Set to `false` to disable inventory features in the agent.
# enable: true
#
# Set to `false` to disable library analysis.
# analyze_libraries: true
#
# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET
```

```
#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10

# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
```

```
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.rules
# Use the following properties to set simple rule configurations.
#
=====
# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====
# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====
# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====
# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====
# sql-injection:
```

```
# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Detect when custom code attempts to access sensitive
# system files. The agent blocks if blocking is enabled.
# detect_custom_code_accessing_system_files: true

# Detect when users attempt to bypass filters by
# using ":::$DATA" channels or null bytes in file
# names. The agent blocks if blocking is enabled.
# detect_common_file_exploits: true

#
=====
# protect.rules.method-tampering
```

```
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
```



```
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
```

```
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Set to `false` to disable detection of cloud
# provider metadata such as resource identifiers.
# discover_cloud_resource: true

#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
```

```
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
UI.
#
=====
==
api:

# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

#
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true
```

```
# Set the absolute or relative path to a CA for communication
# with the Contrast UI using a self-signed certificate.
# ca_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Certificate
# PEM file for communication with the Contrast UI.
# cert_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Key PEM
# file for communication with the Contrast UI.
# key_file: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate with
# the Contrast web interface over a proxy. Set value to
# `false` if you don't want to use the proxy. If no value is
# indicated, the presence of a valid **contrast.proxy.host**
# and **contrast.proxy.port** will enable the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
# url: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.route_coverage
# Use the following properties for the route-based coverage feature.
#
=====
# route_coverage:

# Set to `false` to stop the agent from sending
# route-based coverage data to the Contrast UI when the
#
# application returns an error code indicating
```

```
# the request was not processed as expected.
#
# report_on_error: false

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Override the name of the process the agents uses in logs.
# progname: Contrast Agent

# Set to `true` to redirect all logs to
# `stdout` instead of the file system.
# stdout: false

# Set to `true` to redirect all logs to `stderr` instead
# of the file system. Overriden by `stdout` configuration.
# stderr: false

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the file to which the agent logs security events.
# path: ./contrast/security.log

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
```

```
# level: ERROR

# Change the Contrast security logger from a file-sized based rolling
# scheme to a date-based rolling scheme. At midnight server time,
# the log from the previous day is renamed to *file_name.yyyy-MM-dd*.
# Note - this scheme does not have a size limit; manual log
# pruning will be required. This flag must be set to use the
# backups and size flags. Value options are `true` or `false`.
# roll_daily: NEEDS_TO_BE_SET

# Specify the file size cap (in MB) of each log file.
# roll_size: NEEDS_TO_BE_SET

# Specify the number of backup logs that the agent will create before
# Contrast cleans up the oldest file. A value of `0` means that no
backups
# are created, and the log is truncated when it reaches its size cap.
#
# Note - this property must be used with
# `agent.security_logger.roll_daily=false`; otherwise,
# Contrast continues to log daily and disregard this limit.
#
# backups: NEEDS_TO_BE_SET

#
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
```

```
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

#
=====
# agent.python
# The following properties apply to any Python agent-wide configurations.
#
=====
# python:

#
=====
# agent.python.profiler
# Use the following properties to set up profiler settings.
#
=====
# profiler:

# Allow the agent to dump `cProfile` data to file for each request.
# enable: false

#
=====
# agent.python.tracer
# Use the following properties to set up tracer settings.
#
=====
# tracer:

# Allow the agent to dump `viztracer` data to file for each request.
# enable: true

# Set the minimum duration (in milliseconds)
# for an event to be included in the trace.
# min_duration_ms: 0.010

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
```

```
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Set to `false` to disable library analysis.
# analyze_libraries: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5
```



```
# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10

# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.rules
# Use the following properties to set simple rule configurations.
#
=====
# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====
# protect.rules.bot-blocker
```

```
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====
# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====
# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====
# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
```

```
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Detect when custom code attempts to access sensitive
# system files. The agent blocks if blocking is enabled.
# detect_custom_code_accessing_system_files: true

# Detect when users attempt to bypass filters by
# using "::$DATA" channels or null bytes in file
# names. The agent blocks if blocking is enabled.
# detect_common_file_exploits: true

#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:
```

```
# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
```

```
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
```

```
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Set to `false` to disable detection of cloud
# provider metadata such as resource identifiers.
# discover_cloud_resource: true
```

## Configure the Python agent

The [standard configuration \(page 107\)](#) for all agents uses this [order of precedence \(page 111\)](#).

As of version 5.24.0 of the agent, the [Contrast Runner \(page 505\)](#) is the recommended way to use the Python Agent for most supported frameworks. Manual [middleware configuration \(page 474\)](#) is still supported for backward compatibility and may continue to be necessary for certain frameworks and applications.

## Python YAML template

Use this template to configure the Python agent using a YAML configuration file. (Learn more about [YAML configuration \(page 112\)](#).)

Place your YAML file in the default location: `/etc/contrast/contrast_security.yaml`

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
UI.
#
=====
==
api:

  # ***** REQUIRED *****
  # Set the URL for the Contrast UI.
  url: https://app.contrastsecurity.com/Contrast

  # ***** REQUIRED *****
  # Set the API key needed to communicate with the Contrast UI.
```

```
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

#
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Set the absolute or relative path to a CA for communication
# with the Contrast UI using a self-signed certificate.
# ca_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Certificate
# PEM file for communication with the Contrast UI.
# cert_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Key PEM
# file for communication with the Contrast UI.
# key_file: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate with
# the Contrast web interface over a proxy. Set value to
# `false` if you don't want to use the proxy. If no value is
# indicated, the presence of a valid contrast.proxy.host
```

```
# and **contrast.proxy.port** will enable the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
# url: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.route_coverage
# Use the following properties for the route-based coverage feature.
#
=====
# route_coverage:

# Set to `false` to stop the agent from sending
# route-based coverage data to the Contrast UI when the
#
# application returns an error code indicating
# the request was not processed as expected.
#
# report_on_error: false

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log
```



```
# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Override the name of the process the agents uses in logs.
# progname: Contrast Agent

# Set to `true` to redirect all logs to
# `stdout` instead of the file system.
# stdout: false

# Set to `true` to redirect all logs to `stderr` instead
# of the file system. Overriden by `stdout` configuration.
# stderr: false

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the file to which the agent logs security events.
# path: ./contrast/security.log

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

# Change the Contrast security logger from a file-sized based rolling
# scheme to a date-based rolling scheme. At midnight server time,
# the log from the previous day is renamed to *file_name.yyyy-MM-dd*.
# Note - this scheme does not have a size limit; manual log
# pruning will be required. This flag must be set to use the
# backups and size flags. Value options are `true` or `false`.
# roll_daily: NEEDS_TO_BE_SET

# Specify the file size cap (in MB) of each log file.
# roll_size: NEEDS_TO_BE_SET

# Specify the number of backup logs that the agent will create before
# Contrast cleans up the oldest file. A value of `0` means that no
backups
# are created, and the log is truncated when it reaches its size cap.
#
# Note - this property must be used with
# `agent.security_logger.roll_daily=false`; otherwise,
# Contrast continues to log daily and disregard this limit.
#
# backups: NEEDS_TO_BE_SET

#
```

```
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

#
=====
# agent.python
# The following properties apply to any Python agent-wide configurations.
#
=====
# python:

#
=====
```

```
# agent.python.profiler
# Use the following properties to set up profiler settings.
#
=====
# profiler:

# Allow the agent to dump `cProfile` data to file for each request.
# enable: false

#
=====
# agent.python.tracer
# Use the following properties to set up tracer settings.
#
=====
# tracer:

# Allow the agent to dump `viztracer` data to file for each request.
# enable: true

# Set the minimum duration (in milliseconds)
# for an event to be included in the trace.
# min_duration_ms: 0.010

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Set to `false` to disable library analysis.
# analyze_libraries: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:
```

```
# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10

# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
```

```
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.rules
# Use the following properties to set simple rule configurations.
#
=====
# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====
# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====
# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====
# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====
# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off
```

```
#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Detect when custom code attempts to access sensitive
# system files. The agent blocks if blocking is enabled.
# detect_custom_code_accessing_system_files: true

# Detect when users attempt to bypass filters by
# using "::$DATA" channels or null bytes in file
# names. The agent blocks if blocking is enabled.
# detect_common_file_exploits: true

#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
```

```
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
```

```
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
```



```
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Set to `false` to disable detection of cloud
# provider metadata such as resource identifiers.
# discover_cloud_resource: true

#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
```

```
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
# UI.
#
=====
==
api:

# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

#
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Set the absolute or relative path to a CA for communication
# with the Contrast UI using a self-signed certificate.
# ca_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Certificate
# PEM file for communication with the Contrast UI.
# cert_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Key PEM
```

```
# file for communication with the Contrast UI.
# key_file: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate with
# the Contrast web interface over a proxy. Set value to
# `false` if you don't want to use the proxy. If no value is
# indicated, the presence of a valid **contrast.proxy.host**
# and **contrast.proxy.port** will enable the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
# url: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.route_coverage
# Use the following properties for the route-based coverage feature.
#
=====
# route_coverage:

# Set to `false` to stop the agent from sending
# route-based coverage data to the Contrast UI when the
#
# application returns an error code indicating
# the request was not processed as expected.
#
# report_on_error: false

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
```

```
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Override the name of the process the agents uses in logs.
# progname: Contrast Agent

# Set to `true` to redirect all logs to
# `stdout` instead of the file system.
# stdout: false

# Set to `true` to redirect all logs to `stderr` instead
# of the file system. Overriden by `stdout` configuration.
# stderr: false

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the file to which the agent logs security events.
# path: ./contrast/security.log

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

# Change the Contrast security logger from a file-sized based rolling
# scheme to a date-based rolling scheme. At midnight server time,
# the log from the previous day is renamed to *file_name.yyyy-MM-dd*.
# Note - this scheme does not have a size limit; manual log
# pruning will be required. This flag must be set to use the
# backups and size flags. Value options are `true` or `false`.
# roll_daily: NEEDS_TO_BE_SET
```

```
# Specify the file size cap (in MB) of each log file.
# roll_size: NEEDS_TO_BE_SET

# Specify the number of backup logs that the agent will create before
# Contrast cleans up the oldest file. A value of `0` means that no
backups
# are created, and the log is truncated when it reaches its size cap.
#
# Note - this property must be used with
# `agent.security_logger.roll_daily=false`; otherwise,
# Contrast continues to log daily and disregard this limit.
#
# backups: NEEDS_TO_BE_SET

#
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
```

```
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

#
=====
# agent.python
# The following properties apply to any Python agent-wide configurations.
#
=====
# python:

#
=====
# agent.python.profiler
# Use the following properties to set up profiler settings.
#
=====
# profiler:

# Allow the agent to dump `cProfile` data to file for each request.
# enable: false

#
=====
# agent.python.tracer
# Use the following properties to set up tracer settings.
#
=====
# tracer:

# Allow the agent to dump `viztracer` data to file for each request.
# enable: true

# Set the minimum duration (in milliseconds)
# for an event to be included in the trace.
# min_duration_ms: 0.010

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Set to `false` to disable library analysis.
# analyze_libraries: true
```

```
# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10

# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
```

```
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.rules
# Use the following properties to set simple rule configurations.
#
=====
# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====
# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====
# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false
```



```
#
=====
# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====
# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Detect when custom code attempts to access sensitive
# system files. The agent blocks if blocking is enabled.
# detect_custom_code_accessing_system_files: true

# Detect when users attempt to bypass filters by
```

```
# using "::$DATA" channels or null bytes in file
# names. The agent blocks if blocking is enabled.
# detect_common_file_exploits: true

#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off
```

```
#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
```

```
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Set to `false` to disable detection of cloud
# provider metadata such as resource identifiers.
# discover_cloud_resource: true
```

## Validate the Python agent configuration

The Python agent includes a script for validating and testing your agent configuration.

### Steps to run the script

1. Install `contrast-agent` version 5.1.0 or later using `pip`.
2. Prepare your Contrast configuration using a [YAML file \(page 427\)](#), [environment variables \(page 115\)](#), or both.
3. Run the command `contrast-validate-config`. This script validates your current configuration and tests your ability to communicate with Contrast.



#### NOTE

A **Response: 400 Bad Request** message still indicates a successful connection to Contrast.

For example, this indicates that the application Server has not yet been created in Contrast:

```
[contrast-validate-config] Sending test request to Contrast UI
[contrast-validate-config] Response: 400 Bad Request
[contrast-validate-config] {
  "success" : false,
  "messages" : [ "Invalid agent request" ]
}
[contrast-validate-config] 400 status code indicates success
for this endpoint
[contrast-validate-config] Connection to the Contrast UI
successful
```

And this indicates that the Server has already been created in Contrast:

```
[contrast-validate-config] Sending test request to Contrast UI
[contrast-validate-config] Response: 304 Not Modified
[contrast-validate-config] 304 status code indicates success
for this endpoint
[contrast-validate-config] Connection to the Contrast UI
successful
```

### See also

- [Configure the Python agent \(page 450\)](#)

## Configure middleware



### WARNING

Manual middleware configuration is no longer recommended. Instead, you should run your application with the `contrast-python-run` command, which automatically detects and enables framework-specific instrumentation. See [Contrast Runner \(page 505\)](#) for more information.

For rarer cases where manual middleware configuration is still required, instructions are listed below.

Middleware is a software component that is part of a web application and is capable of reading and modifying inbound requests and outbound responses.

The Python agent is implemented as a middleware for all of the frameworks that Contrast supports. To use the Python agent, you must configure the middleware for the framework that your application uses:

### AIOHTTP

AIOHTTP middleware is a class-based middleware that should be passed into the `aiohttp web.Application` constructor as an argument. The following example shows a sample AIOHTTP application that uses the Contrast middleware class:

```
from aiohttp import web
from contrast.aiohttp import ContrastMiddleware

routes = web.RouteTableDef()

@routes.get("/")
def index(request):
    raise web.HTTPFound("/hello")

middlewares = [ContrastMiddleware(app_name="app name")]
app = web.Application(middlewares=middlewares)
app.add_routes(routes)

web.run_app(app)
```

### Bottle

Contrast's Bottle middleware is a WSGI middleware, which operates by wrapping the Bottle application instance.

To configure the Python agent for Bottle:

1. Find the Bottle application object in your application codebase. This will be an instance of `bottle.Bottle`.  
A sample Bottle application might look like this, where `app` is your Bottle application object:

```
from bottle import Bottle, run

app = Bottle(__name__)
```

```
@app.route("/")
def index():
    return "hello world"
```

<InstallContrastHere>

```
run(app)
```

2. Wrap the Bottle application object with Contrast's middleware. In the example above, replace <InstallContrastHere> with:

```
from contrast.bottle import ContrastMiddleware
app = ContrastMiddleware(app)
```



### IMPORTANT

In rare cases, you may be required to pass the original `bottle.Bottle` application instance directly to the `ContrastMiddleware` in addition to your WSGI application object. If the application does not start, find your original Bottle application and pass it to Contrast's middleware. For example:

```
app = ContrastMiddleware(
    app,
    original_bottle_app, # instance of bottle.Bottle
)
```

## Django

### New configuration steps: works with Contrast Python agent versions 4.6.0 and later

Contrast's Django middleware is a WSGI middleware, not a Django-style middleware.

1. Find your WSGI application object. The `WSGI_APPLICATION` Django configuration option points to your project's WSGI app - this is often located in `wsgi.py`. You must set the `WSGI_APPLICATION` config option if it is not already set.

A sample `wsgi.py` might look like this, where `application` is your WSGI application object:

```
from django.core.wsgi import get_wsgi_application
application = get_wsgi_application()
```

<InstallContrastHere>

2. Wrap the WSGI application object with Contrast's middleware. In the example above, replace <InstallContrastHere> with:

```
from contrast.django import ContrastMiddleware
application = ContrastMiddleware(application)
```

### Old configuration steps: will not work with Contrast Python agent versions 5.0.0 and later

Django middleware is configured in the `settings.py` file.

1. **Find the `settings.py` file.** This file isn't found in the same location for all applications, but it's generally near the top of the application source tree. Common locations include:
  - `/settings.py`

- `config/settings.py`
- `app/settings.py`

**NOTE**

When searching the source tree to find the `settings.py`, make sure to exclude any directories that correspond to Python virtual environments.

Some applications have multiple `settings.py` files, which may correspond to different configurations of the application (for example, prod or test). In these cases, add the Contrast agent middleware to any and all of the configurations where it will be used.

**2. Add the Contrast agent module to the list.**

Include the Contrast middleware as early in the list as possible; although modifying the order may be necessary to get the application working in some circumstances.

- **Django 1.10 and later:** Look for the `MIDDLEWARE` configuration variable, which is an array. Add the Contrast agent module to the list:

```
MIDDLEWARE = [  
    'contrast.agent.middlewares.django_middleware.DjangoMiddleware',  
    # OTHER MIDDLEWARE,  
]
```

- **Django 1.6 to 1.9:** Look for the `MIDDLEWARE_CLASSES` configuration variable in `settings.py` and add the Contrast agent module to the list:

```
MIDDLEWARE_CLASSES = [  
  
    'contrast.agent.middlewares.legacy_django_middleware.DjangoMiddleware',  
    # OTHER MIDDLEWARE  
]
```

See the [Django documentation](#) for more details on middleware inclusion.

**Falcon (ASGI)**

Falcon (ASGI) middleware is an ASGI middleware, which operates by wrapping the Falcon(ASGI) application instance.

The following example shows a sample Falcon(ASGI) application wrapped by the Contrast middleware class.

**NOTE**

If your Falcon (ASGI) application uses other middleware in addition to Contrast, Contrast must be the first middleware initialized in order for certain features to work.

```
import falcon.asgi  
from contrast.falcon_asgi import ContrastMiddleware  
  
class Home(object):  
    async def on_get(self, req, resp):  
        resp.status = falcon.HTTP_200  
        resp.body = "Hello World"
```



```
def create():
    # This is where the example app is declared. Look for something similar
    # in your
    # application since this instance needs to be wrapped by Contrast
    # middleware
    _app = falcon.asgi.App()

    # Add routes to your app
    home = Home()
    _app.add_route("/home", home)

    # This line wraps the application instance with the Contrast middleware
    # NOTE: Contrast should be the first middleware if others are used
    _app = ContrastMiddleware(_app)
    return _app

app = create()
```

## Falcon (WSGI)

Contrast's Falcon middleware is a WSGI middleware, not a Falcon-style middleware.

1. Find your Falcon application object. This will be an instance of `falcon.API` or `falcon.App` depending on your version of Falcon.

A sample Falcon application might look like this, where `app` is your Falcon application object:

```
import falcon
from views import Home

app = falcon.API()

home = Home()
app.add_route('/home', home)

<InstallContrastHere>
```

2. Wrap the Falcon application object with Contrast's middleware. In the example above, replace `<InstallContrastHere>` with:

```
from contrast.falcon import ContrastMiddleware
app = ContrastMiddleware(app)
```



### IMPORTANT

In rare cases, you may be required to pass the original `falcon.App` or `falcon.API` application instance directly to the `ContrastMiddleware` in addition to your WSGI application object. If the application does not start, find your original Falcon application and pass it to Contrast's middleware. For example:

```
app = ContrastMiddleware(
    app,
    original_falcon_app, # instance of falcon.App or
    falcon.API
)
```

**IMPORTANT**

You must wrap the Falcon instance *after* route registration is complete.

**FastAPI**

FastAPI middleware is a class-based ASGI middleware that relies on `starlette.middleware.BaseHTTPMiddleware`. Check [Python supported technologies \(page 94\)](#) for the latest version of FastAPI supported by Contrast. The following example shows a sample FastAPI application that uses the Contrast middleware class:

```
from fastapi import FastAPI
from contrast.fastapi import ContrastMiddleware

app = FastAPI()
app.add_middleware(ContrastMiddleware, original_app=app)

@app.get("/")
def read_root():
    return RedirectResponse("/home")
```

If your FastAPI application uses other middleware in addition to Contrast, Contrast must be the first middleware initialized in order for certain features to work.

```
from fastapi import FastAPI
from fastapi.middleware.httpsredirect import HTTPSRedirectMiddleware
from contrast.fastapi import ContrastMiddleware

app = FastAPI()

# ContrastMiddleware must be the first middleware
app.add_middleware(ContrastMiddleware, original_app=app)
app.add_middleware(HTTPSRedirectMiddleware)
```

Adding middleware via the `add_middleware` method is the only supported way to add middleware at this time, because certain features require the FastAPI `app` to be passed in as the `original_app` keyword argument. Initializing middlewares by passing them in directly to the FastAPI class initialization is not currently supported by Contrast.

```
# Not currently supported.
app = FastAPI(middleware=[...])
```

**WARNING**

Calling `add_middleware` multiple times is known to **re-initialize all previous middleware**.

**Flask**

Contrast's Flask middleware is a WSGI middleware, which operates by wrapping the Flask application instance.

1. Find your Flask application object. This will be an instance of `flask.Flask`.

A sample Flask application might look like this, where `app` is your Flask application object:

```
import Flask

app = Flask(__name__)

<InstallContrastHere>

@app.route('/')
def index():
    return render_template('index.html')

app.run(...)
```

2. Wrap the Flask application object with Contrast's middleware. In the example above, replace `<InstallContrastHere>` with:

```
from contrast.flask import ContrastMiddleware
app.wsgi_app = ContrastMiddleware(app)
```



#### NOTE

Contrast's Flask middleware requires an instance of `flask.Flask` as an argument, rather than `flask.Flask.wsgi_app`.

## Pyramid

**Old configuration steps: will not work with Contrast Python agent versions 5.0.0 and later**

In Pyramid, middlewares are called "tweens".

1. Find the configurator object in your application codebase. It might look like this:

```
from pyramid.config import Configurator
config = Configurator()

<InstallContrastHere>
```

2. Add Contrast's middleware to your config. In the example above, replace `<InstallContrastHere>` with:

```
config.add_tween('contrast.agent.middlewares.pyramid_middleware.PyramidMiddleware')
```

See the [Pyramid documentation](#) for additional details on tween configuration.

**New configuration steps: works with Contrast Python agent versions 4.6.0 and later**

Contrast's Pyramid middleware is a WSGI middleware, not a Pyramid-style "tween".

1. Find your WSGI application object. This is often created by a call to `Configurator.make_wsgi_app()`. For example, it might look like this:

```
from pyramid.config import Configurator

config = Configurator()
app = config.make_wsgi_app()

<InstallContrastHere>
```

2. Wrap the WSGI application object with Contrast's middleware. In the example above, replace `<InstallContrastHere>` with:

```
from contrast.pyramid import ContrastMiddleware
app = ContrastMiddleware(app)
```



### IMPORTANT

In rare cases, Contrast may require that you pass your application's Registry object to the middleware as well. The registry is commonly available as an attribute of both the Configurator instance and the Pyramid application object.

If the application does not start, find your application Registry and pass it to Contrast's middleware, for example:

```
app = ContrastMiddleware(app, config.registry)
```

## Quart

The Quart middleware should wrap the Quart application object and be assigned to the `asgi_app` attribute. The following example shows a sample quart application that uses the Contrast middleware class:

```
from quart import Quart, redirect
from contrast.quart import ContrastMiddleware

app = Quart(__name__)
app.asgi_app = ContrastMiddleware(app)

@app.route("/")
async def index():
    return redirect("/home")
```

## WSGI

Contrast provides a generic WSGI middleware that includes all core agent functionality. Framework-specific features such as route discovery are not implemented in the generic WSGI middleware.

To instrument any WSGI-compliant application with Contrast:

1. Find the WSGI application object in your application codebase. For example, a WSGI app was created as follows:

```
from example.module import make_app
wsgi_app = make_app()

<InstallContrastHere>
```

2. Wrap the WSGI application object with Contrast's middleware. In the example above, replace `<InstallContrastHere>` with:

```
from contrast.wsgi import ContrastMiddleware
wsgi_app = ContrastMiddleware(wsgi_app)
```

See the [WSGI specification](#) for additional details on WSGI middleware.

## ASGI

Contrast also provides a generic ASGI middleware. Like the generic WSGI middleware, the ASGI middleware includes core agent functionality but no framework-specific features.

To instrument an ASGI-compliant HTTP/HTTPS application:

1. Find the ASGI application object in your codebase. For example, take the following ASGI app:

```
from example.module import make_app
asgi_app = make_app()

<InstallContrastHere>
```

2. Wrap the ASGI application object with Contrast's middleware. In the example above, replace `<InstallContrastHere>` with:

```
from contrast.asgi import ContrastMiddleware
asgi_app = ContrastMiddleware(asgi_app)
```

## Python web servers

The Python agent is tested against several common production web servers. Some servers require certain configuration options in order to work properly with Contrast.

### Gunicorn

You can integrate Gunicorn with popular frameworks like Django, Pyramid, Tornado, or others.

Use the following command to start Gunicorn: `gunicorn app.wsgi_app:application` (where `app` is the folder of your application).

The following configurations are available within your Gunicorn server:

- **Bind:**

```
-b ADDRESS1
gunicorn -b 127.0.0.1:8000
```

- **Timeout:**

```
-t INT or --timeout INT
```

Workers silent for more than this many seconds are killed and restarted.

Value is a positive number or 0. Setting it to 0 has the effect of infinite timeouts by disabling timeouts for all workers entirely.

The default is 30 seconds. Only set this noticeably higher if you're sure of the repercussions for sync workers. For the non sync workers, it means that the worker process is still communicating and is not tied to the length of time required to handle a single request.

### Uvicorn

Uvicorn is an asynchronous web server that can be installed with: `pip install uvicorn[standard]`.

The following are some suggested configurations:

- `--loop=uvloop`

- `--http=httptools`

Both `uvloop` and `httptools` are written in Cython, and offer greater performance but are not compatible with Windows or PyPy.

- `--interface`

You may set this to some of the ASGI protocols. If you are using WSGI, and using `ws=websockets`, `websockets` will not be used and defaults to `auto`.

- `--ws`  
If you have set `--ws-max-size`, `--ws-ping-interval`, `--ws-ping-timeout`, and `--ws` is not set with websockets, everything will be ignored.
- To use gunicorn as a manager to uvicorn you can do that by the following:  
`gunicorn -k uvicorn.workers.UvicornWorker`
- The [UvicornWorker implementation](#) uses the `uvloop` and `httptools` implementations. To run under PyPy, you will need to use pure-python implementation instead. You can do this by using the `UvicornH11Worker` class.  
`gunicorn -k uvicorn.workers.UvicornH11Worker`.

## uWSGI configuration

Contrast requires the following configuration options when running on uWSGI. You can set these on the command line or in your uWSGI configuration (.ini) file:

- `--enable-threads`: Contrast's machinery utilizes threads. This option must be enabled so the agent can start background threads.
- `--single-interpreter`: The Python agent applies its instrumentation to the Python process in which it is initialized. This option ensures that Contrast is initialized in the same process that handles requests for your application.
- If using `--master` you must also use `--lazy-apps`: When running in master mode, uWSGI initializes the application in a master process but forks this process into workers which handle requests. To operate correctly, Contrast must be initialized independently in each worker process; `--lazy-apps` achieves this.

## Python YAML template

Use this template to configure the Python agent using a YAML configuration file. (Learn more about [YAML configuration \(page 112\)](#).)

Place your YAML file in the default location: `/etc/contrast/contrast_security.yaml`

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
UI.
#
=====
==
api:

# ***** REQUIRED *****
```

```
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET
```

```
#
```

```
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
```

```
=====
# certificate:
```

```
# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true
```

```
# Set the absolute or relative path to a CA for communication
# with the Contrast UI using a self-signed certificate.
# ca_file: NEEDS_TO_BE_SET
```

```
# Set the absolute or relative path to the Certificate
# PEM file for communication with the Contrast UI.
# cert_file: NEEDS_TO_BE_SET
```

```
# Set the absolute or relative path to the Key PEM
# file for communication with the Contrast UI.
# key_file: NEEDS_TO_BE_SET
```

```
#
```

```
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
```

```
=====
# proxy:
```

```
# Set value to `true` for the agent to communicate with
# the Contrast web interface over a proxy. Set value to
# `false` if you don't want to use the proxy. If no value is
# indicated, the presence of a valid **contrast.proxy.host**
# and **contrast.proxy.port** will enable the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
# url: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.route_coverage
# Use the following properties for the route-based coverage feature.
#
=====
# route_coverage:

# Set to `false` to stop the agent from sending
# route-based coverage data to the Contrast UI when the
#
# application returns an error code indicating
# the request was not processed as expected.
#
# report_on_error: false

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
```



```
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Override the name of the process the agents uses in logs.
# progname: Contrast Agent

# Set to `true` to redirect all logs to
# `stdout` instead of the file system.
# stdout: false

# Set to `true` to redirect all logs to `stderr` instead
# of the file system. Overridden by `stdout` configuration.
# stderr: false

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the file to which the agent logs security events.
# path: ./contrast/security.log

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

# Change the Contrast security logger from a file-sized based rolling
# scheme to a date-based rolling scheme. At midnight server time,
# the log from the previous day is renamed to *file_name.yyyy-MM-dd*.
# Note - this scheme does not have a size limit; manual log
# pruning will be required. This flag must be set to use the
# backups and size flags. Value options are `true` or `false`.
# roll_daily: NEEDS_TO_BE_SET

# Specify the file size cap (in MB) of each log file.
# roll_size: NEEDS_TO_BE_SET

# Specify the number of backup logs that the agent will create before
# Contrast cleans up the oldest file. A value of `0` means that no
backups
# are created, and the log is truncated when it reaches its size cap.
#
# Note - this property must be used with
# `agent.security_logger.roll_daily=false`; otherwise,
```

```
# Contrast continues to log daily and disregard this limit.
#
# backups: NEEDS_TO_BE_SET

#
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

#
=====
# agent.python
# The following properties apply to any Python agent-wide configurations.
#
```

```
=====
# python:
#
=====
# agent.python.profiler
# Use the following properties to set up profiler settings.
#
=====
# profiler:

# Allow the agent to dump `cProfile` data to file for each request.
# enable: false

#
=====
# agent.python.tracer
# Use the following properties to set up tracer settings.
#
=====
# tracer:

# Allow the agent to dump `viztracer` data to file for each request.
# enable: true

# Set the minimum duration (in milliseconds)
# for an event to be included in the trace.
# min_duration_ms: 0.010

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Set to `false` to disable library analysis.
# analyze_libraries: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
```

```
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10

# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
```

```
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====

# protect.rules
# Use the following properties to set simple rule configurations.
#
=====

# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====

# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====

# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====

# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====

# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
```

```
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

# Detect when custom code attempts to access sensitive
# system files. The agent blocks if blocking is enabled.
# detect_custom_code_accessing_system_files: true

# Detect when users attempt to bypass filters by
# using "::$DATA" channels or null bytes in file
# names. The agent blocks if blocking is enabled.
# detect_common_file_exploits: true

#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
```

```
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:
```

```
# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET
```



```
#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Set to `false` to disable detection of cloud
# provider metadata such as resource identifiers.
# discover_cloud_resource: true
```

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==
```

```
# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
# UI.
#
=====
==
api:

# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
# token: NEEDS_TO_BE_SET

#
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Set the absolute or relative path to a CA for communication
# with the Contrast UI using a self-signed certificate.
# ca_file: NEEDS_TO_BE_SET
```

```
# Set the absolute or relative path to the Certificate
# PEM file for communication with the Contrast UI.
# cert_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Key PEM
# file for communication with the Contrast UI.
# key_file: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate with
# the Contrast web interface over a proxy. Set value to
# `false` if you don't want to use the proxy. If no value is
# indicated, the presence of a valid **contrast.proxy.host**
# and **contrast.proxy.port** will enable the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
# url: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.route_coverage
# Use the following properties for the route-based coverage feature.
#
=====
# route_coverage:

# Set to `false` to stop the agent from sending
# route-based coverage data to the Contrast UI when the
#
# application returns an error code indicating
# the request was not processed as expected.
#
# report_on_error: false
```

```
#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Override the name of the process the agents uses in logs.
# progname: Contrast Agent

# Set to `true` to redirect all logs to
# `stdout` instead of the file system.
# stdout: false

# Set to `true` to redirect all logs to `stderr` instead
# of the file system. Overriden by `stdout` configuration.
# stderr: false

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the file to which the agent logs security events.
# path: ./contrast/security.log

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

# Change the Contrast security logger from a file-sized based rolling
# scheme to a date-based rolling scheme. At midnight server time,
```

```
# the log from the previous day is renamed to *file_name.yyyy-MM-dd*.
# Note - this scheme does not have a size limit; manual log
# pruning will be required. This flag must be set to use the
# backups and size flags. Value options are `true` or `false`.
# roll_daily: NEEDS_TO_BE_SET

# Specify the file size cap (in MB) of each log file.
# roll_size: NEEDS_TO_BE_SET

# Specify the number of backup logs that the agent will create before
# Contrast cleans up the oldest file. A value of `0` means that no
backups
# are created, and the log is truncated when it reaches its size cap.
#
# Note - this property must be used with
# `agent.security_logger.roll_daily=false`; otherwise,
# Contrast continues to log daily and disregard this limit.
#
# backups: NEEDS_TO_BE_SET

#
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
```

```
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

#
=====
# agent.python
# The following properties apply to any Python agent-wide configurations.
#
=====
# python:

#
=====
# agent.python.profiler
# Use the following properties to set up profiler settings.
#
=====
# profiler:

# Allow the agent to dump `cProfile` data to file for each request.
# enable: false

#
=====
# agent.python.tracer
# Use the following properties to set up tracer settings.
#
=====
# tracer:

# Allow the agent to dump `viztracer` data to file for each request.
# enable: true

# Set the minimum duration (in milliseconds)
# for an event to be included in the trace.
# min_duration_ms: 0.010

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:
```

```
# Set to `false` to disable inventory features in the agent.
# enable: true

# Set to `false` to disable library analysis.
# analyze_libraries: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10
```

```
# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.rules
# Use the following properties to set simple rule configurations.
#
=====
# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====
# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====
```



```
# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====
# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====
# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off
```

```
# Detect when custom code attempts to access sensitive
# system files. The agent blocks if blocking is enabled.
# detect_custom_code_accessing_system_files: true

# Detect when users attempt to bypass filters by
# using "::$DATA" channels or null bytes in file
# names. The agent blocks if blocking is enabled.
# detect_common_file_exploits: true

#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
```

```
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET
```

```
# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET
```

```
# Set to `false` to disable detection of cloud
# provider metadata such as resource identifiers.
# discover_cloud_resource: true
```

## Contrast Runner

As of version 5.24.0, the Python agent provides a new command-line interface (also called a runner) for instrumenting Python applications. In general, when using the runner, it is no longer required to [manually configure middleware \(page 474\)](#). Instead, the Contrast runner automatically applies framework-specific instrumentation to your Python application.



### NOTE

Instrumentation tools that use a runner or wrapper script may conflict with the Contrast Runner. If your application has issues starting when you use the Contrast Runner with other instrumentation tools, [configure your application with Contrast's middleware \(page 474\)](#).

The runner command is called `contrast-python-run` and is provided as part of the `contrast-agent` package. In most Python environments it will be available on the command line without further changes when the `contrast-agent` package is [installed \(page 425\)](#).

## Using the runner

The runner is used by adding the `contrast-python-run` command to the beginning of the original command that starts your application.

- For example, with a **Django** application that is started with the following command:

```
python manage.py runserver
```

- You would run the following command to add Contrast to this application:

```
contrast-python-run -- python manage.py runserver
```



### NOTE

The double dash separator “--” is used to separate the runner command's arguments from those that belong to the original command.

- In another example, with a **Flask** application that is started with the following command:

```
FLASK_APP=apps/app.py flask run --host=localhost --port=8080
```

- Using the Contrast runner would look like this (note that setting the environment variable still happens before the runner command):

```
FLASK_APP=apps/app.py contrast-python-run -- flask run --host=localhost
--port=8080
```

- The `contrast-python-run` command also works when deploying with web servers such as **uwsgi** and **gunicorn**. For example:

```
contrast-python-run -- gunicorn apps/app:app --preload -b localhost:8080
```

- It also works when deploying to Apache using **mod\_wsgi-express**. For example:

```
contrast-python-run -- mod_wsgi-express start-server app/wsgi.py --  
user=www-data --group www-data
```

The runner follows the normal [order of precedence \(page 111\)](#) for Contrast configuration. It is also possible to use environment variables with the runner directly on the command line:

```
CONTRAST__AGENT__LOGGER__LEVEL=DEBUG contrast-python-run -- python  
manage.py runserver
```

## Python telemetry

The Python agent use telemetry to collect usage data. Telemetry is collected when an instrumented application first loads the agent's sensors and then periodically (every few hours) afterwards.

[Your privacy is important to us \(page 1563\)](#). The telemetry feature does not collect application data. The data is anonymized before being sent securely to Contrast. Then the aggregated data is stored encrypted and under restricted access control. Any collected data will be deleted after one year.

The telemetry feature collects the following data:

| Agent versions | Data                                    |
|----------------|---|
| Python 4.14.0  | Agent version                           |
|                | Operating system and version            |
|                | Python version                          |
|                | Application framework and version       |
|                | Web server and version                  |
|                | Hosted or on-premises Contrast instance |

To opt-out of the telemetry feature, set the `CONTRAST__AGENT__TELEMETRY__OPTOUT` environment variable to `1` or `true`.

Telemetry data is securely sent to `telemetry.python.contrastsecurity.com`. You can also opt out of telemetry by blocking communication at the network level.

## Ruby agent



### IMPORTANT

The Ruby Agent is not currently being sold to new customers. Please contact our Sales team if you have any questions about our offerings and support for the Ruby language.

The Ruby agent is a Rack middleware that's compatible with the most popular web application frameworks. The agent's goal is to be fully Rack compatible and to provide applications built on Rack with interactive application security testing (IAST) and runtime application self-protection (RASP) capabilities.

In Assess, the agent identifies vulnerable dataflow paths and other issues during the normal execution of your application. It reports these findings to your organization in Contrast; you can then remediate the vulnerabilities before deploying the application in a live environment.

In Protect, the Ruby agent inspects HTTP requests to identify potentially harmful input vectors. During the request, the agent inspects database queries, file writes and other potentially damaging actions

resulting from the request. At the end of the request, the agent inspects the rendered output for successful attacks and can block a successful attack from being forwarded to the application user. It then sends the details of the attack to the Contrast application, which then sends you an alert and displays attack details in the interface.

**NOTE**

The Ruby agent supports Assess, Protect, and SCA.

As a next step, you can:

- [Install the Ruby agent \(page 507\)](#)
- [View Ruby agent supported technologies \(page 100\)](#)

## Ruby advanced installation

**IMPORTANT**

The Ruby Agent is not currently being sold to new customers. Please contact our Sales team if you have any questions about our offerings and support for the Ruby language.

The easiest way to deploy Ruby agents is to use the [Agent wizard \(page 99\)](#) in the Contrast web interface.

The topics in this section are for users who want additional information or methods related to deploying Ruby agents.

| Category     | Topics   |
|--------------|--|
| Installation | <ul style="list-style-type: none"><li>• <a href="#">Install the Ruby agent with RubyGems as a gem source (page 508)</a></li><li>• <a href="#">Ruby update agent (page 508)</a></li></ul> |
| Telemetry    | <ul style="list-style-type: none"><li>• <a href="#">Ruby telemetry (page 510)</a></li></ul>  |

**See also**

[Advanced configuration \(page 510\)](#)

## Install the Ruby agent

**IMPORTANT**

The Ruby Agent is not currently being sold to new customers. Please contact our Sales team if you have any questions about our offerings and support for the Ruby language.

The `contrast-agent.gem` is a standard Ruby library that you can add to the application Gemfile.

Install the Ruby agent [using RubyGems as a gem source \(page 508\)](#) or [update the Ruby agent \(page 508\)](#).

## Install the Ruby agent with RubyGems as a gem source



### IMPORTANT

The Ruby Agent is not currently being sold to new customers. Please contact our Sales team if you have any questions about our offerings and support for the Ruby language.

To download the Ruby agent from RubyGems:

1. Add this to your application's gemfile:

```
gem 'contrast-agent'
```

2. Run an install:

```
bundle install
```

or an update:

```
bundle update contrast-agent
```

3. [Configure middleware \(page 511\)](#) (Rails or Sinatra).
4. [Configure the agent \(page 511\)](#).
5. Verify that `autoconf` is installed on the system where you will run the agent.
6. Verify that you can see your application in Contrast.



### NOTE

If installing in Alpine, you may need to run the command `bundle config force_ruby_platform true` prior to installation.



### NOTE

If you only want to run with Contrast in certain environments, you can do so using the [Bundler's Group function](#).

## Ruby update agent



### IMPORTANT

The Ruby Agent is not currently being sold to new customers. Please contact our Sales team if you have any questions about our offerings and support for the Ruby language.



The most reliable and effective way to automatically update the Contrast Ruby agent is to use the `Ruby Bundler package manager` to install and download the latest version available. Because Bundler typically manages all dependencies for your Ruby application, it should already be available and part of your build environment. How frequently you update the Contrast Ruby agent and where you get updates depends on your organization's preferences and your Contrast implementation: Hosted or on-premises.

The main steps are:

1. Choose a source for the Contrast Ruby agent.
2. Install the agent,
3. Use scripts for automatic updates.

## Before you begin

- Some familiarity with Ruby's Bundler package manager.
- Access to the RubyGems repository for the Contrast Ruby agent.
- Confirmed that your Ruby application runs properly without the Contrast Ruby agent.
- Previously successfully installed the Contrast Ruby agent.
- Defined a policy for how and when to update the agent, based on your change management policy and the environment where you deploy agents.

## Install and use scripts automatic updates

1. Choose a source for the Contrast ruby agent:
  - RubyGems public (or private) repository
2. Include the Contrast Ruby agent in the Gemfile to easily keep every new build of your application aligned with the latest version of the agent. Do not specify a version for `contrast-agent`, and it will retrieve the latest version.

The Gemfile is where you specify which dependencies you want to automatically resolve every time your Ruby application builds with artifacts from RubyGems (public or private).
3. After you update the Gemfile, use the following command when you build your application. This will automatically download and add the Contrast Ruby agent from RubyGems to the Ruby application.

```
$ bundle install
```

4. After you add `contrast-agent` to your Gemfile, you can use Bundler to update your agent, like this:

```
bundle update contrast-agent
```

## Install the gem manually

You can manually update agents as part of a Ruby build process in two ways. Choose the one that works best for your organization and workflow:

- **Rubygems:** Use the following command to retrieve and install the Contrast Ruby agent from RubyGems (public or private) to the application:

```
$ gem install contrast-agent
```

Add the following line to your Gemfile to manage updates with Bundler, because the previous command only installs the agent locally:

```
gem "contrast-agent"
```

Then to either install or update the agent using bundler run the following:

```
$ bundle install
```

- Add the following line to your Gemfile to manage the updates with Bundler, because the previous command only installs the agent locally:

```
gem "contrast-agent"
```

## See also

- [Ruby supported technologies \(page 100\)](#)
- [Install Ruby \(page 507\)](#)

## Ruby telemetry

The Ruby agent use telemetry to collect usage data. Telemetry is collected when an instrumented application first loads the agent's sensors and then periodically (every few hours) afterwards.

[Your privacy is important to us \(page 1563\)](#). The telemetry feature does not collect application data. The data is anonymized before being sent securely to Contrast. Then the aggregated data is stored encrypted and under restricted access control. Any collected data will be deleted after one year.

The telemetry feature collects the following data:

| Agent versions | Data                                    |
|----------------|---|
| Ruby 4.13      | Agent version                           |
|                | Operating system and version            |
|                | Ruby version                            |
|                | Application framework and version       |
|                | Web server and version                  |
|                | Hosted or on-premises Contrast instance |

To opt-out of the telemetry feature, set the `CONTRAST_AGENT_TELEMETRY_OPTOUT` environment variable to `1` or `true`.

Telemetry data is securely sent to `telemetry.ruby.contrastsecurity.com`. You can also opt out of telemetry by blocking communication at the network level.

## Ruby advanced configuration



### IMPORTANT

The Ruby Agent is not currently being sold to new customers. Please contact our Sales team if you have any questions about our offerings and support for the Ruby language.

The easiest way to deploy Ruby agents is to use the [Agent wizard \(page 99\)](#) in the Contrast web interface.

The topics in this section are for users who want additional information or methods related to the configuration of Ruby agents.

- [Ruby frameworks \(page 532\)](#)
- [Ruby web servers \(page 535\)](#)
- [Ruby YAML template \(page 511\)](#)

## Configure the Ruby agent

The [configuration \(page 107\)](#) for all agents uses this [order of precedence \(page 111\)](#). Configure the agent using a YAML configuration file.



### TIP

Use the [Contrast agent configuration editor \(page 113\)](#) to create or upload a YAML configuration file, validate YAML, and get setting recommendations.

Follow these guidelines to configure your:

- [Frameworks \(page 532\)](#)
  - [Rails \(page 533\)](#)
  - [Sinatra \(page 533\)](#)
  - [Grape \(page 534\)](#)
- [Web servers \(page 535\)](#)
  - [Passenger \(page 536\)](#)
  - [Puma \(page 539\)](#)
  - [Thin \(page 542\)](#)
  - [Unicorn \(page 542\)](#)

### See also

- [Ruby supported technologies \(page 100\)](#)

### Ruby YAML template

Use this template to configure the Ruby agent using a YAML configuration file. (Learn more about [YAML configuration \(page 112\)](#).)

Place your YAML file in the default location: `/etc/contrast/contrast_security.yaml`

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
```

```
UI.
#
=====
==
api:

# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

#
=====

# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====

# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Set the absolute or relative path to a CA for communication
# with the Contrast UI using a self-signed certificate.
# ca_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Certificate
# PEM file for communication with the Contrast UI.
# cert_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Key PEM
# file for communication with the Contrast UI.
# key_file: NEEDS_TO_BE_SET

#
=====

# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
```

```
=====
# proxy:

# Set value to `true` for the agent to communicate with
# the Contrast web interface over a proxy. Set value to
# `false` if you don't want to use the proxy. If no value is
# indicated, the presence of a valid **contrast.proxy.host**
# and **contrast.proxy.port** will enable the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
# url: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Override the name of the process the agents uses in logs.
# progname: Contrast Agent

# Set to `true` for the agent to tag
# logs with `!AM!` for the metrics tool.
```

```
# metrics: true

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the file to which the agent logs security events.
# path: ./contrast/security.log

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

#
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
```

```
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

#
=====
# agent.heap_dump
# The following properties are used to trigger heap dumps from within
# the agent to snapshot the behavior of instrumented applications.
#
=====
# heap_dump:

# Set to `true` for the agent to automatically
# take heap dumps of the instrumented application.
# enable: false

# Set the location to which to save the heap dump files. If relative,
# the path is determined based on the process' working directory.
# path: contrast_heap_dumps

# Set the amount of time to wait, in milliseconds,
# after agent startup to begin taking heap dumps.
# delay_ms: 10_000

# Set the amount of time to wait, in milliseconds, between each heap
dump.
# window_ms: 10_000

# Set the number of heap dumps to take before disabling this feature.
# count: 5

# Set to `true` for the agent to trigger garbage collection before
# taking a heap dump to remove temporary objects from the dump.
# clean: false

#
=====
# agent.ruby
# The following properties apply to any Ruby agent-wide configurations.
#
=====
# ruby:

# Allow the agent to track frozen Objects returned by
# source methods. This configuration is on by default.
# track_frozen_sources: NEEDS_TO_BE_SET

# Allow the agent to track propagation through interpolated
```

```
# Strings. This configuration is on by default.
# interpolate: NEEDS_TO_BE_SET

# Set a comma-separated string of rake tasks
# in which to disable agent operation.
# disabled_agent_rake_tasks:
about,assets:clean,assets:clobber,assets:environment,assets:precompile,asset
s:precompile:all,db:create,db:drop,db:migrate:status,db:rollback,db:schema:c
ache:clear,db:schema:cache:dump,db:schema:dump,db:schema:load,db:seed,db:set
up,db:structure:dump,db:version,doc:app,log:clear,middleware,notes,notes:cus
tom,rails:template,rails:update,routes,secret,spec,spec:features,spec:reques
ts,spec:controllers,spec:helpers,spec:models,spec:views,spec:routing,spec:rc
ov,stats,test,test:all,test:all:db,test:recent,test:single,test:uncommitted,
time:zones:all,tmp:clear,tmp:create,webpacker:compile

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET
```



```
# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10

# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
```

```
# enable: false

#
=====
# protect.rules
# Use the following properties to set simple rule configurations.
#
=====
# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====
# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====
# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====
# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====
# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
```

```
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off
```

```
#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET
```

```
# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
```

```
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET
```

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
# UI.
#
=====
==
api:

# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
```

```
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

#
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Set the absolute or relative path to a CA for communication
# with the Contrast UI using a self-signed certificate.
# ca_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Certificate
# PEM file for communication with the Contrast UI.
# cert_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Key PEM
# file for communication with the Contrast UI.
# key_file: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate with
# the Contrast web interface over a proxy. Set value to
# `false` if you don't want to use the proxy. If no value is
# indicated, the presence of a valid **contrast.proxy.host**
# and **contrast.proxy.port** will enable the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
# url: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
```

```
=====
==
# agent:

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Override the name of the process the agents uses in logs.
# progname: Contrast Agent

# Set to `true` for the agent to tag
# logs with `!AM!` for the metrics tool.
# metrics: true

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the file to which the agent logs security events.
# path: ./contrast/security.log

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

#
=====
```



```
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

#
=====
# agent.heap_dump
# The following properties are used to trigger heap dumps from within
# the agent to snapshot the behavior of instrumented applications.
#
=====
# heap_dump:

# Set to `true` for the agent to automatically
# take heap dumps of the instrumented application.
```

```
# enable: false

# Set the location to which to save the heap dump files. If relative,
# the path is determined based on the process' working directory.
# path: contrast_heap_dumps

# Set the amount of time to wait, in milliseconds,
# after agent startup to begin taking heap dumps.
# delay_ms: 10_000

# Set the amount of time to wait, in milliseconds, between each heap
dump.
# window_ms: 10_000

# Set the number of heap dumps to take before disabling this feature.
# count: 5

# Set to `true` for the agent to trigger garbage collection before
# taking a heap dump to remove temporary objects from the dump.
# clean: false

#
=====
# agent.ruby
# The following properties apply to any Ruby agent-wide configurations.
#
=====
# ruby:

# Allow the agent to track frozen Objects returned by
# source methods. This configuration is on by default.
# track_frozen_sources: NEEDS_TO_BE_SET

# Allow the agent to track propagation through interpolated
# Strings. This configuration is on by default.
# interpolate: NEEDS_TO_BE_SET

# Set a comma-separated string of rake tasks
# in which to disable agent operation.
# disabled_agent_rake_tasks:
about,assets:clean,assets:clobber,assets:environment,assets:precompile,asset
s:precompile:all,db:create,db:drop,db:migrate:status,db:rollback,db:schema:c
ache:clear,db:schema:cache:dump,db:schema:dump,db:schema:load,db:seed,db:set
up,db:structure:dump,db:version,doc:app,log:clear,middleware,notes,notes:cus
tom,rails:template,rails:update,routes,secret,spec,spec:features,spec:reques
ts,spec:controllers,spec:helpers,spec:models,spec:views,spec:routing,spec:rc
ov,stats,test,test:all,test:all:db,test:recent,test:single,test:uncommitted,
time:zones:all,tmp:clear,tmp:create,webpacker:compile

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
```

```
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10
```

```
# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.rules
# Use the following properties to set simple rule configurations.
#
=====
# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====
# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
```

```
=====
# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====
# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====
# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off
```

```
#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
==
```

```
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
```

```
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET
```

## Ruby frameworks

Application frameworks are software libraries that provide a fundamental structure to support the development of applications for a specific environment.

Follow these guidelines based on your framework:



## Configure with Rails

If you are using Rails, the Ruby agent functions as a [Railtie](#) so no additional configuration is required.

## Configure with Sinatra

If you are using the Sinatra framework, you must configure your application to use the Ruby agent. A simple application configured to work with the Ruby agent looks like the following example:

```
require 'sinatra'
require 'contrast-agent'

class App < Sinatra::Base
  use Contrast::Agent::Middleware, true
end
```

## Configure Sinatra with config.ru

If there is no class extending, `Sinatra::Base` or `config.ru` is the default way of racking up your application with the following configuration:

`config.ru`

```
# frozen_string_literal: true

# Require Sinatra early for Framework support to detect it.
require 'sinatra'

# example app.rb, could be any file implementing Sinatra
# endpoints and logic.
#
# For instance:
#
#   # frozen_string_literal: true
#   require 'sinatra'
#
#   get '/frank-says' do
#     'Put this in your pipe & smoke it!'
#   end
#
require './app.rb'

# Contrast Agent needs to be required after sinatra.
require 'contrast-agent'

# Example for requiring gems:
require 'bundler/setup'
Bundler.require(:default)

# Add Contrast Agent middleware to the rack stack:
use Contrast::Agent::Middleware, true

# Run Sinatra application:
run Sinatra::Application
```

Start the application with:

```
bundle exec rackup
```

OR

```
bundle exec rackup config.ru
```

### Configure with Grape

If you are using the Grape framework, you must configure your application to use the Ruby agent. A simple application configured to work with the Ruby agent looks like the following example:

```
require 'grape'
require 'contrast-agent'

class App < Grape::API
  use Contrast::Agent::Middleware, true
end
```

### Configure Grape with config.ru

If there is no class extending, `Grape::API` or `config.ru` is the default way of racking up your application with the following configuration:

```
config.ru
```

```
# frozen_string_literal: true

require 'rack'
# Require Grape early for Framework support to detect it.
require 'Grape'

# example app.rb, could be any file implementing Grape
# endpoints and logic.
#
# For instance:
#
# # frozen_string_literal: true
#
# require 'Grape'
#
# class App
#   def initialize
#     @filenames = ['', '.html', 'index.html', '/index.html']
#     @rack_static = ::Rack::Static.new(
#       lambda { [404, {}, []] },
#       root: File.expand_path('../public', __dir__),
#       urls: ['/*']
#     )
#   end
#
#   def self.instance
#     @instance ||= Rack::Builder.new do
#       use Rack::Cors do
#         allow do
#           origins '*'
#           resource '*', headers: :any, methods: :get
#         end
#       end
#
#       run App.new
#     end.to_app
#   end
end
```

```
# end

# def call(env)
#   # Grape::API impleted in API module:
#   API.call(env)
#   # handle response
#   .....
# end
# end
#
require './app.rb'

# Contrast Agent needs to be required after Grape.
require 'contrast-agent'

# Example for requiring gems:
require 'bundler/setup'
Bundler.require(:default)

# Add Contrast Agent middleware to the rack stack:
use Contrast::Agent::Middleware, true

# Run Grape application:
run App.instance
```

Start the application with:

```
bundle exec rackup
```

OR

```
bundle exec rackup config.ru
```

## See also

- [Configure the Ruby agent \(page 511\)](#)
- [Ruby supported technologies \(page 100\)](#)

## Ruby web servers

Web Servers are technologies that deploy Web Application Frameworks. These servers manage the application processes and receive HTTP requests which they forward to said Web Application Frameworks.

Follow the guidelines based on your web server:

- [Passenger \(page 536\)](#)
- [Puma \(page 539\)](#)
- [Thin \(page 542\)](#)
- [Unicorn \(page 542\)](#)

## See also

- [Configure the Ruby agent \(page 511\)](#)
- [Ruby supported technologies \(page 100\)](#)

## Configure Passenger

Sometimes the Ruby agent pushes the application over the timeout threshold and that prevents the server from startup. This can be prevented by server configuration.

Passenger can be configured in Standalone mode or along side HTTP servers: *Passenger + NGINX* or *Passenger + Apache*.

The standard way of configuration in Standalone mode goes through these three options:

1. Command line options:

```
$ passenger start --start-timeout 100
```

2. Environment variables:

```
$ env PASSENGER_START_TIMEOUT=100 passenger start
```

3. Passengerfile.json (must be located in the application directory):

```
{  
  "start_timeout": "100"  
}
```

The order of configurations (most to least precedent):

- Command line options
- Environment variables
- Passengerfile.json



### NOTE

An exception is made for [mass deployment](#), then pre-app configurations are overridden both for command line and environment variables.

Passenger in NGINX or Apache mode is configured via the corresponding Apache or NGINX configuration files. These modes don not consult with `Passengerfile.json`.

# example of an Nginx configuration file which also configures Passenger:

```
server {  
    server_name yourserver.com;  
    root /var/www/myapp/code/public;  
    passenger_enabled on;  
    passenger_ruby /usr/bin/ruby2.0;  
    passenger_sticky_sessions on;  
}
```

# example of an Apache configuration file which also configures Passenger:

```
<VirtualHost *:80>  
    ServerName yourserver.com  
    DocumentRoot /var/www/myapp/code/public  
    PassengerStickySessions on  
  
    <Directory /var/www/myapp/code/public>
```

```
    Allow from all
    Options -MultiViews
    Require all granted
  </Directory>
</VirtualHost>
```

## Timeouts

- **Max request time** - The maximum amount of time, in seconds, that an application process may take to process a request. If the request takes longer than this amount of time, then the application process will be forcefully shut down, and possibly restarted upon the next request. A value of 0 means that there is no time limit. This is an enterprise only configuration.

- Default value: 0
- Command line:

```
$ passenger start --max-request-time SECONDS
```

- Environment variables:
- Passengerfile.json:

```
{
  "max_request_time": integer
}
```

- **Max request queue time** - When all concurrent requests are handled and their maximum number is reached, Passenger will queue all incoming requests. This option specifies the maximum time a request may spend in that queue. If a request in the queue reaches this specified limit, then Passenger will send a "504 Gateway Timeout" error for that request. A value of 0 means that the queue time is unbounded. This is an enterprise only configuration.

- Default value: 0
- Command line:

```
$ passenger start --max-request-queue-time NUMBER
```

- Environment variables:

```
PASSENGER_MAX_REQUEST_QUEUE_TIME=integer
```

- Passengerfile.json:

```
{
  "max_request_queue_time": integer
}
```

- **Pool idle time** - Maximum time for idle application process. If an application process hasn't received any traffic after the given number of seconds, then it will be shutdown in order to conserve memory. When this value is set to 0, application processes will not be shutdown unless manual killed or crush occurs. Decreasing this value means that application processes will have to be spawned more often.

- Default value: 300 (5 minutes)
- Command line:

```
$ passenger start --pool-idle-time SECONDS
```

- Environment variables:

```
PASSENGER_POOL_IDLE_TIME=integer
```

- Passengerfile.json:

```
{
  "pool_idle_time": integer
}
```

- **Max preload idle time** - Timeout for automatically shutdown a preloader process if it hasn't done anything for a given period. This option allows you to set the preloader's idle timeout, in seconds. A value of 0 means that it should never idle timeout. Setting a higher value will mean that the preloader is kept around longer, which may slightly increase memory usage. But as long as the preloader server is running, the time to spawn a Ruby application process only takes about 10% of the time that is normally needed.

- Default value: 300 (5 minutes)
- Command line:

```
$ passenger start --max-preloader-idle-time SECONDS
```

- Environment variables:

```
PASSENGER_MAX_PRELOADER_IDLE_TIME=integer
```

- Passengerfile.json:

```
{  
  "max_preloader_idle_time": integer  
}
```

- **Start timeout** - Timeout for the startup of application. If an application process fails to start within the timeout period then it will be forcefully killed with SIGKILL, and the error will be logged.

- Default value: 90
- Command line:

```
$ passenger start --start-timeout SECONDS;
```

- Environment variables:

```
PASSENGER_START_TIMEOUT=integer
```

- Passengerfile.json:

```
{  
  "start_timeout": integer  
}
```

## Forking

Passenger is more like a process manager and instead of running application inside its own process space it launches it as external process and handle the management. This includes shut down of unused processes, or restarting them when they crash. An instance of an application is called a process. Passenger takes care of starting and stopping application.

Spawning is when Passenger starts an instance of an application. There are two methods for spawning an application in Passenger:

- **Direct:** new Ruby process with full copy of the application code and the web framework in memory. This approach uses more memory and takes more time to start.
- **Smart:** For Ruby apps this method is default. It begins with 'preloader' process. This process loads the entire application along with the web framework, by loading the file config.ru. The preloader process doesn't participate in request handling. Whenever new application process is needed the preloader spawns a child process (with the fork() system call).

The command used for creating a new fork is:

```
$ bundle exec passenger start --min-instances 2
```

This tells Passenger to keep 2 instances of the application.

- Default value: 1
- Default pool size for instances: 6

- `Passengerfile.json`:

```
{
  "max_pool_size": 6
}
```

When a request is handled, Passenger will pass it to the process with the least number of requests. If a process is killed, it is restarted automatically. Processes are also dynamically scaled, depending on traffic, spawning new forks up to the maximum pool number.

### See also

- [Configure the Ruby agent \(page 511\)](#)
- [Ruby supported technologies \(page 100\)](#)

### Configure Puma

Sometimes the Ruby agent pushes the application over the timeout threshold and that prevents the server from startup. This can be prevented by server configuration.

Puma can be configured directly through the CLI, in the `config/puma.rb` or `config.ru` files.

### Timeouts

While the agent should work with the default or your custom configuration, it adds overhead to the first request. As such, you may need to increase timeouts, and here's how:



#### IMPORTANT

Some of the options are available only in Cluster Mode. All of the available options for the timeouts are listed in the [puma/dsl.rb](#).

- **`persistent_timeout(seconds)`** - Define how long persistent connections can be idle before Puma closes them. The seconds are passed as integers.
- **`first_data_timeout(seconds)`** - Define how long the tcp socket stays open, if no data has been received. The seconds are passed as integers.
- **`*force_shutdown_after(val=:forever) *`** - How long to wait for threads to stop when shutting them down. You can pass seconds too, but you can pass symbols between `:forever` and `:immediately`.
  - `:forever` - the value is set to -1
  - `:immediately` - the value is set to 0
  - `seconds` - it sets them directly as the timeout



#### NOTE

Puma always waits a couple of seconds before shutdown, even in immediately mode.

The following options are only available in cluster mode:

- **`worker_timeout(seconds)`** - Verifies that all workers have checked in to the master process within the given timeout. This timeout is to protect against dead or hung processes. Setting this value will not protect against slow requests. The minimum value is 6 seconds, the default value is 60 seconds.

- **worker\_boot\_timeout(seconds)** - change the default worker timeout for booting. If unspecified - it will default to the value of `worker_timeout`.
- **worker\_shutdown\_timeout(seconds)** - Set the timeout for worker shutdown.
- **wait\_for\_less\_busy\_worker(val=0.005)** - attempts to route traffic to less-busy workers by causing them to delay listening on the socket, allowing workers which are not processing any requests to pick up new requests first.

**NOTE**

This setting only works with MRI. For all other interpreters, this setting does nothing.

Puma initially sets two default timeout values:

- **DefaultWorkerTimeout** = 60
- **DefaultWorkerShutdownTimeout** = 30

To apply all of the timeouts settings, Puma must be configured to work in Cluster Mode.

## Forking

Cluster mode is introduced in Puma 5, which allows Puma to fork workers from worker 0, instead of directly from the master process.

Similar to the `preload_app` option, the `fork_worker` option allows your application to be initialized only once for copy-on-write memory savings.

This actual mode has couple of advantages, and the first one is that it's compatible with a phased restart. The master process initially does not preload the application and that's why this mode works with phased restart. When worker 0 reloads as part of a phased restart, it initializes a new copy of your application first, then the other workers reload by forking from this new worker already containing the new preloaded application.

**TIP**

A phased restart replaces all running workers in Puma cluster. It is done by first killing an old worker, then starting a new worker, waiting until the new worker has successfully started before proceeding to the next worker, until it goes through all workers. The master process is not restarted.

This allows a phased restart to complete as quickly as a hot restart while still minimizing downtime by staggering the restart across cluster workers.

The other advantage is that a `refork` command is added for additional copy-on-write improvements in running applications and the idea is that it re-loads all nonzero workers by re-forking them from worker 0.

This command can potentially improve memory utilization in large or complex applications that don't fully pre-initialize on startup, because the re-forked workers can share copy-on-write memory with a worker that has been running for a while and serving requests.

A refork will also automatically trigger once, after a certain number of requests have been processed by worker 0 (default 1000). To configure the number of requests before the auto-refork, pass a positive integer argument to `fork_worker` (e.g., `fork_worker 1000`), or 0 to disable.



## Limitations:

- Cluster mode is not compatible with `preload_app`.
- In order to fork new workers cleanly, worker 0 shuts down its server and stops serving requests so there are no open file descriptors or other kinds of shared global state between processes, and to maximize copy-on-write efficiency across the newly-forked workers. This may temporarily reduce total capacity of the cluster during a phased restart / refork.

After going through `fork_worker` and `re-fork` commands, these are other clustered (fork worker) commands:

- **\*workers(count) \*** - How many worker processes to run. Typically this is set to the number of available cores. The default is the value of the environment variable `WEB_CONCURRENCY` if set, otherwise 0.
- **before\_fork(&block)** - code to run immediately before master process forks workers (once on boot). These hooks can block if necessary to wait for background operations unknown to Puma to finish before the process terminates.
- **on\_worker\_boot(&block)** - code to run in a worker when it boots to setup the process before booting the app.
- **on\_worker\_shutdown(&block)** - code to run immediately before a worker shuts down (after it has finished processing HTTP requests)
- **on\_worker\_fork(&block)** - code to run in the master right before a worker is started. The worker's index is passed as an argument.
- **after\_worker\_fork(&block)** - code to run in the master after a worker has been started. The worker's index is passed as an argument.
- **on\_refork(&block)** - When enabled, code to run in Worker 0 before all other workers are re-forked from this process, after the server has temporarily stopped serving requests (once per complete refork cycle). This can be used to trigger extra garbage-collection to maximize copy-on-write efficiency, or close any connections to remote servers(database, Redis, ...) that were opened while the server was running.
- **out\_of\_band(&block)** - code to run out-of-band when the worker is idle. These hooks run immediately after a request has finished processing and there are no busy threads on the worker. The worker doesn't accept new requests until this code finishes. This hook is useful for running out-of-band garbage collection or scheduling asynchronous tasks to execute after a response.
- **fork\_worker(after\_request=1000)** - When enabled, workers will be forked from worker 0 instead of from the master process. This option is similar to `'preload_app'` because the app is preloaded before forking, but it is compatible with phased restart. This option also enables the `refork` command.
- **nakayoshi\_fork(enabled=true)** - This is kind of different, but when enabled, Puma will GC 4 times before forking workers. It will increase time to boot and fork. See your logs for details on how much time this adds to your boot process. For most apps, it will be less than one second. This fork method is based on the work of Koichi Sasada and Aaron Patterson and this option may decrease memory utilization of preload-enabled cluster-mode Pumas.



### NOTE

If available (Ruby 2.7+), it will also call `GC.compact`.

Not recommended for non-MRI Rubies.

## See also

- [Configure the Ruby agent \(page 511\)](#)
- [Ruby supported technologies \(page 100\)](#)

## Configure Thin

Sometimes the Ruby agent pushes the application over the timeout threshold and that prevents the server from startup. This can be prevented by server configuration.

Thin is lightweight web server, supporting clusters and providing options to set timeouts and wait time. Thin accepts CLI commands or adding a `config.yml` file in which you can set all the settings you need.

### Timeouts

The **wait** option is the maximum wait time for the server to be restarted within a cluster.

The **timeout** option is the maximum number of seconds for incoming data to arrive before the connection is dropped.

### Forking

Thin supports clusters and you can run several server instances on different ports.

These are the available options:

```
cluster options:
-s, --servers NUM           Number of servers to start
-o, --only NUM              Send command to only one server of the
cluster
-C, --config FILE           Load options from config file
-O, --onebyone              Restart the cluster one by one (only works
with restart command)
-w, --wait NUM              Maximum wait time for server to be started
in seconds (use with -O)
```

There is also an experimental tuning option that can be run alongside clusters:

```
--threaded                  Call the Rack application in threads
[experimental]
```

### See also

- [Configure the Ruby agent \(page 511\)](#)
- [Ruby supported technologies \(page 100\)](#)

## Configure Unicorn

Unicorn is single-threaded and multi-processed. It doesn't adjust the number of processes automatically based on traffic. You must use a `unicorrf.conf.rb` or `unicorn.conf.minimal.rb` file, or a script, to configure this.

- Example for `unicorn.conf.rb`:

```
# Define your root directory.
root = "/home/deployer/apps/gifroll/current"

# Define worker directory for Unicorn.
working_directory "/path/to/app/current"

# Define number of worker processes.
# Each forked OS process consumes additional memory.
worker_processes 4

# Define timeout for hanging workers before they are restarted.
```

```
timeout 30

# Location of PID file.
pid "/path/to/app/shared/pids/unicorn.pid"

# Define log paths:

# Allow redirecting $stderr to a given path. Unlike doing this from the
# shell,
# this allows the Unicorn process to know the path being written to and
# rotates
# the file if it is used for logging.
stderr_path "#{root}/log/unicorn.log"

# Same as stderr_path, except for $stdout. Not many Rack applications
# write
# to $stdout, but any that do will have their output written here.
stdout_path "#{root}/log/unicorn.log"

# Loads Rails before forking workers for better worker spawn time.
# Preloading your application reduces the startup time of individual
# Unicorn worker_processes and allows you to manage the external
# connections
# of each individual worker using the before_fork and after_fork calls.
#
# Please check if other external connections work properly with
# Unicorn forking. Many popular gems (dalli memcache client, Redis) will
# have
# compatibility confirmation with Unicorn and the process model.
# Check the gem documentation for more information.
preload_app true

# When enabled, Unicorn will check the client connection by writing the
# beginning of the HTTP headers before calling the application. This will
# prevent calling the application for clients who have disconnected while
# their connection was queued.
check_client_connection false

# Enable a local variable to guard against running a hook (before_fork,
# after_fork)
# multiple times
run_once = true

# For example, use of before_fork and after_fork:
#
# POSIX Signals are a form of interprocess communication, and signal
# events or state changes.
# QUIT: Signals a process to exit, but creates a core dump.
# TERM: Tells a process to terminate, but allows the process
# to clean up after itself.
#
# Unicorn uses the QUIT signal to indicate a graceful shutdown.
# The master process receives it and sends it to all workers, telling
# them to
# shutdown after any in-flight request.
```

```

before_fork do |server, worker|
  Signal.trap 'TERM' do
    puts 'Unicorn master intercepting TERM and sending myself QUIT
instead'
    Process.kill 'QUIT', Process.pid
  end

  # You may want to execute code in the master process, before the forking
  # begins, to deal with operations that causes changes in state.
  # You need them to run once:
  if run_once
    # do_something_once_here ...
    run_once = false # prevent from firing again
  end
end

after_fork do |server, worker|
  Signal.trap 'TERM' do
    puts 'Unicorn worker intercepting TERM and doing nothing. Wait for
master to send QUIT'
  end
  # ...
end

# For more information, check the Unicorn Configurator: https://misp-greg.github.io/unicorn/Unicorn/Configurator.html

```

- Example for `unicorn.conf.minimal.rb`:

```

listen 2007 # by default Unicorn listens on port 8080
worker_processes 2 # this should be >= nr_cpus
pid "/path/to/app/shared/pids/unicorn.pid"
stderr_path "/path/to/app/shared/log/unicorn.log"
stdout_path "/path/to/app/shared/log/unicorn.log"

```

## Configure forking

Unicorn has a multi-process architecture to make better use of available CPU cores. On startup, the Unicorn master process loads the application code and then spawns workers which inherit the application code from their master process. The requests are handled only by the workers and never by the master. The operating system network stack queues incoming requests and distributes them among the workers.

Unicorn is designed to replace crashed workers without dropping user requests. When a worker reaches the request timeout, the master process ends it (with `kill -9`) and replaces it with a new process. You can configure the number of worker processes and the request timeout.

| Configurations                                 | Description  |
|--|--|
| <code>worker_processes (nr)</code>             | <p>Sets the current number of <code>worker_processes</code> to <code>nr</code>. Each worker process will serve exactly one client at a time. You can increment or decrement this value at runtime by sending signals <code>SIGTTIN</code> or <code>SIGTTOU</code> respectively to the master process without reloading the rest of your Unicorn configuration.</p> <p>You can read more about signals on <a href="#">Unicorn's site</a>.</p> |
| <code>Unicorn::Configurator#after_fork</code>  | Sets <code>after_fork</code> hook to a given block   |
| <code>Unicorn::Configurator#before_fork</code> | Sets <code>before_fork</code> hook to a given block.   |

| Configurations  | Description   |
|---|---|
| <code>Unicorn::Configurator#preload_app(bool)</code><br><code>ObjectEnabling</code> | This preloads an application before forking worker processes. This allows memory savings when using a copy-on-write-friendly GC but can cause bad things to happen when resources like sockets are opened at load time by the master process and shared by multiple children. |

## Configure timeouts

| Variable                   | Description   | Default value |
|----------------------------|---|---------------|
| <code>timeout 30</code>    | This sets the timeout of worker processes to 30 seconds, the default value is 60 seconds. The timeout configuration will end workers that exceed this limit. This timeout is enforced by the master process itself and not subject to the scheduling limitations by the worker process. | 60 seconds    |
| <code>delay integer</code> | This sets the seconds to wait between successful tries.   | 0.5 seconds   |



### TIP

Unicorn works with [nginx for more settings](#).

## Configure APMs

The following APMs support Unicorn:

- [Scout](#) has a [separate class for Unicorn integration](#).
- [New Relic](#)
- [AppDynamics](#)

## See also

- [Configure the Ruby agent \(page 511\)](#)
- [Ruby supported technologies \(page 100\)](#)

## Ruby YAML template

Use this template to configure the Ruby agent using a YAML configuration file. (Learn more about [YAML configuration \(page 112\)](#).)

Place your YAML file in the default location: `/etc/contrast/contrast_security.yaml`

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==
```

```
# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
# UI.
#
=====
==
api:

# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

#
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Set the absolute or relative path to a CA for communication
# with the Contrast UI using a self-signed certificate.
# ca_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Certificate
# PEM file for communication with the Contrast UI.
# cert_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Key PEM
```

```
# file for communication with the Contrast UI.
# key_file: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate with
# the Contrast web interface over a proxy. Set value to
# `false` if you don't want to use the proxy. If no value is
# indicated, the presence of a valid **contrast.proxy.host**
# and **contrast.proxy.port** will enable the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
# url: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log
```

```
# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Override the name of the process the agents uses in logs.
# progname: Contrast Agent

# Set to `true` for the agent to tag
# logs with `!AM!` for the metrics tool.
# metrics: true

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the file to which the agent logs security events.
# path: ./contrast/security.log

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

#
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
```



```
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

#
=====
# agent.heap_dump
# The following properties are used to trigger heap dumps from within
# the agent to snapshot the behavior of instrumented applications.
#
=====
# heap_dump:

# Set to `true` for the agent to automatically
# take heap dumps of the instrumented application.
# enable: false

# Set the location to which to save the heap dump files. If relative,
# the path is determined based on the process' working directory.
# path: contrast_heap_dumps

# Set the amount of time to wait, in milliseconds,
# after agent startup to begin taking heap dumps.
# delay_ms: 10_000

# Set the amount of time to wait, in milliseconds, between each heap
dump.
# window_ms: 10_000

# Set the number of heap dumps to take before disabling this feature.
# count: 5

# Set to `true` for the agent to trigger garbage collection before
# taking a heap dump to remove temporary objects from the dump.
# clean: false

#
=====
# agent.ruby
# The following properties apply to any Ruby agent-wide configurations.
```

```
#
=====
# ruby:

# Allow the agent to track frozen Objects returned by
# source methods. This configuration is on by default.
# track_frozen_sources: NEEDS_TO_BE_SET

# Allow the agent to track propagation through interpolated
# Strings. This configuration is on by default.
# interpolate: NEEDS_TO_BE_SET

# Set a comma-separated string of rake tasks
# in which to disable agent operation.
# disabled_agent_rake_tasks:
about,assets:clean,assets:clobber,assets:environment,assets:precompile,asset
s:precompile:all,db:create,db:drop,db:migrate:status,db:rollback,db:schema:c
ache:clear,db:schema:cache:dump,db:schema:dump,db:schema:load,db:seed,db:set
up,db:structure:dump,db:version,doc:app,log:clear,middleware,notes,notes:cus
tom,rails:template,rails:update,routes,secret,spec,spec:features,spec:reques
ts,spec:controllers,spec:helpers,spec:models,spec:views,spec:routing,spec:rc
ov,stats,test,test:all,test:all:db,test:recent,test:single,test:uncommitted,
time:zones:all,tmp:clear,tmp:create,webpacker:compile

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
```

```
# present, the decision is delegated to the Contrast UI.
# enable: false

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10

# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# protect
```

```
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====

# protect.rules
# Use the following properties to set simple rule configurations.
#
=====

# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====

# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====

# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====

# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====

# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====

# protect.rules.cmd-injection
```

```
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
=====
# method-tampering:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
=====
```

```
# reflected-xss:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
=====
# xxe:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
```

```
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
```

```
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET
```

```
#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
# UI.
#
=====
==
api:

# ***** REQUIRED *****
# Set the URL for the Contrast UI.
url: https://app.contrastsecurity.com/Contrast

# ***** REQUIRED *****
# Set the API key needed to communicate with the Contrast UI.
```



```
api_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
service_key: NEEDS_TO_BE_SET

# ***** REQUIRED *****
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
user_name: NEEDS_TO_BE_SET

#
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:

# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Set the absolute or relative path to a CA for communication
# with the Contrast UI using a self-signed certificate.
# ca_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Certificate
# PEM file for communication with the Contrast UI.
# cert_file: NEEDS_TO_BE_SET

# Set the absolute or relative path to the Key PEM
# file for communication with the Contrast UI.
# key_file: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate with
# the Contrast web interface over a proxy. Set value to
# `false` if you don't want to use the proxy. If no value is
# indicated, the presence of a valid contrast.proxy.host
# and contrast.proxy.port will enable the proxy.
# enable: NEEDS_TO_BE_SET

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
```

```
# url: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Override the name of the process the agents uses in logs.
# progname: Contrast Agent

# Set to `true` for the agent to tag
# logs with `!AM!` for the metrics tool.
# metrics: true

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:
```

```
# Set the file to which the agent logs security events.
# path: ./contrast/security.log

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

#
=====
# agent.security_logger.syslog
# Define the following properties to set Syslog values. If the
properties
# are not defined, the agent uses the Syslog values from the Contrast
UI.
#
=====
# syslog:

# Set to `true` to enable Syslog logging.
# enable: NEEDS_TO_BE_SET

# Set the IP address of the Syslog server
# to which the agent should send messages.
# ip: NEEDS_TO_BE_SET

# Set the port of the Syslog server to
# which the agent should send messages.
# port: NEEDS_TO_BE_SET

# Set the facility code of the messages the agent sends to Syslog.
# facility: 19

# Set the log level of Exploited attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_exploited: ALERT

# Set the log level of Blocked attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked: NOTICE

# Set the log level of Blocked At Perimeter
# attacks. Value options are `ALERT`, `CRITICAL`,
# `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_blocked_perimeter: NOTICE

# Set the log level of Probed attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_probed: WARNING

# Set the log level of Suspicious attacks. Value options are `ALERT`,
# `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
# severity_suspicious: WARNING

#
=====
```

```
# agent.heap_dump
# The following properties are used to trigger heap dumps from within
# the agent to snapshot the behavior of instrumented applications.
#
=====
# heap_dump:

# Set to `true` for the agent to automatically
# take heap dumps of the instrumented application.
# enable: false

# Set the location to which to save the heap dump files. If relative,
# the path is determined based on the process' working directory.
# path: contrast_heap_dumps

# Set the amount of time to wait, in milliseconds,
# after agent startup to begin taking heap dumps.
# delay_ms: 10_000

# Set the amount of time to wait, in milliseconds, between each heap
dump.
# window_ms: 10_000

# Set the number of heap dumps to take before disabling this feature.
# count: 5

# Set to `true` for the agent to trigger garbage collection before
# taking a heap dump to remove temporary objects from the dump.
# clean: false

#
=====
# agent.ruby
# The following properties apply to any Ruby agent-wide configurations.
#
=====
# ruby:

# Allow the agent to track frozen Objects returned by
# source methods. This configuration is on by default.
# track_frozen_sources: NEEDS_TO_BE_SET

# Allow the agent to track propagation through interpolated
# Strings. This configuration is on by default.
# interpolate: NEEDS_TO_BE_SET

# Set a comma-separated string of rake tasks
# in which to disable agent operation.
# disabled_agent_rake_tasks:
about,assets:clean,assets:clobber,assets:environment,assets:precompile,asset
s:precompile:all,db:create,db:drop,db:migrate:status,db:rollback,db:schema:c
ache:clear,db:schema:cache:dump,db:schema:dump,db:schema:load,db:seed,db:set
up,db:structure:dump,db:version,doc:app,log:clear,middleware,notes,notes:cus
tom,rails:template,rails:update,routes,secret,spec,spec:features,spec:reques
ts,spec:controllers,spec:helpers,spec:models,spec:views,spec:routing,spec:rc
```

```
ov,stats,test,test:all,test:all:db,test:recent,test:single,test:uncommitted,
time:zones:all,tmp:clear,tmp:create,webpacker:compile

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Apply a list of labels to libraries. Labels
# must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

# Value options are `ALL`, `SOME`, or `NONE`.
# stacktraces: ALL

#
=====
# assess.sampling
# Use the following properties to control sampling in the agent.
#
=====
# sampling:

# Set to `true` to enable sampling.
```

```
# enable: false

# This property indicates the number of requests
# to analyze in each window before sampling begins.
# baseline: 5

# This property indicates that every *nth*
# request after the baseline is analyzed.
# request_frequency: 10

# This property indicates the duration for which a sample set is valid.
# window_ms: 180_000

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.rules
# Use the following properties to set simple rule configurations.
#
=====
# rules:

# Define a list of Protect rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
```

```
# Protect rules. The rules must be formatted as a comma-delimited list.
# disabled_rules: NEEDS_TO_BE_SET

#
=====
# protect.rules.bot-blocker
# Use the following selection to configure if the
# agent blocks bots. Set to `true` to enable blocking.
#
=====
# bot-blocker:

# Set to `true` for the agent to block known bots.
# enable: false

#
=====
# protect.rules.sql-injection
# Use the following settings to configure the sql-injection rule.
#
=====
# sql-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or off.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.cmd-injection
# Use the following properties to configure
# how the command injection rule works.
#
=====
# cmd-injection:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
# protect.rules.path-traversal
# Use the following properties to configure
# how the path traversal rule works.
#
=====
```

```
# path-traversal:

# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off
```

```
#
```

```
=====
# protect.rules.method-tampering
# Use the following properties to configure
# how the method tampering rule works.
#
```

```
=====
# method-tampering:
```

```
# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off
```

```
#
```

```
=====
# protect.rules.reflected-xss
# Use the following properties to configure how
# the reflected cross-site scripting rule works.
#
```

```
=====
# reflected-xss:
```

```
# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off
```

```
#
```

```
=====
# protect.rules.xxe
# Use the following properties to configure
# how the XML external entity works.
#
```

```
=====
# xxe:
```

```
# Set the mode of the rule. Value options are
# `monitor`, `block`, `block_at_perimeter`, or `off`.
```



```
#
# Note - If a setting says, "if blocking is enabled",
# the setting can be `block` or `block_at_perimeter`.
#
# mode: off

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET
```

```
# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
```

```
# tags: NEEDS_TO_BE_SET
```

## Go agent

The Go agent is a source code rewriter that instruments Go web applications for library support and vulnerability reporting. It provides runtime insight into the source code and libraries that make up the application.

The latest Go agent supports both Assess (IAST) and Protect (RASP) features.



### NOTE

As a source code rewriter, installing the Go agent in an application requires access to the application build environment.

As a next step, you can:

- [Install the Go agent \(page 103\)](#)
- [Go supported technologies \(page 103\)](#)

## Go advanced installation

The easiest way to deploy Go agents is to use the [Agent wizard \(page 103\)](#) in the Contrast web interface.

If you want additional information or methods related to the deployment of Go agents, visit these topics:

- [Install the Go agent \(page 567\)](#)
- [Install the Go agent in a container \(page 568\)](#)
- [Install the Go agent with direct download \(page 570\)](#)

### See also

[Advanced configuration \(page 570\)](#)

## Install the Go agent

The Go agent uses a tool called `contrast-go` to inject instrumentation into your applications at build time. When you run an instrumented application, the Go agent automatically starts and monitors the application's execution to detect vulnerabilities.



### TIP

To see a list of available flags with [command line arguments for contrast-go](#), type `contrast-go -h`.

## Steps

1. Install `contrast-go` with the [installer](#):

```
go run github.com/contrast-security-oss/contrast-go-installer@latest latest
```

2. Build your application with `contrast-go`:

```
contrast-go build -o output-name-of-application
```

3. [Configure the Go agent \(page 570\)](#) using the [Go YAML template \(page 571\)](#) or environment variables.
4. Run your application using the executable you generated in step 2.
5. Exercise and test your application.
6. Use the Contrast web interface to explore findings that the agent reports, such as vulnerabilities and library usage information.

By default, your application name is based on the application's Go module. Use search in the Applications list to quickly find your application.

## Install the Go agent in a container

Installing the Go agent in a container is essentially the same as the standard installation procedure, except that the installation occurs in a container and, to follow best practices, you should use environment variables to configure the Contrast credentials.

Using environment variables is the most secure method for installing the Go agent in a container. Since containers often migrate through QA and production systems, it's a best practice to avoid hard-coding credentials in the container definition.



### TIP

If you would like to explore a sample application using the Go agent in a Dockerfile, see the [Go Test Bench project](#).

## Before you begin

- You should have a basic understanding of how containers and related software work.
- You may need to adjust the instructions to meet your specific circumstances.

## Install, build, and run the Go application

1. Ensure Go is installed.
2. Install `contrast-go` with this command:

```
RUN github.com/contrast-security-oss/contrast-go-installer@latest latest
```

3. Build the application by replacing your normal `go build` command with `contrast-go build`. This step builds an executable with Contrast embedded in it.

```
RUN contrast-go build ./app
```

4. [Configure the agent \(page 570\)](#) with environment variables.

## Docker example

This example shows how to install, build, and run a Go application in a Docker container.

```
# Step 1: Install Go. You can use a different base image than the one shown in
# this example.
FROM golang:1.21 AS builder
```

```
WORKDIR /build

COPY . .

# Step 2: This step installs contrast-go and makes sure it's in your $PATH
so
# you can use it in the next step.
RUN go run github.com/contrast-security-oss/contrast-go-installer@latest
latest

# Step 3: This step is your normal build step, but uses contrast-go instead
of
# go. This step doesn't replace Go; it just wraps it so that it can add
# instrumentation during the build process.
RUN contrast-go build ./app

# Optional: Move the finished build to a new container.
# Not required, but nice to have!
FROM alpine:latest
COPY --from=builder /build/app .

# Step 4: Configure the agent using environment variables.

ENTRYPOINT [ "./app" ]
```

## Example of environment variable configuration



### NOTE

The Export option in the [Contrast agent configuration editor \(page 113\)](#) is an easy way to create the environment variables for the Contrast credentials.

The process to set environment variables when using a cloud provider typically involves using a secrets manager and then linking the values of those secrets to the environment variables.

For example, you could use this command to build your container:

```
docker build -t my-app-image
```

And then, use these commands when you run the container:

```
docker run -p 3000:3000 --name my-app-instance \
-e "CONTRAST_API_URL=your-ts-url" \
-e "CONTRAST_API_API_KEY=your-api-key" \
-e "CONTRAST_API_SERVICE_KEY=your-service-key" \
-e "CONTRAST_API_USER_NAME=your-user-name" \
my-app-image
```

## See also

- [Kubernetes and Contrast](#)

- [AWS Fargate and Contrast agents](#)

## Install the Go agent with direct download

To install the Go agent:

1. Download the executable files from <https://pkg.contrastsecurity.com>.  
The `contrast-go` executables can be downloaded directly for Mac and Linux operating systems. You can see available versions in the [go-agent-release](#) user interface. Replace `<version>` with the version number you want, or `latest`.

- **For Mac:**

```
wget https://pkg.contrastsecurity.com/go-agent-release/<version>/darwin-amd64/contrast-go
```

or

```
curl -L https://pkg.contrastsecurity.com/go-agent-release/<version>/darwin-amd64/contrast-go > contrast-go
```

- **For Linux:**

```
wget https://pkg.contrastsecurity.com/go-agent-release/<version>/linux-amd64/contrast-go
```

or

```
curl -L https://pkg.contrastsecurity.com/go-agent-release/<version>/linux-amd64/contrast-go > contrast-go
```

2. After download, verify that the agent is executable. For example:

```
chmod u+x contrast-go
```

3. Be sure the application has a `go.mod` file to indicate required dependencies. In the application source directory run the following command:

```
go mod init
```

4. Build your application:

```
./contrast-go build -o output-name-of-application
```

5. [Configure the Go agent \(page 570\)](#) using the [Go YAML template \(page 571\)](#) or environment variables.
6. Run your application using the executable from the output above.
7. Exercise and test your application.
8. Verify that Contrast sees your application.

## Go advanced configuratrion

The easiest way to deploy Go agents is to use the [Agent wizard \(page 103\)](#) in the Contrast web interface.

If you want want additional information or methods related to the configuration of Go agents, visit this topic:

[Go configuration \(page 570\)](#)

## Configure the Go agent

To configure the agent, the recommended method is to specify [environment variables \(page 115\)](#). Using environment variables is useful if you are using Contrast in containers or CI/CD pipelines.

You can also specify settings in a YAML file called `contrast_security.yaml`.

The simplest way to get started is to use the Go Agent wizard in the Contrast web interface. The agent wizard pre-populates environment variables and the YAML file with the required settings for your organization.

**TIP**

If you set values with environment variables and in the agent YAML file, the agent uses the environment variables, as described in [order of precedence \(page 111\)](#).

The variables you can set are:

- **Agent Token:** This variable is a base64 encoded JSON object containing the url, api\_key, service\_key, and user\_name configuration settings, allowing you to set them set in a single variable.

```
CONTRAST__API__TOKEN
```

If your agent configuration refers to both the legacy settings and the agent token, (in environment variables or the YAML file), the legacy settings take precedence. To use just the agent token value, make sure you remove references to the legacy settings.

- **Legacy settings:** If you are using a Go agent version earlier than 6.11.0, the required variables are:

```
CONTRAST__API__URL
CONTRAST__API__API_KEY
CONTRAST__API__SERVICE_KEY
CONTRAST__API__USER_NAME
```

You can also [find the keys \(page 109\)](#) under **Organization settings > Agent** in the Contrast web interface.

### Location of the Go configuration file

If you are using the `contrast_security.yaml` file for configuration, the Go agent looks for it in the following directories until it finds one:

- Current directory
- `/etc/contrast/go/`
- `/etc/contrast/`
- **Darwin:** `$HOME/Library/Preferences/contrast/`
- **Darwin:** `$HOME/Library/Preferences/contrast/go/`
- **Linux:** `$XDG_CONFIG_DIR/contrast/`
- **Linux:** `$XDG_CONFIG_DIR/contrast/go/`

### Go YAML template

This template includes all available settings for the Go agent. (Learn more about [YAML configuration \(page 112\)](#).)

You can also find the settings and generate a custom configuration file with the [Contrast agent configuration editor \(page 113\)](#).

```
#
=====
```

```
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==

# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true

#
=====
==
# api
# Use the properties in this section to connect the agent to the Contrast
# UI.
#
=====
==
api:

  # ***** REQUIRED *****
  # Set the URL for the Contrast UI.
  url: https://app.contrastsecurity.com/Contrast

  # ***** REQUIRED *****
  # Set the API key needed to communicate with the Contrast UI.
  api_key: NEEDS_TO_BE_SET

  # ***** REQUIRED *****
  # Set the service key needed to communicate with the Contrast
  # UI. It is used to calculate the Authorization header.
  service_key: NEEDS_TO_BE_SET

  # ***** REQUIRED *****
  # Set the user name used to communicate with the Contrast
  # UI. It is used to calculate the Authorization header.
  user_name: NEEDS_TO_BE_SET

  # base64 encoded JSON object containing the `url`,
  # `api_key`, `service_key`, and `user_name` config options,
  # allowing them all to be set in a single variable.
  # token: NEEDS_TO_BE_SET

  #
=====
# api.certificate
# Use the following properties for communication
# with the Contrast UI using certificates.
#
=====
# certificate:
```



```
# If set to `false`, the agent will ignore the
# certificate configuration in this section.
# enable: true

# Set the absolute or relative path to a CA for communication
# with the Contrast UI using a self-signed certificate.
# ca_file: NEEDS_TO_BE_SET

#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate
# with the Contrast web interface over a proxy. Set
# value to `false` if you don't want to use the proxy.
# enable: NEEDS_TO_BE_SET

# Set the proxy host. It must be set with port and scheme.
# host: localhost

# Set the proxy port. It must be set with host and scheme.
# port: 1234

# Set the proxy scheme (e.g., `http` or
# `https`). It must be set with host and port.
# scheme: http

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
# url: NEEDS_TO_BE_SET

# Set the proxy user.
# user: NEEDS_TO_BE_SET

# Set the proxy password.
# pass: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
```

```
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:

# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Set to `true` to redirect all logs to
# `stdout` instead of the file system.
# stdout: false

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the file to which the agent logs security events.
# path: ./contrast/security.log

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

#
=====
# agent.go
# The following properties apply to any Go agent-wide configurations.
#
=====
# go:

#
=====
```

```
# agent.go.preview
# Enable opt-in Go agent features.
#
=====
# preview:

# Enable Assess gRPC sources.
# grpc: false

#
=====
# agent.go.profile
# Enable Go agent self-profiling features.
#
=====
# profile:

# Enable CPU profiling for running application.
# cpu: false

# Enable memory profiling for running application.
# mem: false

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Set to `false` to disable library analysis.
# analyze_libraries: true

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Apply a list of labels to vulnerabilities and preflight
```

```
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
# assess.rules
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.probe_analysis
# Use the settings in this section to
# control the behavior of probe analysis.
#
=====
# probe_analysis:

# Set to `false` to disable probe analysis.
# enable: true

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
```

```
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
```

```
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
==
# Use the properties in this YAML file to configure a Contrast agent.
# Go to https://docs.contrastsecurity.com/en/order-of-precedence.html
# to determine the order of precedence for configuration values.
#
=====
==
```

```
# Use this setting if you want to temporarily disable a Contrast agent.
# Set to `true` to enable the agent; set to `false` to disable the agent.
# enable: true
```

```
#
```

```
=====
==
```

```
# api
```

```
# Use the properties in this section to connect the agent to the Contrast
UI.
```

```
#
```

```
=====
==
```

```
api:
```

```
# ***** REQUIRED *****
```

```
# Set the URL for the Contrast UI.
```

```
url: https://app.contrastsecurity.com/Contrast
```

```
# ***** REQUIRED *****
```

```
# Set the API key needed to communicate with the Contrast UI.
```

```
api_key: NEEDS_TO_BE_SET
```

```
# ***** REQUIRED *****
```

```
# Set the service key needed to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
```

```
service_key: NEEDS_TO_BE_SET
```

```
# ***** REQUIRED *****
```

```
# Set the user name used to communicate with the Contrast
# UI. It is used to calculate the Authorization header.
```

```
user_name: NEEDS_TO_BE_SET
```

```
# base64 encoded JSON object containing the `url`,
# `api_key`, `service_key`, and `user_name` config options,
# allowing them all to be set in a single variable.
```

```
# token: NEEDS_TO_BE_SET
```

```
#
```

```
=====
```

```
# api.certificate
```

```
# Use the following properties for communication
# with the Contrast UI using certificates.
```

```
#
```

```
=====
```

```
# certificate:
```

```
# If set to `false`, the agent will ignore the
# certificate configuration in this section.
```

```
# enable: true
```

```
# Set the absolute or relative path to a CA for communication
# with the Contrast UI using a self-signed certificate.
```

```
# ca_file: NEEDS_TO_BE_SET
```

```
#
=====
# api.proxy
# Use the following properties for communication
# with the Contrast UI over a proxy.
#
=====
# proxy:

# Set value to `true` for the agent to communicate
# with the Contrast web interface over a proxy. Set
# value to `false` if you don't want to use the proxy.
# enable: NEEDS_TO_BE_SET

# Set the proxy host. It must be set with port and scheme.
# host: localhost

# Set the proxy port. It must be set with host and scheme.
# port: 1234

# Set the proxy scheme (e.g., `http` or
# `https`). It must be set with host and port.
# scheme: http

# Set the URL for your Proxy Server. The URL form is `scheme://
host:port`.
# url: NEEDS_TO_BE_SET

# Set the proxy user.
# user: NEEDS_TO_BE_SET

# Set the proxy password.
# pass: NEEDS_TO_BE_SET

#
=====
==
# agent
# Use the properties in this section to control the way and frequency
# with which the agent communicates to logs and the Contrast UI.
#
=====
==
# agent:

#
=====
# agent.logger
# Define the following properties to set logging values.
# If the following properties are not defined, the
# agent uses the logging values from the Contrast UI.
#
=====
# logger:
```



```
# Enable diagnostic logging by setting a path to a log file.
# While diagnostic logging hurts performance, it generates
# useful information for debugging Contrast. The value set here
# is the location to which the agent saves log output. If no
# log file exists at this location, the agent creates a file.
#
# Example - `/opt/Contrast/contrast.log` creates a log in the
# `/opt/Contrast` directory, and rotates it automatically as needed.
#
# path: ./contrast_agent.log

# Set the the log output level. Valid options are
# `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: INFO

# Set to `true` to redirect all logs to
# `stdout` instead of the file system.
# stdout: false

#
=====
# agent.security_logger
# Define the following properties to set security logging
# values associated with Protect. If not defined, the agent
# uses the security logging (CEF) values from the Contrast UI.
#
=====
# security_logger:

# Set the file to which the agent logs security events.
# path: ./contrast/security.log

# Set the log level for security logging. Valid options
# are `ERROR`, `WARN`, `INFO`, `DEBUG`, and `TRACE`.
# level: ERROR

#
=====
# agent.go
# The following properties apply to any Go agent-wide configurations.
#
=====
# go:

#
=====
# agent.go.preview
# Enable opt-in Go agent features.
#
=====
# preview:

# Enable Assess gRPC sources.
# grpc: false
```

```
#
=====
# agent.go.profile
# Enable Go agent self-profiling features.
#
=====
# profile:

# Enable CPU profiling for running application.
# cpu: false

# Enable memory profiling for running application.
# mem: false

#
=====
==
# inventory
# Use the properties in this section to override the inventory features.
#
=====
==
# inventory:

# Set to `false` to disable inventory features in the agent.
# enable: true

# Set to `false` to disable library analysis.
# analyze_libraries: true

#
=====
==
# assess
# Use the properties in this section to control Assess.
#
=====
==
# assess:

# Include this property to determine if the Assess
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

# Apply a list of labels to vulnerabilities and preflight
# messages. Labels must be formatted as a comma-delimited list.
# Example - `label1, label2, label3`
#
# tags: NEEDS_TO_BE_SET

#
=====
# assess.rules
```

```
# Use the following properties to control simple rule configurations.
#
=====
# rules:

# Define a list of Assess rules to disable in the agent. To view a
# list of rule names, in Contrast go to user menu > Policy Management >
# Assess rules. The rules must be formatted as a comma-delimited list.
#
# Example - Set `reflected-xss,sql-injection` to disable
# the reflected-xss rule and the sql-injection rule.
#
# disabled_rules: NEEDS_TO_BE_SET

#
=====
==
# protect
# Use the properties in this section to override Protect features.
#
=====
==
# protect:

# Include this property to determine if the Protect
# feature should be enabled. If this property is not
# present, the decision is delegated to the Contrast UI.
# enable: false

#
=====
# protect.probe_analysis
# Use the settings in this section to
# control the behavior of probe analysis.
#
=====
# probe_analysis:

# Set to `false` to disable probe analysis.
# enable: true

#
=====
==
# application
# Use the properties in this section for
# the application(s) hosting this agent.
#
=====
==
# application:

# Override the reported application name.
#
# Note - On systems where multiple, distinct applications may be served
```

```
# by a single process, this configuration causes the agent to report
# all discovered applications as one application with the given name.
#
# Note - On Java systems where multiple, distinct applications may be
# served by a single process, this configuration causes the agent to
report
# all discovered applications as one application with the given name.
#
# name: NEEDS_TO_BE_SET

# Override the reported application path.
# path: NEEDS_TO_BE_SET

# Add the name of the application group with which this
# application should be associated in the Contrast UI.
# group: NEEDS_TO_BE_SET

# Add the application code this application should use in the Contrast UI.
# code: NEEDS_TO_BE_SET

# Override the reported application version.
# version: NEEDS_TO_BE_SET

# Apply labels to an application. Labels must
# be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET

# Define a set of `key=value` pairs (which conforms to RFC 2253) for
# specifying user-defined metadata associated with the application. The
# set must be formatted as a comma-delimited list of `key=value` pairs.
# Example - `business-unit=accounting, office=Baltimore`
#
# metadata: NEEDS_TO_BE_SET

# Provide the ID of a session which already exists in the Contrast
# UI. Vulnerabilities discovered by the agent are associated with
# this session. If an invalid ID is supplied, the agent will be
# disabled. This option and `application.session_metadata` are
# mutually exclusive; if both are set, the agent will be disabled.
# session_id: NEEDS_TO_BE_SET

# Provide metadata which is used to create a new session ID in the
# Contrast UI. Vulnerabilities discovered by the agent are associated with
# this new session. This value should be formatted as `key=value` pairs
# (conforming to RFC 2253). Available key names for this configuration
# are branchName, buildNumber, commitHash, committer, gitTag, repository,
# testRun, and version. This option and `application.session_id` are
# mutually exclusive; if both are set the agent will be disabled.
# session_metadata: NEEDS_TO_BE_SET

#
=====
==
```

```
# server
# Use the settings in this section to set metadata for the server
# hosting this agent. Contrast recognizes common, supported server
# names, paths, types and environments. Doing this may require a new
# server or license, and it may affect functionality of some features.
#
=====
==
# server:

# Override the reported server name.
# name: localhost

# Override the reported server path.
# path: NEEDS_TO_BE_SET

# Override the reported server type.
# type: NEEDS_TO_BE_SET

# Set the environment directly to override the default set
# by the Contrast UI. This allows the user to configure the
# environment dynamically at startup rather than manually
# updating the Server in the Contrast UI themselves afterwards.
#
# Valid values include `QA`, `PRODUCTION` and `DEVELOPMENT`.
# For example, `PRODUCTION` registers this Server as
# running in a `PRODUCTION` environment, regardless of the
# organization's default environment in the Contrast UI.
#
# environment: NEEDS_TO_BE_SET

# Apply a list of labels to the server. Labels
# must be formatted as a comma-delimited list.
# Example - `label1,label2,label3`
#
# tags: NEEDS_TO_BE_SET
```

## Ansible playbook for Contrast agents

An Ansible playbook lets you use a repeatable process for deploying Contrast agents in your build systems. The Ansible playbook for Contrast automatically installs a Contrast agent in a specific directory under the ownership and permissions of a specified user.

You can use an Ansible playbook for any of the Contrast agents.

## Resources

The [Contrast Ansible role](#) provides files that you can use to define the Ansible [role](#) and tasks for Contrast. The instance running this role needs Contrast login credentials and network access to Contrast.

- The `vagrantfile` lets you configure the use of the Ansible playbook to deploy Contrast agents.
- The `defaults/main.yml` file lets you define the Contrast [role variables](#) for the Ansible playbook:

```
contrast_api_key: <apikey>
contrast_service_key: <servicekey>
contrast_username: <email@yourcompany.com>
```

```
contrast_teamserver_url: <https://app.contrastsecurity.com>
contrast_teamserver_organization: <organizationname>
contrast_agent_type: java?jvm=1_6
contrast_agent_path_group: vagrant
contrast_agent_path_owner: vagrant
contrast_agent_path: "/opt"
```

- Replace `<apikey>` with the API key from the Contrast web interface
- Replace `<service key>` with the service key from the Contrast web interface
- Replace `<email@yourcompany.com>` with the Contrast username that you received when you activated your account.
- Replace `<organizationname>` with the name of your Contrast organization.
- The `tasks/main.yml` file lets you define the tasks for the role.

## Ansible Playbook example

This example shows how to apply the Contrast role to any server host that uses the playbook.

```
- hosts: servers
  roles:
    - { role: contrast }
```

## Methods for exercising applications

After you install and configure a Contrast agent, thoroughly exercising your applications ensures that Contrast can provide the most accurate information about vulnerabilities.

These application deployment methods can help to exercise as many routes in your application as possible, depending on your tools and environment.

| For best results:  | Test requirements   |
|--|---|
| Deploy to a server that receives requests from integration and smoke tests in a CI/CD pipeline. (page 586) | Existing automation tests                                       |
| Deploy to a server receiving requests from manual testing (page 587)                                       | Users who do manual testing                                     |
| Deploy to server that receives requests from web application test automation tools (page 587)              | Automated tests   |
| Deploy to a server that receives requests from API testing tools (page 587)                                | API testing tools like Postman                                  |
| Deploy to server with DAST testing tools (page 587)  | DAST tools like Rapid7  |
| Run an open-source crawler (page 587)  | Free tools like Zap   |
| Deploy to server that you use in a manual penetration testing environment (page 588)                       | Either first or third party pen testers exercising applications |
| Deploy to server that you use for BurpSuite-based penetration tests. (page 588)                            | Burp (for BurpTrast integration)                                |
| Use curl commands with Assess data. (page 588)   | Any user who can authenticate an API                            |

## Deployment to CI/CD pipeline

This method of exercising applications involves deployment to a server that receives requests from integration and smoke tests in a CI/CD pipeline.

### Details

| Requirements   | Users   | Best for...      |
|--|---|------------------|
| <ul style="list-style-type: none"> <li>Automation tests (regression, integration, smoke, performance tests),</li> <li>A CI tool to manage and orchestrate the automation,</li> <li>A server for CICD.</li> </ul> | <p>Users responsible for writing tests, maintaining CI, and instrumenting the CI server.</p> <p>These users are usually a mix of QA, development, and DevOps staff.</p> | All environments |

## Deployment with manual testing

This method of exercising applications involves deployment to a server that receives requests from manual testing.

### Details

| Requirements                             | Users                           | Best for...  |
|--|---------------------------------|--|
| A server you can use for manual testing. | QA testers who run manual tests | Environments that have manual resources available instead of automated testing environments. |

## Deployment with web application test tools

This method of exercising applications involves deployment to a server that receives requests from web application test automation tools (for example, Cypress or Selenium)

### Details

| Requirements  | Users  | Best for...      |
|---|--|------------------|
| <ul style="list-style-type: none"><li>Automation tests (regression, integration, smoke, or performance tests)</li><li>A tool like Cypress or Selenium to orchestrate the tests.</li><li>A server to instrument applications</li></ul> | QA, automation engineers and DevOps developers | All environments |

## Deployment with API test tools

This method of exercising applications involves deployment to a server that receives requests from API tests tools (for example, Postman).

### Details


| Requirements   | Users  | Best for...      |
|--|--|------------------|
| A developer with access to Postman in a development environment, or a server and Postman automation in a QA environment. | A developer who instruments a local machine, or a QA engineer who's written a Postman script for QA. | All environments |

## Deployment with DAST tools

This method of exercising applications involves deploying a server alongside an existing dynamic analysis security testing tools (DAST) such as Rapid7, Veracode, or Netsparker.

### Details


| Requirements   | Users   | Best for...                               |
|--|---|---|
| DAST tool needs to be in place.<br><br>Most likely, this is a tool you need to purchase. | Security and DevOps staff who deploy a built-in application to a server for DAST. | A test environment that uses a DAST tool. |

**NOTE**  
Consider this method supplementary to other types of testing.

## Deployment with open-source crawlers

This method of exercising applications involves using an open-source crawler (for example, Zap).

## Details

| Requirements  | Users   | Environment                                   |
|---|---|---|
| <ul style="list-style-type: none"><li>Free crawling tool</li><li>Implementation in a QA environment or local usage in a development environment.</li></ul>  | <ul style="list-style-type: none"><li>DevOps users who integrate open-source crawlers into a CI/CD pipeline.</li><li>Developers who run the tool manually</li></ul> | Any automated deployment and test environment |
| <div><b>NOTE</b><br/>Open-source crawlers tools may not fully exercise the application due to the nature of the payload.</div> |   |   |

## Deployment with manual penetration testing

This method of exercising applications involves deployment to a server that is used for manual penetration testing environment (in house or third parties like NetSPI).

## Details

| Requirements   | Users                           | Best for...   |
|--|---------------------------------|---|
| <ul style="list-style-type: none"><li>Purchase of pen testing services</li><li>Scheduling tests.</li></ul> | In-house or third-party testers | Environments that have in-house penetration testers.<br><br>If you are using third-party penetration testers, consider using Contrast Assess as a way to reduce costs of pen tests. |

## Deployment with Burp Suite-based penetration testing

This method of exercising applications involves deployment to a server that is used for Burp Suite based penetration tests.

## Details

| Requirements   | Users   | Best for...  |
|--|---|--|
| Burp Suite to enable BurpTrast integration.<br><br>The free version is useful because it is easy for security staff to use it.<br><br>Use the paid version if you previously purchased it. | In-house penetration testers or security staff. | Environments that use the free or paid version of Burp Suite.<br><br>In most cases, the free version of Burp Suite is sufficient because security staff can use it directly.<br><br>If you already purchased , use that version. |

## User curl commands with Assess data

This method of exercising applications involves the use of curl ommands with Assess data.

## Details

| Requirements  | Users  | Best for...   |
|---|--|---|
| <ul style="list-style-type: none"><li>Use of a command line interface</li><li>Ability to authenticate an API call</li></ul> | Anyone with access to a server and an authorization token to call specific API | Users who have server and token information.<br><br>Consider this method supplementary to other types of testing. |



## Contrast service



### IMPORTANT

The Contrast service is required for earlier versions of Node.js (before Node.js agent version 5.0.0) and Python (before Python agent version 5.19.0). Newer versions of the agent use a more performant and native analysis that does not require the Contrast Service. Refer to the documentation for each agent to verify the versions where these changes occur.

The Contrast service is a stand-alone executable that enables the communication between Contrast and multi-process dynamic language agents (Node.js and Python agents). It passes settings from Contrast to the agent. It also aggregates and sends information from the agent back to Contrast.

It is compiled for various supported architectures:

- Linux 64-bit
- Macintosh 64-bit
- Windows 64-bit

The service is packaged with the Node.js and Python agents and starts automatically when the instrumented application is started. The service is not packaged or started by the Go agent. You must have a service installed, configured and running for the Go agent to function. You may do the same for more control when running the Node.js or Python agents.

### Install the Contrast service

Installation varies depending on your system:

- **Linux:** Install the Contrast service with a system package manager.
- **Debian:** Use the commands to install from the correct Debian repository.

1. Get the `CODENAME` for your Ubuntu release.

```
grep VERSION_CODENAME /etc/os-release
```

2. Update the command below with the `CODENAME`, and run the commands.

```
curl https://pkg.contrastsecurity.com/api/gpg/key/public | sudo apt-key add -
echo "deb https://pkg.contrastsecurity.com/debian-public/ CODENAME contrast" | sudo tee /etc/apt/sources.list.d/contrastc.list
```

3. Install the Contrast service:

```
sudo apt-get update && sudo apt-get install contrast-service
```

4. [Configure the Contrast service \(page 590\)](#).

- **Red Hat Package Manager (RPM):** Use these commands to install from Contrast's yum repository.

1. Configure your system to use the repository:

```
OSREL=$(rpmquery -E "%{rhel}")
sudo -E tee /etc/yum.repos.d/contrast.repo << EOF
[contrast]
name=contrast repo
```

```
baseurl=https://pkg.contrastsecurity.com/rpm-public/centos-$OSREL/  
gpgcheck=0  
enabled=1  
EOF
```

2. Install the Contrast service:

```
yum install contrast-service
```

3. [Configure the Contrast service. \(page 590\)](#)

**TIP**

To remove the `contrast-service` package, run `apt-get remove contrast-service` or `yum remove contrast-service`.

## Configure the Contrast service

The Contrast service is not preconfigured with connection parameters. You must configure the service with a YAML configuration file.

When installed as a system service, the Contrast service is controlled by this YAML configuration file located in the `/etc` directory. Frequently, the service shares the same `contrast_security.yaml` file with any other applications on the same server, to ensure that all connection values (like the socket name or port number) are consistent.

Assuming an application-specific configuration file is not already installed in the application's working directory, the location of the YAML configuration file determines whether it can be shared with the agent on the same server:

- If you **don't** want it to be shared, place the configuration file at `/etc/contrast/webserver/contrast_security.yaml`.
- If you **do** want it to be shared, place the configuration file at `/etc/contrast/contrast_security.yaml`.

A default configuration YAML file is installed with the Contrast service Linux package at `/etc/contrast/webserver/contrast_security.yaml`. This template has placeholders for most necessary items, but you should update the following:

- **api:** Set the API properties. This determines how the Contrast service connects to Contrast.
- **agent:** This is the top-level configuration section for agent-related configuration.
  - **service:** These options affect communication between an agent and the Contrast service. The connection configuration must be identical between the Contrast service and the agent communicating with that service.
    - **socket:** The path to the local unix socket (for example, `/tmp/contrast.sock`)
    - **host and port:** Optionally, instead of socket, the Contrast Service can be configured to connect at a host and port.
    - **grpc:** (applies to Go and Node.js agents only) Set to "true" to use gRPC for agent to service communication. This is optional and may provide a slight performance improvement.

If this configuration has an issue or incorrect values, or the Contrast service fails to connect to Contrast, you can troubleshoot the failed connection result at `/var/log/contrast/service.log`.

## Install the Contrast service

Installation varies depending on your system:

- **Linux:** Install the Contrast service with a system package manager.
- **Debian:** Use the commands to install from the correct Debian repository.

1. Get the `CODENAME` for your Ubuntu release.

```
grep VERSION_CODENAME /etc/os-release
```

2. Update the command below with the `CODENAME`, and run the commands.

```
curl https://pkg.contrastsecurity.com/api/gpg/key/public | sudo apt-key add -  
echo "deb https://pkg.contrastsecurity.com/debian-public/ CODENAME  
contrast" | sudo tee /etc/apt/sources.list.d/contrastc.list
```

3. Install the Contrast service:

```
sudo apt-get update && sudo apt-get install contrast-service
```

4. [Configure the Contrast service \(page 590\).](#)

- **Red Hat Package Manager (RPM):** Use these commands to install from Contrast's yum repository.

1. Configure your system to use the repository:

```
OSREL=$(rpmquery -E "%{rhel}")  
sudo -E tee /etc/yum.repos.d/contrast.repo << EOF  
[contrast]  
name=contrast repo  
baseurl=https://pkg.contrastsecurity.com/rpm-public/centos-$OSREL/  
gpgcheck=0  
enabled=1  
EOF
```

2. Install the Contrast service:

```
yum install contrast-service
```

3. [Configure the Contrast service. \(page 590\)](#)

**TIP**

To remove the `contrast-service` package, run `apt-get remove contrast-service` or `yum remove contrast-service`.

## Configure the Contrast service

The Contrast service is not preconfigured with connection parameters. You must configure the service with a YAML configuration file.

When installed as a system service, the Contrast service is controlled by this YAML configuration file located in the `/etc` directory. Frequently, the service shares the same `contrast_security.yaml` file with any other applications on the same server, to ensure that all connection values (like the socket name or port number) are consistent.

Assuming an application-specific configuration file is not already installed in the application's working directory, the location of the YAML configuration file determines whether it can be shared with the agent on the same server:

- If you **don't** want it to be shared, place the configuration file at `/etc/contrast/webserver/contrast_security.yaml`.

- If you **do** want it to be shared, place the configuration file at `/etc/contrast/contrast_security.yaml`.

A default configuration YAML file is installed with the Contrast service Linux package at `/etc/contrast/webserver/contrast_security.yaml`. This template has placeholders for most necessary items, but you should update the following:

- **api:** Set the API properties. This determines how the Contrast service connects to Contrast.
- **agent:** This is the top-level configuration section for agent-related configuration.
  - **service:** These options affect communication between an agent and the Contrast service. The connection configuration must be identical between the Contrast service and the agent communicating with that service.
    - **socket:** The path to the local unix socket (for example, `/tmp/contrast.sock`)
    - **host and port:** Optionally, instead of socket, the Contrast Service can be configured to connect at a host and port.
    - **grpc:** (applies to Go and Node.js agents only) Set to "true" to use gRPC for agent to service communication. This is optional and may provide a slight performance improvement.

If this configuration has an issue or incorrect values, or the Contrast service fails to connect to Contrast, you can troubleshoot the failed connection result at `/var/log/contrast/service.log`.

## Agent Operator (Kubernetes operator)

The Contrast Agent Operator is a standard [Kubernetes operator](#) that executes within Kubernetes and OpenShift clusters to automate injecting Contrast agents into existing workloads, configuring injected agents, and facilitating agent upgrades.



### NOTE

The Contrast Agent Operator is an open-source project. You can review the code and contribute to its development [here](#).

## Security policies

The Contrast Agent Operator supports clusters with various security policies. It is recommended to familiarize yourself with them before installation. See [here](#) for the latest policies.

## Custom registries

If you want to use Agent Operator in an air-gapped environment (or you cannot use DockerHub), use the [Contrast custom registry examples](#) to guide you.

## Pod restart

Configuration changes are the primary drivers for [pod restarts \(page 612\)](#) and affect the pod's runtime environment.

## Next steps

To get started, [install and configure \(page 594\)](#) the agent operator.

Familiarize yourself with the [Agent Operator supported technologies \(page 593\)](#) and [Agent Operator networking requirements \(page 594\)](#).

## See also

- [Agent Operator telemetry \(page 611\)](#)

## Supported technologies for Agent Operator

### Kubernetes / OpenShift support

For the latest supported technology information see [here](#).

| Kubernetes version | OpenShift version | Operator version | End-of-support |
|--------------------|-------------------|------------------|----------------|
| v1.31              |                   | v0.14.0+         | 2025-10-28     |
| v1.30              |                   | v0.14.0+         | 2025-06-28     |
| v1.29              | v4.16             | v0.14.0+         | 2025-02-28     |
| v1.28              | v4.15             | v0.14.0+         | 2024-10-28     |
| v1.27              | v4.14             | v0.14.0+         | 2024-06-28     |

- The Contrast Agent Operator follows the upstream [Kubernetes community support policy](#). End-of-life dates are documented on the [Kubernetes releases](#) page.
- OpenShift support is dependent on the included version of Kubernetes. For example, OpenShift v4.10 uses Kubernetes v1.23 and will be supported by Contrast until 2023-02-28. See Red Hat's [support article](#) for the mapping between Kubernetes and OpenShift versions.
- The Contrast Agent Operator only supports executing on Linux amd64/arm64 hosts and will refuse to be scheduled onto incompatible nodes. Additionally, the operator only supports injecting workloads running on Linux amd64/arm64 hosts, even if the Contrast Agent supports additional platforms. Contact [Contrast Support](#) if Kubernetes on Windows is desired.

## Agent types

| Agent     | Agent type    | Support status | Compatibility notes  |
|-----------|---------------|----------------|--|
| .NET Core | dotnet-core   | Supported      | <a href="#">Supported .NET Core technologies (page 70)</a> |
| Java      | java          | Supported      | <a href="#">Supported Java technologies (page 55)</a>      |
| NodeJS    | nodejs        | Supported      | <a href="#">Supported Node.js technologies (page 81)</a>   |
|           | OR            |                |  |
|           | nodejs-legacy |                |  |
| PHP       | php           | Beta           | <a href="#">Supported PHP technologies (page 89)</a>       |
| Python    | python        | Supported      | <a href="#">Supported Python technologies (page 94)</a>    |



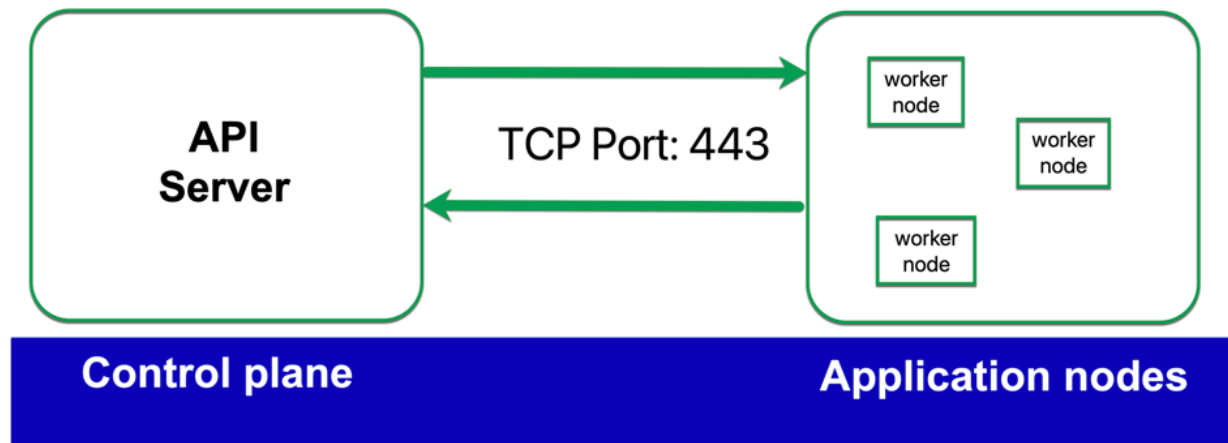
### NOTE

- Injection of the Node.js agent may result in a substantial increase in the startup time of the instrumented application. If startup time is unacceptable, injecting the agent during compilation may be desirable. If the application was injected by the Node.js agent during compilation then injection during runtime by the operator should be disabled. See the [rewriter CLI \(page 354\)](#) for more information.
- Use `nodejs` for NodeJS LTS  $\geq$  18.19.0 and `nodejs-legacy` for NodeJS LTS  $<$  18.19.0
- Injection of a PHP application is in beta. Beta status means the feature might change or act unexpectedly. Using this feature, you agree to the [Contrast Beta Terms and Conditions \(page 1563\)](#).

## Agent Operator networking requirements

The agent operator needs to be installed in environments where the networking restrictions do not block functionality.

To maintain optimal functionality, it is required to set up bi-directional communication between the control plane and worker nodes on port 443.



## Install the Agent Operator

Getting the agent operator synced with Contrast can be divided into a few areas, so this guide should get the agent operator up and running in just a few minutes so you can see how it works.

Set up the agent operator using one of the methods described below.

- With [Helm charts \(page 594\)](#). This is the recommended method.
- With [Terraform \(page 597\)](#)
- With a [Manifest file \(page 599\)](#)

The operator is configured using declarative Kubernetes native resource types. Resource types are documented in the [agent operator configuration \(page 600\)](#) section.

If you prefer, use the [agent operator walkthrough \(page 605\)](#) as an alternative method for installation and configuration.

## See also

- [Agent Operator networking requirements \(page 594\)](#)
- [Agent Operator telemetry \(page 611\)](#)

## Set up Agent Operator with Helm charts

Helm is a package manager for Kubernetes, which helps manage Kubernetes applications. Helm uses charts to configure, install, and upgrade Kubernetes Operators. This is the recommended method of installation.

## Before you begin

Make sure you have everything you need before you start:

- Must use [supported versions, frameworks, and tools \(page 593\)](#).

## Steps

1. Run these Helm commands:

```
helm repo add contrast https://contrastsecurity.dev/helm-charts
helm repo update contrast
helm show values contrast/contrast-agent-operator > contrast-agent-operator.yaml
```

2. [Add agent keys \(page 109\)](#) to the `clusterDefaults` section of the YAML file. You will also need to set the `enabled:` property to `true`.

```
clusterDefaults:
  enabled: true
  url: YOUR_CONTRAST_URL
  apiKeyValue: YOUR_API_KEY
  serviceKeyValue: YOUR_AGENT_SERVICE_KEY
  userNameValue: YOUR_AGENT_USERNAME
  yaml: |-
    enable: true
```

3. Run this Helm command:

```
helm upgrade --install --namespace contrast-agent-operator --create-namespace -f contrast-agent-operator.yaml contrast-agent-operator contrast/contrast-agent-operator
```

The Helm notes include details on the labels to apply to your workloads, as shown in this example:

```
Release "contrast-agent-operator" has been upgraded. Happy Helming!
NAME: contrast-agent-operator
LAST DEPLOYED: Tue Jul  2 12:04:40 2024
NAMESPACE: default
STATUS: deployed
REVISION: 4
TEST SUITE: None
NOTES:
contrast-agent-operator version 1.4.0 deployed!
6 injectors have been deployed to namespace: default
To use with your workloads:

contrast-java-injector (java):
  kubectl label deployment/<your_deployment_name> contrast-agent=java

contrast-dotnet-core-injector (dotnet-core):
  kubectl label deployment/<your_deployment_name> contrast-agent=dotnet-core

contrast-nodejs-injector (nodejs):
  kubectl label deployment/<your_deployment_name> contrast-agent=nodejs

contrast-nodejs-esm-injector (nodejs-esm):
  kubectl label deployment/<your_deployment_name> contrast-agent=nodejs-esm

contrast-php-injector (php):
  kubectl label deployment/<your_deployment_name> contrast-agent=php
```

```
contrast-python-injector (python):  
  kubectl label deployment/<your_deployment_name> contrast-  
agent=python  
  
Cluster agent defaults deployed  
  
To watch the operator logs:  
  kubectl logs -f -l app.kubernetes.io/part-of=contrast-agent-  
operator --namespace contrast-agent-operator  
  
More documentation: https://docs.contrastsecurity.com/en/agent-  
operator.html  
  
Get support: https://support.contrastsecurity.com /  
support@contrastsecurity.com
```

4. Label your deployments by using the [values from the table \(page 598\)](#).

**TIP**

Run the `kubectl get deployments` command to also find the deployment names.

Example commands for labeling a deployment:

Run:

```
kubectl get deployments
```

Get an output (for example):

| NAME            | READY | UP-TO-DATE | AVAILABLE | AGE |
|-----------------|-------|------------|-----------|-----|
| appl-deployment | 0 / 3 | 0          | 0         | 1s  |

Then run the following command:

```
kubectl label deployment appl-deployment contrast-agent=java
```

The default configuration from the YAML file deploys AgentInjectors only to the default namespace. If you use other namespaces, you can add them to the `agentInjectors.namespaces` array in the YAML file.

The following example shows how you might configure the `agentInjectors.namespaces` array:

```
agentInjectors:  
  enabled: true  
  # Required. All injectors will be created in each specified namespace.  
  lookupNamespaces:  
    # If enabled, Helm will lookup namespaces and deploy AgentInjectors  
to any accessible namespaces.  
    deployToAllAccessibleNamespaces: true  
    # List of namespace patterns to exclude deploying AgentInjectors to  
only when looking up namespaces.  
    excludePatterns:  
      - gatekeeper*  
      - kube*  
  # Required if lookupNamespaces.deployToAllAccessibleNamespaces is not
```



```
enabled. All injectors will be created in each specified namespace.
namespaces:
  - default
injectors:
  ...
```

## Set up Agent Operator with Terraform

Terraform can be used to create code that provisions all sorts of resources including Kubernetes clusters.

### Before you begin

Make sure you have everything you need before you start:

- Must use [supported versions, frameworks, and tools \(page 593\)](#).

### Steps

1. Create a values file based on the [latest version of the YAML file found here](#).
2. Name it `contrast-agent-operator.yaml`.
3. [Add agent keys \(page 109\)](#) to the `clusterDefaults` section of the YAML file. You will also need to set the `enabled:` property to `true`.

```
clusterDefaults:
  enabled: true
  url: YOUR_CONTRAST_URL
  apiKeyValue: YOUR_API_KEY
  serviceKeyValue: YOUR_AGENT_SERVICE_KEY
  userNameValue: YOUR_AGENT_USERNAME
  yaml: |-
    enable: true
```

4. Label your deployments by using the [values from the table \(page 598\)](#).



#### TIP

Run the `kubectl get deployments` command to also find the deployment names.

Example commands for labeling a deployment via CLI:

Run:

```
kubectl get deployments
```

Get an output (for example):

| NAME            | READY | UP-TO-DATE | AVAILABLE | AGE |
|-----------------|-------|------------|-----------|-----|
| appl-deployment | 0/3   | 0          | 0         | 1s  |

Then run the following command:

```
kubectl label deployment appl-deployment contrast-agent=java
```

Updating your Helm chart for the application being deployed is highly recommended.

5. Add the following Terraform code:

```
resource "helm_release" "contrast-agent-operator" {
  name      = "contrast-agent-operator"
```

```
repository = "https://contrastsecurity.dev/helm-charts"
chart      = "contrast-agent-operator"
values = [
  file("${path.module}/contrast-agent-operator.yaml")
]
```

You can use the [values in this table \(page 598\)](#).



#### NOTE

If the YAML file is edited any time after this setup, you will need to repeat all of the steps above to get the Operator properly running again. Run the `terraform apply` command after step 5.

## Values and labels for the Operator

### Label selectors

The following is the default mapping for label selectors used by the Operator.

| Name           | Value         | Instrumentation                           |
|----------------|---------------|---|
| contrast-agent | java          | Adds the Java agent to the container      |
| contrast-agent | dotnet-core   | Adds the .NET Core agent to the container |
| contrast-agent | nodejs        | Adds the Node.js agent to the container   |
|                | OR            |   |
|                | nodejs-legacy |   |
| contrast-agent | php           | Adds the PHP agent to the container       |
| contrast-agent | python        | Adds the Python agent to the container    |

### Terraform values

Terraform values include the following.

| Key  | Definition  |
|--|---|
| <code>namespace</code>                     | Namespace where Operator is installed.  |
| <code>image.registry</code>                | Registry to pull the image from. Defaults to Contrast's registry.   |
| <code>image.repository</code>              | The repository to pull the image from. Defaults to Contrast's repository.                                     |
| <code>image.tag</code>                     | Tag to pull from. Defaults to the version of the chart.   |
| <code>operator.defaultRegistry</code>      | Same as <code>image.registry</code> .   |
| <code>operator.eventQueueSize</code>       | The operator processes events from a stream in Kubernetes. This is the maximum number of messages to process. |
| <code>operator.eventQueueFullMode</code>   | Wait or DropOldest.   |
| <code>operator.webhookSecretName</code>    | The name of the secret. Unless the secret was manually created, leave it as default.                          |
| <code>operator.webhookConfiguration</code> | The name of the webhook configuration. Unless the configuration was manually created, leave it as default.    |
| <code>operator.enableEarlyChaining</code>  | Whether or not early chaining should be added (when using the agent with other agents).                       |
| <code>clusterDefaults.enabled</code>       | Whether or not the cluster defaults are enabled. This is recommended to be enabled to consolidate API keys.   |
| <code>defaultsDefaults.url</code>          | The agent hostname to use from the Kubernetes cluster.  |

| Key   | Definition   |
|---|--|
| clusterDefaults.apiKeyValue<br>serviceKeyValue<br>userNameValue | The values for the agent user to use. Should be referenced as secrets on the cluster.  |
| clusterDefaults.yaml  | Optional additional YAML as generated by <a href="https://agent.config.contrastsecurity.com/">https://agent.config.contrastsecurity.com/</a> . Omit the API section. |

## Install Agent Operator with manifest files

Contrast provides a single-file installation YAML that can be directly applied to a cluster and provides reasonable defaults. Additional modifications may be desired based on your specific circumstances.

### Before you begin

Make sure you have everything you need before you start:

- Must use [supported versions, frameworks, and tools \(page 593\)](#).

### Steps



#### NOTE

It is possible to install into a namespace other than the default `contrast-agent-operator`, although modifications to the deployment manifests will be required.

1. Executing as a cluster administrator, apply the operator manifests using `kubectl` (Kubernetes) or `oc` (OpenShift).

```
kubectl apply -f https://github.com/Contrast-Security-OSS/agent-operator/releases/latest/download/install-prod.yaml
```

```
oc apply -f https://github.com/Contrast-Security-OSS/agent-operator/releases/latest/download/install-prod.yaml
```

The manifests:

- Create the `contrast-agent-operator` namespace.
- Install the operator Deployment workload.
- Install the required Custom Resource Definitions.
- Configure RBAC with the minimum necessary permissions.
- Register the operator for admission webhooks.

2. After applying the operator manifests, wait for the cluster to converge.

```
kubectl -n contrast-agent-operator wait
pod --for=condition=ready --selector=app.kubernetes.io/
name=operator,app.kubernetes.io/part-of=contrast-agent-operator --
timeout=30s
```

```
oc -n contrast-agent-operator wait
pod --for=condition=ready --selector=app.kubernetes.io/
name=operator,app.kubernetes.io/part-of=contrast-agent-operator --
timeout=30s
```

3. When the wait command succeeds the operator is ready to be [configured \(page 600\)](#).

## Upgrades

If the Agent Operator requires an upgrade [follow the steps here \(page 604\)](#) to complete the upgrade process.

## Agent Operator configuration

The topic describes the schema for every configuration entity type the Contrast Agent Operator accepts. Some entities are optional.

### AgentConfiguration

```
apiVersion: agents.contrastsecurity.com/v1beta1
kind: AgentConfiguration
metadata:
  name: example-agent-configuration
  namespace: default
spec:
  yaml: |
    server:
      environment: QA
  suppressDefaultServerName: false
  suppressDefaultApplicationName: false
```

| Property                            | Type    | Required | Default value | Description   |
|-------------------------------------|---------|----------|---------------|---|
| spec.yaml                           | string  | No       |               | A YAML configuration file as documented "YAML configuration"  |
| spec.suppressDefaultServerName      | boolean | No       | False         | If false, automatically set the Contrast server name on injected workloads ('kubernetes-{namespace}'), rather than use the default (normally the pod name). |
| spec.suppressDefaultApplicationName | boolean | No       | False         | If false, automatically set the Contrast application name on injected workloads (the workload name), rather than use the default (generated by the agent).  |



### NOTE

Connection keys will be ignored in the provided YAML file and should not be provided.

### AgentConnection

```
apiVersion: agents.contrastsecurity.com/v1beta1
kind: AgentConnection
metadata:
  name: example-agent-connection
  namespace: default
spec:
  url: https://app.contrastsecurity.com/Contrast
  apiKey:
    secretName: example-agent-connection-secret
    secretKey: apiKey
  serviceKey:
    secretName: example-agent-connection-secret
    secretKey: serviceKey
```

```
userName:
  secretName: example-agent-connection-secret
  secretKey: userName
```

| Property                   | Type   | Required | Default value | Description   |
|----------------------------|--------|----------|---------------|---|
| spec.url                   | string | Yes      |               | The URL of your Contrast server.                                    |
| spec.apiKey.secretName     | string | Yes      |               | The name of the Secret containing the apiKey.                       |
| spec.apiKey.secretKey      | string | Yes      |               | The key of the value in the named Secret containing the apiKey.     |
| spec.serviceKey.secretName | string | Yes      |               | The name of the Secret containing the serviceKey.                   |
| spec.serviceKey.secretKey  | string | Yes      |               | The key of the value in the named Secret containing the serviceKey. |
| spec.userName.secretName   | string | Yes      |               | The name of the Secret containing the userName.                     |
| spec.userName.secretKey    | string | Yes      |               | The key of the value in the named Secret containing the userName.   |



### IMPORTANT

For security, Secrets referenced must be contained in the same namespace as the AgentConnection.

## AgentInjector

```
apiVersion: agents.contrastsecurity.com/v1beta1
kind: AgentInjector
metadata:
  name: example-injector-dotnet-core
  namespace: default
spec:
  enabled: true
  version: latest
  type: dotnet-core
  image:
    registry: docker.io/contrast
    name: agent-dotnet-core
    pullSecretName: contrastdotnet-pull-secret
    pullPolicy: Always
  selector:
    images:
      - "*"
    labels:
      - name: app
        value: example-*
  connection:
    name: example-agent-connection
  configuration:
    name: example-agent-configuration
```

| Property     | Type    | Required | Default value | Description                              |
|--------------|---------|----------|---------------|--|
| spec.enabled | boolean | No       | TRUE          | Enables or disables this agent injector. |

| Property                  | Type            | Required | Default value   | Description   |
|---------------------------|-----------------|----------|---|---|
| spec.version              | string          | No       | latest  | The version of the agent to inject. The literal 'latest' will inject the latest version. Partial version matches are supported, e.g. '2' will select version '2.1.0'. |
| spec.type                 | agentType       | Yes      |   | The type of agent to inject. Can be one of ['dotnet-core', 'java', 'nodejs' or 'nodejs-esm', 'php', 'python'].  |
| spec.image.registry       | string          | No       | docker.io/contrast  | The image registry to use for downloading agent images. This registry must be accessible by the pods being injected and by the operator.                              |
| spec.image.name           | string          | No       | {based on type}   | The name of the injector image to use.  |
| spec.image.pullSecretName | string          | No       |   | The name of a pull Secret to append to the pod's imagePullSecrets list.   |
| spec.image.pullPolicy     | string          | No       | Always  | The pull policy to use when fetching Contrast images. See Kubernetes imagePullPolicy for more information.  |
| spec.selector.images      | string[]        | No       | Select all containers in Pod.   | Container images to inject the agent into. Glob patterns are supported.   |
| spec.selector.labels      | labelSelector[] | No       | Select all workloads in namespace.                                      | Deployment/ StatefulSet/DaemonSet/ DeploymentConfig labels whose pods are eligible for agent injection.   |
| spec.connection.name      | string          | No       | Defaults AgentConnection specified by a ClusterAgentConnection.         | The name of AgentConnection resource. Must exist within the same namespace.   |
| spec.configuration.name   | string          | No       | Defaults a AgentConfiguration specified by a ClusterAgentConfiguration. | The name of a AgentConfiguration resource. Must exist within the same namespace.  |

- Disabling an existing AgentInjector will remove all injections from selected workloads.
- The referenced AgentConnection and AgentConfiguration must exist in the same namespace as the AgentInjector.
- If using a custom registry, both the Pod being injected and the operator must have access, either through the default pull secret, or custom pull secrets.
- Agent version `latest` is recommended when using the agent in pre-production environments.
- The AgentInjector supports selecting Deployment, StatefulSet, DaemonSet, and DeploymentConfig (on OpenShift) workloads. Injecting pods directly is not supported.
- If the selected workload creates many containers in a single Pod, `spec.selector.images` can be used to filter which containers are injected.

## labelSelector

| Property | Type   | Required | Default value | Description   |
|----------|--------|----------|---------------|---|
| name     | string | Yes      |               | The name of the label to match.                               |
| value    | string | Yes      |               | The value of the label to match. Glob patterns are supported. |

**NOTE**

Label selections are cumulative using the logical AND operation.

**agentType**

| Agent     | Agent Type  |
|-----------|-------------|
| .NET Core | dotnet-core |
| Java      | java        |
| Node.js   | nodejs      |
|           | OR          |
|           | nodejs-esm  |
| PHP       | php         |
| Python    | python      |

Types are further documented in [Operator supported technologies \(page 593\)](#).

**ClusterAgentConfiguration**

```
apiVersion: agents.contrastsecurity.com/v1beta1
kind: ClusterAgentConfiguration
metadata:
  name: default-agent-configuration
  namespace: contrast-agent-operator
spec:
  namespaces:
    - default
  template:
    spec:
      yaml: |
        server:
          environment: QA
```

| Property       | Type               | Required | Default value   | Description  |
|----------------|--------------------|----------|-----------------|--|
| spec.namespace | string[]           | No       | All namespaces. | The namespaces to apply this AgentConfiguration template to. Glob syntax is supported.   |
| spec.template  | AgentConfiguration | Yes      |                 | The default AgentConfiguration to apply to the namespaces selected by 'spec.namespaces'. |

**NOTE**

For security, ClusterAgentConfiguration manifests must be deployed into the same namespace of the operator.

**ClusterAgentConnection**

```
apiVersion: agents.contrastsecurity.com/v1beta1
kind: ClusterAgentConnection
```

```
metadata:
  name: default-agent-connection
  namespace: contrast-agent-operator
spec:
  namespaces:
    - default
  template:
    spec:
      url: http://app.contrastsecurity.com/Contrast
      apiKey:
        secretName: default-agent-connection-secret
        secretKey: apiKey
      serviceKey:
        secretName: default-agent-connection-secret
        secretKey: serviceKey
      userName:
        secretName: default-agent-connection-secret
        secretKey: userName
```

| Property       | Type            | Required | Default value   | Description  |
|----------------|-----------------|----------|-----------------|--|
| spec.namespace | string[]        | No       | All namespaces. | The namespaces to apply this AgentConfiguration template to. Glob syntax is supported. |
| spec.template  | AgentConnection | Yes      |                 | The default AgentConnection to apply to the namespaces selected by 'spec.namespaces'.  |



## NOTE

- For security, ClusterAgentConnection manifests must be deployed into the same namespace of the operator.
- Secrets referenced by ClusterAgentConnection must exist in the same namespace in which the ClusterAgentConnection entity is deployed.

## See also

- [Install Agent Operator \(page 594\)](#)
- [Agent Operator supported technologies \(page 593\)](#)
- [Agent operator telemetry \(page 611\)](#)

## Upgrade the operator

The Contrast Agent Operator follows [semantic versioning](#).

- **MAJOR** versions may include breaking changes to the operator API. Care should be taken when upgrading between MAJOR versions as manifests may have changed or existing CRDs may need to be updated.
- **MINOR** versions contain new features and are fully backwards compatible and are safe to apply to an existing cluster. Optional manifest changes may be needed to use new functionality.
- **Patch** versions contain security and bug fixes and are fully backwards compatible and are safe to apply to an existing cluster. No manifest changes are required.

Contrast publishes image tags in the following format:



```
:2
:2.1
:2.1.10
:latest
```

Where `:2` represents the latest release in the 2.X.X semantic version branch. To simplify upgrades, prefix versions may be used based on your risk tolerance (ensure `imagePullPolicy` is set to `Always`).



#### NOTE

While the Contrast Agent Operator supports high availability setups using multiple replicas and leader leases, Contrast only supports deployments where all operator instances are running the same version for extended periods of time. The option `imagePullPolicy` should not be relied on to keep multiple instances on the same version. Using an operator, such as [Keel](#) to facilitate safe upgrades, is recommended if automatic upgrades are desired.

### Minor and patch upgrades

Upgrading to new versions follows the same steps as installing into a fresh cluster. Executing as a cluster administrator, apply the operator manifests using `kubectl` (Kubernetes) or `oc` (OpenShift).

```
kubectl apply -f https://github.com/Contrast-Security-OSS/agent-operator/
releases/latest/download/install-prod.yaml
```

```
oc apply -f https://github.com/Contrast-Security-OSS/agent-operator/
releases/latest/download/install-prod.yaml
```

### Major upgrades

Major upgrades may include additional manifest changes. Deleting only the `contrast-agent-operator` namespace maintains the installed CRDs (and by extension any cluster configurations).

```
kubectl delete namespace contrast-agent-operator
kubectl apply -f https://github.com/Contrast-Security-OSS/agent-operator/
releases/latest/download/install-prod.yaml
```

```
oc delete project contrast-agent-operator
oc apply -f https://github.com/Contrast-Security-OSS/agent-operator/
releases/latest/download/install-prod.yaml
```

While these generic steps may work in most major upgrades, care should be taken to follow the migration steps provided in the release notes, if any, to ensure the major upgrade is successful.

### See also

- [Agent Operator configuration \(page 600\)](#)
- [Operator supported technologies \(page 593\)](#)

## Agent Operator walkthrough

### Before you begin

This topic provides a complete walk-through of installing the Contrast Agent Operator and injecting an example workload as a cluster administrator using vanilla Kubernetes. **You can use this as an alternative installation method.**

To follow this example using OpenShift, the Kubernetes commands will need to be converted to their OpenShift equivalents. All commands are expected to execute within a Bash-like terminal.

You should have a basic understanding of how Kubernetes and related software work. You may need to adjust the instructions to meet your specific circumstances.

### Step 1: Install the operator

To install the operator, the operator manifests must be applied to the cluster. See [Install Agent Operator with manifest files \(page 599\)](#) for installation steps. Contrast provides a single-file installation YAML that can be directly applied to a cluster and provides reasonable defaults. Additional modifications may be desired based on your specific circumstances, in which case, a configuration management framework, such as [Kustomize](#), is recommended.



#### NOTE

This single-file installation YAML will create and install into the `contrast-agent-operator` namespace. This namespace will be used later.

After waiting for cluster convergence, the operator should be ready in the `Running` status.

```
% kubectl -n contrast-agent-operator get pods
```

*Output:*

| NAME                                    | READY | STATUS  | RESTARTS | AGE |
|---|-------|---------|----------|-----|
| contrast-agent-operator-57f5cfbf7-9svtt | 1/1   | Running | 0        | 27s |
| contrast-agent-operator-57f5cfbf7-fp4vp | 1/1   | Running | 0        | 39s |

The operator is ready to be configured.

### Step 2: Configure the operator

The operator must first be configured before injecting cluster workloads.

Kubernetes secrets are used to store connection authentication keys. Note that the name of the Secret created in the next part is `default-agent-connection-secret` and is created in the `contrast-agent-operator` namespace.

```
% kubectl -n contrast-agent-operator \  
    create secret generic default-agent-connection-secret \  
    --from-literal=apiKey=TODO \  
    --from-literal=serviceKey=TODO \  
    --from-literal=username=TODO
```

*Output:*

```
secret/default-agent-connection-secret created
```



#### NOTE

Replace `TODO` with the equivalent values for your Contrast server instance. [Find the agent keys \(page 109\)](#) describes how to retrieve agent keys from the Contrast UI.

To complete the connection configuration, a `ClusterAgentConnection` is needed. Note that `ClusterAgentConnection` created in the next part is created in the `contrast-agent-operator` namespace and refers to the Secret's key values used above.

```
% kubectl apply -f - <<EOF
apiVersion: agents.contrastsecurity.com/v1beta1
kind: ClusterAgentConnection
metadata:
  name: default-agent-connection
  namespace: contrast-agent-operator
spec:
  template:
    spec:
      url: https://app.contrastsecurity.com/Contrast
      apiKey:
        secretName: default-agent-connection-secret
        secretKey: apiKey
      serviceKey:
        secretName: default-agent-connection-secret
        secretKey: serviceKey
      userName:
        secretName: default-agent-connection-secret
        secretKey: userName
EOF
```

#### Output:

```
clusteragentconnection.agents.contrastsecurity.com/default-agent-connection
created
```



#### NOTE

The name of the `ClusterAgentConnection` is not important and can be named anything.

The operator is now configured and can inject agents into existing workloads.

### Step 3: Inject workloads

This example will focus on injecting the Contrast Java agent into the [Java sample application](#) using a Deployment workload.

First, deploy the sample application to the cluster. Note that the Deployment created in the next part is created in the `default` namespace.

```
% kubectl apply -f - <<EOF
apiVersion: apps/v1
kind: Deployment
metadata:
  name: spring-petclinic
  namespace: default
  labels:
    arbitrary-label: arbitrary-value
spec:
  selector:
```

```

matchLabels:
  app: spring-petclinic
template:
  metadata:
    labels:
      app: spring-petclinic
  spec:
    containers:
      - image: contrastsecuritydemo/spring-petclinic:1.5.1
        name: spring-petclinic
EOF

```

**Output:**

```
deployment.apps/spring-petclinic created
```

After waiting for cluster convergence, the deployed workload should be ready in the `Running` status.

```
% kubectl -n default get pods
```

**Output:**

| NAME                              | READY | STATUS  | RESTARTS | AGE |
|-----------------------------------|-------|---------|----------|-----|
| spring-petclinic-77d97bdbd5-ts2cz | 1/1   | Running | 0        | 15d |

Next, the operator can be configured to inject the Java agent using an `AgentInjector` configuration entity. Note that the `AgentInjector` needs to be created in the same namespace that the previous `Deployment` was deployed into, `default` in this case.

```

% kubectl apply -f - <<EOF
apiVersion: agents.contrastsecurity.com/v1beta1
kind: AgentInjector
metadata:
  name: spring-petclinic-injector
  namespace: default
spec:
  type: java
  selector:
    labels:
      - name: arbitrary-label
        value: arbitrary-value
EOF

```

**Output:**

```
agentinjector.agents.contrastsecurity.com/spring-petclinic-injector
configured
```

Checking the logs of the `spring-petclinic-app` Pod shows that the Contrast Java agent is now instrumenting the application.

```

% kubectl -n default logs Deployment/spring-petclinic
Defaulted container "spring-petclinic" out of: spring-petclinic, contrast-init (init)
Picked up JAVA_TOOL_OPTIONS: -javaagent:/opt/contrast/contrast-agent.jar
[Contrast] Wed Dec 20 21:47:23 GMT 2023 Loading pre-packaged configuration
[Contrast] Wed Dec 20 21:47:23 GMT 2023 Couldn't find pre-packaged configuration.

```

[illegible]

### Step 4: Uninstall the operator (optional)

To restore the original state of the cluster, first remove existing AgentInjectors.

```
% kubectl -n default delete agentinjector spring-petclinic-injector
```

*Output:*

```
agentinjector.agents.contrastsecurity.com "spring-petclinic-injector"
deleted
```

After which, the operator will restore all injected workloads to their previous non-instrumented state. Once the cluster converges, the operator can be safely removed.

```
% kubectl delete -f https://github.com/Contrast-Security-OSS/agent-operator/
releases/latest/download/install-prod.yaml
```

*Output:*

```
namespace "contrast-agent-operator" deleted
customresourcedefinition.apiextensions.k8s.io
"agentconfigurations.agents.contrastsecurity.com" deleted
customresourcedefinition.apiextensions.k8s.io
"agentconnections.agents.contrastsecurity.com" deleted
customresourcedefinition.apiextensions.k8s.io
"agentinjectors.agents.contrastsecurity.com" deleted
customresourcedefinition.apiextensions.k8s.io
"clusteragentconfigurations.agents.contrastsecurity.com" deleted
customresourcedefinition.apiextensions.k8s.io
"clusteragentconnections.agents.contrastsecurity.com" deleted
serviceaccount "contrast-agent-operator-service-account" deleted
clusterrole.rbac.authorization.k8s.io "contrast-agent-operator-service-
role" deleted
clusterrolebinding.rbac.authorization.k8s.io "contrast-agent-operator-
service-role-binding" deleted
service "contrast-agent-operator" deleted
deployment.apps "contrast-agent-operator" deleted
poddisruptionbudget.policy "contrast-agent-operator" deleted
mutatingwebhookconfiguration.admissionregistration.k8s.io "contrast-web-
hook-configuration" deleted
```

**See also**

- [Install the Agent Operator \(page 594\)](#)
- [Agent Operator configuration \(page 600\)](#)

**Uninstall the Agent Operator**

The Contrast Agent Operator stores all data in the Kubernetes backplane, and is designed to completely remove all modifications when removed from a cluster. To ensure that everything is cleaned up correctly, it is recommended the following steps are taken in order.

```
kubectl delete crd agentconfigurations.agents.contrastsecurity.com
kubectl delete crd agentconnections.agents.contrastsecurity.com
kubectl delete crd agentinjectors.agents.contrastsecurity.com
kubectl delete crd clusteragentconfigurations.agents.contrastsecurity.com
kubectl delete crd clusteragentconnections.agents.contrastsecurity.com
```

```
oc delete crd agentconfigurations.agents.contrastsecurity.com
oc delete crd agentconnections.agents.contrastsecurity.com
oc delete crd agentinjectors.agents.contrastsecurity.com
oc delete crd clusteragentconfigurations.agents.contrastsecurity.com
oc delete crd clusteragentconnections.agents.contrastsecurity.com
```

Deleting the CRDs will delete any operator configuration entities automatically. Allow the Contrast Agent Operator to reverse any changes it has made to cluster workloads once the configuration entities have been removed.

**NOTE**

This may cause substantial shifting of deployed pods as Kubernetes redeploys impacted workloads, depending on how many workloads were injected by the operator. Caution is advised in larger clusters.

After the cluster settles, the operator is safe to remove.

```
kubectl delete -f https://github.com/Contrast-Security-OSS/agent-operator/releases/latest/download/install-prod.yaml
```

```
oc delete -f https://github.com/Contrast-Security-OSS/agent-operator/releases/latest/download/install-prod.yaml
```

**NOTE**

Errors around missing CRDs is normal if the CRDs were deleted in the first step as recommended.

## .NET Core chaining support

The .NET Core Agent, paired with the [Contrast Agent Operator \(page 592\)](#), supports [profiler chaining with Dynatrace](#) using the [Dynatrace Operator](#). Support is enabled automatically when the Dynatrace Operator is used to inject the Dynatrace agent into workloads.

If you use the Dynatrace Operator in `classicFullStack` mode, set the `CONTRAST_ENABLE_EARLY_CHAINING=true` environment variable for the Contrast Agent Operator and restart the affected pods. Use this [manifest example](#) to guide you.

The Agent Operator supports executing in OpenShift clusters that have security context constraints (SCCs) using the built-in admission or mutating controllers. The Dynatrace Operator and any injections are tested against the `restricted` policy. If you are running your application in an OpenShift cluster where the default restricted policy disallows setting an SCCs policy, ensure the `CONTRAST_SUPPRESS_SECCOMP_PROFILE=true` environment variable is applied to the Agent Operator workload.

| Vendor    | Version         | Support validated on |
|-----------|-----------------|----------------------|
| Dynatrace | Operator v0.6.0 | 2022/06/09           |

Future Dynatrace versions may break chaining. Chaining can introduce incompatibilities and can be disabled using the `agent.dotnet.enable_chaining: false` option.

## Agent Operator Telemetry

The Contrast Agent Operator uses telemetry to collect usage data. Telemetry is collected when the operator is first installed in a cluster and then periodically (every few hours) afterwards.

Your privacy is important to us. The telemetry feature doesn't collect application data. The data is anonymized before being sent securely to Contrast. Then the aggregated data is stored encrypted and under restricted access control. Any collected data will be deleted after one year.

To opt-out of the telemetry feature, set the `CONTRAST_AGENT_TELEMETRY_OPTOUT` environment variable to `1` or `true`.

Telemetry data is securely sent to *telemetry.dotnet.contrastsecurity.com*. You can also opt out of telemetry by blocking communication at the network level.

The telemetry feature collects the following data:

## Operator v0.3.0

- The version of the operator.
- The uptime of the operator.
- Cluster version information and platform as published by the Kubernetes API.
- A cryptographically (SHA256) anonymous hash of the cluster ID, a randomly generated GUID created at first launch by the operator and stored in the operator's namespace as a Secret.
- The count of watched resources in the cluster (all operator entities, DaemonSets, DeploymentConfigs, Deployments, Namespaces, Pods, Secrets, and StatefulSets).
- Exceptions thrown internally by the operator, including log message, exception type, exception message, and stack trace frames.

## Pod restart

Kubernetes pods are designed to maintain a desired state defined in YAML configurations. When changes occur to configurations that affect a pod's runtime environment, Kubernetes initiates pod restarts to ensure the actual state aligns with the desired state. This reconciliation process is fundamental to Kubernetes' operation.

Specifically, modifications to resources such as `AgentConfiguration`, `AgentConnection`, and `AgentInjector` trigger these restarts. These resources define critical aspects of the pod's behavior, including connectivity, settings, and injection rules. When these configurations are updated, Kubernetes detects the discrepancy between the current pod state and the new desired state.

The impact extends to `ClusterAgentConnection` and `ClusterAgentConfiguration` too. These cluster-level resources generate `AgentConnections` and `AgentConfigurations` within specified namespaces. Therefore, changes to these cluster-level resources cascade down, leading to corresponding updates and restarts of pods in the affected namespaces.

Any change to the pod's configuration, whether direct or indirect through related resources, necessitates a restart to guarantee that the pod reflects the latest defined state within the cluster. This ensures consistency and reliability across the application. It is essential to understand that only the pods affected explicitly by the configuration change will be restarted. For instance, if an `AgentInjector` targets deployments using a specific label selector, only the pods within those targeted deployments will be restarted, not all pods in the cluster.

## Agent performance

Agent performance in application security refers to the effectiveness and efficiency of security agents or software tools deployed to protect applications from vulnerabilities and threats. These agents can be various security mechanisms such as firewalls, intrusion detection systems (IDS), intrusion prevention systems (IPS), web application firewalls (WAF), and vulnerability scanners.

## See also

[Agent performance with Protect \(page 613\)](#)



[Java agent performance \(page 614\)](#)

[.NET Core agent performance \(page 615\)](#)

## Agent performance with Protect

### What can impact Protect performance?

The performance of these agents is crucial because they need to accurately and swiftly detect and respond to potential security risks in real-time. Here are a few main aspects related to agent performance in application security:

1. **Accuracy:** The security agent should have a high level of accuracy in identifying and classifying security threats. To address genuine risks, we want to minimize false positives (misidentifying legitimate activities as threats) and false negatives (failing to detect actual threats).
  - When sensitive rules are detected, they are audited and validated. The rules are adjusted or turned off for a quick fix. The engineering team is responsible for fixing and tuning the false positives (FP) to ensure the system's accuracy.
2. **Speed and responsiveness:** Application security agents should operate in real-time or near real-time to detect and respond promptly to security incidents. Delayed responses can lead to extended exposure to vulnerabilities and increase the risk of successful attacks.
  - Contrast's infrastructure services are expected to have enough resources and capacity to handle high loads and errors without impacting performance.
3. **Scalability:** Agents should be capable of handling the demands of large-scale applications and networks. The system has a cloud-native licensing model that allows easy deployment and scaling of microservices in clustered environments. It provides flexibility for scaling up and down based on demand to ensure optimal performance.
  - Our updated configuration deployment enables the efficient scaling up and down of the system with microservices. It simplifies the process of deploying and managing the system at scale, ensuring smooth operations.
4. **Resource utilization:** Effective security agents should need to utilize system resources, such as CPU, memory, and network bandwidth, efficiently. They should handle the need for robust security measures and minimize resource consumption to avoid adversely impacting the performance of the protected applications.
  - The memory consumption is typically capped. See the agent-specific sections for detailed information about memory usage.
5. **Adaptability:** Application security agents should be adaptable to evolving threats and new attack vectors. Regular updates and enhancements to the agent's capabilities, such as signature updates, rule updates, and machine learning models, are necessary to ensure the continued effectiveness of security measures.
  - You can optimize performance by determining the most applicable rules and tuning them. You can also use exclusions and allowlisting to reduce unnecessary scans and analysis, which helps in further tuning and reducing performance impact.

Overall, the agent performance objective in application security is to provide a robust and reliable defence against potential threats while minimizing false positives, response times, and resource utilization. Organizations can enhance the security posture of their applications and protect them from various attacks by balancing security effectiveness and system performance.

### See also

[Java agent performance \(page 614\)](#)

[.NET Core agent performance \(page 615\)](#)

## Performance expectations for the Java agent with Protect

To provide insights into its impact on performance, we have gathered information based on internal tests conducted with a sample Java application. Please note that the actual performance numbers may vary based on several other factors.

### CPU Usage

- The Java agent typically utilizes 5-15% of CPU resources
- This range provides an estimate of the additional CPU load incurred when the agent is enabled in Protect mode
- The impact may vary based on the complexity of your application, the load it experiences, and other environmental factors

### Memory consumption

- The Java agent typically requires 200-300 MB of additional memory
- This memory usage accounts for the Agent's operations and any associated data structures
- The actual memory impact may depend on the size and complexity of your application, as well as the number of concurrent requests it handles

### Latency

- Enabling the Java agent in Protect mode may introduce additional latency to the processing of requests
- 99% of observed requests for Protect analysis take between 100  $\mu$ s - 5 ms
- The specific impact will depend on various factors like the application's workload, the number of concurrent users, and the nature of the requests
- It is important to note that the latency introduced is generally minimal, but it may vary based on your specific application characteristics. These performance numbers serve as a baseline to provide you with an initial understanding of the Java agent's impact on your application. However, we emphasize that the actual performance impact may differ based on the unique aspects of your environment and application. We recommend conducting your performance tests using representative workloads and realistic scenarios to accurately gauge the impact on your application's performance. By simulating conditions similar to your production environment, you can fine-tune the configuration and evaluate the trade-off between security and performance. Our team is committed to continuously enhancing the Java agent's efficiency and optimizing its impact on your application's performance. We value your feedback and encourage you to reach out to us with any performance-related observations or concerns. Feel free to [contact our support team](#) if you require any assistance or further information regarding the performance characteristics of our Java agent. We are here to help you ensure the security and stability of your application while maintaining optimal performance levels.

The following graph illustrates a combined representation of the request handling time for real customer host applications instrumented with our agent. It showcases a 24-hour sample of Java performance impact.



- The top row shows the overall request handling time, indicating that a substantial portion of the HTTP requests, approximately 93% of requests (1.06 billion hits), fall within the 10 milliseconds to 50 milliseconds range. Additionally, you can see 98.1 million hits with a handling time between 5 and 10 milliseconds, while the remaining handling times follow a normal distribution.
- The bottom row displays the Protect time, which represents the length of time our Protect RASP product takes to analyze each request. Notably, among the total requests, 800 million were analyzed within a time frame of 1 to 5 milliseconds, demonstrating a negligible impact on latency. Similarly, an additional 344 million requests underwent analysis within an even shorter time range of 0.5 to 1 milliseconds, indicating minimal latency impact. The distribution of request handling times for host applications instrumented with our agent allows us to observe the number of requests falling into different time ranges while also providing insights on the performance impact introduced by Protect.
- Garbage collecting and other JVM elements can pause execution, which impacts timing.

## Performance expectations for the .NET Core agent with Protect

To provide insights into its impact on performance, we have gathered information based on internal tests conducted with a sample .NET Core application. Please note the actual performance numbers may vary based on several other factors.

### CPU usage

- The .NET Core agent typically utilizes 5-10% of CPU resources
- This range represents the additional CPU load incurred when the agent is enabled in Protect mode
- The actual impact may vary depending on the complexity of your application, the workload it handles, and other environmental considerations

### Memory consumption

- The .NET Core agent typically requires around 200 MB of additional memory
- This memory usage accounts for the agent's operations and relevant data structures
- The actual memory impact may differ based on your application's size, complexity, and the number of concurrent requests it processes

## Latency

- Enabling the .NET Core agent in Protect mode may introduce additional latency during request processing
- The latency increase can range from 1-10 milliseconds
- The specific impact on latency depends on factors such as your application's workload, the number of concurrent users, and the nature of the requests being handled
- It is important to note that the introduced latency is generally minimal, but actual numbers may vary based on your specific application characteristics. These performance numbers serve as a baseline, providing an initial understanding of the impact the .NET Core agent has on your application's performance. However, it is crucial to recognize that the actual performance impact may differ based on the unique aspects of your environment and application. We strongly recommend conducting your performance tests using representative workloads and realistic scenarios to accurately assess the impact on your application's performance. By simulating conditions similar to your production environment, you can optimize the configuration and evaluate the balance between security and performance. Our team remains dedicated to continuously improving the efficiency of the .NET Core agent and optimizing its impact on your application's performance. We value your feedback and encourage you to reach out to us with any performance-related observations or concerns. Feel free to [contact our support team](#) if you require any assistance or further information regarding the performance characteristics of our .NET Core agent. We are here to assist you in ensuring the security and stability of your application while maintaining optimal performance levels.

# Incident management with ADR

Application Detection and Response (ADR) is a powerful application-layer security solution that is designed specifically to monitor, detect, and prevent application layer attacks in production environments.

It also provides comprehensive visibility into the application layer attack surface and insights into vulnerabilities that remove blind spots for defenders and enable faster, more accurate detection and response.

## ADR Benefits

Contrast ADR defends your applications with:

- **Zero-day protection:** Runtime protection blocking for known and unknown vulnerabilities.
- **Real-time monitoring:** Detects and alerts on anomalous behavior within the application layer.
- **Actionable Alerts:** Know the context for all application alerts through a summary of suspicious activity, payloads, Indicators of Compromise (IoC), and more.
- **Runtime observability:** Real-time security blueprints provide context to incidents better to assess the severity and impact of an attack.
- **Guided runbooks:** Clear, actionable steps to quickly identify true positive attacks and contain threats.

- **SIEM integration:**

You can ingest ADR alerts, events, attack payload, and vulnerability data into your SIEM tools for effective monitoring and triage.

Contrast currently supports these SIEM integrations:

- Azure Sentinel
- Data Dog
- Splunk
- Sumo logic

## How ADR works

1. **Integrated agent:** Integrate a Contrast agent into your application code.
2. **Policies:** Set policies for rules that monitor or block threats while your application is in use.
3. **Monitor and protect:** Observe attack events and adjust policies, as needed.
4. **Mitigation actions:** Review the suggestions that Contrast provides for reducing threats to your applications based on a set of rules.

## Requirements for ADR

To use ADR, make sure Contrast Protect is turned on and the server environment is set to **DEVELOPMENT**, **QA**, or **PRODUCTION**.

[Enable Protect \(page 1437\)](#) describes how to turn on Protect.

## See also

- [Attack events \(hosted customers\) \(page 618\)](#)
- [Attacks \(page 624\)](#)
- [Vulnerabilities \(page 1305\) \(IAST\)](#)
- [Libraries \(page 1205\) \(SCA\)](#)

- [Contrast Security observability \(page 646\)](#)

## Vulnerability assessment with AVM

Contrast Security combines the power of Application Detection and Response (ADR) with an optional Application Vulnerability Monitoring (AVM) add-on to address critical application security challenges.

### Benefits

The combination of ADR and AVM helps organizations to reduce risk by providing continuous visibility into attacks and vulnerabilities in production environments. AVM goes beyond static code analysis, theoretical assessments, and simulated testing to pinpoint the weaknesses that actually pose the greatest risk in production environments.

### Features

- **Continuous monitoring:** Real-time visibility into exploitable vulnerabilities
- **Risk insight:** Vulnerability awareness with severity
- **Attack context:** Connect vulnerabilities to attacks to guide triage prioritization
- **Security controls:** Implement ADR security controls to mitigate risk while remediation is in progress
- **Collaboration:** Notify development team about real risk that is live in production to help prioritize remediation
- **Reports:** AVM vulnerability reports let security teams help AppSec to prioritize remediation efforts and also respond to threats effectively.

To get the most out of your AVM solution, visit our [vulnerability \(page 1305\)](#) topics.

### Requirements

To use AVM, make sure Contrast Assess is turned on and the server environment is set to **PRODUCTION**.

[Enable Assess \(page 1435\)](#) describes how to turn on Assess.

## Attack events ☹️



### NOTE

The Attacks events view is for hosted customers.

If you are an on-premises customer, visit [Attacks \(page 624\)](#).

Attack events are any actions that unauthorized individuals or groups take to damage, disrupt, or gain illegal access to an application's systems, data, or functionality. Examples of attack events include:

- **SQL injection:** An attacker inserts malicious code into your application's database queries to steal data or take control of your systems.
- **Cross-site scripting (XSS):** An attacker injects malicious scripts into your application to steal user data or redirect them to malicious websites.
- **API attacks:** An attacker exploits vulnerabilities in your APIs to gain unauthorized access to data or functionality.

### Event data retention

Contrast keeps attack event data for up to a year. You can also:

- [Output to syslog \(page 1201\)](#)
- [Set up a generic webhook \(page 1356\)](#)  
A webhook receives data in a POST request only when a specified event occurs. When the webhook sees the event, it collects the data and sends it to the specified URL.
- [Integrate ADR \(page 1331\)](#) with Security Information and Event Management (SIEM) tools

## Exclusion of PROBED event data

You can choose to stop saving data for attack events with a **PROBED** result. You might want to do this to improve performance in the Contrast web interface.

To stop saving PROBED event data, contact [Customer Support Customer Support](#).

## Tasks

In Contrast you can:

- [View attack events \(hosted customers\) \(page 619\)](#)
- [Manage attack events \(hosted customers\) \(page 623\)](#)

## View attack events ☹



### NOTE

This feature is for hosted customers.

If you are an on-premises customer, visit [View attacks \(page 625\)](#).




An [attack event](#) occurs when there is a violation of Protect rules or other suspicious application activity in instrumented applications.

## Before you begin

- Ensure that [role-based access control \(page 1565\)](#) is turned on.
- If role based access control is turned on, you need a role with the View Attack Data action. Contact [Contrast support Contrast support](#) for access to this action.

## Steps

1. Select **Attack events** in the header.
2. Set the main view by selecting an option in **Group by**:
  - If you want to view groups of attack events, select a group type (currently the only option is Source IP).  
For example, if a source IP address of 111.111.111.111 has multiple attack events, grouping by Source IP displays an aggregated view for all the events.
  - Group by Source IP is the default selection.
  - If you want to view all individual attack events, clear the group by selection by moving your cursor to the Group by box and selecting the **Delete** (✕) icon.
3. To refine the view, open the filter panel by selecting **Open filters**.  
Use any of these filters:
  - **Date range**: Select a date range or select **Custom** to specify a preferred data range.  
The default date range is 12 hours.

- **Severity:** Select one or more vulnerability severity levels.
  - **Results:** Select one or more result types for an attack event.
  - **Rules:** Select one or more of the Protect rules associated with the attack event.
  - **Application:** Select one or more of the available applications.
  - **Environments:** Select one or more server environments.
  - **Source IP:** Select one or more source IP addresses associated with the attack event.
4. To view details about a specific attack event, select an individual attack event (not a group) which opens the Attack details view. This view includes:
- **Overview tab:** An overview of the attack event details, including these details:
    - **Source IP:** The IP address where the attack event originated.
    - **Application:** The application affected by the attack event.
    - **Server:** The server associated with the application.
    - **Rule:** The Contrast rule associated with the attack event.
    - **Severity:** The severity that Contrast assigned to the attack event.
    - **Attack value:** The suspicious value that Contrast observed.
    - **Vector analysis:** The different pathways or methods that Contrast observed where a malicious attacker could gain access to your system.
    - **Request details:** The details that Contrast observed in a request associated with the attack event.
    - **MITRE ATT&CK tactics:** Links to details for MITRE ATT&CK tactics.  
 The MITRE ATT&CK framework is a knowledge base of adversary tactics and techniques derived from real-world observations.  
 A single attack event can map to multiple tactics. In the case where multi-stage attacks events occur, an observed event might represent a single action within a larger attack chain. Alternatively, it could indicate a threat vector.  
 Combining event data with context from other security tools, such as Web Application Firewalls (WAFs) or Endpoint Detection and Response (EDR) solutions, allows for more precise identification of tactics. This refinement helps you to understand the full scope of an attack.  
 Mapping events to ATT&CK tactics is crucial for risk assessment. It enables you to identify high-risk areas and prioritize the development of new detections. This process leads to expanded security coverage.  
 For more information, visit [MITRE ATT&CK](#).
  - **Recommended steps of action:** Actions that Contrast recommends to protect against the attack event.
  - **Code location tab:** Where available, details about the location in your code where Contrast detected the attack event. If no information is available, this tab is not displayed. The displayed details include:
    - **File:** The file associated with the attack event.
    - **Method:** The method associated with the attack event.
    - **Stack:** The code stack associated with the attack event.
  - **Actions:** These actions are available:
    -  [Configure a Protect rule \(page 1415\)](#) to block or monitor the event
    -  [Create an exclusion \(page 1424\)](#)
    -  [Add the source IP to the denylist \(page 1431\)](#)  
 In the Add IP to denylist window, enter these details and select **Add**.
      - The name of the policy.
      - The IP address and, optionally, the subnet mask you want to deny. Classless Inter Domain Routing (CIDR) notation is supported for IPv4 and IPv6.  
 The IP source address for the selected event is displayed as the default value.



- An expiration time.
- [Create a virtual patch \(page 1420\)](#)
- [Download the event details to a JSON file](#)

SQL Injection from 192.

Exploited 2025/28/02 05:22 PM URL: .

Overview Code Location

Source IP

Application

Server

Rule

Severity

192.

Web-Application-

Petclinic-

SQL Injection

Critical

Attack Value

Contrast observed the following suspicious value accessing the application through the HTTP Request Parameter lastName

' or 1=1; # 100\_staging\_3

Vector Analysis

Contrast observed this value altering the meaning of the SQL query executed within org.springframework.samples.petclinic.customer.CustomerRepository.findByName(CustomerRepository.java:31) again.

SELECT DISTINCT \* FROM customers WHERE customers.last\_name LIKE '% ' or 1=1; # 100\_staging\_3%

Request Details

GET /customers?lastName=contrast-redacted-name http/1.1

accept: text/html,application/xhtml+xml,application/xml;q=0.9,\*/\*;q=0.8  
accept-encoding: gzip, deflate  
accept-language: en-US,en;q=0.9  
connection: keep-alive  
Cookie: JSESSIONID  
host: localhost:8080

MITRE ATT&CK

This event may be an indicator of the following tactics:

- Initial Access
- Execution
- Persistence
- Privilege Escalation
- Defense Evasion
- Credential Access
- Discovery
- Collection
- Command and Control

Recommended Steps Of Action

- We did not block this attack because blocking was not enabled for Web-Application-bsow-adr-5 in QA. [Configure Protect Rule](#)
- Add an exclusion for this attack event. [Create Exclusion](#)

## Attack event views

Depending on whether you are using a grouped view or an individual view, the Attack Events list displays these details:

| Column    | Grouped view  | Individual view                                       |
|-----------|---|---|
| Source IP | <p>The IP address where multiple attack events originated.</p> <p>To see this detail for each attack event, select the group row or clear the Group by selection.</p> | The IP address from which an attack event originated. |

| Column              | Grouped view  | Individual view   |
|---------------------|---|---|
| <b>Severity</b>     | A severity bar that shows the number of severity types for the attack events in the group.  | <p>The severity of the attack event:</p> <ul style="list-style-type: none"> <li>• <b>Critical:</b> Immediate action is required. <ul style="list-style-type: none"> <li>• The attack event impacts a large number of users, renders an application inoperable, or does irreparable damage to the organization.</li> <li>• Maps to this result: Exploited.</li> </ul> </li> <li>• <b>High (deprecated):</b> Immediate action is required. <ul style="list-style-type: none"> <li>• The event impacts a moderate number of users, substantially degrades the functioning of an application, or does substantial damage to the organization.</li> <li>• Maps to this result: Exploited</li> </ul> </li> <li>• <b>Medium:</b> Action is required, but the threat is not serious. <ul style="list-style-type: none"> <li>• The event impacts a small number of users, minimally degrades the functioning of an application, or does minor damage to the organization.</li> <li>• Maps to this result: Suspicious</li> </ul> </li> <li>• <b>Low:</b> Suspicious activity. <ul style="list-style-type: none"> <li>• May be an indicator of a larger threat.</li> <li>• Maps to this result: Probed</li> </ul> </li> <li>• <b>Informational:</b> No action required. <ul style="list-style-type: none"> <li>• Maps to this result: Blocked</li> </ul> </li> </ul> |
| <b>Rules</b>        | <p>The number of Contrast rules that the attack value violated.</p> <p>To see the name of the rule for each attack event, select the group row or clear the Group by selection.</p>       | The name of the Contrast rule that the attack value violated.   |
| <b>Applications</b> | <p>The number of applications where Contrast detected the attack event.</p> <p>To see the names of the applications, select the group row or clear the Group by selection.</p>            | The name of the Contrast rule that the attack value violated.   |
| <b>Servers</b>      | <p>The number of servers where Contrast detected the attack event.</p> <p>To see the name of the server for each attack event, select the group row or clear the Group by selection.</p>  | The name of the server where Contrast detected the attack event.  |
| <b>Detected</b>     | <p>The time frame when Contrast detected the attack events in the group.</p> <p>To see the detected time for each attack event, select the group row or clear the Group by selection.</p> | The time when Contrast detected the attack event.   |

| Column              | Grouped view   | Individual view   |
|---------------------|--|---|
| <b>Result</b>       | <p>A result bar that shows the number of result types for the attack events in the group.</p> <p>To see the result for each attack event, select the group row or clear the Group by selection.</p>  | <p>The result for the attack event.</p> <p>The possible results are, in order of severity:</p> <ul style="list-style-type: none"> <li>• <b>Exploited:</b> <ul style="list-style-type: none"> <li>• Contrast detected an attack event at the perimeter and confirmed it at the sink. The mode is set to <b>Monitor</b>.</li> <li>• Maps to this severity: Critical or High</li> </ul> </li> <li>• <b>Suspicious:</b> <ul style="list-style-type: none"> <li>• Contrast detected a low confidence attack event at the perimeter for a perimeter-only rule in <b>Block</b> mode.</li> <li>• Contrast detected a high or low confidence attack event at the perimeter for a perimeter-only rule in <b>Monitor</b> mode.</li> <li>• Contrast detected an attack event using sink-only heuristics. The mode is set to <b>Monitor</b>.</li> <li>• Maps to this severity: Medium</li> </ul> </li> <li>• <b>Blocked:</b> <ul style="list-style-type: none"> <li>• Contrast detected an attack event at the perimeter and confirmed it at the sink. The mode is set to <b>Block</b>.</li> <li>• Contrast detected an attack using sink-only heuristics. The mode is set to <b>Block</b>.</li> <li>• Maps to this severity: Informational</li> </ul> </li> <li>• <b>Probed:</b> <ul style="list-style-type: none"> <li>• Contrast detected an attack event at the perimeter, but did NOT confirm it at the sink. The mode is set to <b>Block</b> or <b>Monitor</b>.</li> <li>• These are ineffective attacks that can indicate an attacker is probing, scanning, or fuzzing your application for vulnerabilities.</li> <li>• Maps to this severity: Low</li> </ul> </li> </ul> |
| <b>URL</b>          | <p>Not shown.</p> <p>To view the URL for each attack event, select the group row or clear the Group by selection.</p>  | <p>The path the attacker used for the attack event.</p>   |
| <b>Attack value</b> | <p>Not shown.</p> <p>To view the attack value for each attack event, select the group row or clear the Group by selection.</p>   | <p>The value that the attacker sent that the Contrast agent detected was going to a sink.</p>   |
| <b>Actions</b>      | <p>The possible action you can take for an attack event in the grouped view:</p> <ul style="list-style-type: none"> <li>• Add the IP address to a denylist</li> </ul> <p>To view additional actions for each attack value, select the group row or clear the Group by selection.</p> | <p>The possible actions you can take for the attack event:</p> <ul style="list-style-type: none"> <li>• Configure a Protect rule.</li> <li>• Create an exclusion</li> <li>• Add the IP address to a denylist</li> <li>• Download the event details to a JSON file</li> </ul>  |

## See also

[Manage attack events \(hosted customers\) \(page 623\)](#)

## Manage attack events ☹️



### NOTE

This feature is for hosted customers.

If you are an on-premises customer, visit [Manage attacks \(page 629\)](#).

When Contrast reports an attack event, you have the option of configuring a Protect rule to determine how Contrast reacts to the event or adding an application exclusion to suppress the event that you consider to be safe.

## Before you begin

- Ensure that [role-based access control \(page 1565\)](#) is turned on.  
Role-based access control is a preview feature and not available to all customers. Contact your Contrast representative to have role-based access control turned on.
- You need a role with the View Attack Data action.

## Steps

1. Select **Attack events** in the header.
2. If you are using a grouped view, select an event row. If you are using an individual view, skip this step.
3. To configure a [Protect rule \(page 1412\)](#) for the event, select the **Configure Protect rule** icon (🛡️) in the Actions column.  
Configuring a Protect rule lets you decide whether Contrast should monitor or block the event if it occurs.
4. To create an [application exclusion \(page 1424\)](#) for the event, select the **Configure exclusion** icon (🔒) in the Actions column.  
Configuring an application exclusion lets you specify whether Contrast should suppress events that you know are safe.
5. To add the IP address to a [denylist \(page 1431\)](#), select the Denylist icon (🚫) in the Actions column.

## Attacks ↕



### NOTE

This topic is for on-premises customers.

If you are a hosted customer, visit [Attack events \(page 618\)](#).

Attacks are groups of attack events that target applications and servers. There are multiple attack events that Contrast includes in an attack, including, but not limited to:

- SQL injection
- Untrusted deserialization
- Command injection
- Many other common vulnerability types

When Contrast detects multiple attack events from the same IP address within 60 minutes, Contrast groups these events together as an attack. If Contrast sees new events from the same IP address after you fix the code, Contrast shows a new attack.

The displayed dates on the dashboard for attacks seen are based on the time when the Contrast task runs on the server, not your local timezone.

## Event data retention

Contrast keeps attack event data for 30 days before removing it. To keep attack data for a longer amount of time, do the following:

- [Output to syslog \(page 1201\)](#)
- [Set up a generic webhook \(page 1356\)](#)  
A webhook receives data in a POST request only when a specified event occurs. When the webhook sees the event, it collects the data and sends it to the specified URL.
- Select the arrow at the end of the attack row and then select **Export attack (CSV)** or **(XML)** from the menu.

Effective (19) Find Attack 05/09/2021 03:28 pm - 06/08/2021 03:28 pm Advanced

| <input type="checkbox"/> Source IP | Status  | Application | Server | Rule   | Start      | End        | Events |  |
|------------------------------------|---------|-------------|--------|--|------------|------------|--------|--|
| <input type="checkbox"/> 127.0.0.1 | BLOCKED |             |        | Command Injection  | a day ago  | a day ago  | 1      |  |
| <input type="checkbox"/> 1.2.3.5   | BLOCKED |             |        | Command Injection<br>Command Injection - Command Backdoors | 5 days ago | 5 days ago |        | <div>Denylist IP<br/>Suppress attack<br/>Export attack (CSV)<br/>Export attack (XML)</div> |

## Exclusion of PROBED event data

You can choose to stop saving data for attack events with a **PROBED** result. You might want to do this to reduce your database storage consumption for attacks that have a lower likelihood of being problematic.

To stop saving PROBED event data, use this JVM argument in the `contrast-server.vmoptions` file.

```
contrast.feature.TS-37298_do_not_save_probed_attack_events=on
```

This setting applies to all organization in your Contrast instance.

## Tasks

In Contrast, you can:

- [View attack details \(page 625\)](#) such as which application and server was attacked and the location in the code where the attack occurred.
- [Manage attacks \(page 629\)](#) by taking actions on attacks and attack events. For example, you can configure a Protect rule for specific attack events.
- [Monitor attacks \(page 628\)](#) in an overview of current and past attacks.

## View attacks ↗



### NOTE

This topic is for on-premises customers.

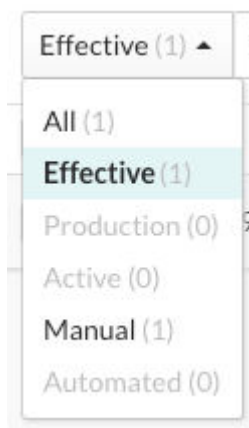
If you are a hosted customer, visit [View attack events \(page 619\)](#).

The Attacks list shows all attacks that have occurred in an organization.

| Monitor Attacks Attack Events                      |           |                   |                          |   |             |             |        |  |  |
|--|-----------|-------------------|--------------------------|---|-------------|-------------|--------|--|--|
| Effective (25) Find Attack Set Date Range Advanced |           |                   |                          |   |             |             |        |  |  |
| Source IP  | Status    | Application       | Server                   | Rule  | Start       | End         | Events |  |  |
| <input type="checkbox"/> 127.0.0.1                 | EXPLOITED | myapplication/new | myserver-local-mycompany | Command Injection - Chained Commands<br>Command Injection - Command Backdoors | 7 hours ago | 7 hours ago | 3      |  |  |
| <input type="checkbox"/> 127.0.0.1                 | BLOCKED   | myapplication/new | myserver-local-mycompany | Path Traversal<br>Server-Side JavaScript Injection                            | a day ago   | a day ago   | 9      |  |  |
| <input type="checkbox"/> 127.0.0.1                 | BLOCKED   | myapplication/new | myserver-local-mycompany | Path Traversal  | a day ago   | a day ago   | 9      |  |  |
| <input type="checkbox"/> 127.0.0.1                 | BLOCKED   | myapplication/new | myserver-local-mycompany | Path Traversal  | a day ago   | a day ago   | 12     |  |  |

## Steps

1. Select **Attacks** in the header.
2. To view all attacks that occurred in your organization, select the **Attacks** tab.
3. To filter the view, select one of these filters:
  - **All:** Shows all attacks
  - **Effective:** Shows attacks with a status of **Blocked**, **Suspicious**, and **Exploited**.
  - **Production:** Shows attacks that occurred in a production server
  - **Active:** Shows attacks that are currently in progress
  - **Manual:** Shows attacks that have less than 20 requests per second. It could indicate that a human is generating attacks.
  - **Automated:** Shows attacks that have more than 20 requests per second. It could indicate that a malicious bot is generating attacks.



4. To view more details on the attack, select **source name** or **IP address** in the Source IP column.
5. To see each attack event in the attack, select the **Overview** tab.
6. For more filters, select **Advanced** next to the date range and select a filter.

**Advanced** ✕

☐ Show suppressed

☐ Show bots blocked

☐ Show blacklisted

Tags ▼

Attack Severity ▲

☐ Low (0)

☐ Medium (9)

☐ High (0)

Results ▼

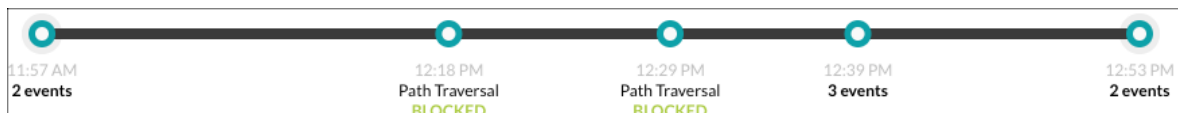
Rules ▼

Applications ▼

Servers ▼

Environments ▼

7. To see more details about the attack event, select **Source IP**.
8. To view the time of each event, under **Attack duration**, select **See timeline**.



9. To see more details including the rate of events, severity, and attacker, select the **Notes** tab.
10. To share or view communications with your team, select the **Discussion** tab.  
Read existing comments or enter a new comment and click **Add Comment**.

## Attack details

The attack data that Contrast displays includes these items:

- **Source IP:** The IP address from which the attack is originating.
- **Status:** The current status of the attack.  
An attack status is determined by the highest severity status of the attack events within the attack. If any event has an **Exploited** status, the attack status will be **Exploited**. If there are no Exploited events, the status will be the next highest severity event's status. The severity order, starting with the highest, is:
  - **Exploited:** If Contrast detects and confirms a definite attack but the mode for the applicable rule is set to **Monitor**, Contrast does not block the request.  
This status only applies to input tracing rules where Contrast is confident that an attack occurred. Confirmed attacks are those that met a high confidence threshold at the perimeter, or those that are watched and verified at the sink.

- **Suspicious:** If Contrast detects an attack and the applicable rule reports the attack as suspicious, but the mode for the rule is set to **Monitor**, Contrast does not block the request. This status applies to non-input tracing rules, where Contrast is unable to verify that an attack occurred.
- **Blocked:** If Contrast detects an attack and the mode for the applicable rule is set to **Block**, Contrast blocks the request.
- **Blocked (P):** This status applies to rules that support both Block At Perimeter and Block modes. If Contrast detects an attack before the application can process the request and the mode for the applicable rule is set to **Block At Perimeter**, Contrast blocks the request. If Contrast detects an attack that is not at the perimeter, it blocks the request and the status is **Blocked**, even if the mode for the rule is set to **Block At Perimeter**.
- **Probed:** If Contrast detects an attack but cannot confirm it and the mode for the applicable rule is set to **Monitor**, Contrast does not block the attack. Unconfirmed attacks are those that did not meet a high confidence threshold at the perimeter; they are watched but not detected at the sink.
- **Application:** Specific applications that saw attack events from the IP address while the attack was active.
- **Server:** Specific server that saw attack events from the IP address while the attack was active.
- **Rule:** Any attack type identified from the IP address while the attack was active.
- **Start:** The timestamp of the first attack event seen from the IP address during the attack time frame.
- **End:** The timestamp of the last attack event seen from the IP address during the attack time frame.
- **Events:** The number of attack events that comprise the attack.

## Monitor attacks ↗



### NOTE

This procedure is for on-premises customers.

You can see an overview of current and past attacks, the IP addresses of attackers, attack types, and which applications were exploited.

1. Select **Attacks** in the header.
2. If an attacker has a [source name \(page 1432\)](#), you can hover over it to see a list of associated IP addresses .  
If an attacker doesn't have a source name, their avatar will show a question mark. If an attacker has successfully exploited an application, their avatar will be red.



### NOTE

If the data reported for an attack event matches more than one source name, Contrast applies the most recently updated name.

Click on a IP address or source name to see details for that attacker.

3. To filter attacks you can:
  - Filter attacks by date range and environment.
  - Search to find attacks by a specific attacker IP or source name.
  - Search by affected applications or specific Assess or Protect rules.
  - Check **Show probed** to include information for attack events that resulted in a "Probed" status.
4. Under **Attack events** you can see a list of the types of attacks detected, along with the total number of attack events per type.



5. Under **Target application**, you can see each application targeted by an attack.

## Manage attacks



### NOTE

This procedure is for on-premises customers.

If you are a hosted customer, visit [Manage attack events. \(page 623\)](#)

## Before you begin

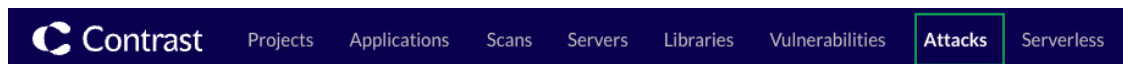
Ensure that Protect is enabled on the servers that host your applications. The Contrast header displays Attacks only when Protect is enabled.

## Steps

To take action on attacks and attack events, use the following procedures.

1. View attacks or attack events.


- a. Select **Attacks** in the header.



- b. Select the **Attacks** tab or the **Attack Events** tab.


2. (Optional) Tag attacks or attack events.

Tagging attacks or attack events lets you organize them for better search results.

- a. Select one or more attacks or attack events.
- b. Select the tag icon (  ) above the list.
- c. In the Tag Attacks window, enter a name for one or more tags.

3. Suppress attacks or events.

Suppressing attacks removes an attack and its related events from view. To suppress an attack or an attack event, use the following procedure:

- a. On the Attacks or Attacks Events list, select the check box for one or more rows and select the **Suppress Attacks** or **Suppress Events** icon (  ).  
Alternatively, select the arrow at the end of a row and select the **Suppress Attacks** or **Suppress Events** option in the dropdown.
- b. Click **Suppress**.

4. Block IP addresses

This option [blocks a specified IP address \(page 1431\)](#). Blocking an IP address prevents unwanted activity from a specific IP address in the future.

- a. At the end of an attack or attack events row, select the dropdown (  ).
- b. From the menu, select **Denylist IP**.
- c. Enter a name for the rule that blocks the specified IP address.
- d. Select a date when the block expires.
- e. Click **Save**.

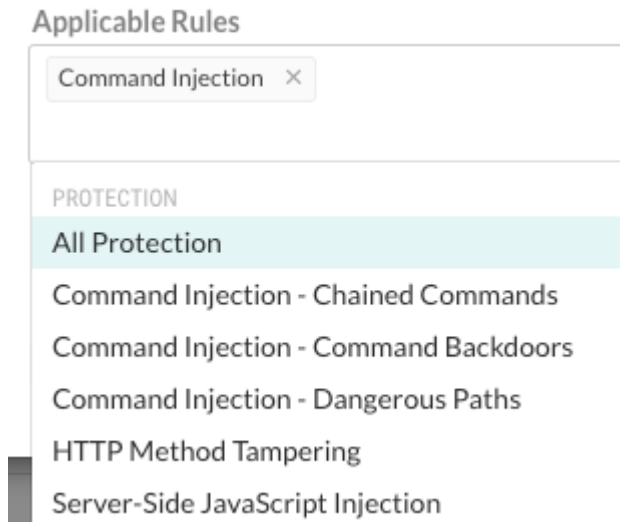
5. Add exclusions (attack events)

[Adding application exclusions \(page 1424\)](#) lets you exclude certain applications, or parts of them, from security analysis.

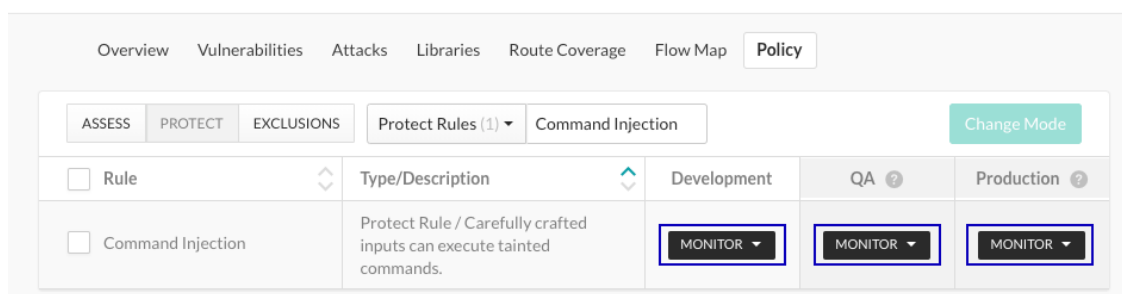
This option is available if you are using Java, .NET Framework, .NET Core, Python, Node.js, Go, or Ruby agents.

- a. In the Attack Events list, at the end of an attack events row, select the dropdown ( ▾ ).
- b. Select **Add Exclusion**.
- c. Specify a name for the exclusion.
- d. Select the exclusion type and enter the details for that type.
- e. Select the rules for which the exclusion applies.

To see a list of rules, click the **Applicable rules** box.



- f. (Optional) Select the checkbox to suppress all events that match the exclusion.
  - g. Click **Add**.
6. Create a virtual patch (attack events):
- [Virtual patches \(page 1420\)](#) are short-term, custom defense rules that defend against specific, newly-discovered vulnerabilities in your code.
- a. In the Attack Events grid, at the end of an attack events row, select the arrow.
  - b. Select **Create Virtual Patch**.
  - c. In [Add Virtual Patch \(page 1420\)](#), enter the details for the virtual patch.
  - d. Click **Save**.
7. Specify modes for Protect rules (attack events):
- [Protect rules \(page 1412\)](#) let you monitor or block specific kinds of cyber-attacks in application environments.
- a. In the Attack Events list, select an event.  
This action displays the details for the attack event.
  - b. Select the settings icon (⚙️) next to the event name.
  - c. As needed, change the modes for each rule by selecting **Change Mode** or the **current mode** or a specific environment.



- d. Select the appropriate modes for each environment.

8. Save attack data:

Contrast keeps attack event data for thirty days before removing it. You have several options for saving your data:

- Output the data to [syslog](#). (page 1201)
- Set up a [generic webhook](#) (page 1356).  
A generic webhook can receive notifications on any URL that receives POST messages.
- Export the data to a CSV or XML file.

At the end of an attack row, select the arrow at the end of the row and select **Export attack (CSV)** or **Export Attack (XML)**.



## Add tags to attacks ☺



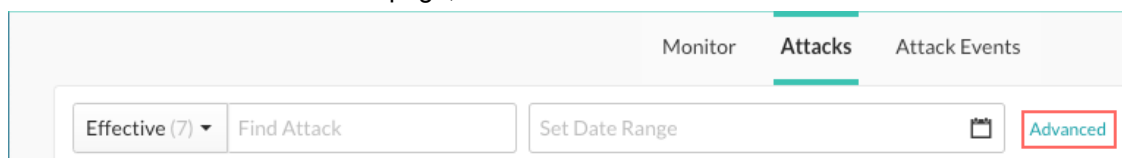
### NOTE

This procedure is for on-premises customers.

To make it easier to find specific attacks or attack events, use tags.

## Steps

1. Add tags to attacks or attack events:
  - a. Select **Attacks** in the header.
  - b. Select **Attacks** or **Attack events**.
  - c. Select the check box next to one or more attacks or attack events and select the tag icon (🔖).
  - d. In the Tag attacks or Tag attack event window, select an existing tag or create one.
  - e. Select **Save**.
2. Use tags to find attacks or attack events:
  - a. On the Attacks or Attack events page, select **Advanced** next to the search boxes.



- b. Expand the Tags section.

Advanced ✖ Clear ✕

☐ Show suppressed

☐ Show bots blocked

☐ Show denylisted

Tags (1 selected) ▲

☒ webgoat (1)

Status ▼

Rules ▼

Applications ▼

Application Importance ▼

Attackers ▼

Servers ▼

Environments ▼

Severity ▼

- c. Select the check box next to one or more tags.  
The display changes to show the attacks or attack events that have the selected tags.

# Use Contrast

The way you interact with Contrast depends on your particular situation, the tools and integrations you use, your roles and permissions, and whether you are accessing Contrast through the web interface, command line tools or the [REST API](#).



## NOTE

All commands used in this guide should be run in a command shell with administrative privileges from the directory in which Contrast was installed.

The majority of Contrast users will likely be assigned an Editor role. (You can see what [permission level you have](#) (page 639) under [user settings](#) (page 636).)

With Editor permissions, you can [instrument an application](#) (page 51), start viewing results in Contrast, and interact with the basic components of Contrast (all visible in the header of the web interface):



## NOTE

If your organization has the new role-based access control turned on, your administrator can tell you what [permissions](#) (page 1546) you have and what you can access.

- [Projects](#) (page 640)  
View projects and findings for open source software after you run the CLI on a manifest, or you connect a GitHub, Bitbucket, or GitLab account to your Contrast organization.
- [Applications](#) (page 642)  
View a searchable list of an organization's applications. License, merge, tag, archive and restore applications.
- [Scans](#) (page 672)  
Run static scans and view results for Java binaries and multi-language source code using SAST technology.
- [Servers](#) (page 1192)  
View a searchable list of an organization's servers. Designate server environment, enable Assess and Protect, settings, tagging and deleting.
- [Libraries](#) (page 1205)  
View a searchable list of libraries being used by all the applications in an organization. Use tags and view statistics for known vulnerabilities present in libraries and high-risk libraries.
- [Vulnerabilities](#) (page 1305)  
View a searchable list of vulnerabilities discovered. You can view this list for each application in an organization. Mark status, merge, share, tag, and export vulnerabilities. View details of any vulnerability for more information and guidance for fixing it.
- [Attacks](#) (page 624)

View a searchable list of attacks that are occurring or have occurred on all the applications in an organization. View attacks at the highest level or delve into the individual attack events.

You can also use other features and tools to enhance your Contrast experience:

- [Reports \(page 1323\)](#)  
Collect data and export as a CSV or PDF to share it outside of Contrast.
- [Integrations \(page 1331\)](#)  
Use Contrast in conjunction with other tools like bugtrackers, build tools, application servers, Security Incident Event Management (SIEM), notifications and chat.
- [Contrast CLI \(page 1278\)](#)  
Perform software composition analysis (SCA) on your application to show you the dependencies between open-source libraries.

Although most of the configuration for these features requires [system \(page 1467\)](#), [organization \(page 1435\)](#) or [RulesAdmin \(page 1400\)](#) permissions, an Editor can:

- [Instrument an application \(page 51\)](#)
- [Send notifications \(page 639\)](#)
- [Customize scoring \(page 1459\)](#)

## Supported languages for Contrast

This table provides a view of the languages the different Contrast components support.

Table key:

|   |
|---|
| <span style="color: green;">●</span> Supported          |
| <span style="color: gray;">●</span> Under consideration |
| -- Not applicable for this technology                   |

| Language                    | Contrast Scan | Contrast Runtime SCA | Contrast Assess | Contrast Protect | Contrast Application Detection and Response (ADR) | Contrast Serverless   | Application Vulnerability Monitoring (AVM) |
|-----------------------------|---------------|----------------------|-----------------|------------------|---|---|--|
| Java                        | ●             | ●                    | ●               | ●                | ●<br>Includes observability                       | ●<br>(AWS and Azure)<br><br>Includes SCA library data, SAST scans, and IAM policies | ●  |
| Kotlin                      | ●             | ●                    | ●               | ●                | ●   | --  | ●  |
| Supported by the Java agent |               |                      |                 |                  |   |   |  |
| Scala                       | ●             | ●                    | ●               | ●                | ●   | --  | ●  |
| Supported by the Java agent |               |                      |                 |                  |   |   |  |

| Language   | Contrast Scan | Contrast Runtime SCA | Contrast Assess                      | Contrast Protect | Contrast Application Detection and Response (ADR) | Contrast Serverless  | Application Vulnerability Monitoring (AVM) |
|--|---------------|----------------------|--------------------------------------|------------------|---|--|--|
| .NET Framework   | ●             | ●                    | ●<br>(Azure functions)<br>(page 331) | ●                | ●   | ●<br>(Azure functions)<br>(page 331)<br><br>Includes SCA library data and IAM policies | ●  |
| .NET Core  | ●             | ●                    | ●<br>(Azure functions)<br>(page 331) | ●                | ●   | ●<br>(Azure functions)<br>(page 331)<br><br>Includes SCA library data and IAM policies | ●  |
| C#<br><br>Supported by the .NET Core and .NET Framework agents                             | ●             | ●                    | ●                                    | ●                | ●   | ●<br><br>Includes SCA library data and IAM policies                                    | ●  |
| VB.NET<br><br>Supported by the .NET Core and .NET Framework agents                         | ●             | ●                    | ●                                    | ●                | ●   | --   | ●  |
| Node.js  | ●             | ●                    | ●                                    | ●                | ●   | ●<br><br>Includes SCA library data and IAM policies                                    | ●  |
| Client-side JavaScript   | ●             | --                   | --                                   | --               | --  | --   | --   |
| Ruby (version 3.2.X or earlier)<br><br>Visit <a href="#">Maintenance status for Ruby</a> . | ●             | ●                    | ●                                    | ●                | ●   | --   | --   |
| Python   | ●             | ●                    | ●                                    | ●                | ●   | ●<br><br>Includes SCA library data and IAM policies                                    | ●  |
| Go   | ●             | ●                    | ●                                    | ●                | ●   | --   | ●  |
| PHP  | ●             | ●                    | ●                                    | ●                | ●   | --   | ●  |

## Additional technologies for Contrast Scan

Contrast Scan supports these additional languages and technologies:

|                        |                       |              |
|------------------------|-----------------------|--------------|
| SAP ABAP               | JavaScript/TypeScript | RPG IV       |
| ActionScript           | JCL                   | Swift        |
| ASP.NET                | JSP                   | Transact-SQL |
| C and C++              | NATURAL               | TypeScript   |
| COBOL                  | Objective-C           | Visual Basic |
| Hana SQL Script        | Oracle Forms          | XML          |
| HTML                   | PS-SQL                |              |
| Informix (SQL and 4GL) | PowerScript           |              |

## Contrast dashboard

Typically, when you log in to Contrast, you see the Contrast dashboard. The dashboard provides a high-level view of the state of your application risks to vulnerabilities and attack threats. It also provides trend information for vulnerability remediation and attacks.

### Dashboard details

- **Summary:** The summary at the top of the dashboard provides these details
  - **Application Score:** This section shows the Custom Code score, the Library score, and the Overall score. The [Application scoring guide \(page 1557\)](#) describes how Contrast calculates these scores.
  - **Score trend:** This value shows whether your application score is improving.
  - **Attack trend:** This value shows whether your level of risk due to attacks is improving.
  - **This week's status for applications:** This value shows the number of deployed applications and the number of applications at risk for vulnerabilities for the current week.
  - **Library status:** This value shows the number of libraries discovered and the number of libraries at risk for vulnerabilities.
  - **Server status:** This value shows the number of known servers and their status.
- **Average time to remediate:** This section shows the current Average Time to Remediate (ATTR) vulnerabilities with a critical, high, and medium severity. It also shows the ATTR for critical, high, and medium vulnerabilities over time in a graph.

Use the filters to select a specific time frame and data type to refine the displayed details. The data types are: Last seen, First seen, and Closed.

When you use these filters, the graph and counts update based on the following criteria:

  - Vulnerabilities in a closed state.
  - Vulnerabilities with a last seen date within the date range.
  - The average time to remediation (ATTR) from the set of vulnerabilities. Contrast calculates this value by looking at the difference between the first seen and closed dates on the selected vulnerabilities, and averaging them.
- **Status and trends for vulnerabilities:** This section shows the number and types of vulnerabilities that Contrast discovered and are not remediated. It also shows the remediate trend.

For the vulnerability status, use the filter to refine the view by severity, status, or type.

For the vulnerability trend, use the filter to set a time frame for the trend details.
- **Attack status and trends:** This section shows the number of attacks and the trend for attacks that Contrast has seen.

For the attack status, use the filter to refine the view by status or type.

For the attack trend, use the filter to select a specific time frame for the trend details.

## Manage user settings

To manage user settings in Contrast, open the **user menu** (your name in the top right corner of the Contrast web interface), and select **User settings**. There you can:



- [Change your password \(page 637\)](#)
- [Set up two-step authentication \(page 637\)](#)
- [Edit your profile \(page 638\)](#)
- [Find API keys \(page 638\)](#)
- [Manage notifications \(page 639\)](#)
- [View your permissions \(page 639\)](#)

## Log in to Contrast

To log in to Contrast for the first time, you must accept an email invitation generated by your administrator. Select the link in the email to log in to Contrast.

If your organization is using [single sign-on \(SSO\) \(page 1451\)](#), select the checkbox on the login page to disable the password input field. You are only required to enter your email address. Once your email is verified you can log in with your full SSO credentials.

If you are using [two-step authentication \(page 637\)](#), your login process occurs *after* successful SSO authentication.

## Change your password

To change your account password, complete the following steps.

1. Log in to Contrast.
2. In the user menu, select **User settings > Change password**.
3. In the form fields, enter your current password and new password. Retype your new password in the next field to confirm it.



### NOTE

Your new password must adhere to the password policy [set by your administrator \(page 1450\)](#). Contrast notifies you of their requirements as you begin typing.

4. Check the box to agree to the [Terms and Conditions](#).
5. Select **Save**.



### NOTE

Customers using single sign-on (SSO) to [log in \(page 637\)](#) don't have the option to change their password.

## Set up multi-factor authentication

If your administrator has enabled multi-factor authentication at an [organization \(page 1450\)](#) or [system \(page 1514\)](#) level, you can add an extra layer of protection beyond your username and password. To set it up:

1. In the user menu, select **User settings > Multi-factor verification**.
2. Use the toggle to enable multi-factor authentication.  
If an administrator has disabled multi-factor authentication at an organization level, you cannot turn it on.
3. Use the radio buttons to select how you want to receive verification codes:

- **Email:** You can receive authentication codes in the email you associated with Contrast. To set this up, you will receive an email with a verification code to enter in the configuration page
  - **Google Authenticator:** You will need to download the app to your mobile device, and you can receive authentication codes there. To set this up, scan the QR code provided in Contrast, and follow the instructions to validate your device.
4. Before completing multi-factor authentication setup, you can download a set of backup codes in the form of a `.txt` file, which allows you to login if you encounter an error or get locked out of your account. You must download and save these codes in a secure location.
  5. If you want to change the way you receive verification codes, you can go back and reconfigure notification settings. Once you change your selection, Contrast automatically issues a new set of backup codes. It is not necessary to save your changes.

**TIP**

If you run into issues using either method, you can use the backup codes provided, select **Can't sign in?** or use the **Reset Device** link in Google Authenticator.

## Manage your profile

Add or update your name, time, date and language preferences to customize your experience using Contrast.

1. In the user menu, select **User settings > Profile**.
2. Under **General information**, you can enter your basic information, such as your name or time zone.
3. Click on the thumbnail to upload a new profile image.
4. Here you can also [view your organization and personal keys \(page 638\)](#) under **Your keys**.
5. Select **Save**.

## View your API keys

Use API keys to establish communication between agents or custom scripts and Contrast. The agent and the Contrast API use the keys for these purposes:

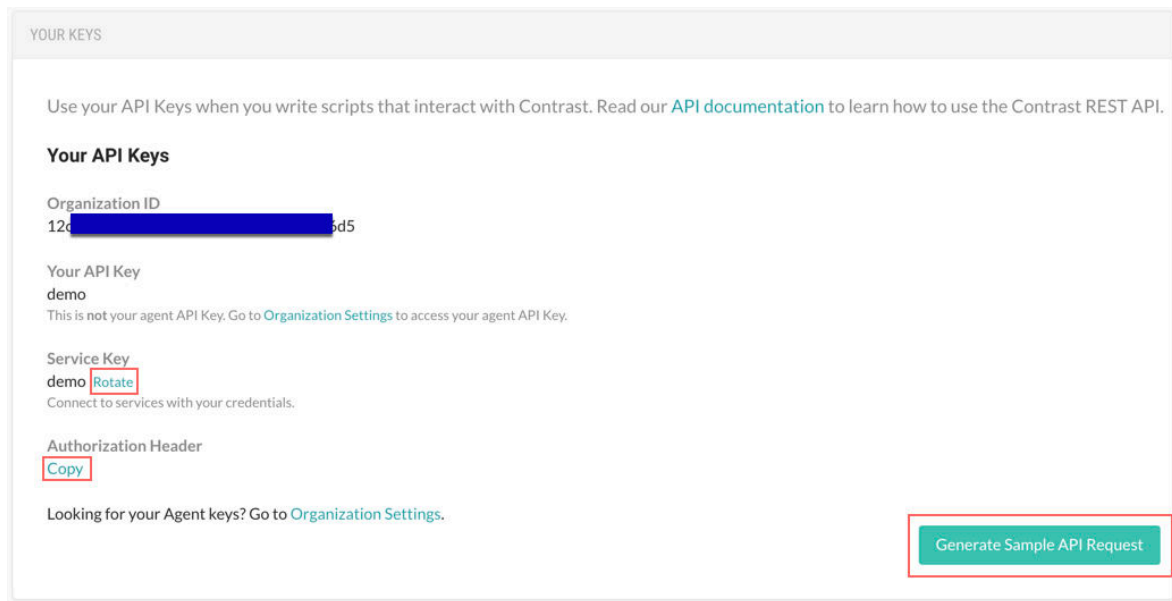
- To identify which organization is being accessed.
- To identify you as a valid user.

## Steps

1. Go to **User menu > User settings > Profile**.  
Under **Your keys** you can see the **API keys**, which include the API key and these keys:
  - **Organization ID:** Identifies the organization being accessed.
  - **Service key:** Uses your credentials to connect to Contrast services.
  - **Authorization header:** Identifies you as a valid user.This key contains this value: `base64(username:service_key)`

**NOTE**

The Organization ID and API key are shared across all users. Only the service key is unique to each individual user.



2. To copy the authorization header, select **Copy**.
3. To rotate the service key, click **Rotate**.  
Rotating the service key affects any integrations using that key. To reconnect, update your credentials in your integrations.
4. To generate a sample API request and copy it to clipboard, select **Generate sample API request**.

## Manage user notifications

To change your notification settings:

1. In the **user menu**, select **User settings > Notifications**.
2. Click in the **Subscriptions** field to choose the application(s) for which you want to receive notifications. The default selection is "All Applications".
3. Use the toggles in the **In Contrast** and **Email** columns to enable or disable the following subscriptions.
  - **Active attack:** There is an active attack on an application with Protect enabled.
  - **New vulnerability:** Contrast has detected a new vulnerability. Click in the field to receive notifications for specific severity levels or "Library"; the default selection is "All".
  - **Vulnerable library:** Get notifications when a new vulnerable library is detected or a new CVE is detected in a library.
  - **Server messages:** Get server messages around reliability issues.
  - **Server offline:** A server can no longer be reached.
  - **New comment:** A team member commented on a finding.
  - **New asset:** A new asset (application or server) to which you have [access \(page 639\)](#) has been added. Click in the field to set this notification for "Application" or "Server"; the default selection is "All".
  - **Nearing expiration:** An application license is about to expire.
  - **Policy violations:** A compliance, library or remediation policy is in violation. Select the box if you want to aggregate policy violation emails into a digest.
  - **Email:** A daily summary of Contrast activities.

## View your permissions

The **Permissions** page provides a detailed view of the assigned permissions for both the organization and the applications to which you have access. To see your permissions:

1. Go to the **User menu > User settings > Permissions**.

2. See your organization listed at the top of the page along with your organization role.  
The **Application permissions** grid shows your role for each application within the organization.
3. Click the help icon next to each role for details on the data access and actions made available by each level.

## See also

- [Application roles \(page 1553\)](#)
- [Organization roles \(page 1555\)](#)
- [Actions and permissions \(page 1546\)](#)

## Projects

After the CLI is run on a [manifest](#), or a GitHub, Bitbucket, or GitLab account has been connected to your Contrast organization, you can view the associated projects and findings in Contrast. This provides earlier and broader visibility of vulnerabilities in open-source software where instrumentation is impossible or too late in the software development life cycle (SDLC).

To view CLI results on this page, you must have the Contrast CLI 2.0 [installed via npm \(page 1279\)](#).

To view repository scan results on this grid, you must [connect your accounts \(page 642\)](#) to Contrast.



### NOTE

Connections to Bitbucket and GitLab are available by request only. [Contact Support](#) to enable the connections.

## See also

- [View projects \(page 640\)](#)
- Supported [languages and package managers \(page 1279\)](#) for Contrast CLI
- [Libraries and SCA \(page 1217\)](#)

## View projects

There are multiple ways to view information about Projects and repositories connected to Contrast from GitHub, Bitbucket or GitLab.



### NOTE









































- Depending on your permissions in the organization, you may or may not be able to perform actions on this page. To be able to delete a repository you will need [admin permissions \(page 1552\)](#) enabled.
- Connections to Bitbucket and GitLab are available by request only. [Contact Support](#) to enable the connections.

Projects All (710)

Sort by 



Name

Connections

| Name   | Last Activity Date                    | Vulnerable Libraries  |   |
|--|---------------------------------------|---|---|
| >  contrast-security-app-test/team-xyz-test-java-not-protected-repo-202306... | 07/07/2023 01:56 PM<br>Branch updated |  None identified |   |
| >  contrast-security-app-test/team-xyz-test-java-not-protected-repo-202306... | 07/07/2023 01:56 PM<br>Branch updated |  None identified |   |
| >  contrast-security-app-test/team-xyz-test-java-not-protected-repo-202306... | 07/07/2023 01:56 PM<br>Branch updated |  (44)            |   |
| >  contrast-security-app-test/team-xyz-test-java-not-protected-repo-202306... | 07/07/2023 01:56 PM<br>Branch updated |  None identified |   |
| >  contrast-security-app-test/team-xyz-test-java-not-protected-repo-202306... | 07/07/2023 01:57 PM<br>Branch updated |  (44)            |   |
| >  contrast-security-app-test/team-xyz-test-java-not-protected-repo-202306... | 07/07/2023 01:57 PM<br>Branch updated |  (44)            |   |
| >  contrast-security-app-test/team-xyz-test-java-protected-repo-1             | 07/07/2023 01:57 PM<br>Branch updated |  (44)            |   |
| >  contrast-security-app-test/team-xyz-test-java-protected-repo-10            | 07/07/2023 01:43 PM<br>Branch updated |  (44)            |   |
| >  contrast-security-app-test/team-xyz-test-java-protected-repo-2             | 07/07/2023 01:38 PM<br>Branch updated |  (44)            |   |
| >  contrast-security-app-test/team-xyz-test-java-protected-repo-20230628...   | 07/07/2023 01:57 PM<br>Branch updated |  None identified |   |

< Page 26 of 71 >

Results per page 10 25 50

- Select **Projects** in the header.
- Select a project name from the list and, if applicable, expand the row to view more information about the connected projects. Each row contains the latest activity and the total number of vulnerable libraries along with the total number of critically vulnerable libraries.
- The Projects view shows:
  - **Name:** This is the name of the project containing either the manifest stored locally for the CLI or the GitHub, Bitbucket, or GitLab account and repository name. The type of project is identified by the analysis performed.
    - Projects analyzed by Contrast CLI are identified with this icon 
    - Projects analyzed by the Contrast Security GitHub App, Bitbucket, or GitLab are identified with this icon .
  - **Last activity date:** The latest activity (the reason for the trigger) and a timestamp of the latest activity.
  - **Connections:** [Connect \(page 642\)](#) Contrast to your GitHub, Bitbucket, or GitLab account to see results.
  - **Vulnerable libraries:** This shows the number of libraries in the project with an identified vulnerability (CVE). The number of libraries with at least one critical severity CVE is coded red. If applicable, expand a row to view the connected projects. Hover over the thermometer section to see the number of CVEs by severity. Click the thermometer to open the details panel. If vulnerabilities exist, they are displayed in a list and are color-coded by severity.
    - If a message of *Analysis not complete. Try again or contact Support.* appears, it means that the analysis is in progress or there is a failure. Try connecting the repository again. If that fails [contact Support](#) for help.
    - If a message of *None identified* appears, it means that no vulnerable libraries have been found.
  - **Actions:** This is where you can view the repository, [disconnect \(page 642\)](#) the repository connections, or [export \(page 642\)](#) the CLI project data to a CSV file.
- Use the *sort by* dropdown at the top-right to sort the list by the last activity date or the repository name.


## Export project details

You can export project details in a CSV file or in a generated Software Bill of Materials (SBOM) file.

The exported CSV file contains data fields like *Library Name*, *Language*, *Version*, *Release Date*, *CVE Count*, and *Licenses* for each project.

## Steps

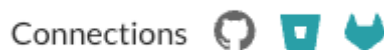
To export project details:

1. Select **Projects** in the header.
2. Locate the row for the project to be exported.
3. Select the **Export** icon  at the end of the row.
4. Select the format under the *Download As* options. If you select the SBOM option you will need to specify the standard.

The file will be downloaded to your desktop.

## Account connections

With the connection options at the top of the Projects grid, you can easily connect Contrast to your GitHub, Bitbucket, or GitLab repositories.



Once you connect to either platform, scan results will appear on the Projects grid in Contrast. You can manage individual connections row-by-row on the Projects page.



### NOTE

Connections to Bitbucket and GitLab are available by request only. [Contact Support](#) to enable the connections.

To learn more about the repo connections and how they work, see [Libraries and SCA \(page 1217\)](#).

## Applications

After an [application has been instrumented \(page 51\)](#), you can [view your applications \(page 643\)](#) in Contrast and explore these features:

- [Route coverage \(page 659\)](#)
- [Session metadata \(page 656\)](#)
- [Flow maps \(page 671\)](#)
- [Application scoring \(page 1557\)](#)



### NOTE

An Organization or Application Administrator will need to [license your application \(page 1443\)](#) for these features to work.

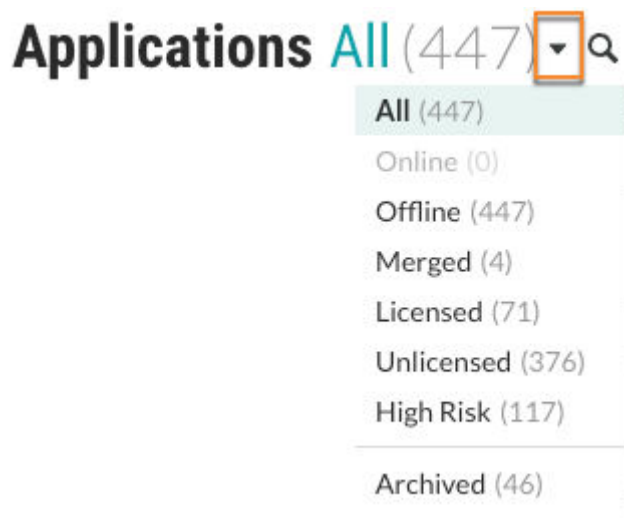
## View applications

There are multiple ways to view application information.

### Steps

1. Select **Applications** in the header to view a list of all applications found in your organization.
2. Select an application name from the list to view the application's **Overview** tab.
3. To filter the list based on application status, select the small triangle at the very top of the applications list.

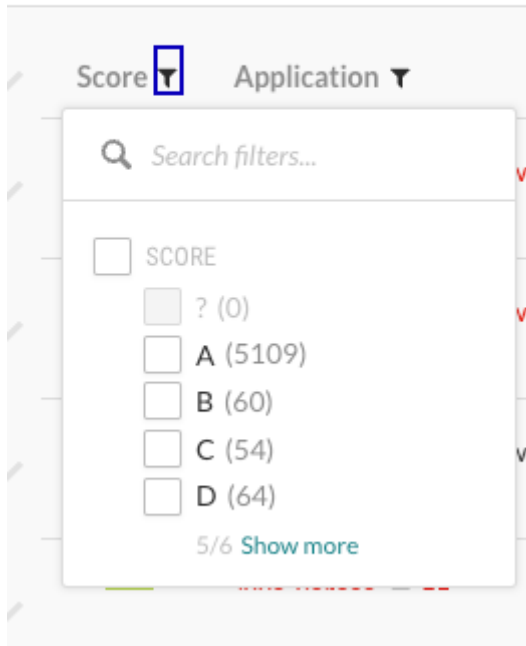
Alternatively, to search for specific application by name, select the **magnifying glass** icon (🔍) to search for them.



The filters include:

- **All:** Applications that you added to Contrast, excluding archived applications.
  - **Online:** Only applications whose agents have contacted Contrast within the last 5 minutes. Excludes archived applications.
  - **Offline:** Only applications whose agents have had no contact with Contrast for more than 5 minutes. Excludes archived applications.
  - **Merged:** Only applications that are part of a merged application (the primary application and its components). Excludes archived applications.
  - **Licensed:** Only applications that have a Contrast license applied to them. Excludes archived applications.
  - **Unlicensed:** Only applications that have no Contrast license applied to them. Excludes archived applications.
  - **High risk:** Only applications that have a high or critical vulnerability with a status of: *Reported*, *Suspicious*, or *Confirmed*. Excludes archived applications.
  - **Policy violation:** This filter is available when the organization has enabled compliance policies. Only applications that are in violation of a compliance policy. Excludes archived applications.
  - **Archived** Only applications that are visible for historical purposes. The agent for an archived application no longer reports vulnerabilities to Contrast.
4. To filter by application score, select the **filter** icon (▼) next to the Score column header and select one or more scores.  
To remove filters, select **Clear** next to the column header.

## Applications All (53)



5. To filter the list of applications, select the **filter** icon ( ▼ ) next to the Application column header. The filters include:
- **Application metadata (if configured):** Application metadata that you associated with applications.
  - **Application tags (if created):** Tags you assigned to applications.
  - **Languages:** The language that an application uses.
  - **Servers:** The servers where applications are running.
  - **Open vulnerability severity:** The severity for open vulnerabilities.
  - **Technologies:** Technologies that applications use. For example, JSON or jQuery. To remove filters, select **Clear** next to the column header.
  - **Environments:** The environments associated with applications: Development, QA, and Production.
  - **Application importance:** The importance level you set in the application settings.



# Applications All (5301) 🔍

| Score ▼ | Application ▼   |
|---------|---|
| A       | <input type="checkbox"/> Search filters...                |
| A       | <input type="checkbox"/> BUSINESSUNIT                     |
| A       | <input type="checkbox"/> Death Star Security (1)          |
| A       | <input type="checkbox"/> TESTNUMERICFIELD                 |
| A       | <input type="checkbox"/> 421 (1)                          |
| A       | <input type="checkbox"/> TESTPOINTOFCONTACTFIELD          |
| A       | <input type="checkbox"/> TK-421 (1)                       |
| A       | <input type="checkbox"/> APPLICATION TAGS                 |
| A       | <input type="checkbox"/> (3)                              |
| A       | <input type="checkbox"/> 28052021 (2)                     |
| A       | <input type="checkbox"/> abc (4)                          |
| A       | <input type="checkbox"/> abc123 (5)                       |
| A       | <input type="checkbox"/> app-other-tag (6)                |
| A       | 5/1208 <a href="#">Show more</a>                          |
| A       | <input type="checkbox"/> LANGUAGES                        |
| A       | <input type="checkbox"/> Java (4809)                      |
| A       | <input type="checkbox"/> .NET Framework (206)             |
| A       | <input type="checkbox"/> .NET Core (22)                   |
| A       | <input type="checkbox"/> Node (115)                       |
| A       | <input type="checkbox"/> Ruby (39)                        |
| A       | 5/9 <a href="#">Show more</a>                             |
| A       | <input type="checkbox"/> SERVERS                          |
| A       | <input type="checkbox"/> 0035f200-f1b6-11ec-8a53... (9)   |
| A       | <input type="checkbox"/> 01c8dd20-f1ad-11ec-b32a... (9)   |
| A       | <input type="checkbox"/> 023b1f90-f1b0-11ec-b415... (10)  |
| A       | <input type="checkbox"/> 023b1f90-f1b0-11ec-b415... (10)  |
| A       | <input type="checkbox"/> 028da1d0-f1af-11ec-afa4-... (10) |
| A       | 5/1171 <a href="#">Show more</a>                          |
| A       | <input type="checkbox"/> OPEN VULNERABILITY SEVERITY      |

## Application details

The Overview tab for an application shows details about the application configuration and activity.

### Summary

The summary at the top of the tab shows this information:

- **Scores:** The letter grade is based on the number and seriousness of the vulnerabilities found in the application. Use the [application scoring guide \(page 1557\)](#) for guidance.
- **Libraries:** The number of open-source libraries that Contrast SCA identified and the number of vulnerable libraries.
- **Routes exercised:** The first value is the number of routes exercised in the application. The second value is the number of observed routes.  
To view [route coverage \(page 661\)](#) details, select the value for the exercised routes.
- **Servers:** The number of servers associated with the selected application.
- **Routing frameworks:** The supported frameworks that Contrast detected during route discovery.  
During an agent session, Contrast [checks its compatibility \(page 661\)](#) with the frameworks it detects in your code.

### Environment details

For each environment, you see these details, if servers are defined for the application:

- **Protect and Assess settings:** The setting bars indicate the number of servers where Assess or Protect is turned on or off.  
To manage the settings, select a section of the bar. Doing so opens a filtered [view of the servers \(page 1193\)](#) where you can manage the Assess and Protect settings.
- **Servers:** The number of servers associated with the application.
- **Vulnerabilities:** The number of vulnerabilities. Use filters to change the view by severity, status, or type.  
Hover over a section of the vulnerabilities bar to view additional details.
- **Vulnerability trend:** This view shows the trends for vulnerabilities that Contrast identifies and the remediation of these vulnerabilities, either by manual verification or auto-verification policies.

### Additional details

The Applications page contains these additional tabs with application details:

- [Vulnerabilities \(page 1308\)](#)
- [Libraries \(page 1205\)](#)
- [Route coverage \(page 659\)](#)
- [Flow map \(page 671\)](#)
- [Policies for Assess rules \(page 1401\)](#)
- [Policies for Protect rules \(page 1412\)](#)

## Contrast Security Observability

Contrast Security Observability models an application's security architecture and behavior at runtime.

Use this information to better understand the underlying behavior of your applications for threat modeling, pen test support, and contextual information around vulnerabilities and attacks.



### NOTE

Currently, this feature is supported for Java applications only.

## Benefits

Once you add Contrast with security observability turned on for your applications, services, and APIs, you can quickly view in-depth details about their behavior and actions, such as:

- Security defenses by resource, such as authentication (authn) and authorization (authz)
- Potentially dangerous calls made during each of those resource calls (for example, SQL or system commands)
- Backend connections for each resource

You can use this information for:

- Threat modeling data flow diagrams  
The observed data provides a ground-truth view into the behavior and architecture of your application that most impacts its security posture. You get:
  - Lightweight instrumentation of applications that offers continuous monitoring for high-performance examination of real application behavior.
  - Runtime visibility into application architecture, for example: Identification of all services, APIs, and files that the application accesses.
- Penetration testing support  
The observed data about your endpoints can help you effectively target your tests. You get:
  - Contextual behavior based on application utilization
  - Run time visibility in to application architecture
- Vulnerability prioritization  
The observed data provides information about a vulnerability's context to help you determine its impact and exploitability. You get:
  - Identification of services, APIs, files, and databases that the application accesses.
- Attack context  
The observed data provides context when a service or API is under attack. This data can help you determine its impact and exploitability.

## Observe mode configuration

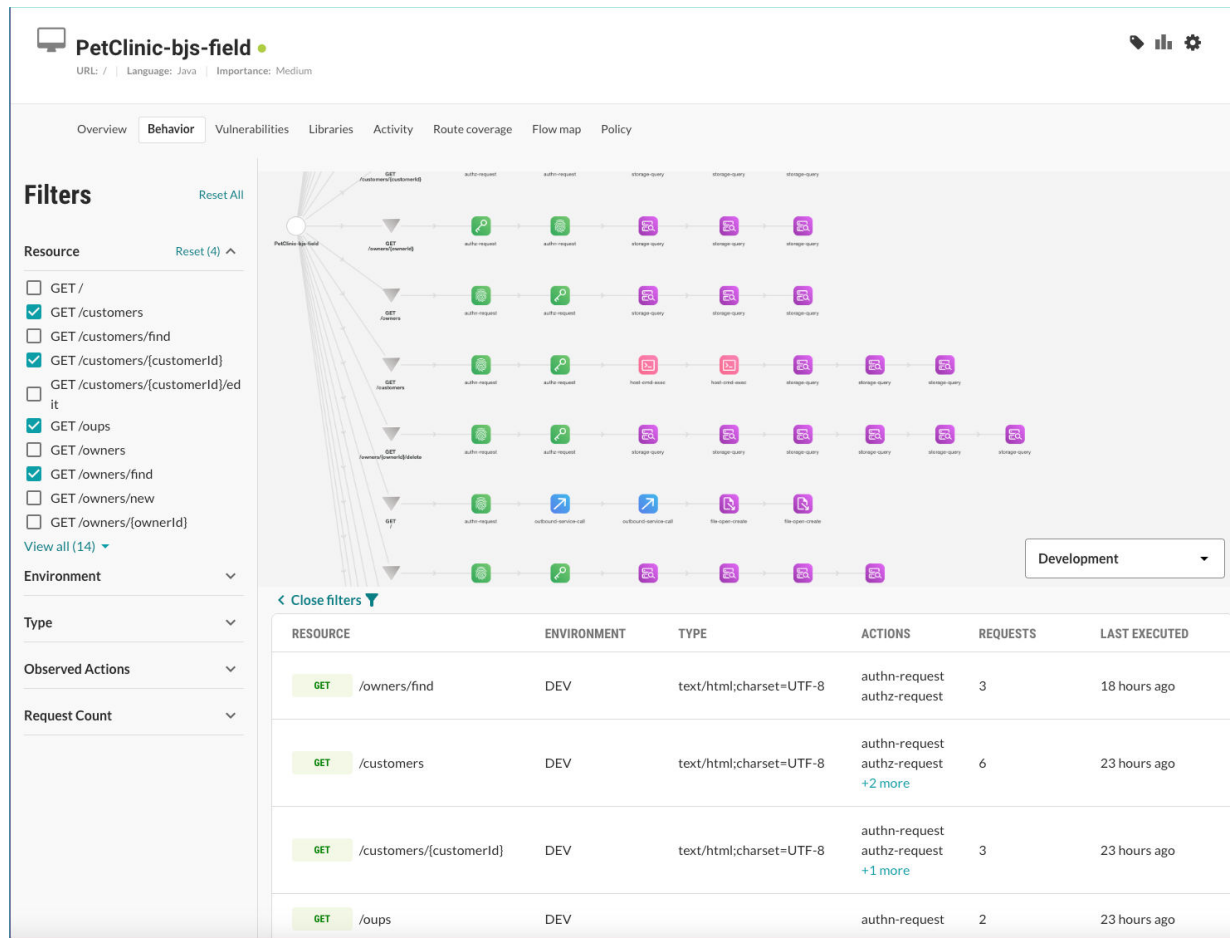
The observe mode setting in your agent's configuration file turns on the ability to view security observability details:

```
observe:  
  enable: true
```

Once observe mode is turned on and you exercise your application, [view the behavior insights \(page 648\)](#) from the Applications page in the Contrast web interface.

## Runtime behavior insights

The runtime behavior insights that security observability provides includes these key details:



- **Application model:** An graphical representation of the behavior and connections to other components that Contrast detects in an application.
- **Resource:** Identifies an application's entry points, such as routes used, message queues, web requests, and so forth.
- **Type:** The response type that a resource uses. For example: `application/json` or `text/html`.
- **Actions:** Security-relevant behavior that Contrast observes in the application, including:
  - Database connections, including the instance name of the database
  - File system access, including the name of the file or directory accessed
  - Outbound service or API calls
  - Authentication and authorization detection
  - System commands
  - Potentially dangerous functions
  - Security controls: Shows which of your service or API routes have custom security controls applied.
- **Environment:** The environment where an action occurs: Development, QA, or Production.
- **Requests:** The number of requests made for the resource.
- **Last executed:** The last time a resource was exercised in the application.

## See also

[View runtime behavior \(page 648\)](#)

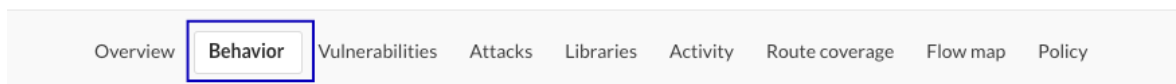
## View insights for runtime behavior

## Before you begin

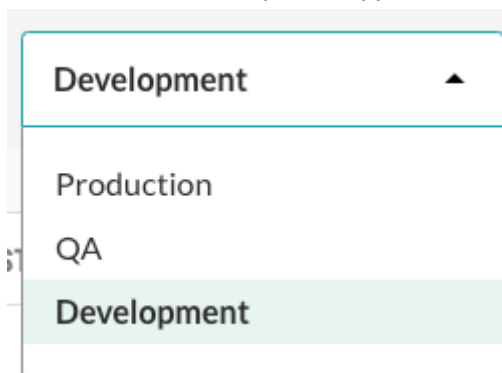
- Verify that the [observe mode setting \(page 647\)](#) is turned on in the agent's configuration file.

## Steps

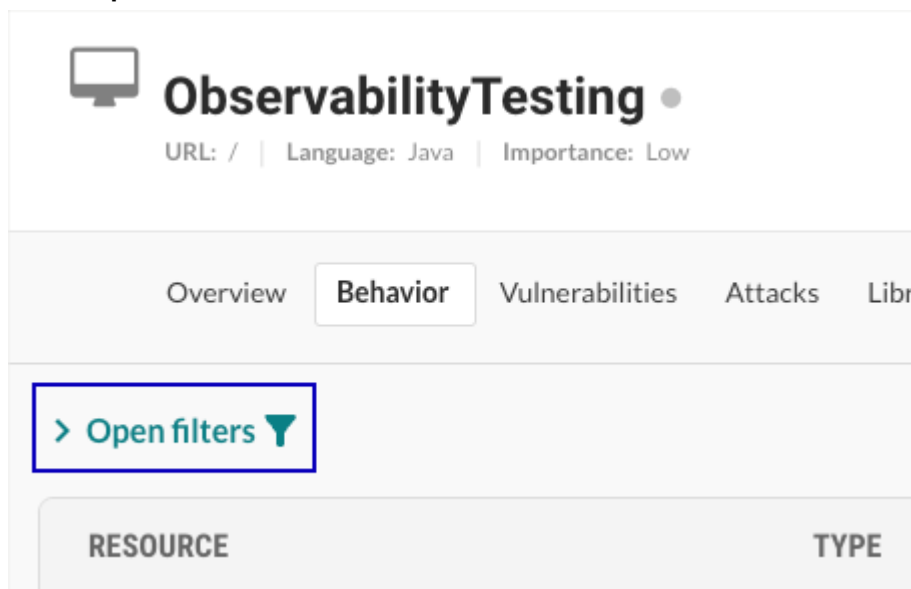
1. Select **Applications** from the header
2. Select an application.
3. Select **Behavior**.



4. To view details for a specific application environment, select it in the dropdown above the list.

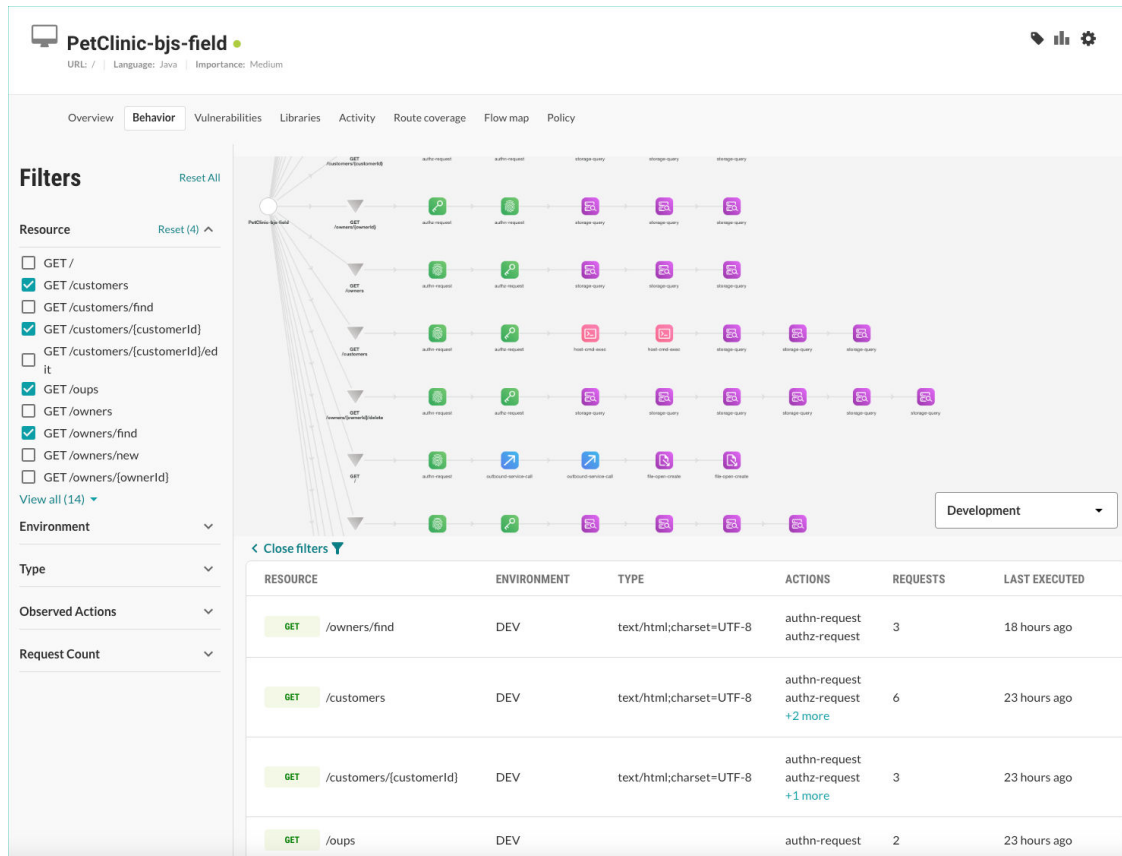


5. To refine the view with filters:
  - a. Select **Open filters**



- b. Select all the filters you want to use. The filters are:
  - **Resource:** Select one or more resources.
  - **Environment:** Select any or all of these environments: Development, Production, and QA
  - **Type:** Select any or all data exchange types.
  - **Observed actions:** Select the actions you want to view from these categories. For example, Authn-Request, File-Open-Create, and Storage-Query.

- **Request count:** Select a count grouping, from 0-1000 up to 100000+.



6. To view additional details, select a resource in the list.

This selection opens a panel that shows a model of the resource behavior and connections to other components that Contrast detects. It also shows details for the actions, including database queries and outgoing API calls


When you select an element in the model, the list highlights the actions associated with that element.

The screenshot shows the Contrast Security interface for an application named 'PetClinic-bjs-field'. The 'Applications' tab is active, displaying a flow map of requests. A sidebar on the left contains filters for resources, environment, type, and request count. The main area shows a detailed view of a request to 'GET /customers/{customerId}'. The request path is highlighted, showing the sequence of actions: 'authn-request', 'storage-query', 'storage-query', and 'storage-query'. The environment is 'DEV' and the request count is 3. The last executed time is 23 hours ago. The actions section shows 'AUTHN-REQUEST' with a 'password' field and 'STORAGE-QUERY' with database details.

## Edit application settings

You may need to access or edit settings for your application:

- **Application names:** Each application in an organization must have a unique name. To change the name, select Applications in the header, then click on the application's name in the grid to go to its **Overview** page. Click on the name at the top of the page to update the text. Alternatively, select the **Settings** icon in the top right of the Overview page and update the name in the **Application defaults** window. SuperAdmins can also edit application names by selecting **SuperAdmin** in the user menu, then **Applications** in the header, then clicking on the name in the grid.
- **Application ID:** The application ID is the last URI segment in the URL of your browser. To locate an application's ID, select an application from the grid. The segment after `applications/` is the application ID.
- **Application importance:** This value appears in the application's metadata and may also be used in your organization's integrations settings. To set an application's importance level select an application name to view its **Overview** page and select the **Settings** icon. In the **Application defaults** window, use the **Importance** field to select a level from the dropdown.

1. Select your application from the **Applications** tab. Your selected application overview displays.
2. Select the settings  icon in your application overview. The **Application Settings** popup displays.
3. Edit any of the fields as required.
4. Click **Save** to save your updated application settings.

## Field descriptions

- **Application names:** Each application in an organization must have a unique name. To change the name, select Applications in the header, then click on the application's name in the grid to go to its **Overview** page. Click on the name at the top of the page to update the text.  
Alternatively, select the **Settings** icon in the top right of the Overview page and update the name in the **Application defaults** window.  
SuperAdmins can also edit application names by selecting **SuperAdmin** in the user menu, then **Applications** in the header, then clicking on the name in the grid.
- **Application Code:** The identification code or number that's internal to your organization and unique to the application or microservice. Use this field if you want to integrate these applications' unique identifiers into your usage of Contrast. This code can be configured upon application startup, in the application properties section of an agent configuration.
- **Override URL:** This is the url used to replicate a vulnerability.
- **Importance:** This value appears in the application's metadata and may also be used in your organization's integrations settings. To set an application's importance level select an application name to view its **Overview** page and select the **Settings** icon. In the **Application defaults** window, use the **Importance** field to select a level from the dropdown.


## Add tags to applications

Use application tags to better organize applications and improve search functionality.

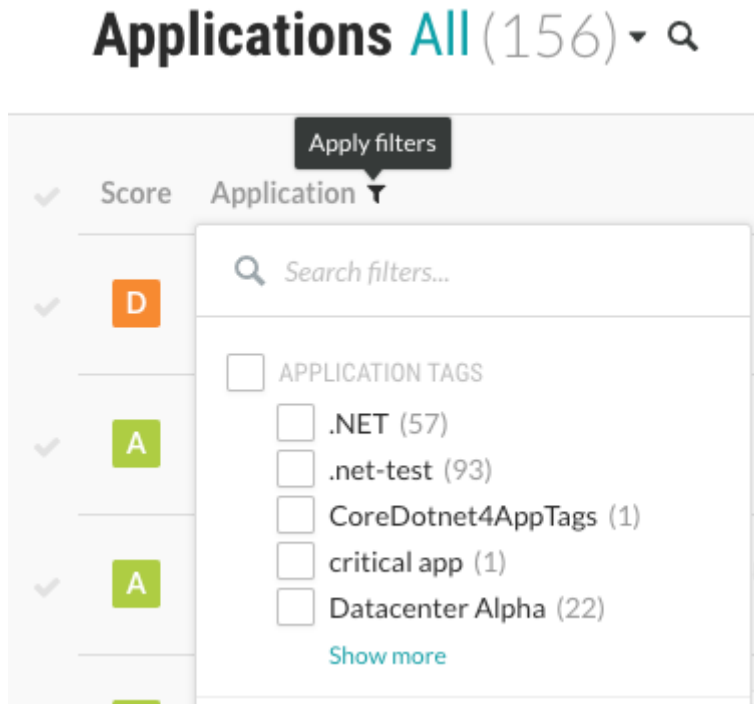
### Steps

1. Select **Applications** in the header.
2. Add tags:
  - a. To add tags for a single application, hover over the end of the application's row and select the **Tag** icon (🏷️).  
Alternatively, go to the Overview page for the application and select the **Tag** icon (🏷️) at the top of the list.
  - b. To add tags for multiple applications, select the check mark next to each application and select the **Tag** icon from the action menu at the bottom of the list.



3. In the Tag application window, start typing to view a list of existing tags. Select the tags you want to use or enter a new tag.  
After adding tags, you can see them next to the application name in the Overview tab for the application.  
To remove a tag, click **x** in the tag name.  

4. To use tags for filtering, select the Filter icon (▼) next to the Applications column and select Application tags.





## Merge and unmerge applications

Merging two or more applications creates a single application called a primary application. Merging applications is a common operation for administrators responsible for bringing applications online.

The main purpose of merging is to present a single application view for the purposes of scoring, discovered vulnerabilities, and remediation. Merged applications can be made up of modules, which show up individually in the application list. Merging also allows you to logically organize all of an application's modules into one entity in Contrast.

## Data access after merging

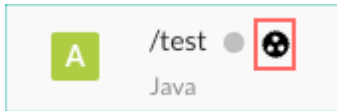
Access to data for merged applications depends on the type of Contrast access control you are using.

- **Legacy access control** (on-premises customers and customers who are not using the new role-based access control):
  - When you merge applications, an application module inherits the application group of the primary application.
  - To access data for the application module, users must be a member of the application group that includes the primary application.
- **New role-based access control** (customers with role-based access control turned on):
  - When you merge applications, access to application data is unaffected. Administrators can change user access to application data after you merge an application.
  - If a user has a role that includes an application module as a resource, they continue to have access to that application's data. If you remove the application module from a resource group associated with the role, users no longer have access to the data.
  - If a user has a role that doesn't include the application module as a resource, they have no access to the application's data. To provide access to the data, add the application module to a resource group associated with the role.

## Steps

1. Select **Applications** in the header, and use the check marks to select the applications to merge.

2. Select the **Merge** icon (🔗) from the menu at the bottom of the list.
3. In the Merge applications window, use the dropdown to choose one of the merged applications to represent the primary application.
4. Once your applications are merged, you see the primary application icon (⊕) beside the name of the primary application.



5. To see the application modules in the merged application as well as details about exercised routes, select the primary application icon in the application's row .

**Application Modules (2)** ×

/test is a LICENSED application that represents 2 modules.

| <input type="checkbox"/> | Grade | Application  | Routes Exercised |
|--------------------------|-------|--|------------------|
| <input type="checkbox"/> | A     | /test ⊕ ●<br>Java                                  | 7 / 7            |
| <input type="checkbox"/> | A     | app-01a057e4-5f7a-478c-af13-3b1763fe2ce7 ●<br>Java | 4 / 4            |

Cancel Unmerge Selected

6. To unmerge either all or specific application modules from the primary application, select the primary application icon (⊕) in the application's row or Overview page. In the Applications modules window, select any number of the modules, and select **Unmerge selected**.

## Archive and unarchive applications

If an application should no longer collect vulnerabilities, but you want to keep it in your organization for historical purposes, the best solution is to archive the application.

Archiving an application maintains the integrity of past application data, such as vulnerabilities and libraries, but the agent no longer reports vulnerabilities to Contrast.

Archived applications also improve your overall portfolio score, as they don't count against the total score.

An administrator can restore an archived application. After you unarchive an application, it is visible in the default Applications list. All vulnerabilities and issues immediately impact the its score.

## Before you begin

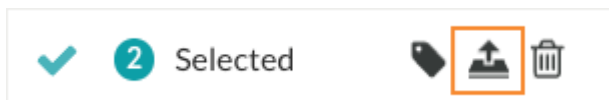
- Archiving an application doesn't free up a license in Contrast. To return a license back to the pool of available licenses is to archive and fully [delete \(page 656\)](#) the application.

## Steps

1. Select **Applications** in the header.
2. Find the application you want to archive.
3. Archive the application:
  - a. To archive a single application, hover over the end of the application's row and select the **Archive** icon (🗳️).
  - b. To archive multiple applications, select the checkmark next to each one and select the **Archive** icon (🗳️) from the action menu at the bottom of the list.



- c. In the displayed window, select **Archive** to confirm your choice.
4. To unarchive an application::
    - a. Select the small triangle (▾) next to the Applications header at the top of the list.
    - b. Select **Archived**.
    - c. To unarchive a single application, hover over the end of the application's row and select the **Unarchive** icon (📁).
    - d. To unarchive multiple applications, select the checkmark next to each one and select the **Unarchive** icon in the action menu at the bottom of the list.



- e. In the displayed window, select **Unarchive** to confirm your choice.

## Reset an application

Resetting an application purges all the data associated with it, but doesn't remove the application. Resetting applications is useful when you want to clear all history and findings associated with a specific application.

It is common to reset an application before [deleting \(page 656\)](#) it to make sure that all associated vulnerabilities, URLs and components are cleared properly.

## Reset behavior

- **General behavior:**

When you reset an application, it loses its historical vulnerability data, library data, and route coverage data. It keeps its license association and entry in Contrast, as well as its server associations.

- **Application or server is online:**

If you reset an application that is online or its server is online, the count for vulnerabilities, libraries, and routes becomes 0. If you browse some of the application endpoints, data for vulnerabilities, libraries, and routes repopulate. Discovered routes remain lost, because route discovery occurs during application startup.

- **Application or server is offline:**

If you reset the application when the application or its server is offline, all the data populates, as expected.

## Before you begin

You can reset only one application at a time.

**CAUTION**

If you reset an application, there is no way to restore the purged data.

**Steps**

1. Select **Applications** in the header.
2. Hover over the end of the row and select the **Reset** icon (↺),  
Alternatively, in the application's Overview tab, select the **Settings** icon (⚙️) and select **Reset application**.
3. In the Reset Application window, select **Reset**.

**Delete applications**

When you delete an application, Contrast permanently removes all of its associated findings, such as vulnerabilities and libraries.

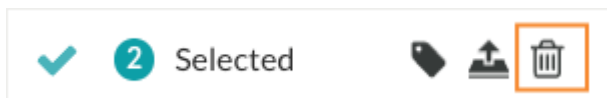
Licenses applied to applications permanently count towards the number of maximum allowable applications. Deleting a licensed application has no effect on the number of licenses you are allowed to apply to applications

**Before you begin**

- **Optional:** You can [reset the application \(page 655\)](#) before you archive and delete it.  
Resetting an application purges all of the data associated with it, but doesn't remove the application. Users often reset applications to clear all history and findings associated with a specific application.

**Steps**

1. Select **Applications** in the header.
2. Find the application that you want to delete.
3. Archive the application:
  - a. To archive a single application, hover over the end of the application's row and select the **Archive** icon (📁).
  - b. To archive multiple applications, select the check mark next to each one and select the **Archive** icon (📁) in the action menu at the bottom of the list.
  - c. In the displayed window, select **Archive**.
4. Select the **Dropdown** icon (⌵) next to the Applications header at the top of the page and select **Archived**.
5. Delete the application:
  - a. To delete a single application, hover over the end of the row of the application you want to delete and select the **Delete** (🗑️) icon.
  - b. To delete multiple applications, select the check mark next to each one and select the **Delete** icon (🗑️) in the action menu at the bottom of the list.



- c. In the displayed window, select **Delete**.

**Use session metadata filters**

Use session metadata to filter vulnerabilities and route information for a specific branch, build, committer, or repository. When you [add the necessary configuration settings \(page 658\)](#) to your agent

configuration file, the agent reports this information along with the rest of your standard vulnerability data to Contrast.

A session is the combination of metadata values that you set in the agent configuration file. Depending on the defined values, each agent run could be part of a single session or every agent run could have its own session. If you are integrating Contrast into a CI/CD pipeline, ensure that you send at least one session metadata value that is unique each time you deploy a new version of the application. For example, configure the agent to send the Commit Hash or Build Number metadata because these values are likely to change for each application deployment.

If you don't select a specific session metadata filter, the Session column in the Vulnerability list displays up to 10 of the values specified in the agent configuration file. This limit ensures that the Contrast web interface can display vulnerability and sink group data correctly.

The session metadata filters that you apply affect the Vulnerabilities and Route coverage lists.

## Auto-generated session metadata

When a Contrast agent starts, it automatically creates a unique fingerprint that is equal to that unique build of an agent and populates session metadata values. The key used for this feature is called `artifactHash`.

You can use this metadata in the same way as the ones you create manually.

The agent versions that support this feature are:

- Java 6.11.1 and later
- .NET Core 4.3.9 or later
- .NET Framework 51.1.9 and later
- Python 9.7.0 and later
- Node.js 5.24.0 and later

## Steps

1. Select **Applications** in the header.
2. Select an application in the list.
3. Select either the **Vulnerabilities** tab or the **Route coverage** tab.
  - In the Vulnerabilities tab, select the Session metadata icon (🔍) at the top of the list.
  - In the Route Coverage tab, in the Session routes section of the Route coverage summary, select **Apply filter**.
4. Select the session: **Most recent session** or **Custom session** and the filter.

In the Vulnerabilities list in the Vulnerabilities tab, the Session column and the View by filter are hidden and the details of the most recent session display above the session metadata icon.

  - a. In **System property**, select one of the displayed properties.
  - b. In **Value**, start typing to find values for the selected system property.

Session metadata filtering

Specify the session metadata of Adam Webgoat Route Session Metadata Test to display historical views.

☐ Most recent session
☒ Custom session

System property  
Committer

Value  
8/25/2021, 4:50:10 PM - Build Number: 8.0.1, Repository: webgoat, Committer: Jane, Branch Name : feature/some-n...

Clear filter
Apply filter

5. Select **Apply filter** to save the selected filter.

6. To clear a session metadata filter, use one of these methods:


- In the Vulnerabilities tab, In the Vulnerabilities list, select the Session metadata icon (  ). and select **Clear filter**.

Session metadata filtering

A session metadata filter was applied to Adam Webgoat Route Session Metadata Test. To specify a different session, select Clear filter.

Current session: 8/25/2021, 4:50:10 PM  
Build Number: 8.0.1  
Repository: webgoat  
Committer: Jane  
Branch Name : feature/some-new-thing

Clear filter
Apply filter

Alternatively, select **Clear** next to the displayed metadata above the Session metadata icon (  ).

Current Session: 8/25/2021, 4:50:10 PM
Clear

↓ SORT BY LAST ACTIVITY

In the Vulnerabilities list, the Session column displays after you clear the session metadata filter.

- In the Route Coverage tab, in the Session metadata section of the Route coverage summary, select **Clear filter**.

## Configure session metadata

To send session metadata for your application to Contrast, add session metadata key-value pairs to your agent configuration file.

The agent reports the following build properties. You may include all or some of these properties. When you do, the metadata will be available to you as additional information for each vulnerability reported or as a way to filter them.

Supply these settings as system properties, environment settings or properties in a YAML configuration file.

| Name         | Setting     |
|--------------|-------------|
| Commit Hash  | commitHash  |
| Committer    | committer   |
| Branch Name  | branchName  |
| Git Tag      | gitTag      |
| Repository   | repository  |
| Test Run     | testRun     |
| Version      | version     |
| Build Number | buildNumber |

The metadata string format must be an RFC 2253 compliant string of comma delimited key=value pairs. Do not include these characters:

- A space or hash (#) characters at the beginning of the string.
- A space at the end of the string
- Special characters: comma (,) , plus sign (+), double quotes ("), backslash (\), left angle bracket (<), right angle bracket (>), or semicolon (;)

Here are some examples of how you might configure session metadata in the following instances:

- **Java system properties:** Include an additional entry in the line where you add your `javaagent` flag. In this case, you will set the property `contrast.application.session_metadata` to a set of key-value pairs (which conform to RFC 2253) that identify your test run.

```
-Dcontrast.application.session_metadata="branchName=feature/some-new-thing,committer=Jane,repository=Contrast-Java"
```

- **.NET Framework using *app.config* or *web.config*:** You can add an entry to your configuration to specify this property.

```
<?xml version="1.0"?>
<configuration>
  <connectionStrings />
  <appSettings>
    <add
key="contrast.application.session_metadata" value="branchName=feature/
some-new-thing,committer=Jane,repository=Contrast-DotNet" />
  </appSettings>
</configuration>
```

- **YAML configuration:** You can add an additional entry to your `contrast_security.yaml` file.

```
application:
  session_metadata: branchName=feature/some-new-thing,committer=Jane,repository=Contrast-Ruby
```

- **Continuous integration (CI) build scripts:** You can set values using environment variables.

```
-Dcontrast.application.session_metadata="branchName=feature/some-new-thing,committer=Jane,repository=Contrast-Java,buildNumber=$BUILD_NUMBER"
```

```
-Dcontrast.application.session_metadata="branchName=$GIT_BRANCH,committer=$GIT_COMMITTER_NAME,commitHash=$GIT_COMMIT_HASH,repository=$GIT_URL,buildNumber=$BUILD_NUMBER"
```

## Route coverage

For Assess users, route coverage associates vulnerabilities with the originating web request.

With route coverage, you can see detailed information on the components of your application, such as which routes were exercised and which ones were not. This information can help you decide where to focus testing and remediation.

## Web request example

Web requests are the primary interface of web applications. A request may be handled by one function with many subsequent functions coordinating interactions with other services, databases, or files.

During the request handling process, Contrast monitors data flows across the application to identify vulnerabilities. A single web request may be vulnerable to multiple types of attacks. Contrast associates these vulnerabilities with the original request.

This example shows a web request:

```
GET /users?active=true
Host: YourDomain.com
Accept: application/json
```

This example shows how a function might handle the web request:

```
@Controller
public class UserController {
    @GetMapping("/users")
    public String users(@RequestParam(name="active", required=false,
    defaultValue=true) Bool active) {
        ...
    }
}
```

## How route coverage works

An application route is a combination of three parts:

- An HTTP verb (for example: `GET`).
- The resource path (for example: `/users`).
- The method signature of the controller (for example: `UserController.users(Bool active)`).  
For cases where using a method signature isn't appropriate, Contrast uses route templates, such as `route.jsp`, `route.xhtml`, or `/route/id/{id}`.

When a Contrast agent starts, it instruments functions in the application so that the agent can assess web requests for vulnerabilities while the application is running. If a function implements a framework to handle web requests, Contrast can identify the route before a request is handled. In Contrast, the status for these routes is **Discovered**.

When your application is handling a request, Contrast tracks the activity as an **Exercised** route.

## Frameworks and technologies

Contrast supports route discovery for these frameworks:

- **Java:** all [currently supported technologies \(page 55\)](#)
- **.NET Framework:** all [currently supported frameworks \(page 63\)](#)
- **.NET Core:** all [currently supported frameworks \(page 70\)](#)
- **Node.js:** all [currently supported frameworks \(page 81\)](#)
- **Python:** all [currently supported frameworks \(page 94\)](#)
- **Ruby:** all [currently supported frameworks \(page 508\)](#)
- **Go:** all [currently supported frameworks \(page 103\)](#)

If the framework you are using is unsupported, [contact Support](#). For unsupported frameworks, Contrast will attempt to infer the routes based on observed requests, but you will not see any routes discovered within Contrast.



## Exclusion of built-in routes and applications

Contrast route coverage excludes built-in routes in select web frameworks and applications. For example:

- The Jersey framework for Java applications includes a built-in route for serving a WADL file. Contrast does not include this route in its route coverage. Other web frameworks have similar built-in routes.
- The Contrast Java agent does not report routes from built-in applications such as the Tomcat Manager Application.

## Compatibility checking for routing frameworks

When you instrument an application with a Contrast agent, Contrast looks for routing frameworks that it supports. Supported routing frameworks help Contrast to report detailed data about vulnerabilities and route coverage.

If your application has unsupported frameworks, you may be able to see vulnerability data but other features like route coverage or dedupe may not be available for your application.



### NOTE

These agent versions support this feature:

- Java 6.3.0 and later
- .NET Core 4.2.14 and later
- .NET Framework 51.0.32 and later
- Node.js 5.9.0 and later
- Python 8.2.0 and later

## How compatibility checking works

During an agent session, the Contrast agent discovers routes and checks for supported routing frameworks. Where possible, Contrast displays details about which frameworks it finds.

- If Contrast detects supported frameworks during route discovery, it displays a list of these frameworks.
- If the selected application is a merged application, Contrast displays routing framework details for the primary application only.
- If Contrast doesn't support the routing frameworks that your application uses, it displays a message that it can't detect routing frameworks.

If you are using older agents, Contrast might not be able to detect the routing frameworks. Consider updating your agent if you want to be able to view this information.

## View routing framework details

1. Select **Applications** in the header.
2. Select an application.
3. In the Overview tab, in the Summary section, view the routing framework details on the right side.

## View route details

[Route coverage \(page 659\)](#) helps you understand how vulnerabilities map to your application's attack surface.

If you remove routes from the Route coverage list (steps 8 and 9) and they still exist when the server restarts or you exercise the application, Contrast includes them in the list again. To permanently exclude routes, select the **Exclude** icon (🗑️) at the end of the route's row.

## Steps

1. Select **Applications** in the header.
2. Select the name of an application.  
The Overview tab shows the number of routes exercised compared to the number of total routes in your application.
3. In the Overview tab, select the number of routes exercised or select the **Route coverage** tab.

4. In the Route coverage tab, the Route coverage summary shows this information:

- **Exercised routes:** This section shows these details:
  - The percentage of discovered routes that you exercised.
  - The number of exercised routes.
- **Session metadata:** This section shows these details, based on the applied session metadata filters:



### NOTE

If you haven't applied session metadata filters, no values display. To see values for session metadata, select **Apply filter** or **Edit filter** (to change the current filters) and [specify the filters \(page 656\)](#) you want to use.

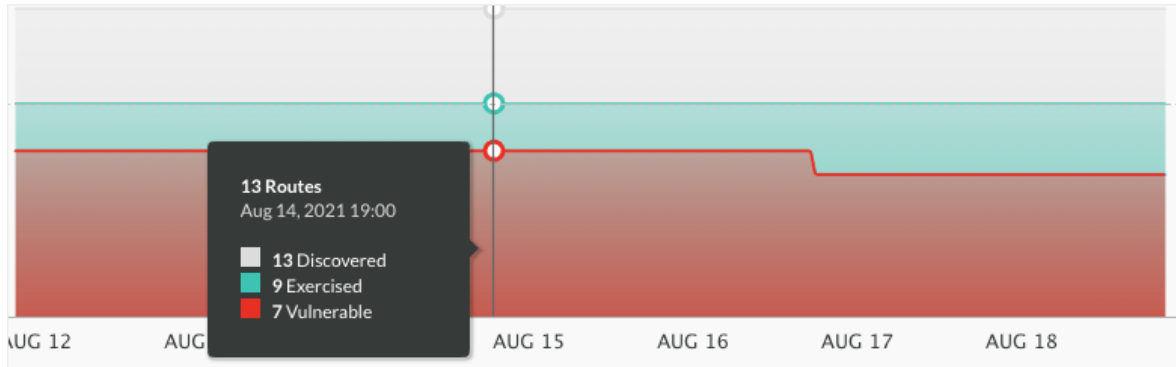
- Percentage of routes exercised that match the applied filters.
- The number of exercised routes that match the applied filters.
- The selected session.
- The repository for the application
- Build number
- Branch name
- Committer

5. In the Route Coverage tab, if you don't apply session metadata filters, the route coverage chart displays.



### NOTE

If you previously selected metadata filters, this chart does not display. To see the chart, select **Clear the filters**.



The chart displays details about routes based on their status:

- Discovered by Contrast (but never exercised with the agent)
- Exercised with the Contrast agent
- Exercised and found to contain vulnerabilities

6. In the Route coverage list, view additional details about each route.

- **Route:** A route that Contrast identified or is tracking.
- **Server:** The servers where the application is running.

By default, the Server column shows up to three servers. To view a complete list of servers (if more than three are in use), select **Show all**.

| Route   | Environment | Server  | Vulnerabilities | Application   | First Seen   | Last Activity | Status    |
|---|-------------|---|-----------------|---------------|--------------|---------------|-----------|
| hello.ContactController.contactForm(org.springframework.ui.Model) | Development | CONTRAST-SVR1<br>CONTRAST-SVR2<br>CONTRAST-SVR3<br><a href="#">Show all (5)</a> | 0               | 8885-test-app | 2 months ago | 1 minute ago  | Exercised |



### NOTE

When you delete a server, Contrast removes it from the list instead of displaying it as greyed out.

- **Vulnerabilities:** The number of vulnerabilities associated with the route.
- **First seen:** The first time Contrast observed the route.
- **Last activity:** The activity time span for the route.
- **Status:** The route status.

7. Select an option to view details for each route that Contrast has identified in the application:
  - a. To view the URL for the route, select a route name.
  - b. To view vulnerability details for a specific route, select a section of the severity bar Vulnerability column. Each section indicates one or more severity levels: Critical, High, Medium, Low, and Notes.
  - c. To view routes based on the applications where Contrast observed them, select the Filter icon (▼) next to the Application column.
  - d. To view routes based on the time when Contrast first observed them, select the **Filter** icon (▼) next to the First seen column.

- e. To view routes based on an activity time span, select the **Filter** icon (▼) next to the Last Activity column.  
Changing the time span also changes the time span for the route coverage chart.  
To clear the filter selection, select **Clear** next to the column heading.
8. To remove a single route from the list:
  - a. Hover over the end of the row and click the **Remove** icon (🗑️).
  - b. To confirm the removal of the route, select **Delete**.
9. To remove multiple routes from the list:
  - a. Select the check mark next to one or more routes or to select all routes, select the check mark next to **Route**.
  - b. In the batch action menu at the bottom of the page, select the **Remove** icon (🗑️).
  - c. To confirm the removal of the route, select **Delete**.
10. To view and share route details outside of Contrast:
  - a. Select the check mark next to one or more routes or to select all routes, select the check mark next to **Route**.
  - b. In the batch action menu at the bottom of the page, select the **Export** icon (📄).  
This action exports the details to a CSV file. The file downloads to your default download location.  
The CSV file includes:
    - A list of the application's routes.
    - Details about the server on which they were found.
    - Details of when the routes were last exercised.
    - A list of vulnerabilities, the severity and status of each.

## See also

- [Exclude routes \(page 665\)](#)
- [Include routes \(page 665\)](#)

## Route exclusion and inclusion

In situations where you require a specific percentage of route coverage for security reasons, Contrast provides an option to exclude irrelevant or inaccessible routes from route coverage calculations.

You can choose to re-include any routes that you excluded previously.

Including or excluding routes requires an Admin role.

### Effects of route exclusion

- Contrast collects vulnerability data for excluded routes, but excludes this data from application scoring calculations.
- Excluding a route excludes it from all environments where Contrast discovers it.
- If you defined session metadata to exercise and discover routes in an application, excluding a route also excludes this data.
- The audit log includes an entry for each route that you exclude.

### Effects of route inclusion

- Contrast includes data for the included route in application scoring calculations.
- Including a route includes it in all environments where Contrast discovers it.
- The audit log includes an entry for each route that you include.

## Exclude routes

Excluding routes (page 664) that are irrelevant or inaccessible helps to ensure that route coverage calculations for applications are accurate.

To ensure the route remains excluded, don't remove it after you mark it as excluded. If you exclude a route and then remove it, Contrast includes the route again if its detected when the application server starts or after you exercise the application.

## Before you begin

- Identify the routes that you want to exclude.

## Steps

- Select **Applications** from the header.
- Select an application name.
- Select the **Route Coverage** tab.
- Exclude one or more routes:
  - To exclude a single route, hover over the end of the row and select the **Exclude** icon (🗑️).
  - To exclude multiple routes, use the check marks in the left column to select routes. Then, select the **Exclude** icon from the batch action menu at the bottom of the page.



- Confirm the exclusion in the Exclude route window.  
The status for the selected routes changes to **Excluded**.

## Include routes

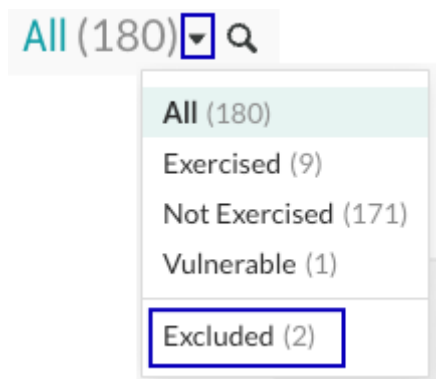
You can include routes (page 664) that you previously excluded. On the Route coverage page, excluded routes have a status of **Excluded**.


## Before you begin

- Identify the excluded routes that you want to include.

## Steps

- Select **Applications** in the header.
- Select an application name.
- Select the **Route coverage** tab.
- Display a list of excluded routes by selecting the **triangle** (▾) at the top of the list and select **Excluded**.



5. Include one or more excluded routes:
  - a. To include a single, excluded route, hover over the end of the row and select the **Re-include** icon (  ).
  - b. To select multiple excluded routes, use the check marks in the left column to select routes. Then, select the **Re-include** icon in the batch action menu at the bottom of the page.



- c. Confirm the inclusion in the Re-include route window.  
The status returns to the status the route had before you excluded it.

## Configure route expiration policy

Configuring a route expiration policy can ensure that your route coverage metric in Contrast is more accurate.

The policy affects route data that Contrast displays in the following ways:

- Routes expire only for active applications with discovered or exercised routes.  
For route expiration purposes, Contrast views an application as active if it has had at least one route observed or exercised within the configured time period. For example, if you set the route expiration policy to 30 days, the application must have had at least one instance of route activity within the past 30 days for its routes to be eligible for expiration
- If Contrast does not see discovered or exercised routes in an active application after a specified number of days, the route is considered expired.
- After the specified expiration date occurs, Contrast deletes the expired route.  
The route coverage calculation doesn't include the deleted routes.
- Before Contrast deletes expired routes, it sets the status of vulnerabilities associated with the route to **Remediated-Auto-Verified**.
- Routes do not expire if the application isn't active and has no discovered or exercised routes.

### Before you begin

- The policy applies to all applications.
- Contrast applies the policy once per day.  
Depending on the number of expired routes, it is possible that Contrast might not be able to delete all of them on the same day that they expire.

### Steps

1. From the user menu, select **Organization settings**.
2. Select **Applications**.
3. In the Default section, under Route expiration policy, select the **Remove expired routes** checkbox and specify the number of days after which Contrast expires routes without activity.  
The minimum value is one day. The maximum value is 365 days. The default value is 30 days.

## Improve route coverage with production traffic

### Before you begin

- Supported agent versions:
  - Java 6.6.0 and later
  - Node.js 5.20.0 and later
  - Python 9.4.0 and later

- .NET Core 4.3.0 and later
- .NET Framework 51.1.0 and later
- If you have any questions or concerns before using this feature, contact your Contrast representative for guidance.

## Best practices

- Turn on IAST (Assess) in the application while it's in a pre-production environment before you deploy the application with IAST in the production environment. Doing so lets you check for compatibility and performance issues.
- Only use IAST in production environments for applications that use frameworks that Contrast Assess supports.
- Instrument singular instances of the application server.  
If you use a load balancer that shifts traffic to different instances, it might be worth instrumenting one or more containers depending on the traffic routing rules.  
[Limit agent deployments \(page 669\)](#) provides additional details for this situation.
- For performance impact and reduced overhead for IAST in production mode, reach out to your Contrast CSM. They have detailed data on average response time, average CPU usage, TPS, memory allocation, and more.
- For sensitive data masking, Contrast is not storing any sensitive data.
- Avoid changing the sampling settings in the agent configuration (YAML) file.  
The settings in the agent configuration file override settings in the Contrast web interface. If you need to change sampling settings, it is best to use the web interface for this purpose.  
In many cases, hosted customers don't have access to the sampling settings; Contrast manages them instead.

## Turn on Assess in production environments

1. At the time of deployment, enable Assess in the agent configuration file.

```
Assess:
  enable: true
```

2. When Assess is enabled, deploy an application to Contrast and set **one** of these options:
  - **System property:** `-Dcontrast.server.environment= PRODUCTION`
  - **Environment variable:** `CONTRAST__SERVER__ENVIRONMENT= PRODUCTION`
  - **Agent configuration file (YAML file):**

```
server:
  Environment: PRODUCTION
```

This option is case-sensitive.

The easiest method for deploying an agent is to use the Add New agent wizards in the Contrast web interface.

## Alternative deployment

An alternative deployment option is to include the lower level sampling configurations for the agent. This case is applicable if you want to do testing in a lower environment and set the server environment appropriately. Follow these steps:

1. In the agent configuration file, leave the setting for Assess as `enable: false`. You can update this setting in the Contrast web interface if you need to turn off Assess analysis.
2. Update the agent configuration using environment variables or settings in the agent configuration file, as shown in these examples:

**Environment variables:**

```
CONTRAST__ASSESS__SAMPLING__ENABLE=true
CONTRAST__ASSESS__SAMPLING__BASELINE=20
CONTRAST__ASSESS__SAMPLING__REQUEST_FREQUENCY=2147483647
CONTRAST__ASSESS__SAMPLING__WINDOW_MS=3600000
CONTRAST__ASSESS__CACHE__VULNERABILITY__CACHE_PURGE_MS=3600000
CONTRAST__ASSESS__EVENT_DETAIL=minimal
CONTRAST__ASSESS__STACKTRACES=SINK
```

#### Agent configuration file (YAML file):

```
assess:
  event_detail: "minimal"
  stacktraces: "SINK"
  sampling:
    enable: true
    request_frequency: 2147483647
    baseline: 20
    window_ms: 3600000
  cache:
    vulnerability_cache_purge_ms: 3600000
```

### Address performance issues

If you notice a negative performance impact after you enable Assess in production environments, change the [sampling rate frequency: \(page 1198\)](#)

1. In the Contrast web interface, select **Servers** in the header.
2. Select the server where Assess is enabled in a production environment.
3. Select the Settings icon (⚙️).
4. Select **Enable sampling for higher performance**.
5. Change the **Analyzation frequency** to a lower value.



#### NOTE

Settings in the agent configuration file override settings in the Contrast web interface. When you turn on Assess for a production environment in the agent configuration file, the Contrast web interface shows the Assess setting as greyed out or turned off.

If you used the alternative deployment by setting the sampling settings, use this method to address performance issues.

1. In the Contrast web interface, select Servers in the header.
2. Select the server where Assess is enabled in a production environment.
3. Turn Assess to OFF  
This setting takes effect only if Assess is not enabled in the agent configuration file.

### Effect of using route coverage with production traffic

Using this feature does not result in any data loss. The effects of using this feature are:

- **Sampling:** Contrast analyzes routes only once in the Analyzation frequency window. Typically, this value is 24 hours.
- **Sensitive data:** Sensitive data is not returned to Contrast. There is no risk of storing real user data in Contrast. This behavior is typically preferred for security purposes.



- **Stacktrace and Contrast web interface differences (Java only and .NET only):** Java and .NET results show less depth in stacktrace data. In the Contrast web interface, all dataflow data is present, however red highlighting is not displayed.
- **Data tracing in events** Contrast doesn't highlight potentially exploitative payloads when it reports attack events. Contrast supports all other data tracing and analysis features.

## Performance metrics

Use these performance metrics as a guide for understanding the potential impact of using Assess in your production environments.

For each agent, Contrast does performance testing in their SaaS environments with applications that may produce different results from applications in your environment. Your performance metrics may be different from Contrast metrics.

| Language | Metrics  |
|----------|--|
| Java     | The baseline impact for performance for the default settings increases the baseline of total request time by 2 ms against a baseline of no deployed agents.              |
| .NET     | The baseline impact increases the agent's total request time to 1.5 ms, compared to a baseline of .5 ms for Protect only, which already runs in production environments. |
| Node.js  | The baseline impact to the test application increases the agent request time by an average of less than 10 ms compared to a baseline of no deployed agents.              |
| Python   | The baseline impact for performance for the default settings increases the baseline of total request time by 56 ms against a baseline of no agent.                       |

## Limit the number of agent deployments

When you deploy agents to monitor applications with IAST (Assess), you want consider their impact on performance. In cases where your web traffic is load balanced across a farm of servers, you may not need to install an agent on every server. If your load balancer distributes traffic evenly and routes all traffic through every server in the farm, you could achieve the same level of monitoring or vulnerability detection by deploying an agent to just one server. Similarly, you could have sample points at each back-end destination based on your load balancing topology.

This topic provides examples of how you can limit the deployment of agents to improve performance.

## Reasons for limiting agent deployments

- **Performance optimization:** Deploying agents across all servers can add unnecessary overhead, especially if your applications are latency-sensitive or resource-constrained. By reducing the number of deployed agents, you minimize CPU and memory usage, which can improve response times and overall application performance.
- **Sufficient traffic coverage:** Since your load balancer evenly distributes traffic across all servers, an agent on one server would still monitor representative traffic. In many cases, this can provide enough data for security and monitoring purposes without the need to instrument every instance.

## Deploy selected agents in Kubernetes (K8s)

In a Kubernetes environment, you can manage which pods in a deployment are instrumented with an agent by controlling the number of replicas that run with the agent. Use this strategy as a guide:

1. **Nodes taints:** Use node taints and tolerations to dedicate specific nodes for pods with agents. Label one node with a specific taint and schedule the agent-enabled pod to run on that node, leaving the others unaffected.
2. **Pod affinity:** Use pod affinity and anti-affinity to control where your agent-enabled pods run. You can create an affinity rule that only schedules the agent-enabled pod to a particular node or pod, ensuring it doesn't replicate across the entire farm.

3. **Deployment overrides:** Use a custom deployment manifest where you set up two deployments: one for the regular application pods and another for the agent-enabled pods. For the agent-enabled deployment, you can set replicas: on to ensure only one instance runs with the agent.

### Example: Selective agent deployment in K8s

In this YAML example, only one replica of the application has the agent enabled.

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: app-with-agent
spec:
  replicas: 1
  template:
    metadata:
      labels:
        app: my-app
        agent: enabled
    spec:
      containers:
        - name: app-container
          image: my-app-image
          env:
            - name: ENABLE_AGENT
              value: "true"
```

### Deploy selected agents with Docker Swarm

Similar to what you can do with K8s, you can use service scaling and constraints in Docker Swarm, as described in this strategy:

1. **Service constraints:** Use service constraints to deploy the agent-enabled container to a specific node or set of nodes. For example, you can label a node and ensure that only one agent-enabled service runs on that node.

#### Bash example

This example deploys the agent-enabled instance to a node with the label `agent == true`, leaving other nodes unaffected.

```
docker service create \
  --replicas 1 \
  --constraint "node.labels.agent == true" \
  --env ENABLE_AGENT=true \
  my-app-image
```

2. **Task replication:** In Docker Swarm, you can use two services: one with the regular application and one with the agent. Scale the regular service across all nodes and the agent-enabled service to just one replica.

#### Bash example

This example shows how creates a setup where most of the containers run without the agent, but one instance includes the agent for monitoring purposes.

```
docker service create --replicas 5 my-app-image # Regular service
docker service create --replicas 1 --env ENABLE_AGENT=true my-app-image
# Agent-enabled service
```

### Troubleshooting and testing recommendations

Deploying the agent to only one server in a web farm can introduce issues with traffic routing. Since your load balancer distributes traffic across all servers, you can't always guarantee that test traffic

will consistently go to the server with the installed agent. Verifying results can be more difficult, because some traffic may bypass the instrumented server. You may observe incomplete data or gaps in monitoring because not all traffic is routed to the correct server.

In such cases, you need to investigate your load balancer settings: Consider the following :

- **Session affinity (sticky sessions):** Ensure that your load balancer supports session affinity, which can route repeat requests from the same client to the same server. By enabling sticky sessions, you can direct all test traffic from a specific user or IP address to the server with the agent, improving consistency during testing.
- **Targeted testing:** You might need to use a load balancer feature that allows for weighted routing or manual targeting of specific servers for certain traffic. This feature would let you send your test traffic to the server with the agent, ensuring that the agent processes it.

## Flow maps

The application flow map provides an interactive view of where data and resources are shared within your organization and beyond it.

Every time you exercise an application, Contrast uses data reported from your Contrast agent to create a detailed diagram of your application, the layers of technologies within it and the back-end systems to which it connects. As more applications are exercised within your organization and their back-end systems are identified by the agent, Contrast also identifies which applications are connected to the application you're currently viewing by shared back-end systems.

When you [view a flow map \(page 671\)](#), you can see the entire landscape of systems and resources that are associated with the application. By focusing on connections between individual systems and applications, you can also determine if users and connected applications in your organization have appropriate access to the current application and sensitive data potentially associated with it. Learn more about [understanding flow maps \(page 672\)](#).

The agent performs application matching through string credentials. Other instrumented applications that share common string credentials - for example, REST endpoints, database connection, or other unique host and port combinations - are displayed as connected applications.



### NOTE

Users who [don't have access \(page 1446\)](#) to view details for a connected application, won't see that application in the flow map.

## View flow maps

The application flow map provides an interactive view of where data and resources are shared within your organization and beyond it.

To view the flow map for an application:

1. Select **Applications** in the header and select the name of an application.
2. Click on the **Flow map** tab.
3. Here you will see three connected sections: **Application Architecture**, **Back-End Systems** and **Connected Applications**. Learn more about [understanding flow map data \(page 672\)](#).

## Understand flow maps

The application flow map provides an interactive view of where data and resources are shared within your organization and beyond it.

When you [view a flow map \(page 671\)](#) for an application, the information is organized into three connected sections:

- **Application architecture:** This section breaks down the view, presentation and service layers of the application's front end. You can also see foundational information about the application, including the environments in which it's deployed, letter grade, vulnerability statuses and attack status. There are three layers to this section:
  - **View:** This column displays the layer of technologies that determine what a browser sees and processes.
  - **Presentation:** This column displays the layer of libraries that generates the application view.
  - **Service:** This column displays the layer comprised of the database, LDAP driver or back-end code performing the application logic.

Hover on an item in any of the lists to see how many instances of each type of library are used in the application, or click on the library to go to the library's page. If the agent reports any vulnerabilities, a warning icon appears beside the library in which they were found; hover over the icon for links to the vulnerabilities' **Overview** pages.

- **Back-end systems:** These columns display each of the systems to which your application is connected. Hover on the cylinder icon for databases, the globe icon for URLs, or the plug icon for LDAP databases to see more details on each system; click on an icon to highlight its connection to other applications. A solid line with lock indicates that the connection is encrypted; a dashed line shows that the connection is unencrypted or the state of encryption is unknown.
- **Connected applications:** This column lists each of the applications that are connected to the primary application by a back-end system. To see connected applications that meet specific criteria, click the funnel icon to select filters from the dropdown, such as environment, application language and custom tags. The menu also shows session metadata fields for the primary application (not the connected applications), if available. Select **See Flowmap** to go to the **Flow Map** tab for that application.



### NOTE

If the agent isn't currently reporting data for the current application, the **Back-end systems** and **Connected applications** sections are left blank.



### TIP

If the application is being accessed by another user while you're viewing the flow map, the **Browser** tab appears with a list of the browsers on which it's being accessed. Hover over the icons to see more details, such as the browser type and version.

## Scans

Contrast Scan is a static application security testing (SAST) tool that lets you quickly scan code to identify vulnerabilities in early stages of development.

You can use these scan methods:

- **Hosted:** Use this scan method if you are able to upload code to the Contrast platform. To start a scan, use the Contrast web interface. Scan results are posted in the Contrast web interface.
- **CLI:** Use this scan method if you prefer to use CLI commands to upload code to the Contrast platform. Scan results are posted in the Contrast web interface or an integration such as GitHub or Jenkins.
- **Contrast Scan local engine:** Use this scan method for code on your local system. The Contrast platform receives the results but you don't upload local code. Scan results are posted in the Contrast web interface or in an integration such as GitHub or Jenkins.

Depending on the type of code you submit for scanning, Contrast Scan uses one of these scan engines:

- **Java binary:** Scans Java JAR or WAR files.  
The Java binary scan supports only web applications (applications that handle HTTP traffic). This type of scan has a more narrow focus than a source code scan. It looks for data that comes from an untrusted source, such as user input and gets to a dangerous sink, like an SQL statement, without sanitization. The scan doesn't report on code that is not security relevant. This type of scan uses Scan policies (for example: the code contains dangerous potential sink calls or the calls or entry points allow untrusted data to enter the application) to find security-relevant code.
- **Source code** Scans artifacts for [most languages](#) ([page 697](#)).  
This type of scan has a wider focus than a Java binary scan. It searches the code for potential vulnerabilities based on a rule set. The results are typically less accurate than a Java binary scan.

## Scan feature comparison

This table lists the features that each scan method supports.

| Features                                    | Scan local engine | Contrast hosted platform | CLI |
|---|-------------------|--------------------------|-----|
| <b>Scan types</b>                           |                   |                          |     |
| Multi-language source code scan             | ✓                 | ✓                        | ✓   |
| Java binary                                 | ✓                 | ✓                        | ✓   |
| Upload source code to Contrast platform     | ×                 | ✓                        | ✓   |
| <b>File size</b>                            |                   |                          |     |
| Max file size =1GB                          | ×                 | ✓                        | ✓   |
| <b>Integrations</b>                         |                   |                          |     |
| SCM integration with GitHub action          | ✓                 | ×                        | ✓   |
| Pipeline integration (for example, Jenkins) | ✓                 | ×                        | ✓   |
| Branch support                              | ✓                 | ×                        | ×   |
| Fail builds                                 | ✓                 | ×                        | ✓   |
| <b>Customizations</b>                       |                   |                          |     |
| Timeout settings                            | ✓                 | ×                        | ×   |
| Memory settings                             | ✓                 | ×                        | ×   |
| Resource group assignments                  | ✓                 | ✓                        | ✓   |
| File exclusions                             | ✓                 | ×                        | ×   |

## Scan tasks

In Contrast Scan, you can:

- [Run scans locally](#) ([page 714](#))
- [Create a scan project](#) ([page 706](#))
- [Archive a scan project](#) ([page 1187](#))
- [Delete a scan project](#) ([page 707](#))
- [Monitor scans](#) ([page 711](#))
- [Analyze scan results](#) ([page 1168](#))

- [Start a new scan \(page 710\)](#)
- [Cancel a scan \(page 711\)](#)
- [Change scan settings \(page 1186\)](#)
- [Use Contrast Scan with GitHub repositories \(page 1165\)](#)
- [Generate SAST Attestation report \(page 712\)](#)
- [Set notifications for failed scans \(page 1458\)](#)

## See also

[Scan supported languages \(page 697\)](#)

## Scan release notes

### Scan source code engine

#### August 2024: Scan source code engine

**Release date:** August 29, 2024

These updates apply to the source code scan engine which you can use with the Scan local engine and a hosted deployment of Contrast.

#### New and improved:

- Made a significant number of improvements across languages to reduce false positives.
- Improved parsing of Natural source code to reduce false positives and improve scan performance.
- Improved parsing of COBOL source code to reduce false positives and improve scan performance.
- Updated the supported version of Kotlin to 1.6.0.
- Added support for scanning of Java 16 and 17 files.
- Improved support for Vue.JS.

#### Bug fixes:

- Fixed a bug that caused the source code scan engine to fail for all scans.

### Scan engine and Scan local engine

#### Scan local engine 1.1.7

**Release date:** April 15, 2025

#### New and improved:

- Added new options to only fail a scan on a branch if it would introduce new vulnerabilities.

#### Bug fixes:

- Multiple fixes to improve Scan local engine behavior and performance.

#### Checksum:

- **MD5 checksum:** fa99a209ba3662a198df735fa4c795eb
- **SHA1 checksum:** 1c78f9570e20c18b01c4b609904f4bdf9cfe8eff
- **SHA256 checksum:** e4316485cba75bf032cfcd4537d1c9281bf8813bac03d84004e55b5bf415ec99

**NOTE****How to generate a checksum**

- **MD5:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-scan-runner/X.X.XX/sast-local-scan-runner-X.X.XX.jar.md5 -o sastXX.md5
```

- **SHA:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-scan-runner/X.X.XX/sast-local-scan-runner-X.X.X.jar.sha1 -o sastXX.sha
```

For both types of checksums, replace `x.x.xx` with the version of the engine you are downloading and validating with a checksum. For example, for the 1.1.0 version of the engine, replace `x.x.xx` with `1.1.0`, and for the output (`SastXX.sha` or `MD5`), a value to represent the current version, such as `10`.

**Application signing verification**

To verify that Contrast created and signed the Scan local engine that you downloaded, use this command:

```
jarsigner -verify -verbose -certs sast-local-scan-runner-0.0.XX.jar
```

Replace `xx` with the version of the Scan local engine that you want to verify.

**Scan local engine 1.1.6**

**Release date:** March 18, 2025

**New and improved:**

- Added these rules:
  - Improper Neutralization of Special Elements used in an SQLCommand (SQL injection) in [ASP.NET Core | Open-source web framework for .NET](#) applications.
  - Improper Control of Remote Code Execution for JavaScript.
- Updated Log4j libraries throughout codebase.
- Added the ability to identify and upload total lines of code and files scanned.

**Bug fixes:**

- Fixed a stack overflow error resulting from PHP scans under specific circumstances.
- Fixed an issue where the engine failed to parse some C# extension methods properly.

**Checksum:**

- **MD5 checksum:** fa99a209ba3662a198df735fa4c795eb
- **SHA1 checksum:** 1c78f9570e20c18b01c4b609904f4bdf9cfe8eff

- **SHA256 checksum:** e4316485cba75bf032cfcd4537d1c9281bf8813bac03d84004e55b5bf415ec99



## NOTE

### How to generate a checksum

- **MD5:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://  
$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-  
Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-  
scan-runner/X.X.XX/sast-local-scan-runner-X.X.XX.jar.md5 -o  
sastXX.md5
```

- **SHA:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://  
$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-  
Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-  
scan-runner/X.X.XX/sast-local-scan-runner-X.X.X.jar.sha1 -o  
sastXX.sha
```

For both types of checksums, replace `x.x.xx` with the version of the engine you are downloading and validating with a checksum. For example, for the 1.1.0 version of the engine, replace `x.x.xx` with `1.1.0`, and for the output (SastXX.sha or MD5), a value to represent the current version, such as 10.

## Application signing verification

To verify that Contrast created and signed the Scan local engine that you downloaded, use this command:

```
jarsigner -verify -verbose -certs sast-local-scan-runner-0.0.XX.jar
```

Replace `xx` with the version of the Scan local engine that you want to verify.

## Scan local engine 1.1.5

**Release date:** December 10, 2024

### New and improved:

- Added support for Ruby source code scanning.

### Checksum:

- **MD5 checksum:** fa99a209ba3662a198df735fa4c795eb
- **SHA1 checksum:** 1c78f9570e20c18b01c4b609904f4bdf9cfe8eff
- **SHA256 checksum:** e4316485cba75bf032cfcd4537d1c9281bf8813bac03d84004e55b5bf415ec99



**NOTE****How to generate a checksum**

- **MD5:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-scan-runner/X.X.XX/sast-local-scan-runner-X.X.XX.jar.md5 -o sastXX.md5
```

- **SHA:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-scan-runner/X.X.XX/sast-local-scan-runner-X.X.X.jar.sha1 -o sastXX.sha
```

For both types of checksums, replace `x.x.xx` with the version of the engine you are downloading and validating with a checksum. For example, for the 1.1.0 version of the engine, replace `x.x.xx` with `1.1.0`, and for the output (`SastXX.sha` or `MD5`), a value to represent the current version, such as `10`.

**Application signing verification**

To verify that Contrast created and signed the Scan local engine that you downloaded, use this command:

```
jarsigner -verify -verbose -certs sast-local-scan-runner-0.0.XX.jar
```

Replace `xx` with the version of the Scan local engine that you want to verify.

**Scan local engine 1.1.4**

**Release date:** November 26, 2024

**New and improved:**

- Added a new `--metadata` option for the Scan local engine that lets you specify metadata when you create a scan project.
- Added optional support for Rust and Terraform using the Semgrep open source engine. If you want to scan code in these languages and send the results to the Contrast web interface, you must download the Semgrep engine. If the Scan local engine identifies the presence of either of these languages, it sends the relevant files to Semgrep and combines the SARIF results with the file that Contrast creates.

[Scan languages with the Semgrep engine \(page 1167\)](#) provides additional details about this feature.

**Checksum:**

- **MD5 checksum:** `fa99a209ba3662a198df735fa4c795eb`
- **SHA1 checksum:** `1c78f9570e20c18b01c4b609904f4bdf9cfe8eff`
- **SHA256 checksum:** `e4316485cba75bf032cfcd4537d1c9281bf8813bac03d84004e55b5bf415ec99`

**NOTE****How to generate a checksum**

- **MD5:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-scan-runner/X.X.XX/sast-local-scan-runner-X.X.XX.jar.md5 -o sastXX.md5
```

- **SHA:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-scan-runner/X.X.XX/sast-local-scan-runner-X.X.X.jar.sha1 -o sastXX.sha
```

For both types of checksums, replace `x.x.xx` with the version of the engine you are downloading and validating with a checksum. For example, for the 1.1.0 version of the engine, replace `x.x.xx` with `1.1.0`, and for the output (`SastXX.sha` or `MD5`), a value to represent the current version, such as `10`.

**Application signing verification**

To verify that Contrast created and signed the Scan local engine that you downloaded, use this command:

```
jarsigner -verify -verbose -certs sast-local-scan-runner-0.0.XX.jar
```

Replace `xx` with the version of the Scan local engine that you want to verify.

**Scan local engine 1.1.3**

**Release date:** October 8, 2024

**New and improved:**

- The `--memory` option now works with the binary scan engine.  
**Recommendation:** Keep your memory allocation for the binary scan engine at 12GB or higher. A lower memory allocation can adversely affect the binary scan engine's performance and accuracy.
- To reduce noise and potential false positives, `.h` files are no longer implicitly scanned for C, C++, or ObjectiveC languages.  
If, during the course of scanning these languages, the source code calls a `.h` file, then that file is scanned as part of the overall code analysis.

**Checksum:**

- **MD5 checksum:** `fa99a209ba3662a198df735fa4c795eb`
- **SHA1 checksum:** `1c78f9570e20c18b01c4b609904f4bdf9cfe8eff`
- **SHA256 checksum:** `e4316485cba75bf032cfcd4537d1c9281bf8813bac03d84004e55b5bf415ec99`

**NOTE****How to generate a checksum**

- **MD5:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://  
$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-  
Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-  
scan-runner/X.X.XX/sast-local-scan-runner-X.X.XX.jar.md5 -o  
sastXX.md5
```

- **SHA:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://  
$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-  
Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-  
scan-runner/X.X.XX/sast-local-scan-runner-X.X.X.jar.sha1 -o  
sastXX.sha
```

For both types of checksums, replace `X.X.XX` with the version of the engine you are downloading and validating with a checksum. For example, for the 1.1.0 version of the engine, replace `X.X.XX` with `1.1.0`, and for the output (`SastXX.sha` or `MD5`), a value to represent the current version, such as `10`.

**Application signing verification**

To verify that Contrast created and signed the Scan local engine that you downloaded, use this command:

```
jarsigner -verify -verbose -certs sast-local-scan-runner-0.0.XX.jar
```

Replace `xx` with the version of the Scan local engine that you want to verify.

**Scan local engine 1.1.2**

**Release date:** August 29, 2024

**New and improved:**

- Added a `--level` command option that provides better logging from the multi-language scan engine. To turn on logging for a specific log level, use one of these values: `ERROR`, `WARN`, `INFO`, `DEBUG`, or `TRACE`.  
Use this option only when the Contrast Support team instructs you to do so rather than using it with all scans
- Changed the maximum log size to 20MB before creating a new log file.

**Bug fixes:**

- Due to a bug that caused the source code scan engine to fail, all customers should upgrade their local scanner to **version 1.1.2** to resume operations.  
All previous versions are now considered end of life.  
To help you understand the Contrast version control policy, [Scan local engine releases and versions \(page 917\)](#) describes the policy that applies to all future releases.

**Checksum:**

- **MD5 checksum:** 7be87ce1ab990c45e91c7060e5300ce2
- **SHA1 checksum:** e55d9fa9323dc93bc29d4f68e927763c6e5fb12b
- **SHA256 checksum:** ef8c84c1ad4549ab4e22a638dbf5d5d4d5700f6209ddcabfe66a20639880e0be



## NOTE

### How to generate a checksum

- **MD5:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-scan-runner/X.X.XX/sast-local-scan-runner-X.X.XX.jar.md5 -o sastXX.md5
```

- **SHA:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-scan-runner/X.X.XX/sast-local-scan-runner-X.X.X.jar.sha1 -o sastXX.sha
```

For both types of checksums, replace `x.x.xx` with the version of the engine you are downloading and validating with a checksum. For example, for the 1.1.0 version of the engine, replace `x.x.xx` with `1.1.0`, and for the output (`SastXX.sha` or `MD5`), a value to represent the current version, such as `10`.

## Application signing verification

To verify that Contrast created and signed the Scan local engine that you downloaded, use this command:

```
jarsigner -verify -verbose -certs sast-local-scan-runner-0.0.XX.jar
```

Replace `xx` with the version of the Scan local engine that you want to verify.

### Scan 1.1.1

**Release date:** June 14, 2024

#### New and improved:

- The Scan local engine now creates a unique output folder for each scan. The location of the folder name is: `.contrast-scan/<CURRENT_TIMESTAMP>`. where `<CURRENT_TIMESTAMP>` is the date and time when the scan ran.

#### Bug fixes:

- Updated configuration for C/C++ languages to avoid duplication of results.  
In previous versions of the Scan local engine, scans analyzed `.h` and `.c` files using C++ and C rules. This behavior generated duplicate vulnerabilities. The latest version of the scan engine no longer generates duplicate vulnerabilities. If you had this issue previously, when you run the new version of the scan engine, it will change the status of the duplicates to **Remediated**.

**IMPORTANT**

The new multi-language source code scan engine is now version 1.1.1. Versions 1.0.0, 1.0.1, and 1.0.2, 1.0.5, and 1.0.6 are considered internal test and beta versions of the multi-language scan engine and are not available for download by Contrast customers.

**Checksum:**

- **MD5 checksum:** 4ad02dbb651afd65aa34540b74070460
- **SHA1 checksum:** 31fe66afb757422aab0cb9f59fc4f1d858146bce
- **SHA256 checksum:** 3f7fe7b9940c78b98721fdd865a058e0e3b61b65e45cd905615b91a828128ff7

**NOTE****How to generate a checksum**

- **MD5:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-scan-runner/X.X.XX/sast-local-scan-runner-X.X.XX.jar.md5 -o sastXX.md5
```

- **SHA:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-scan-runner/X.X.XX/sast-local-scan-runner-X.X.X.jar.sha1 -o sastXX.sha
```

For both types of checksums, replace `x.x.xx` with the version of the engine you are downloading and validating with a checksum. For example, for the 1.1.0 version of the engine, replace `x.x.xx` with `1.1.0`, and for the output (`SastXX.sha` or `MD5`), a value to represent the current version, such as `10`.

**Application signing verification**

To verify that Contrast created and signed the Scan local engine that you downloaded, use this command:

```
jarsigner -verify -verbose -certs sast-local-scan-runner-0.0.XX.jar
```

Replace `xx` with the version of the Scan local engine that you want to verify.

**Scan 1.1.0**

**Release date:** April 30, 2024

**New and improved:**

- Added these exclusions to the Java binary scanner: `com.azure`, `org.apache`, and `com.nimbusds`.
- Added a `--severity` parameter for the Scan local engine to let you get a build fail status. The specified values is the minimum level of severity that returns a build fail status code that you can use to gate builds in pipelines.  
For example, if you specify `--severity high`, a finding of that severity or higher returns a build fail status code.
- Added support for multi-branch scanning when using the GitHub action for the Scan local engine.
- You can now [download the Scan local engine \(page 917\)](#) with a reusable script.

**Bug fixes:**

- Improved the Scan architecture to allow scanning of larger source code repos and faster processing of a large amount of findings.

**IMPORTANT**

The new multi-language source code scan engine is now version 1.1.0. Versions 1.0.0, 1.0.1, and 1.0.2, 1.0.5, and 1.0.6 are considered internal test and beta versions of the multi-language scan engine and are not available for download by Contrast customers.

**Checksum:**

- **MD5 checksum:** 4ad02dbb651afd65aa34540b74070460
- **SHA1 checksum:** 31fe66afb757422aab0cb9f59fc4f1d858146bce
- **SHA256 checksum:** 3f7fe7b9940c78b98721fdd865a058e0e3b61b65e45cd905615b91a828128ff7

**NOTE****How to generate a checksum**

- **MD5:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://  
$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-  
Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-  
scan-runner/X.X.XX/sast-local-scan-runner-X.X.XX.jar.md5 -o  
sastXX.md5
```

- **SHA:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://  
$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-  
Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-  
scan-runner/X.X.XX/sast-local-scan-runner-X.X.X.jar.shal -o  
sastXX.sha
```

For both types of checksums, replace `X.X.XX` with the version of the engine you are downloading and validating with a checksum. For example, for the 1.1.0 version of the engine, replace `X.X.XX` with `1.1.0`, and for the output (`SastXX.sha` or `MD5`), a value to represent the current version, such as `10`.

## Application signing verification

To verify that Contrast created and signed the Scan local engine that you downloaded, use this command:

```
jarsigner -verify -verbose -certs sast-local-scan-runner-0.0.XX.jar
```

Replace `xx` with the version of the Scan local engine that you want to verify.

### Scan 1.0.9

**Release date:** March 15, 2024



#### NOTE

This version of the Scan local engine is available by request only. Contrast is not publishing checksum information at this time.

To request access to this version of the Scan local engine, follow your normal Contrast support process.

Contrast plans to make the new Scan local engine generally available in the near future.

### New and improved:

- Added a `--timeout` CLI option that lets you control the maximum time the multi-language source code scan engine scans the specified source code.  
The value for this option is a specified number of minutes. This option applies to each language. For example, if you set the value of this option to 120 minutes and your repo contains four languages, potentially, the scan can take up to eight hours (120 minutes x 4 languages).  
This feature is only available for the Contrast local scan engine only.
- Added support for file and folder exclusions.  
To use this feature, add a file named `.contrast-scan.json` to the root folder of the source code you are going to scan. [Exclude files and folders \(page 924\)](#) describes how to use this feature.  
This feature is only available for the Contrast local scan engine and is only supported for multi-language source code scans.  
The file format for the JSON file is:

```
// File name ".contrast-scan.json"
{
  "excludes": [
    "**/MavenWrapperDownloader.java",
    "**/*.js"
  ]
}
```

- Scans automatically fail if the multi-language source code scan engine doesn't find any technologies in the submitted code.

### Bug fixes:

- Fixed a bug that could cause a race condition, resulting in slow performance.
- Fixed a bug that caused incorrect date formats to be generated in the SARIF output. The incorrect formats caused which caused errors when using the SARIF output in Github.

**IMPORTANT**

The new multi-language source code scan engine is now version 1.0.9. Versions 1.0.0, 1.0.1, and 1.0.2, 1.0.5, and 1.0.6 are considered internal test and beta versions of the multi-language scan engine and are not available for download by Contrast customers.

**Application signing verification**

To verify that Contrast created and signed the local scan engine that you downloaded, use this command:

```
jarsigner -verify -verbose -certs sast-local-scan-runner-0.0.XX.jar
```

Replace `xx` with the version of the local scan engine that you want to verify.

**Scan 1.0.8**

**Release date:** February 15, 2024

**NOTE**

This version of the local scan engine is available by request only. Contrast is not publishing checksum information at this time.

To request access to this version of the local scan engine, follow your normal Contrast support process.

Contrast plans to make the new local scan engine generally available in the near future.

**New and improved:**

- Added support for scanning in the repo for Github customers.  
Starting with 1.0.8, Scan supports a new Github action that supports main branch scanning in a Github repo. This feature supports failing builds based on the presence of a specified vulnerability severity (or higher). Learn more at [Use Contrast Scan with GitHub repositories \(page 1165\)](#).
- Increased the minimum memory requirement for the multi-language scan engine to 8 GB and the timeout setting to 60 minutes. This does not replace the minimum memory requirement of 12 GB when scanning .JAR and .WAR files using the Java binary scanner. We continue to recommend that all users of the local scan engine should ensure that 12 GB of memory is available when running scans.

**Bug fixes:**

- Addressed a number of issues that prevented some languages from being correctly identified by the multi-language source code scan engine when scanned by the local scan engine. All languages identified by the multi-language source code scan engine should now correctly identify and be scanned.



**IMPORTANT**

The new multi-language source code scan engine is now version 1.0.8. Versions 1.0.0, 1.0.1, and 1.0.2, 1.0.5, and 1.0.6 are considered internal test and beta versions of the multi-language scan engine and are not available for download by Contrast customers.

**Application signing verification**

To verify that Contrast created and signed the local scan engine that you downloaded, use this command:

```
jarsigner -verify -verbose -certs sast-local-scan-runner-0.0.XX.jar
```

Replace `xx` with the version of the local scan engine that you want to verify.

**Scan 1.0.7**

**Release date:** January 25, 2024

**NOTE**

This version of the local scan engine is available by request only. Contrast is not publishing checksum information at this time.

To request access to this version of the local scan engine, follow your normal Contrast support process.

Contrast plans to make the new local scan engine generally available in the near future.

**New and improved:**

- Increased the memory that the multi-language source code scan engine uses to 2G to better support larger code bases. The minimum memory requirement when using the local scan engine is still 12GB.
- Added a `--memory` parameter to the CLI that you can use to override the allocated memory for the multi-language source code scan engine.
- Added additional logging to capture the parameters used when invoking the local scan engine. This logging captures the entire invocation command for the local scan engine (for example, `-r`, `-p` and so forth) for use when troubleshooting errors.

**IMPORTANT**

The new multi-language source code scan engine is now version 1.0.7. Versions 1.0.0, 1.0.1, and 1.0.2, 1.0.5, and 1.0.6 are considered internal test and beta versions of the multi-language scan engine and are not available for download by Contrast customers.

**Bug fixes:**

- Addressed an issue when scanning .NET applications that resulted in source code being incorrectly identified
- Addressed an issue that caused the multi-language scan engine to ignore ABAP code when presented in a code artifact

### Application signing verification

To verify that Contrast created and signed the local scan engine that you downloaded, use this command:

```
jarsigner -verify -verbose -certs sast-local-scan-runner-0.0.XX.jar
```

Replace **xx** with the version of the local scan engine that you want to verify.

### Scan 1.0.4

**Release date:** December 14, 2023



#### NOTE

This version of the local scan engine is available by request only. Contrast is not publishing checksum information at this time.

To request access to this version of the local scan engine, follow your normal Contrast support process.

Contrast plans to make the new local scan engine generally available in the near future.

### Bug fixes:

- Fixed a bug that prevented VB.NET and Scala source code from being correctly identified and scanned by the multi-language engine.



#### IMPORTANT

The new multi-language source code scan engine is now version 1.0.4. Versions 1.0.0, 1.0.1, and 1.0.2 are considered internal test and beta versions of the multi-language scan engine and are not available for download for Contrast customers.

### Application signing verification

To verify that Contrast created and signed the local scan engine that you downloaded, use this command:

```
jarsigner -verify -verbose -certs sast-local-scan-runner-0.0.XX.jar
```

Replace **xx** with the version of the local scan engine that you want to verify.

### Scan 1.0.3

**Release date:** November 2023

**NOTE**

Local Scan Engine 1.0.3 is currently on restricted release. As a result, we are not providing checksum information at this time.

To get access to this version, open a [support ticket](#) to request it. We apologize for this inconvenience and are working hard to address this issue as soon as possible.

**New and improved:**

November 29, 2023

- Fixed an issue in role-based access control authentication that could trigger a 403 error when you try to assign a project to an empty resource group or when a user has access to multiple resource groups and they do not specify one.  
If role-based access control is turned on, the `-r <ResourceGroupName>` option in the Contrast CLI is now mandatory when you create a scan project.

November 8, 2023

- The Contrast local scan engine now supports the ability to scan source code for over 25 languages. For a complete list of supported languages, see [Contrast Scan supported languages \(page 697\)](#).
- The local scan engine can now run natively under Windows environments running a suitable JVM.
- Fixed an issue where using spaces in the path for an artifact to be scanned caused a fatal scan error.
- Removed an unneeded log from the local scan engine, reducing overall disk space utilization when scanning Java binary files (JAR or WAR files).
- Fixed an issue that caused the local scan engine to fail when running under Alpine Linux.

**IMPORTANT**

The new multi-language source code scan engine is now version 1.0.3. Versions 1.0.0, 1.0.1, and 1.0.2 are considered internal test and beta versions of the multi-language scan engine and are not available for download for Contrast customers.

**Application signing verification**

To verify that Contrast created and signed the local scan engine that you downloaded, use this command:

```
jarsigner -verify -verbose -certs sast-local-scan-runner-0.0.XX.jar
```

Replace `xx` with the version of the local scan engine that you want to verify.

**Scan 0.0.63**

**Release date:** July 24, 2023

**Bug fixes:**

- Fixed a bug that prevented the local scanner from reporting all vulnerabilities found across multiple JAR files. Only the last JAR file scanned in the ZIP file was reported.

**Checksum:**

- **MD5 checksum:** f57f9174d0643832f9e38b95998fe280
- **SHA checksum:** 8b2f5680111c5a4e5999a3449ee871bb822d27f6

**NOTE****How to generate a checksum**

- **MD5:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-scan-runner/X.X.XX/sast-local-scan-runner-X.X.XX.jar.md5 -o sastXX.md5
```

- **SHA:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-scan-runner/X.X.XX/sast-local-scan-runner-X.X.X.jar.shal -o sastXX.sha
```

For both types of checksums, replace `x.x.xx` with the version of the engine you are downloading and validating with a checksum. For example, for the 0.0.60 version of the engine, replace `x.x.xx` with `0.0.60`, and for the output (`SastXX.sha` or `MD5`), a value to represent the current version, such as `60`.

**Application signing verification**

To verify that Contrast created and signed the local scan engine that you downloaded, use this command:

```
jarsigner -verify -verbose -certs sast-local-scan-runner-0.0.XX.jar
```

Replace `xx` with the version of the local scan engine that you want to verify.

**Scan 0.0.60**

**Release date:** May 22, 2023

**New and improved:**

- Added the ability to specify a resource group as a parameter in the local scan engine when you scan a project for the first time.  
To use this feature, your organization must have role-based access control enabled and you require sufficient permissions to create a new project (Manage Project Role or higher).  
Specify the resource group name using the `-r` parameter.

**Checksum:**

- **MD5 checksum:** 0fa38c5c9e46e3b2c6bdb2d2ed3baa20
- **SHA checksum:** 76fe00f7d70d45176904a2b62a9d1083f0731a03

**NOTE****How to generate a checksum**

- **MD5:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-scan-runner/X.X.XX/sast-local-scan-runner-X.X.XX.jar.md5 -o sastXX.md5
```

- **SHA:** Use the following command:

```
curl -L -H 'Accept: application/vnd.github.v3.raw' -s https://$CONTRAST_GITHUB_PAT@maven.pkg.github.com/Contrast-Security-Inc/sast-local-scan-runner/com.contrastsecurity.sast-local-scan-runner/X.X.XX/sast-local-scan-runner-X.X.X.jar.shal -o sastXX.sha
```

For both types of checksums, replace `x.x.xx` with the version of the engine you are downloading and validating with a checksum. For example, for the 0.0.60 version of the engine, replace `x.x.xx` with `0.0.60`, and for the output (`SastXX.sha` or `MD5`), a value to represent the current version, such as `60`.

**Application signing verification**

To verify that Contrast created and signed the local scan engine that you downloaded, use this command:

```
jarsigner -verify -verbose -certs sast-local-scan-runner-0.0.XX.jar
```

Replace `xx` with the version of the local scan engine that you want to verify.

**Scan 0.0.56 - 0.0.59**

**Release date:** April 6, 2023

**New and improved:**

- Support for multi-JAR scanning

This release adds the ability to scan multiple JAR files as one artifact. You can add multiple JAR files to a ZIP file and scan it as a single artifact.

To scan a multi-JAR ZIP file, package the JAR files at the top level in a ZIP file and scan it using the Scan local engine, as normal. For example:

```
multiple-jar-artifact.zip
-> artifact1.jar
-> artifact2.jar
-> artifact3.jar
```

Once completed, the Contrast web interface displays the scan as a single project under the Scans tab.

**Bug fixes:**

Releases 0.0.57 through 0.0.59 contained internal bug fixes that had no effect on the Scan behavior or performance.

## Scan web interface

### May 2025 Scan web interface

**Release date:** May 20, 2025

**New and improved:**

- Added a visual representation of total lines of code scanned for individual languages.
- Added the ability to archive multiple scan projects at the same time.
- Added the ability to exclude files and folders with scan you run in the Contrast web interface.
- Added the ability to configure dynamic scoring for scan projects at the organization level.

### April 2025 Scan web interface

**Release date:** April 15, 2025

**New and improved:**

- Added a visual representation of total lines of code scanned for individual languages.
- Added a Created time column to the Scan project list that shows the date and time when you created a scan project.  
This feature applies to new scans only.
- Added a new tab on the Scan project page that shows files and rule that were excluded based on file exclusions and policies.  
This tab is available only for scans with the Contrast Scan local engine.
- The Contrast web interface now shows a warning message when you upload a code artifact to be scanned that navigating away before the upload completes cancels the upload operation.
- Added support to configure notifications for failed scans in the Contrast web interface.

### March 2025 Scan web interface

**Release date:** March 18, 2025

**New and improved:**

- Added the ability to see the total number of lines of code scanned during a particular scan.
- Added the ability to see the total number of files scanned during a particular scan.
- Added a visual representation of total lines of code scanned for individual languages.
- Added the ability to see the version of the local scanner used during a scan.
- Added a new tab on the Scan project page that shows files that were excluded based on file exclusions and policies.

### February 2025 Scan web interface

**Release date:** February 20, 2025

**New and improved:**

- Adjusted the default sorting of projects.  
By default, projects are now automatically sorted by last scan date in ascending order (the newest project is at the top, the oldest is at the bottom).
- Added a 90 day option to the Last Scan filter on the Scan project page.
- For organizations with role-based access control enabled, the Scan project page now shows the resource groups with which the project is associated.  
The displayed resource groups are based on the role for the logged-in user. Different users could see different resource groups. For example, a standard user could see different resource groups than a user with administrator permissions.

- Added a Branch tab to the Scan project page.

This tab is visible only when you run scans using the branch command with the Scan local engine.

## January 2025 Scan web interface

**Release date:** January 21, 2025

### New and improved:

- Added more details about the source of a vulnerability.  
Where relevant, the vulnerability overview displays the source file name, line number and code snippet as well as the sink file name, line number and code snippet.
- Added more details for the reason a scan failure.  
In the Scan history, you can hover over a scan fail message to see a tool tip that displays information on the reason for a scan failure.

## Archive

### January 2024 - December 2024

#### December 2024 Scan web interface

**Release date:** December 10, 2024

### New and improved:

- Added support for dynamic scoring when you change the status of a vulnerability to **Not a Problem**.

### Bug fixes:

- Fixed an issue that prevented the display of metadata values as tags for a scan project.

#### November 2024 Scan web interface

**Release date:** November 26, 2024

### New and improved:

- Added support for metadata for scan projects.  
Metadata consists of a key-value pair that is displayed on the Scan project page. You have the option of restricting scan project creation when required metadata is missing.  
Currently, this feature is available for new scan projects only.
- For enhanced clarity, the Scan vulnerability list now shows the names of source files and line numbers.

### Bug fixes:

- Fixed a bug that prevented the Language column on the Scan project page from correctly reflecting in scope languages when you selected other filters.
- Fixed a bug that caused a scan to appear as though it failed due to overly large code snippets being present in the vulnerability overview.

#### October 2024 Scan web interface

**Release date:** October 8, 2024 (updated October 17, 2024)

### New and improved:

- When you download a CSV file that contains more than 2,000 vulnerabilities, you are now prompted to select individual pages of results that contain up to 2,000 vulnerabilities. For example, if a report

contains 5,400 vulnerabilities, when you download it, you have the option of selecting Page 1, Page 2, or Page 3. You download each page individually and can combine them afterwards.

Selecting multiple pages is not supported.

- Increased the number of vulnerabilities included in the Attestation report from 100 to 3,000.
- Increased the number of vulnerabilities included in the General Vulnerability report to 3,000
- Added a new column to the Vulnerabilities tab that shows the CWE for the vulnerability. This column can has a filter you can use to refine the view.
- Added the ability for a user with the View, edit, and delete project action (role-based access control) or Organization Admin (organization users and groups access control) to change the severity of a detected vulnerability.

To change the severity of a vulnerability, select the current severity and select an option from the dropdown (for example, select High and change it to Critical or Medium).

If more than one vulnerability of the same type exists, you have the option of changing the severity for the selected vulnerability only or the severity of all matching vulnerabilities. Future scans do not override this severity change.

- Added a Secure Code Warrior Guidelines tab to an individual vulnerability. This tab uses the associated CWE for a particular vulnerability to provide Secure Code warrior guidelines and training video information. The purpose of this information is to provide additional context on the vulnerability and ways to resolve it.

Where possible, the guidelines reflect the vulnerability language. If the CWE does not support that language is not supported, the tab displays generic guidelines. If no guidelines or information exists for a specific CWE, the tab is not available.

## September 2024 Scan web interface

**Release date:** September 10, 2024

### New and improved:

- Fixed an issue where changing the status of a vulnerability to **Not a Problem** could change to **Remediated** if subsequent scans didn't discover the vulnerability. Now, the status of **Not a Problem** never changes.  
To have vulnerabilities assessed again, change the status to **Confirmed** or **Suspicious**.
- You can now change the status of a single vulnerability and apply that change to all vulnerabilities of the same type.

## August 2024 release: Scan web interface

**Release date:** August 29, 2024

### New and improved:

- Added the ability to create tags for Scan projects.  
[Add tags to Scan projects \(page 702\)](#) describes how to use this feature.
- **NEW:** General Vulnerability report: a PDF report based on the CSV report.  
This report includes the first 3,000 open vulnerabilities in the project based on severity and status.
- Added the ability to change the status for all vulnerabilities of the same type simultaneously.  
If you update the status of a large number of vulnerabilities (1,000 or more) at one time, this change can take several minutes to complete. Contrast displays a message in the web interface when this action is done.
- Added the ability to use the last Contrast Scan date to filter and sort scan projects.

## July 2024 release: Scan web interface

**Release date:** July 16, 2024

### New and improved:



- Added the ability to update the status of multiple vulnerabilities at the same time, as described in [Batch edit Scan vulnerability status. \(page 1176\)](#)

**Bug fixes:**

- Fixed an issue that prevented some how-to-fix information from displaying correctly for VB.NET and ABAP vulnerabilities

**June 2024 release: Scan web interface**

**Release date:** June 11, 2024

**New and improved:**

- Added the ability to see the language associated with a detected vulnerability.  
To see content in the new Language column, run a new scan in the project. The Contrast web interface doesn't display the language for older scans.  
If you are using the Scan local engine, you must use version 1.1.1. Using an earlier version of the local scan engine results in the Contrast web interface displaying **Composite** as the language. If you see this and you are using the Scan local engine, upgrade to version 1.1.1.
- Added the ability to filter views based on the language associated with a detected vulnerability.

**Bug fixes:**

- Fixed a bug that prevented the How-to-fix information from being properly displayed in the Web interface.
- Fixed an issue that caused C++ and C# vulnerabilities to be counted twice.  
As a result of this change, the system remediation workflow marks duplicate vulnerabilities as remediated for C++. For C#, these vulnerabilities remain open.

**May 2024 release: Scan web interface**

**Release date:** May 14, 2024

**Bug fixes:**

- Due to performance issues when generating the Scan attestation report, the report is now limited to generating 100 open vulnerabilities, by severity and status. Larger reports will be supported in the future.
- Addressed an issue with file uploads to Contrast where files over 500 MB could cause out of memory (OOM) errors, especially when you used the Scan CLI commands. . This fix does not increase the file upload size beyond 1GB but provides a consistent user experience between uploads to the Contrast web interface and with the CLI. If you have repos that are larger than 1 GB, consider using the Contrast Scan local engine.

**April release: Scan web interface**

**Release date:** April 25, 2024

**New and improved:**

- Enhanced the CSV report to include code snippets for each vulnerability.
- Changed the CSV report so that you can see the file name and line number from the path for each vulnerability.
- Changed the CSV report to exclude vulnerabilities with a **Remediated** and **Not a problem** status.
- Added the ability to supply a filter to the API call when generating a CSV report programmatically.
- To aid in timely generation of the CSV report and address performance issues, the CSV report is now limited to the first 2,000 open entries based on severity and status.

- Added pagination to the API when generating a CSV report so it can exceed the 2,000 line limit.

**Bug fixes:**

- Improved the Scan architecture to allow scanning of larger source code repos and faster processing of a large amount of findings.

**March release: Scan web interface**

**Release date:** March 2024

**Bug fixes:**

- Fixed a bug that could cause a race condition, resulting in slow performance in the Contrast web interface.
- Fixed a bug in the Contrast web interface that resulted in an error when specifying an underscore (\_) as part of a search parameter when searching projects.

**January release: Scan web interface and CLI**

**Release date:** January 2024

**New and improved:**

- January 25, 2024

**New and improved;**

- On the Scan project page in the Contrast web interface, you can view the languages that the multi-language source code scan engine detected.
- Added the ability to search for scan projects based on detected languages.

**Bug fixes:**

- Fixed a bug in the CLI that suggested a scan had failed when it invoked the multi-language source code scan engine.
- Fixed a bug in the CLI that prevented the list of found vulnerabilities from being displayed in the CLI output once a scan completes.
- Addressed an issue when scanning .NET applications that resulted in source code being incorrectly identified
- Addressed an issue that caused the multi-language scan engine to ignore ABAP code when presented in a code artifact

**January - December 2023****December release: Scan web interface**

**Release date:** December 2023

**New and improved:**

- December 14, 2023
  - **NEW:** You can now generate an Attestation report for your scan projects from a scan project page and from the vulnerability tab on the scan project page.
  - Removed the ability for a user to change a vulnerability status to **Fixed**. The Scan engine determines this status based on whether a vulnerability is still seen in the source code in subsequent scans.
  - Fixed a bug that prevented VB.NET and Scala source code from being correctly identified and scanned by the multi-language engine.

**November release: Scan web interface**

**Release date:** November 2023

**New and improved:**

- November 28, 2023
  - If role-based access control is turned on, creating a scan project now requires that you specify a resource group. The Create your scan project screen has a dropdown that displays a list of the resource groups assigned to the user who is creating the project. If users have a single resource group assigned to their role, this resource group is the default selection.  
In addition, users need a role that includes the **Create project** action.  
[Create a scan project \(page 706\)](#) describes this new requirement.
- November 8, 2023
  - **NEW:** Contrast Scan now provides two types of scans: Java binary for Java files, and source code for most other languages and technologies.  
When you select a source code scan, upload a ZIP file that contains the source code you want to scan.
  - **NEW:** Source code scanning is expanded to include over 25 additional languages and technologies, as listed in [Scan supported languages and technologies \(page 697\)](#). To use the expanded source code scanner, select the **Source code** option when you create a new project.
  - **For hosted customers:** Contrast Scan now supports multi-language detection for source code scanning. When you upload a ZIP file, the scan engine determines which languages are present in the ZIP file and scans each file. Contrast displays the results in a single scan project.
  - Removed the need to select a language when you create a scan project. Scan can now determine the type of code artifact you are uploading. Scan continues to support single JAR and WAR files as well as ZIP files that contain multiple JAR files or source code.
  - Added two fields to the CSV file you can download:
    - **Language:** Identifies the language for a specific vulnerability.
    - **Comment:** Shows the last comment made for a vulnerability.The CSV file populates these fields after you run a new scan for an existing project.

**June release: Scan web interface****Release date:** June 2023**New and improved**

- June 30, 2023
  - Added the ability to add a comment for a vulnerability status without changing the current status.  
The Activity tab for a specific vulnerability lets you add comments.
- June 12, 2023
  - Added the ability to see who created a project by displaying the project creator's name at the top of the Scans page and the Scan details page.
  - Added the ability to see who ran a specific scan for a project.  
The Scan history in the Scans page has a new Name column that shows the name of the individual who ran a specific scan. The Summary section of the Scan details page also shows who ran the scan.

**NOTE**

Both of these features apply to new projects and new scans. Existing projects or scans do not display the new information.

**May release: Scan web interface****Release date:** May 2023**New and improved:**

- Added support for multi-JAR scanning in the Java binary scanner.  
You can now include multiple JAR files in a single ZIP file when you use the hosted Java binary scanner (using the Contrast CLI or the Contrast web interface).  
The maximum upload size limit for a ZIP file is 1 GB.

## April release: Scan web interface

**Release date:** April 2023

### New and improved:

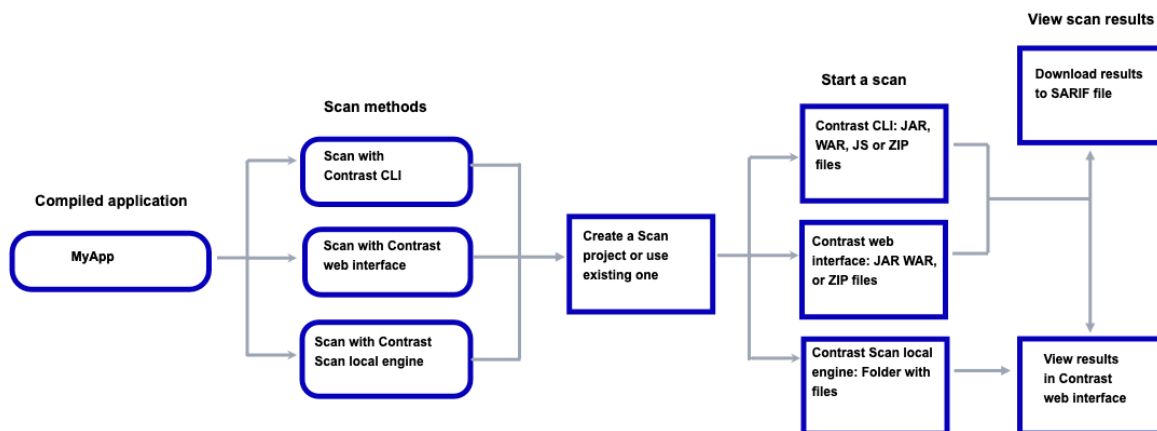
- Added a vulnerability activity tab that shows information on status changes made to vulnerabilities within a project.  
To view this tab, select the Vulnerabilities tab for selected scan project and then, select a specific vulnerability
- Added the requirement to add comments when you change the status of a vulnerability in a project.
- Added the ability to delete a project and all associated data in the Contrast web interface for users with a Manage all projects role.

## Scan process

This section provides details about the workflow for using Contrast Scan as well as the process Scan uses when analyzing your code.

## Scan workflow

This diagram illustrates the Scan workflow that you follow.



## Data entry points for Java binary scans

When scanning JAR files (compiled java binaries), the Java binary scan engine looks for data entry points typically found in web applications to find code to scan. If the compiled application does not contain data entry points, the scan completes successfully, but does not find vulnerabilities. For these scenarios, scan the uncompiled source code instead. If you previously scanned the JAR binary, create a new project and then, scan the uncompiled source code.

Here are some examples of typical data entry points that the Java binary scan examines:

|                                       |                                 |   |
|---------------------------------------|---------------------------------|---|
| <b>pet</b> Everything about your Pets |                                 |   |
| <b>POST</b>                           | <b>/pet/{petId}/uploadImage</b> | uploads an image                          |
| <b>POST</b>                           | <b>/pet</b>                     | Add a new pet to the store                |
| <b>PUT</b>                            | <b>/pet</b>                     | Update an existing pet                    |
| <b>GET</b>                            | <b>/pet/findByStatus</b>        | Finds Pets by status                      |
| <b>GET</b>                            | <b>/pet/findByTags</b>          | Finds Pets by tags                        |
| <b>GET</b>                            | <b>/pet/{petId}</b>             | Find pet by ID                            |
| <b>POST</b>                           | <b>/pet/{petId}</b>             | Updates a pet in the store with form data |
| <b>DELETE</b>                         | <b>/pet/{petId}</b>             | Deletes a pet                             |

## Contrast Scan supported languages and technologies

Contrast Scan supports these languages and technologies:

| Technology                                    | Latest supported version | Associated file extensions                                       | Artifacts to upload   |
|---|--------------------------|--|---|
| <b>Java binary scan</b>                       |                          |  |   |
| Java (for example: J2EE, JSP, and Spring MVC) | Oracle Java 17           | java   | JAR and WAR files or a ZIP file with JAR or WAR files in the root directory of the ZIP file.                    |
| <b>Source code scan</b>                       |                          |  |   |
| ABAP  | 7.51                     | abap ,bsp, asprog, aclass, aint, asfinc, asfugr, appl, component | ZIP files or folders that contain files to scan. Contrast Scan automatically detects the language of the files. |
| ActionScript                                  | 3                        | as   |   |
| ASP.NET                                       | Current version          | asax, ascx, ashx, asmx, aspx, master                             |   |
| C#  | 9 and later              | cs, cshtml   |   |
| C   | 18                       | c, h, pc   |   |
| C++   | 20                       | h, hh, cpp, hpp, cc, pc  |   |
| COBOL   | Current version          | cob, cbl, cpy, pco   |   |
| Go  | 1.13                     | go   |   |
| Hana SQL Script                               | Current version          | sql  |   |
| HTML  | Current version          | htm, html, xhtml   |   |
| Informix                                      | Current version          | sql, 4gl   |   |

| Technology            | Latest supported version  | Associated file extensions   | Artifacts to upload |
|-----------------------|---|--|---------------------|
| Java                  | Oracle Java 17 and later<br><br>Contrast Scan can scan Oracle Java LTS 21 code, however any specific Oracle Java 21 controls are not scanned. The Contrast scan engine is not fully Oracle Java 21 LTS compliant. | java   |                     |
| JavaScript/TypeScript | ES5   | js, xsjs, ts, tsx  |                     |
| JCL                   | Current version   | jcl,prc  |                     |
| JSP                   | Current version   | jsp,j spx, xhtml   |                     |
| Kotlin                | 1.6   | kt, kts, ktm   |                     |
| NATURAL               | Current version   | nls, nlp, nlh, nlm, nss, nsp, nsh                                    |                     |
| Objective-C           | 2   | h, m   |                     |
| Oracle Forms          | Current version   | oforms   |                     |
| PHP                   | 7.4   | php,php3,php4,php5,php6,phps,phtml                                   |                     |
| PL-SQL                | Current version   | sql, sf, sps, spb, sp, fnc, spp, plsqli, trg, st, prc, pks, pkb, pck |                     |
| PowerScript           | 11.5  | sru, sra, srw, srf, srs, srm, srx                                    |                     |
| Python                | 3.9   | python, py   |                     |
| Ruby                  |   | rb   |                     |
| RPG4                  | 7.4   | rpg, rpg3, rpg4, rpgle, dspf, mbr                                    |                     |
| Scala                 | 2.13  | scala  |                     |
| Swift                 | 5.3   | swift  |                     |
| Transact-SQL          | Current version   | sql, tsqli,sp  |                     |
| TypeScript            | Current version   | js,xsjs,ts,tsx   |                     |
| Visual Basic 6        | Current version   | bas,frm,cls  |                     |
| VB.NET                | 14  | vb   |                     |
| XML                   | Current version   | xml  |                     |

## Limited support with Semgrep open source engine

Only the Scan local engine supports these languages.

| Language  | Details  |
|-----------|--|
| Terraform | Visit <a href="#">semgrep-rules/terraform at develop · semgrep/semgrep-rules</a> |
| Rust      | Visit <a href="#">rust/lang/security</a>   |
| Ruby 3.X  | Visit <a href="#">semgrep.dev/p/ruby</a>   |

Semgrep and associated rules are copyrighted software made available under Version 2.1 of the GNU Lesser General Public License. Complete source code for Semgrep, including complete copyright information, is located [here](#).

Visit the links in the table for complete source code for rules. You can access and update them in the Contrast Scan local engine JAR file using the information in [Create custom Scan rule exclusions \(page 716\)](#).

Contrast provides scanning of Terraform and Rust as is. [Scan languages with the Semgrep engine \(page 1167\)](#) provides details about using the Semgrep open source scanner with the Contrast Scan local engine.

## Scan package preparation

To get the best results from a scan, consider these best practices before you upload packages.



### NOTE

This topic applies to the use of [hosted scans, \(page 710\)](#) where you upload files to Contrast. [Package preparation for local scans \(page 714\)](#) describes the best practices for the Scan local engine.

## Artifact types

- For Java binary scans, upload either a WAR or JAR package.
- For source code scans, upload a ZIP package that contains the repository you want to scan.

You can include multiple JAR or WAR files in a ZIP package. Place these files at the root directory of the ZIP package, not in subdirectories.

The maximum uncompressed size of your code artifact must not exceed 1GB.

When preparing your ZIP file for uploading to Contrast, either with the CLI or the Contrast web interface, ensure the uncompressed data is no larger than 1 GB. Contrast Scan might reject uncompressed files that are larger than 1 GB. In that case, you need to split the files into multiple projects for successful scans.

## Use a consistent file structure

Using a consistent file structure for each scan is crucial to preventing duplicate vulnerability findings. After an initial scan, if you need to change the file structure for the files you are scanning, create a new scan project for those files instead of using an existing one. If you are planning to scan multiple branches without using the [Contrast Scan Analyze](#) GitHub action, create a separate scan project for your personal branch.

If you use an existing scan project, change the file structure, and then run a scan, Contrast sets the original vulnerability status to **Remediated** and reports a new, duplicate vulnerability. The new finding is linked to the same file and line number but shows the new path.

Consistent file structure affects files in ZIP files and files **not** in a ZIP file.

### Example 1: Changing ZIP file name

In this example, we rename a ZIP file but maintain the file structure in the ZIP file. This change doesn't result in Contrast reporting duplicate vulnerabilities:

```
scan.zip
|
|-- source_files

changed to

contrastscan.zip
```

```
|  
|-- source_files
```

In this case, the ZIP file name isn't part of the scan path, so changing it has no effect on the scan findings.

### Example 2: Changing file structure in a ZIP file

In this example, we rename the ZIP file and also change the file structure by adding a new directory. This change causes Contrast to report duplicate vulnerabilities.

```
scan.zip  
|  
|-- source_files  
  
changed to  
  
contrastscan.zip  
|  
|-- contrastscan  
|  
|-- source files
```

In this case, changing the file structure within the ZIP file causes duplicate findings. To avoid this issue, create a new scan project and use it for future scans.

### Example 3: Changing file structure in directories

In this example, we change the file structure by adding a new directory. This change causes Contrast to report duplicate vulnerabilities.

```
scan  
|  
|-- source_files  
  
changed to  
  
contrastscan  
|  
|-- contrastscan  
|  
|-- source files
```

In this case, changing the directory name and the file structure within the directory causes duplicate findings. To avoid this issue, create a new scan project and use it for future scans.

## Access to class files and dependencies

If you package your files differently than suggested here, Scan has to make assumptions about your code. The results might not be as precise as they could be. They could include false negatives and positives.

When Scan has access to all the appropriate class files and dependencies, the results do not include phantom classes. A phantom class is a referenced class but either scan is unable to find bytecode for it or the scan was unable to decompile the code into intermediate representation (IR).

- Scan needs access to these files:
  - Application class files



- Application dependency jar or class files
- Organize application and dependencies in WAR files as described in the Oracle Java™ Servlet Specification.
- Organize applications and dependencies in JAR files similar to the way SpringBoot JAR files are organized.  
SpringBoot JAR files place applications and dependencies in well-known areas.
- Including standard JDK files and common servlet container-provided dependencies are not required. Scan provides these dependencies for you.

## Frameworks

To be able to deliver accurate results, Scan needs to understand the web framework that your application uses.

- **Source code scans:** This scan type supports all frameworks for the supported languages.
- **Java binary scans:** This scan type supports these frameworks:
  - Angular 8 or later
  - J2EE
  - Jakarta EE 2.0-3.0
  - jQuery
  - React 16 or later
  - SpringBoot
  - Spring MVC
  - Vue.JS 2 or later

## Avoid use of thin JAR files

Thin JAR files contain only application byte code. These files require special execution loaders to dynamically access dependencies for loading. If you upload a thin JAR file, Scan does not execute any of your application code. It cannot access the application dependencies for accurate scanning.

## View scan projects

The Scan project list shows these details for each scan project in your organization:

- **Score:** A letter grade that represents the potential security risk for an application based on the most recent scan in the project.  
Scan uses the [Contrast application scoring \(page 1557\)](#).
- **Scan project:** The name of the scan project.
- **Vulnerable languages:** The languages in a project where Contrast detected vulnerabilities. The project can include multiple languages or just a single language.
- **Open vulnerabilities:** The number of open vulnerabilities that Contrast detected.
- **Last scan:** The amount of time since the last scan completed.
- **Created by:** The name of the person who created the scan project.
- **Created time:** The date and time when someone created the scan project.

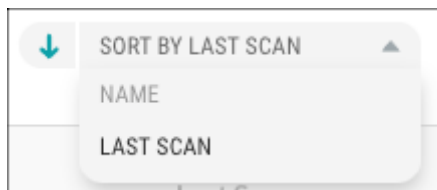
## Before you begin

If role-based access control is turned on for your organization, verify that users have the correct [actions \(page 1546\)](#), [user access groups \(page 1546\)](#), and [resource groups \(page 1572\)](#) assigned to them.

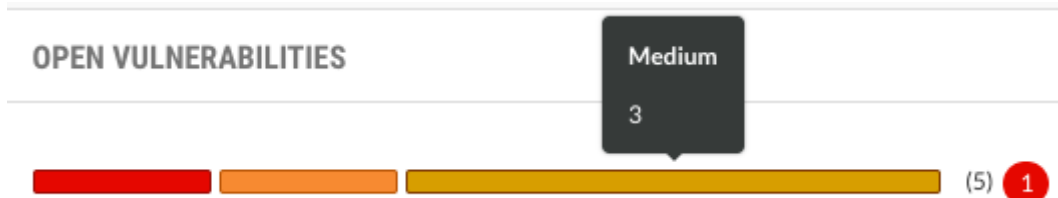
## Steps

1. Select **Scans** in the header.  
Contrast displays a list of scan projects.

2. To filter the view, select the small triangle ( ▾ ) at the top of the list and select a filter:
  - **All:** Shows all scan projects except for archived ones.
  - **Archived:** Shows only archived scan projects.
3. To find a specific scan project, select the magnifying glass icon ( 🔍 ) and enter a partial or full name of the project or a tag in the search box.
4. To sort the view, select the sort box and select an option:
  - **Name:** Sort the view by the project name.
  - **Last scan:** Sort the view based on when the the last scan completed.  
By default, projects are automatically sorted by last scan date in ascending order (the newest project is at the top, the oldest is at the bottom).
  - **Created by:** Sort the view based on who created scan projects.
 Use the green arrow to sort by ascending or descending order.



5. To filter the list of projects, select the Filter icon ( ▾ ) next to a column heading:
  - a. **Scan project:** To view scans associated with specific tags, select one or more tags.
  - b. **Vulnerable languages:** To view only the projects that include specific vulnerable languages, select one or more languages.
  - c. **Last scan:** To filter the list according to the last scan time frame:
    - i. Select a specific time frame or select **Custom** to specify a preferred time frame.
    - ii. Select **Apply**.
  - d. **Created by:** To view scan projects according to the person who created them.
6. To view the number of vulnerabilities with a specific severity, hover over a section in the Vulnerabilities bar. To view vulnerabilities of a specific severity, select a section in the bar.



7. To view details for a specific project, select the project name in the Scan project column.

## Add tags to scan projects

Use scan project tags to better organize scan projects and improve search functionality.

## Before you begin

- **Users and groups:** An Organization Admin role is required.
- **Role-based access control (Preview):** A role with the Project Update action is required.  
Role-based access control is part of the Contrast pre-release customer testing program. If you want to use this feature, contact your Contrast representative.

## Steps

1. Select **Scans** in the header.
2. Select the checkbox on the left for one or more projects.

3. In the batch action menu at the bottom of the page, select the **Tag** icon (🔖).
4. Enter the name of a tag and select **Create tag**.

5. Create additional tags, as needed.  
To remove an existing tag, select the **Delete** icon (X) next to it in the Tag project window.
6. Select **Save**.

## Create metadata for scan projects

You can configure metadata that Contrast collects when you try to create a scan project. Configuring metadata lets you decide whether to restrict the creation of scan projects or running scans if metadata is missing.

The scan project list shows the configured metadata.

## Before you begin

- If role-based access control is turned on, you need a role with the Manage organization action.
- If you are using organization users and groups for access control, you need the Organization Admin role.
- Currently, metadata is supported for new scan projects only.

## Steps

1. From the user menu, select **Organization settings**.
2. Select **Scan projects**.
3. In Scan Configuration, for each field enter:
  - **Field type:** Freeform.  
Freeform is the only supported field type.
  - **Value:** Enter a new value for this field.
  - **Value condition:** Use the checkbox to indicate whether the metadata value provided is **Required** or **Unique** for each project.  
You can select both conditions.

The Scan local engine configuration preview shows the settings that you can include in a `.contrast-scan.json` file. If you want to use this file to configure the Scan local engine, create this file in the root folder of the source code you are scanning.

**Organization Settings**

Organization  
Groups  
Users  
Access Control  
Audit Log  
Security  
Agent Keys  
Single Sign-On  
Integrations  
Servers  
Applications  
Notifications  
Score Settings  
**Scan projects**

**Scan Configuration**  
Set key-value pairs

| FIELD TYPE    | VALUE           | REQUIRED?                                    | UNIQUE?                                 |
|---------------|-----------------|--|---|
| Freeform Text | TestingMetadata | <input checked="" type="checkbox"/> Required | <input type="checkbox"/> Unique value x |

+ Add field

Scan local engine configuration [Learn more](#)

```
"metadata" : {
  "testingMetadata" : "<value>"
}
```

Restrict projects

☐ Restrict scan projects missing required fields

Cancel Save

4. Select **Add field** to complete as many rows as needed.
5. To prevent creation of scan projects or the ability to run a new scan that is missing all required fields, select **Restrict scan projects missing required fields**.  
This restriction applies to new scan projects that you create with the Contrast web interface, the Contrast CLI, or the Contrast Scan local engine.  
When you select this option, the Contrast web interface displays a warning message if you try to create a scan project without selecting the required metadata.

## Configure dynamic scoring for Contrast Scan

Turning on dynamic scoring automatically adjusts the application score when you change the status for one or more scan vulnerabilities to **Not a Problem**. The application score no longer includes vulnerabilities with a status of **Not a Problem**.

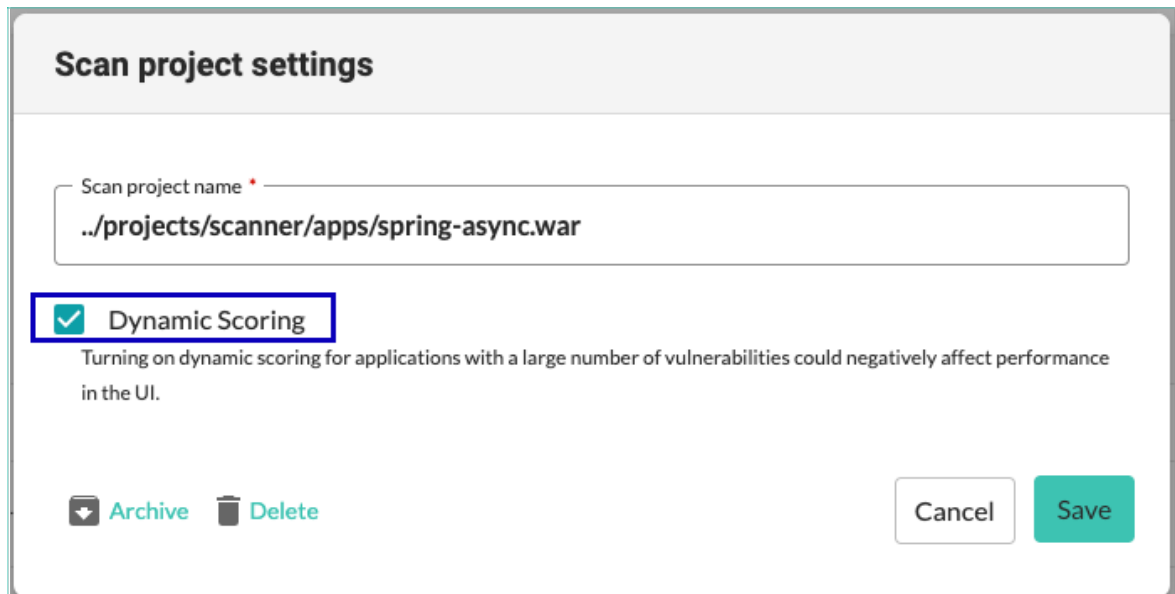
The default setting for this option is disabled.

## Before you begin

- If role-based access control is turned on, you need a role with the Manage organization action.
- If you are using organizational users and groups, you need the Organization Admin role.
- Turning on dynamic scoring for applications with a large number of vulnerabilities can negatively affect performance in the Contrast web interface.

## Steps

1. Select **Scans** in the header.
2. Select a scan project.
3. Select the **Settings** icon (⚙️) at the top of the list.
4. To turn on dynamic scoring, select the **Dynamic Scoring** checkbox.





**Scan project settings**

Scan project name \*

../projects/scanner/apps/spring-async.war

☒ **Dynamic Scoring**

Turning on dynamic scoring for applications with a large number of vulnerabilities could negatively affect performance in the UI.

 Archive  Delete

Cancel Save

To turn off dynamic scoring, clear the checkbox.

5. Select **Save**.
6. In the Vulnerability tab for a scan project, select one or more vulnerabilities and change the status to **Not a Problem**.
7. To view the updated score, go to the Overview tab for the scan project.

## See also

[Edit Scan vulnerability status \(page 1175\)](#)

[Batch edit Scan vulnerability status \(page 1176\)](#)

## Configure Scan dynamic scoring for an organization

Turning on dynamic scoring automatically adjusts the application score when you change the status for one or more scan vulnerabilities to **Not a Problem**. The application score no longer includes vulnerabilities with a status of **Not a Problem**.

The default setting for this option is disabled.

## Before you begin

- If role-based access control is turned on, you need a role with the Manage organization action.
- If you are using organizational users and groups, you need the Organization Admin role.
- Turning on dynamic scoring for applications with a large number of vulnerabilities can negatively affect performance in the Contrast web interface.
- You can override the organization setting by changing the dynamic scoring setting for individual projects.

## Steps

1. Under the user menu, select **Organization settings**.
2. Select **Scan projects**.
3. Under Dynamic scoring, select the **Dynamic Scoring** toggle.
4. Select **Save**.  
Depending on the number of scan projects that you have, this change can take several minutes to complete.  
You can change this setting for individual scan projects by selecting the settings for an individual scan project.

5. In the Vulnerability tab for a scan project, select one or more vulnerabilities and change the status to **Not a Problem**.
6. To view the updated score, go to the Overview tab for the scan project.

## See also

[Configure dynamic scoring for Scan \(page 704\)](#)

[Edit Scan vulnerability status \(page 1175\)](#)

[Batch edit Scan vulnerability status \(page 1176\)](#)

## Create a scan project

Scan projects are containers for files that you want to scan.

### Before you begin

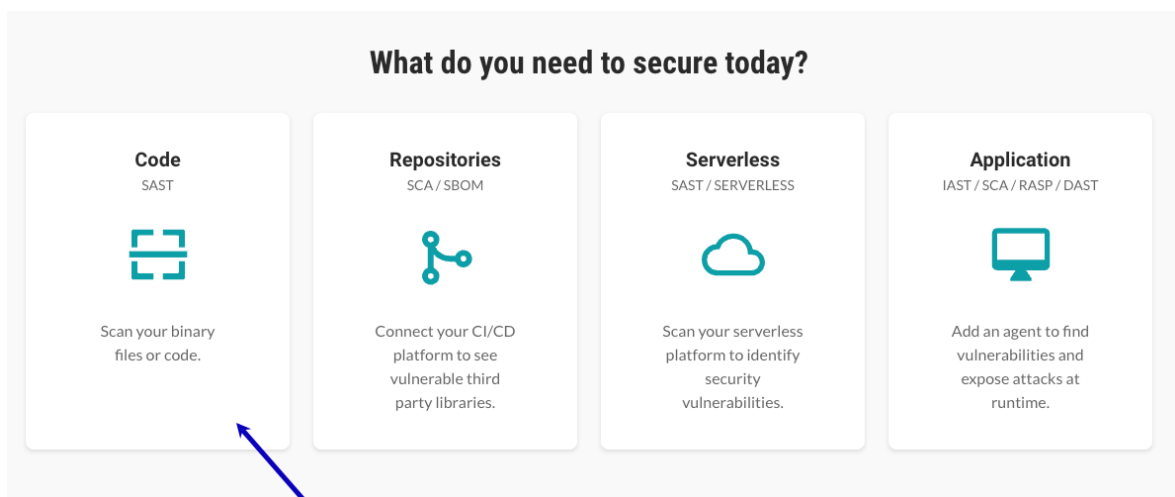
- Identify the files that you want to upload for scanning.  
Scan supports different files types for each programming language. For example, for Java, upload a JAR or WAR file.
- If you are a hosted customer and role-based access control is turned on, your role must include the **Create project** action.
- If role-based access control is turned on for your organization, verify that users have the correct [actions \(page 1546\)](#), [user access groups \(page 1577\)](#), and [resource groups \(page 1572\)](#) assigned to them.

### Steps

1. In the Contrast web interface, select **Add New** in the top right corner.



2. Select the **Code** card.



3. If you're a hosted customer and [role-based access control \(page 1565\)](#) is turned on, select a resource group from the dropdown.

## Scan your code

Perform a SAST analysis of your code to find security risks.

- Resource Group \*

All projects

This is the only **resource group** you have access to.
- Create your Scan project

Give your project a name. [View scan projects](#)

Scan project name \*

MyScanProject

Enter a minimum of 3 characters
- Include required metadata ⓘ

TestingMetadata \*

TestingMetadata

Create Scan Project

Perform subsequent scans and see progress.  
This container will allow you to perform scans of your code and provide progress on remediation efforts.

- If you have access to only one resource group, you don't select a resource group. Instead, you see the name of the resource group to which you have access.
  - If you're an on-premises customer or you are not using role-based access control, no resource group option is available.
4. Specify a name for the project.  
Scan project names must be unique. Specify a name that lets you easily identify the scan project in other Contrast lists.  
As a best practice, consider naming the project to match the name of the file. For example, if your file is `webgoat.jar`, name your project `webgoat` or `webgoat.jar`.
  5. Specify the values for the scan project metadata.  
if metadata is required, you are unable to create the project until you specify the required metadata.
  6. Select **Create scan project**.



### NOTE

if you want to use an existing scan project instead of creating one, select **View scan projects**. This action opens the Scan project tab with your existing projects.

## Next step

[Start a scan \(page 710\)](#)

## Delete scan projects

If you want to permanently remove a scan project, you can delete it. Contrast permanently deletes all the data associated with the project.

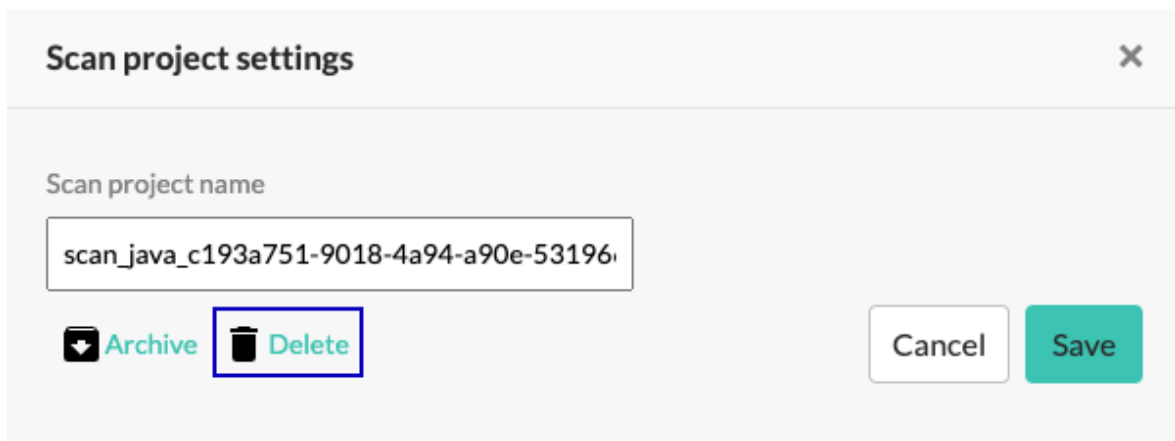
You cannot undo this action.

## Before you begin

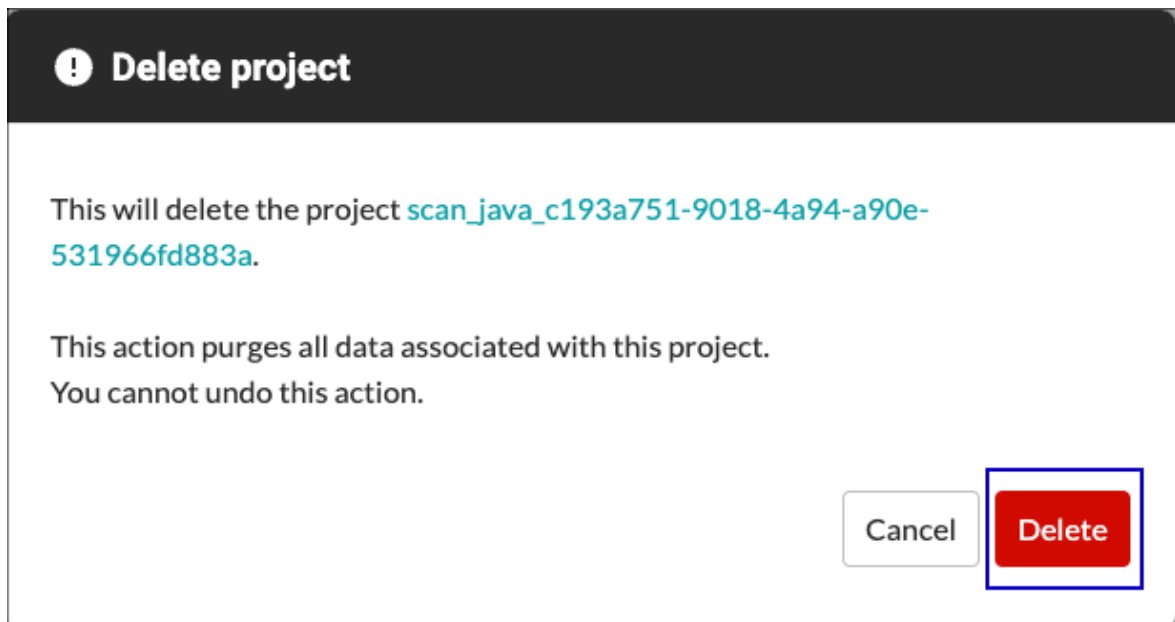
If role-based access control is turned on for your organization, verify that users have the correct [actions \(page 1546\)](#), [user access groups \(page 1577\)](#), and [resource groups \(page 1572\)](#) assigned to them.

## Steps

1. Select **Scans** in the header.
2. Select a scan project.
3. Select the Settings icon (⚙️).
4. In the Scans projects settings window, select **Delete**.



5. In the Delete project window, confirm that you want to delete the project by selecting **Delete**.



## Exclude Scan files and folders with the Contrast web interface

You have the option to exclude specified files or folders from scans. This feature is useful when you want to exclude artifacts that generate a lot of noise or are irrelevant to the scan.

Contrast [excludes some files and folders by default \(page 709\)](#).

## Before you begin



- If you exclude files from a previously scanned project, Contrast changes the status of vulnerabilities affected by the exclusions to **Remediated**. For example, after you exclude files, the number of vulnerabilities in the scan results could be reduced from the original findings and the number of remediated vulnerabilities could increase.
- Specified file and folder names are case-sensitive.

## Steps

1. In the root of the ZIP file you are scanning, create a file named `.contrast-scan.json`.
2. In the JSON file, specify the files and folders you want to exclude using this format:

```
{
  "excludes": [
    "**/MavenWrapperDownloader.java",
    "**/*.js"
  ]
}
```

Replace the examples of `MavenWrapperDownloader.java` and `*.js` with the names of your files and folders.

3. Run the scan in the Contrast web interface.

## Pattern examples

These examples show how you can specify excluded files and folders.

Patterns are considered relative paths.

| This pattern example:              | Excludes...  |
|------------------------------------|--|
| <code>*.java</code>                | Files with zero or more than one character before the <code>.java</code> extension. For example: <code>.java</code> , <code>x.java</code> , and <code>FooBar.java</code> .<br><br><b>Not excluded:</b> Files that are not in the root directory being scanned, even if the filename has an extension of <code>.java</code> . |
| <code>? .java</code>               | Files with one character before the <code>.java</code> extension For example: <code>x.java</code> or <code>A.java</code> .<br><br><b>Not excluded:</b> Files such as <code>.java</code> or <code>xyz.java</code> because they have zero or more than one character before the <code>.java</code> extension.                  |
| <code>**/*.java</code>             | All folders and files with the extension of <code>.java</code> .   |
| <code>**/CVS/*</code>              | All files in <code>CVS</code> directories that exist anywhere in the directory tree.   |
| <code>org/apache/jakarta/**</code> | All files in the <code>org/apache/jakarta</code> directory tree.<br><br><b>Not excluded:</b> The file <code>org/apache/xyz.java</code> because <code>jakarta</code> is not included in the path  |
| <code>org/apache/**/CVS/*</code>   | All files in <code>CVS</code> directories that are located anywhere in the directory tree under <code>org/apache</code> .<br><br><b>Not excluded:</b> A file named <code>org/apache/CVS/foo/bar/Entries</code> because <code>foo/bar/</code> does not match the pattern.   |
| <code>**/test/**</code>            | All files that have <code>test</code> in their path, including <code>test</code> as part of a filename.  |
| <code>**/*test**</code>            | Excludes the string <code>test</code> wherever it is found in the path.  |

## Default exclusions

By default, Contrast Scan excludes these files, folders, patterns, and extensions:

| Excluded file and folder patterns  | Excluded extensions  | Excluded files  |
|--|--|---|
| <ul style="list-style-type: none"><li>• /src/test/</li><li>• /__MACOSX/</li><li>• /*.min.js,</li><li>• /.Designer.vb</li><li>• **/.designer.vb</li><li>• /*Reference.vb</li><li>• /Service.vb</li><li>• /*Silverlight.vb</li><li>• /.Designer.cs</li><li>• /*.designer.cs</li><li>• /Reference.cs</li><li>• /*Service.cs</li><li>• /Silverlight.cs</li><li>• **/.</li><li>• /Pods/BuildHeaders/**/*.h</li><li>• /Pods/Headers/**/*.h</li><li>• /node_modules/</li><li>• /bower_components/</li><li>• /target/</li><li>• /bin/</li><li>• /obj/</li><li>• /dist/</li><li>• /lib/</li></ul> | <ul style="list-style-type: none"><li>• exe</li><li>• dll</li><li>• so</li><li>• bin</li><li>• arc</li><li>• arj</li><li>• zip</li><li>• rar</li><li>• ear</li><li>• tar</li><li>• tgz</li><li>• gz</li><li>• gzip</li><li>• z</li></ul> | <ul style="list-style-type: none"><li>• readme</li><li>• changelog</li><li>• changes</li><li>• todo</li><li>• license</li><li>• copying</li><li>• maintainers</li><li>• thumbs.db</li></ul> |

## See also

[Directory-based tasks](#) provides additional information on patterns for specifying files and folders.

## Start a scan

Start a scan when you want to do the following tasks:

- Begin analysis of a new application.
- Test code changes you made to fix vulnerabilities on an application you scanned previously.

## Before you begin

- Identify the scan project that contains the file you want to scan again or [create one \(page 706\)](#).
- If you navigate away from the page while an upload is in progress, Contrast Scan cancels the upload. Contrast displays a warning message if you try to leave the page.

## Steps

1. Select **Scans** in the header.
2. Select a scan project.
3. Select **New Scan**.



4. From the displayed window, select a file or folder to upload and select **Open** or **Upload**. If the scan project contains a previous scan, select a new version of the file you previously scanned. The scan starts automatically after the file upload completes.

**NOTE**

**Java binary scan:** Upload a ZIP file that contains multiple JAR files or upload a single JAR or WAR file.

**Source code scan:** Upload a ZIP file or a folder that contains the files you want to scan. The ZIP file or folder can include files with different languages. Contrast Scan automatically detects the languages for the files.

5. [Monitor \(page 711\)](#) the scan progress.

**Cancel a scan**

You can cancel a scan that is in progress.

After you cancel a scan, its status changes to Cancelled in Scan history.

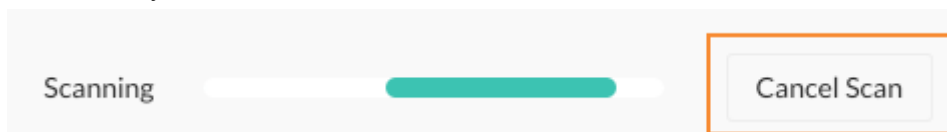
**Before you begin**

Find a scan project that contains a scan that's in progress.

**Steps**

To cancel a scan:

1. Select **Scans** in the header.
2. Select a scan project that has a scan in progress.
3. In the activity bar, select **Cancel scan**.



The scan stops immediately.

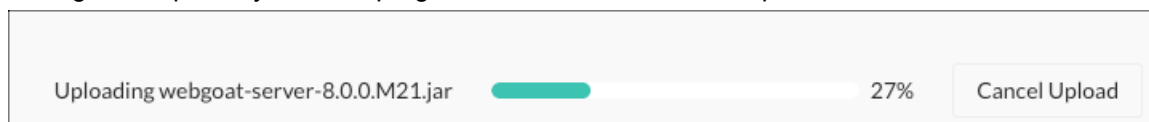
**Monitor scans**

After you start a scan, you can monitor the progress of the file upload and the scan from any tab under Scans.

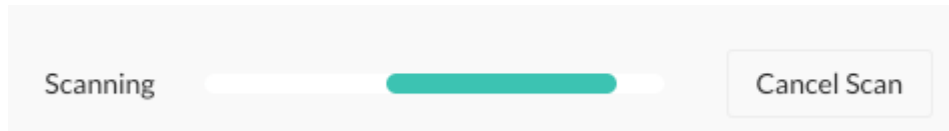
You can view a history of the scans in a selected project under Scan history in the Overview tab.

**Steps**

1. Select **Scans** in the header.  
The Scans page shows these scan details:
  - The grade score for each scan project.
  - The names of the scan projects.
  - The number and status of open vulnerabilities.
  - The time the last scan completed.
2. Select a scan project.
3. [Start a scan \(page 710\)](#).
4. While uploading a file or running a scan, you can monitor its progress at the top of a Scans page.
  - During a file upload, you see a progress bar similar to this example:



- During a file scan, you see an activity bar similar to this example:



- To view a history of the scans in a selected project, under Scans, select the **Overview** tab and view the details under Scan history.

| SCAN HISTORY    |                                   |                       |          |                      |
|-----------------|-----------------------------------|-----------------------|----------|----------------------|
| All (3)         |                                   |                       |          |                      |
| Vulnerabilities | Label                             | Scan Date             | Language | Coverage             |
| 34 <b>7</b>     | 2022-03-10 20:36:32<br>1 hour ago | 3/10/2022 3:36:32 ... | Java     | <a href="#">View</a> |
| 34 <b>7</b>     | 2022-03-10 20:34:33<br>1 hour ago | 3/10/2022 3:34:33 ... | Java     | <a href="#">View</a> |
| 34 <b>7</b>     | 2022-03-10 20:29:43<br>1 hour ago | 3/10/2022 3:29:43 ... | Java     | <a href="#">View</a> |
| 1               |                                   |                       |          | Results per page 10  |

- To see additional details about a scan, select a scan label or, under the Coverage. column, select **View**.

## SAST reports

Contrast Scan provides these reports in PDF format:

- SAST Attestation report: (page 712)** This report provides evidence of vulnerability remediation based on the most current scan information.
- SAST General Vulnerability report: (page 713)** This report provides details for the vulnerabilities that Contrast discovers.

## Generate a SAST Attestation report

The SAST Attestation report for Contrast Scan provides evidence of vulnerability remediation based on the most current scan information. The report is a PDF file.

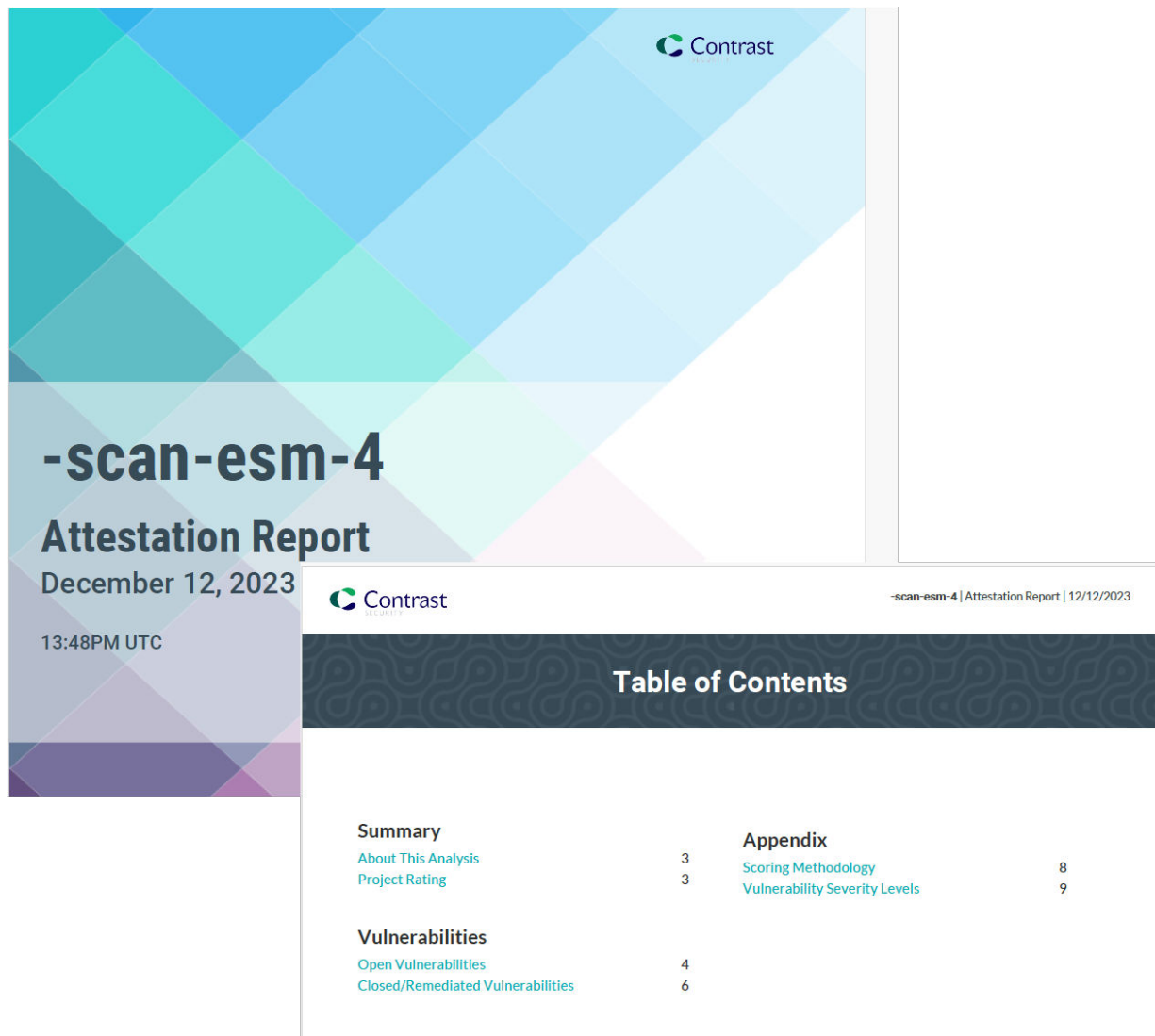
This report includes up to 3,000 entries.

### Steps

- Select **Scans** in the header.
- Select a scan project.
- Select the **Reports** icon (📄) located at the top-right of the Scan project page.  
You can also generate the report from the Vulnerabilities tab.
- Select **Generate Attestation report**.
- After Contrast generates the report, it prompts you to download it.

### SAST attestation report details

For a selected project, the SAST Attestation report includes charts and details about the project score, open vulnerabilities found during scans, and closed or remediated vulnerabilities.



## Generate a SAST General Vulnerability report

The SAST General Vulnerability report includes these details:

- **Vulnerability name:** Links to the vulnerability details in the Contrast web interface.
- **Vulnerability type:** For example, cryptography or injection
- **Severity:** The Contrast vulnerability severity: critical, high, medium, low, or note
- **Language:** The language of the code where Contrast found the vulnerability.
- **Vulnerable file name:** Name of file where Contrast discovered the vulnerability..
- **Vulnerable line number:** Line number in the file where Contrast discovered the vulnerability
- **Status:** The Contrast status for the vulnerability: Reported, Confirmed, Suspicious, Not a problem, Remediated, Remediated - Auto-Verified, or Fixed.
- **Code snippet:** A portion of the code where Contrast Scan found the vulnerability.
- **CWE:** (if available): A link to the relevant Common Weakness Enumeration (CWE).
- **OWASP:** A link to the OWASP page for the vulnerability.

This report can include up to 3,000 vulnerabilities.

## Steps

1. Select **Scans** in the header.
2. Select a scan project.
3. Select the **Reports** icon (📄) located at the top-right of the Scan project page.
4. Select **Generate SAST General Vulnerability Report**.
5. After Contrast generates the report, it prompts you to download it.

## Contrast Scan local engine

The Contrast Scan local engine lets you scan your application using a Java JAR file instead of the Contrast CLI or the Contrast web interface. When a scan completes successfully, the Scan local engine uploads the results to the Contrast platform where you can view them. The uploaded files include:

- Scan results in Static Analysis Results Format (SARIF) in a `JSON` file.
- Output from the scan in a `LOG` file.

This method of scanning is useful if you want to scan files locally without uploading them to the Contrast platform.

## Supported platforms

- The Scan local engine is supported for Linux systems.
- **Multi-language Scan local engine:** Oracle Java 17.
- **Binary Java scan engine:** Oracle Java 17.

It's possible to use Oracle Java 11, however, that version is considered to be End-of-Life.

## Proxy server settings for local scans

For security purposes, you might want to use a proxy server for communication between the local scan engine and the Contrast platform. Use the following environment variables to enable a proxy server when you [run a local scan \(page 919\)](#):

| Variable                       | Description  |
|--------------------------------|--|
| CONTRAST__API__PROXY__ENABLE   | Enables proxy settings.  |
| CONTRAST__API__PROXY__URL      | <b>Required.</b><br><br>The URL for the proxy server (for example, <code>http://host:port</code> ) |
| CONTRAST__API__PROXY__TYPE     | <b>Required.</b><br><br>The proxy server type (for example, <code>BASIC</code> )                   |
| CONTRAST__API__PROXY__USERNAME | <b>Optional.</b><br><br>Username for the proxy server  |
| CONTRAST__API__PROXY__PASSWORD | <b>Optional.</b><br><br>Password for the proxy server  |

## Package preparation for local scans

Consider these best practices when you prepare to run a local scan:

- **JAR or WAR files:** Specify the binary file to be scanned.
- **Source code scanning:** Place the source code you want to scan in a folder and **not** in a ZIP file. There is no limit to the size of this folder for the local scanner. However some large source code repos may require more memory or a longer time to execute. Use the [memory and timeout options \(page 922\)](#) to manage these situations.
- **Multi-JAR or WAR scanning:** Specify a ZIP file that contains multiple JAR or WAR files. Place these files in the root of the ZIP file.

There is no limit to the size of the files in the ZIP file.

### Use a consistent file structure

Using a consistent file structure for each scan is crucial to preventing duplicate vulnerability findings. After an initial scan, if you need to change the file structure for the files you are scanning, create a new scan project for those files instead of using an existing one. If you are planning to scan multiple branches without using the [Contrast Scan Analyze](#) GitHub action, create a separate scan project for your personal branch.

If you use an existing scan project, change the file structure, and then run a scan, Contrast sets the original vulnerability status to **Remediated** and reports a new, duplicate vulnerability. The new finding is linked to the same file and line number but shows the new path.

Consistent file structure affects files in ZIP files and files **not** in a ZIP file.

#### Example 1: Changing ZIP file name

In this example, we rename a ZIP file but maintain the file structure in the ZIP file. This change doesn't result in Contrast reporting duplicate vulnerabilities:

```
scan.zip
|
|-- source_files

changed to

contrastscan.zip
|
|-- source_files
```

In this case, the ZIP file name isn't part of the scan path, so changing it has no effect on the scan findings.

#### Example 2: Changing file structure in a ZIP file

In this example, we rename the ZIP file and also change the file structure by adding a new directory. This change causes Contrast to report duplicate vulnerabilities.

```
scan.zip
|
|-- source_files

changed to

contrastscan.zip
|
|-- contrastscan
|   |
|   |-- source_files
```

In this case, changing the file structure within the ZIP file causes duplicate findings. To avoid this issue, create a new scan project and use it for future scans.

#### Example 3: Changing file structure in directories

In this example, we change the file structure by adding a new directory. This change causes Contrast to report duplicate vulnerabilities.

```
scan
|
|-- source_files

changed to

contrastscan
|
|-- contrastscan
|
|-- source files
```

In this case, changing the directory name and the file structure within the directory causes duplicate findings. To avoid this issue, create a new scan project and use it for future scans.

## Scan process

To use the Scan local engine:

1. [Download the Scan local engine application \(page 917\)](#) or contact [Contrast Support](#) to get the latest local engine application.
2. Decide if you want to use a proxy server for uploading results.
3. [Run the scan on a local system \(page 919\)](#).
4. [View results \(page 1167\)](#) in the Contrast web interface.

## Create custom Scan rule exclusions

Create custom Scan rule exclusions when you are confident that a specific rule is generating multiple false positives and you are frequently setting the status for these findings to **Not a Problem**.

### Before you begin

- Before you exclude rules, run a baseline scan to determine which rules are creating false positives
- Excluding rules affects the findings for the scan project.

### Location of Scan rules

The [Contrast Scan rules \(page 717\)](#) section links to tables where you can find the rules for each language. Alternatively, during a scan, you can find the rules in `target/engines/sast-engine4/rulesets` under the source directory that you're scanning with the Scan local engine.



#### IMPORTANT

The `sast-engines4` folder and its subfolders are available temporarily when a scan is in progress.

For easy access, make a copy of the `rulesets` folder. This folder contains security rules files for each language (`qaking_{lang}_security.xml`) that the Scan local engine supports. To find the name of a rule in a file, search for `<rule name " "`.



## Steps

1. Create a text file called `contrastsec.checks.config` and place it at the root of the project you are going to scan.

The format of the file is:

```
[rule-Engine-rule-ID]
active=false
```

2. To exclude multiple rules, repeat the block of lines with an empty row between each block. For example, to exclude the **Detect and handle input/output errors** and **Don't use cast** rules for CPP, the file looks like this:

```
[OPT.CPP.CERTC.FIO33]
active=false

[OPT.CPP.DontUseCast]
active=false
```

## Effects of Scan rule exclusions

When you disable rules using the `contrastsec.checks.config` file, the status for the findings corresponding to the excluded rule change to **Remediated**.

If you reenables the rule using the `contrastsec.checks.config` file or remove the file, the status for the findings corresponding to the newly enabled rule changes to **Reopened**.

## Contrast Scan rules

These tables include the supported Contrast Scan rules: test

|   |                                       |   |   |
|---|---------------------------------------|---|---|
| <a href="#">ABAP (page 717)</a>         | <a href="#">Go (page 787)</a>         | <a href="#">NATURAL (page 849)</a>      | <a href="#">Scala (page 886)</a>          |
| <a href="#">ActionScript (page 729)</a> | <a href="#">HTML (page 790)</a>       | <a href="#">Objective-C (page 850)</a>  | <a href="#">SQL (page 888)</a>            |
| <a href="#">ASP (page 733)</a>          | <a href="#">Informix (page 793)</a>   | <a href="#">Oracle Forms (page 858)</a> | <a href="#">SQLScript (page 891)</a>      |
| <a href="#">ASP.NET (page 731)</a>      | <a href="#">Java (page 795)</a>       | <a href="#">PHP (page 860)</a>          | <a href="#">Swift (page 892)</a>          |
| <a href="#">C (page 776)</a>            | <a href="#">JavaScript (page 831)</a> | <a href="#">PL/SQL (page 869)</a>       | <a href="#">Transact-SQL (page 896)</a>   |
| <a href="#">C# (page 734)</a>           | <a href="#">JCL (page 842)</a>        | <a href="#">PowerScript (page 874)</a>  | <a href="#">VB.NET (page 899)</a>         |
| <a href="#">COBOL (page 749)</a>        | <a href="#">JSP (page 843)</a>        | <a href="#">Python (page 876)</a>       | <a href="#">Visual Basic 6 (page 913)</a> |
| <a href="#">CPP (page 763)</a>          | <a href="#">Kotlin (page 845)</a>     | <a href="#">RPG4 (page 882)</a>         | <a href="#">XML (page 915)</a>            |

## ABAP Scan rules

Contrast Scan supports these rules for ABAP.

| Severity | Contrast rule            | Engine rule ID                      | Description   |
|----------|--------------------------|-------------------------------------|---|
| Medium   | Access B Din Loop        | OPT.ABAP.AMR.AccessBDInLoop         | AccessBDInLoop: Avoid massive database operations inside a loop                           |
| High     | Alter Layout Dinamically | OPT.ABAP.AWD.AlterLayoutDinamically | AlterLayoutDinamically: WebDynpro Layout should be modified only in wdDoModifyView method |
| High     | Assign I D Element       | OPT.ABAP.AWD.AssignIDElement        | AssignIDElement: Attributes for Web Dynpro elements must be unique                        |
| Info     | Authority Checks         | OPT.ABAP.SEC.AuthorityChecks        | AuthorityChecks: Authority checks (informative)   |
| Medium   | Avoid Batch Input        | OPT.ABAP.AMR.AvoidBatchInput        | AvoidBatchInput: Do not call transactions using batch input                               |

| Severity | Contrast rule                        | Engine rule ID                                 | Description  |
|----------|--------------------------------------|--|--|
| Medium   | Avoid Call No Def Module             | OPT.ABAP.APBR.AvoidCallNoDefModule             | AvoidCallNoDefModule: Avoid call modules that have not been declared                       |
| High     | Avoid Client Specified               | OPT.ABAP.ASR.AvoidClientSpecified              | AvoidClientSpecified: Avoid CLIENT SPECIFIED option  |
| Low      | Avoid Commented Out Code             | OPT.ABAP.MAINT.AvoidCommentedOutCode           | AvoidCommentedOutCode: Avoid commented out code blocks                                     |
| Medium   | Avoid Complex Context                | OPT.ABAP.AWD.AvoidComplexContext               | AvoidComplexContext: Too deeply nested nodes in Web Dynpro context                         |
| Medium   | Avoid Controller With Code           | OPT.ABAP.AWD.AvoidControllerWithCode           | AvoidControllerWithCode: Too much code in Web Dynpro view                                  |
| High     | Avoid Database Hints                 | OPT.ABAP.PORTABILITY.AvoidDatabaseHints        | AvoidDatabaseHints: Avoid %_HINTS in SELECT  |
| Medium   | Avoid Declare Vars In Mod            | OPT.ABAP.AGR.AvoidDeclareVarsInMod             | AvoidDeclareVarsInMod: Avoid declarations inside a dialog module                           |
| Medium   | Avoid Duplicate Events               | OPT.ABAP.AGR.AvoidDuplicateEvents              | AvoidDuplicateEvents: Avoid duplicate declarations for same event block                    |
| Info     | Avoid Duplicate Includes In Programs | OPT.ABAP.APFR.AvoidDuplicateIncludesInPrograms | AvoidDuplicateIncludesInPrograms: Avoid same INCLUDE in different programs                 |
| Low      | Avoid Elementil U Tree               | OPT.ABAP.AWD.AvoidElementilUTree               | AvoidElementilUTree: In Web Dynpro, do not use the Tree UI element                         |
| Low      | Avoid Empty Blocks In Loop Or If     | OPT.ABAP.MAINT.AvoidEmptyBlocksInLoopOrIf      | AvoidEmptyBlocksInLoopOrIf: Avoid using loops and conditional statements with empty blocks |
| Medium   | Avoid Empty Catch Blocks             | OPT.ABAP.APBR.AvoidEmptyCatchBlocks            | AvoidEmptyCatchBlocks: Avoid use empty CATCH blocks  |
| Low      | Avoid Empty Subroutine Or Function   | OPT.ABAP.MAINT.AvoidEmptySubroutineOrFunction  | AvoidEmptySubroutineOrFunction: Avoid using functions or subroutines with empty blocks     |
| Medium   | Avoid Empty When Others              | OPT.ABAP.APBR.AvoidEmptyWhenOthers             | AvoidEmptyWhenOthers: If used, WHEN OTHERS clause should not be empty                      |
| Low      | Avoid Form Param Without Type        | OPT.ABAP.AGR.AvoidFormParamWithoutType         | AvoidFormParamWithoutType: Avoid subroutines with untyped or too generic type parameters   |
| Critical | Avoid Free Memory                    | OPT.ABAP.AGR.AvoidFreeMemory                   | AvoidFreeMemory: Avoid using FREE MEMORY without explicit data cluster                     |
| Low      | Avoid From Dynamic                   | OPT.ABAP.ASR.AvoidFromDynamic                  | AvoidFromDynamic: Avoid subqueries in FROM clauses   |
| Medium   | Avoid Literal Wit Add                | OPT.ABAP.AGR.AvoidLiteralWitAdd                | AvoidLiteralWitAdd: In the sentece Add is better use variables instead of literal          |
| Low      | Avoid Logic DB                       | OPT.ABAP.ASR.AvoidLogicDB                      | AvoidLogicDB: Do not to use logical databases  |
| High     | Avoid Macro                          | OPT.ABAP.AGR.AvoidMacro                        | AvoidMacro: Do not define custom macros  |
| Low      | Avoid Modify Context                 | OPT.ABAP.AWD.AvoidModifyContext                | AvoidModifyContext: Avoid programmatic modification of a Web Dynpro context                |

| Severity | Contrast rule                         | Engine rule ID                                     | Description  |
|----------|---------------------------------------|--|--|
| Low      | Avoid Modify Elements Directly        | OPT.ABAP.AWD.AvoidModifyElementsDirectly           | AvoidModifyElementsDirectly: Do not modify programmatically the layout for Web Dynpro context nodes                    |
| Low      | Avoid Module Messed Up                | OPT.ABAP.APBR.AvoidModuleMessedUp                  | AvoidModuleMessedUp: Avoid call a module from a program  |
| Low      | Avoid Multiple Dynamic Attributes     | OPT.ABAP.AWD.AvoidMultipleDynamicAttributes        | AvoidMultipleDynamicAttributes: Avoid assigning multiple attributes dynamically in a WebDynpro element                 |
| Low      | Avoid Nested Layout                   | OPT.ABAP.AWD.AvoidNestedLayout                     | AvoidNestedLayout: To avoid to nest layouts  |
| Low      | Avoid Non Transp Table                | OPT.ABAP.AGR.AvoidNonTranspTable                   | AvoidNonTranspTable: Do not create tables that are not transparent   |
| Medium   | Avoid Non Used Declared Module        | OPT.ABAP.AMR.AvoidNonUsedDeclaredModule            | AvoidNonUsedDeclaredModule: Avoid declaring dialog modules that are not used   |
| Info     | Avoid No Standard Page Heading        | OPT.ABAP.ADR.AvoidNoStandardPageHeading            | AvoidNoStandardPageHeading: The standard SAP report header should not be disabled (NO STANDARD PAGE HEADING)           |
| Medium   | Avoid No Use Fields                   | OPT.ABAP.AGR.AvoidNoUseFields                      | AvoidNoUseFields: Avoid declare fields on internal tables that are not used  |
| High     | Avoid Percentage Var                  | OPT.ABAP.AMR.AvoidPercentage_Var                   | AvoidPercentage_Var: Avoid identifier names starting with %_   |
| Medium   | Avoid Pool And Include                | OPT.ABAP.AWD.AvoidPoolAndInclude                   | AvoidPoolAndInclude: Do not use TYPE-POOL and INCLUDE TYPE/STRUCTURE   |
| High     | Avoid Read S A P Tables               | OPT.ABAP.ASR.AvoidReadSAPTables                    | AvoidReadSAPTables: READ TABLE on database table   |
| Medium   | Avoid S A P Queries                   | OPT.ABAP.ASR.AvoidSAPQueries                       | AvoidSAPQueries: Do not call SAP Query   |
| Medium   | Avoid Sap Script                      | OPT.ABAP.AGR.AvoidSapScript                        | AvoidSapScript: Avoid SAP Script   |
| High     | Avoid SQL Exist Subqueries            | OPT.ABAP.EFFICIENCY.AvoidSqlExistSubqueries        | AvoidSqlExistSubqueries: Avoid using the EXISTS clause   |
| Medium   | Avoid Stop Messed Up                  | OPT.ABAP.APBR.AvoidStopMessedUp                    | AvoidStopMessedUp: Avoid STOP statement out of the event blocks START-OF-SELECTION, GET or AT SELECTION-SCREEN         |
| High     | Avoid Stretched Vertically            | OPT.ABAP.AWD.AvoidStretchedVertically              | AvoidStretchedVertically: Do not set StretchedVertically in MatrixLayout   |
| Medium   | Avoid Sub Select Queries              | OPT.ABAP.APFR.AvoidSubSelectQueries                | AvoidSubSelectQueries: Avoid subqueries in WHERE   |
| High     | Avoid Trace On                        | OPT.ABAP.APFR.AvoidTraceOn                         | AvoidTraceOn: Avoid use sentences that activate the trace generator  |
| Critical | Avoid Up To Rows With For All Entries | OPT.ABAP.EFFICIENCY.AvoidUpToRowsWithForAllEntries | AvoidUpToRowsWithForAllEntries: Avoid using UP TO ROWS clause in combination with FOR ALL ENTRIES in SELECT statements |
| Info     | Avoid Vble Message                    | OPT.ABAP.ADR.AvoidVbleMessage                      | AvoidVbleMessage: Do not use variables as parameters for messages  |
| Low      | Avoid Where Dynamic                   | OPT.ABAP.ASR.AvoidWhereDynamic                     | AvoidWhereDynamic: Avoid subqueries in WHERE   |

| Severity | Contrast rule                          | Engine rule ID                            | Description   |
|----------|--|---|---|
| Info     | Avoid Write To                         | OPT.ABAP.AGR.AvoidWriteTo                 | AvoidWriteTo: Replace WRITE TO sentence with MOVE TO                              |
| Critical | Backdoors                              | OPT.ABAP.SEC.Backdoors                    | Backdoors: Avoid development/test backdoors in production code                    |
| High     | Bad Authorization Check                | OPT.ABAP.SEC.BadAuthorizationCheck        | BadAuthorizationCheck: Improper implementation of authorization check             |
| High     | Call Editor Call                       | OPT.ABAP.AGR.CallEditorCall               | CallEditorCall: Avoid EDITOR-CALL   |
| Medium   | Call F M In Group                      | OPT.ABAP.AGR.CallFMInGroup                | CallFMInGroup: Unused function  |
| Info     | Calls2 Critical Functions              | OPT.ABAP.SEC.Calls2CriticalFunctions      | Calls2CriticalFunctions: Calls to Critical ABAP functions                         |
| Critical | Call Sys Function                      | OPT.ABAP.AGR.CallSysFunction              | CallSysFunction: Do not call system / kernel functions from ABAP application code |
| Low      | Call S Y S U B R C                     | OPT.ABAP.APBR.CallSYSUBRC                 | CallSYSUBRC: Check the value of SY-SUBRC after certain operations                 |
| High     | Call Tx                                | OPT.ABAP.AGR.CallTx                       | CallTx: Avoid called transactions corresponding to a certain module               |
| Medium   | Case No Repeat When                    | OPT.ABAP.AGR.CaseNoRepeatWhen             | CaseNoRepeatWhen: Avoid repeat WHEN conditions in a CASE sentence                 |
| Low      | Case Should Have At Least3 When        | OPT.ABAP.MAINT.CaseShouldHaveAtLeast3When | CaseShouldHaveAtLeast3When: A CASE statement should have at least 3 WHEN clauses  |
| Low      | Check Atr No Exist Dynpro              | OPT.ABAP.APBR.CheckAtrNoExistDynpro       | CheckAtrNoExistDynpro: Avoid checking attributes of a non-existing dynpro         |
| Medium   | Check Auth In All Programs             | OPT.ABAP.SEC.CheckAuthInAllPrograms       | CheckAuthInAllPrograms: Any report must perform an authority check                |
| High     | Check Authority                        | OPT.ABAP.APBR.CheckAuthority              | CheckAuthority: Invalid authorization fields in AUTHORITY-CHECK                   |
| High     | Check Dlg Modules                      | OPT.ABAP.APBR.CheckDlgModules             | CheckDlgModules: Avoid work with non-existing dynpros                             |
| Medium   | Check F Don't use masterpage filesaram | OPT.ABAP.APBR.CheckFMPParam               | CheckFMPParam: Avoid use an incorrect category for a function module parameters   |
| High     | Check Fn Module                        | OPT.ABAP.APBR.CheckFnModule               | CheckFnModule: Avoid working with non-existing functions                          |
| Low      | Check Includes                         | OPT.ABAP.APBR.CheckIncludes               | CheckIncludes: Avoid call files from include sentece that are not type I          |
| High     | Check Load Table                       | OPT.ABAP.APBR.CheckLoadTable              | CheckLoadTable: Load only existing tables in SAP system                           |
| High     | Check Messages                         | OPT.ABAP.APBR.CheckMessages               | CheckMessages: Use only existing messages in the table T100                       |
| Info     | Check Status P F                       | OPT.ABAP.AGR.CheckStatusPF                | CheckStatusPF: Check if the program program personalizes the STATUS PF            |
| Medium   | Check Submit With Param                | OPT.ABAP.APBR.CheckSubmitWithParam        | CheckSubmitWithParam: Avoid undeclared selection criteria in SUBMIT               |
| Info     | Check Titlebar                         | OPT.ABAP.AGR.CheckTitlebar                | CheckTitlebar: Check if the program program personalizes the TITLEBAR             |
| High     | Check Tx                               | OPT.ABAP.APBR.CheckTx                     | CheckTx: Only use existing transactions   |

| Severity | Contrast rule                       | Engine rule ID                               | Description  |
|----------|-------------------------------------|--|--|
| High     | Close All Open Resources            | OPT.ABAP.APFR.CloseAllOpenResources          | CloseAllOpenResources: Every open resource (cursor or dataset) should be closed                              |
| Low      | Cmd Table Out Loop                  | OPT.ABAP.ASR.CmdTableOutLoop                 | CmdTableOutLoop: Avoid to use commands of table with implicit use of index out of the LOOP                   |
| Critical | Command Injection                   | OPT.ABAP.SEC.CommandInjection                | CommandInjection: Improper Neutralization of Special Elements used in an OS Command ('OS Command Injection') |
| Low      | Comments Before Classes             | OPT.ABAP.MAINT.CommentsBeforeClasses         | CommentsBeforeClasses: Check if there are comment lines before a class                                       |
| High     | Comments Before Programs Or Reports | OPT.ABAP.ADR.CommentsBeforeProgramsOrReports | CommentsBeforeProgramsOrReports: Check if there are comment lines before programs and reports                |
| Low      | Comments Before Subroutines         | OPT.ABAP.ADR.CommentsBeforeSubroutines       | CommentsBeforeSubroutines: Check if there are comment lines before functions, method, forms or macro         |
| Medium   | Compatible Form Params              | OPT.ABAP.APBR.CompatibleFormParams           | CompatibleFormParams: With PERFORM, arguments should match subroutine formal parameters                      |
| Medium   | Complex Layout Use Matrix Layout    | OPT.ABAP.AWD.ComplexLayoutUseMatrixLayout    | ComplexLayoutUseMatrixLayout: Avoid too many elements in Web Dynpro views                                    |
| High     | Control Fields Client Tables        | OPT.ABAP.ASR.ControlFieldsClientTables       | ControlFieldsClientTables: Include audit fields in custom tables   |
| Low      | Correct Naming Meth                 | OPT.ABAP.ADR.CorrectNamingMeth               | CorrectNamingMeth: Methods must follow a standard naming convention  |
| High     | Correspond Raise Excep              | OPT.ABAP.APBR.CorrespondRaiseExcep           | CorrespondRaiseExcep: EXCEPTIONS and RAISE must match  |
| Critical | Cross Client Database Access        | OPT.ABAP.SEC.CrossClientDatabaseAccess       | CrossClientDatabaseAccess: Do not bypass SAP client separation mechanism                                     |
| Critical | Cross Site Scripting                | OPT.ABAP.SEC.CrossSiteScripting              | CrossSiteScripting: Improper Neutralization of Input During Web Page Generation ('Cross-site Scripting')     |
| High     | Cx Root Caught                      | OPT.ABAP.RELIABILITY.CxRootCaught            | CxRootCaught: Do not catch CX_ROOT   |
| High     | Cyclomatic Complexity               | OPT.ABAP.AMTR.CyclomaticComplexity           | CyclomaticComplexity: Avoid functions/forms/methods...." with high cyclomatic complexity                     |
| Info     | Dangerous File Download             | OPT.ABAP.SEC.DangerousFileDownload           | DangerousFileDownload: Dangerous file download   |
| Info     | Dangerous File Upload               | OPT.ABAP.SEC.DangerousFileUpload             | DangerousFileUpload: Dangerous file upload   |
| Low      | Data Definition At The Beginning    | OPT.ABAP.AMR.DataDefinitionAtTheBeginning    | DataDefinitionAtTheBeginning: Do not insert declarations after the first executable line                     |
| Medium   | Deeply Nested Statements            | OPT.ABAP.MAINT.DeeplyNestedStatements        | DeeplyNestedStatements: Avoid too deeply nested statements   |

| Severity | Contrast rule                               | Engine rule ID                                     | Description   |
|----------|---|--|---|
| High     | Delete From Table Without Where             | OPT.ABAP.RELIABILITY.DeleteFromTableWithoutWhere   | DeleteFromTableWithoutWhere: DELETE FROM statement must have WHERE condition  |
| High     | Deprecated Asynchronous R F C               | OPT.ABAP.PORTABILITY.DeprecatedAsynchronousRFC     | DeprecatedAsynchronousRFC: Use Background RFC instead of older Transactional or Queue RFC                           |
| High     | Direct Recursive Call                       | OPT.ABAP.RELIABILITY.DirectRecursiveCall           | DirectRecursiveCall: Avoid recursive calls  |
| High     | Direct Update                               | OPT.ABAP.SEC.DirectUpdate                          | DirectUpdate: SQL Bad Practices - Direct Update   |
| Critical | Dynamic Code                                | OPT.ABAP.SEC.DynamicCode                           | DynamicCode: Avoid Dynamic Code constructs  |
| High     | Dynamic Constructs                          | OPT.ABAP.SEC.DynamicConstructs                     | DynamicConstructs: Avoid dynamic constructs controlled by external input  |
| Medium   | Dynpro Non Exist Atr                        | OPT.ABAP.APBR.DynproNonExistAtr                    | DynproNonExistAtr: Avoid references to non-existing attributes for a dynpro screen element                          |
| Low      | Elseif With Else                            | OPT.ABAP.RELIABILITY.ElseifWithElse                | ElseifWithElse: IF ... ELSEIF statements must be terminated with ELSE   |
| Critical | Empty Select Endselect                      | OPT.ABAP.EFFICIENCY.EmptySelectEndselect           | EmptySelectEndselect: Avoid empty SELECT-ENDSELECT statements   |
| Critical | Enqueue Instead Of Select Single For Update | OPT.ABAP.ASR.EnqueueInsteadOfSelectSingleForUpdate | EnqueueInsteadOfSelectSingleForUpdate: Use SAP locking mechanism instead of SELECT SINGLE FOR UPDATE                |
| Low      | Equal Number Param                          | OPT.ABAP.APBR.EqualNumberParam                     | EqualNumberParam: Avoid call a FORM with diferent number of parameters as declared                                  |
| Low      | Excess Of Parameters                        | OPT.ABAP.AMTR.ExcessOfParameters                   | ExcessOfParameters: Avoid functions/forms/methods with an excess of parameters                                      |
| Low      | Excess Of Responsibility                    | OPT.ABAP.AMTR.ExcessOfResponsibility               | ExcessOfResponsibility: Avoid programs with excess of responsibility  |
| Low      | Excess Of Return                            | OPT.ABAP.AMTR.ExcessOfReturn                       | ExcessOfReturn: Avoid an excess of RETURN statements  |
| Low      | Exist Prog Form Decl                        | OPT.ABAP.APBR.ExistProgFormDecl                    | ExistProgFormDecl: Avoid declare FORMS in programs that do not exists in the analyzed system                        |
| Medium   | Exists Form                                 | OPT.ABAP.AGR.ExistsForm                            | ExistsForm: Avoid call non-declared FORMS   |
| Medium   | Extract Code Into Subroutines               | OPT.ABAP.AMR.ExtractCodeIntoSubroutines            | ExtractCodeIntoSubroutines: Organize big code sections in smaller ones  |
| Low      | Fan In                                      | OPT.ABAP.AMTR.FanIn                                | FanIn: Limit the number of calls to each routine in programs, reports and classes                                   |
| Medium   | Fan Out                                     | OPT.ABAP.AMTR.FanOut                               | FanOut: Limit number of calls (fan-out) from each processing block  |
| Info     | Fields Curr Quan                            | OPT.ABAP.AGR.FieldsCurrQuan                        | FieldsCurrQuan: CURR and QUAN fields must have asociated unit fields  |
| Critical | First Stmt Return Select Endselect          | OPT.ABAP.EFFICIENCY.FirstStmtReturnSelectEndselect | FirstStmtReturnSelectEndselect: Avoid using a RETURN statement as the first statement into a SELECT-ENDSELECT block |
| High     | Form Corresponds Perform                    | OPT.ABAP.AGR.FormCorrespondsPerform                | FormCorrespondsPerform: Avoid declaring unused subroutines  |

| Severity | Contrast rule                       | Engine rule ID                                   | Description   |
|----------|-------------------------------------|--|---|
| Low      | Hardcoded Text In Message           | OPT.ABAP.MAINT.HardcodedTextInMessage            | HardcodedTextInMessage: Avoid hardcoding text in message  |
| High     | Hardcoded Client Check              | OPT.ABAP.SEC.HardcodedClientCheck                | HardcodedClientCheck: Hardcoded SAP client check (sy-mandt)   |
| Low      | Hardcoded Date Check                | OPT.ABAP.SEC.HardcodedDateCheck                  | HardcodedDateCheck: Avoid hardcoding into the code current server date checks (sy-datum)            |
| Medium   | Hardcoded Host Check                | OPT.ABAP.MAINT.HardcodedHostCheck                | HardcodedHostCheck: Avoid hardcoding sy-host checks   |
| Low      | Hardcoded OS Check                  | OPT.ABAP.MAINT.HardcodedOSCheck                  | HardcodedOSCheck: Avoid hardcoding sy-opsys checks  |
| Medium   | Hardcoded Rfc Destination           | OPT.ABAP.RELIABILITY.HardcodedRfcDestination     | HardcodedRfcDestination: Avoid hardcoding the RFC destination parameter                             |
| Low      | Hardcoded Sensitive Data            | OPT.ABAP.SEC.HardcodedSensitiveData              | HardcodedSensitiveData: Avoid hardcoding sensitive information                                      |
| High     | Hardcoded System Id Check           | OPT.ABAP.SEC.HardcodedSystemIdCheck              | HardcodedSystemIdCheck: Hardcoded System ID check (sy-sysid)  |
| High     | Hardcoded Username Check            | OPT.ABAP.SEC.HardcodedUsernameCheck              | HardcodedUsernameCheck: Hard-coded user name in check (potential backdoor)                          |
| Critical | Http Header Manipulation            | OPT.ABAP.SEC.HttpHeaderManipulation              | HttpHeaderManipulation: Unvalidated data in HTTP response header                                    |
| Medium   | Implement Layout                    | OPT.ABAP.AWD.ImplementLayout                     | ImplementLayout: All Web Dynpro views must have a layout  |
| Low      | Import Export Dynpro                | OPT.ABAP.AMR.ImportExportDynpro                  | ImportExportDynpro: Avoid using import/export dynpro  |
| Critical | Import Export Nametab               | OPT.ABAP.AGR.ImportExportNametab                 | ImportExportNametab: Avoid IMPORT / EXPORT NAMETAB  |
| High     | Insecure Randomness                 | OPT.ABAP.SEC.InsecureRandomness                  | InsecureRandomness: Standard pseudo-random number generators cannot withstand cryptographic attacks |
| High     | Join Instead Of Select In Loop      | OPT.ABAP.EFFICIENCY.JoinInsteadOfSelectInLoop    | JoinInsteadOfSelectInLoop: Use join instead of select + loop + nested select                        |
| High     | Key Select Option                   | OPT.ABAP.AGR.KeySelectOption                     | KeySelectOption: SELECT-OPTIONS must always include key or indexed fields                           |
| Info     | Keywords For User Identifiers       | OPT.ABAP.MAINT.KeywordsForUserIdentifiers        | KeywordsForUserIdentifiers: ABAP keywords should not be used as identifiers                         |
| Info     | Limited Number Of Includes          | OPT.ABAP.APFR.LimitedNumberOfIncludes            | LimitedNumberOfIncludes: Too many included source files   |
| High     | Limited Number Of Tables In Queries | OPT.ABAP.ASR.LimitedNumberOfTablesInQueries      | LimitedNumberOfTablesInQueries: Try to limit the number of tables used in a SELECT query            |
| Medium   | Limit Indexes                       | OPT.ABAP.ASR.LimitIndexes                        | LimitIndexes: Do not to create too many indexes in a table  |
| Medium   | Logic Depending On Text Symbols     | OPT.ABAP.RELIABILITY.LogicDependingOnTextSymbols | LogicDependingOnTextSymbols: Logic depending on text symbols  |

| Severity | Contrast rule                      | Engine rule ID                              | Description   |
|----------|------------------------------------|---|---|
| Info     | Loop At Into                       | OPT.ABAP.EFFICIENCY.LoopAtInto              | LoopAtInto: Avoid LOOP AT itab INTO   |
| Low      | Loop At Where Inside Loop          | OPT.ABAP.APFR.LoopAtWhereInsideLoop         | LoopAtWhereInsideLoop: Avoid using LOOP AT with WHERE inside another LOOP AT                                      |
| Info     | Loop Where Instead Of Loop Check   | OPT.ABAP.APFR.LoopWhereInsteadOfLoopCheck   | LoopWhereInsteadOfLoopCheck: Use LOOP + WHERE instead of LOOP + CHECK   |
| High     | Mark Buffering If Necessary        | OPT.ABAP.ASR.MarkBufferingIfNecessary       | MarkBufferingIfNecessary: Activate table buffering when needed  |
| Medium   | Match Layout With View Controller  | OPT.ABAP.AWD.MatchLayoutWithViewController  | MatchLayoutWithViewController: Without associated layout, view controller code is stored in wdDoModifyView method |
| Low      | Maximum Joins Per Query            | OPT.ABAP.APFR.MaximumJoinsPerQuery          | MaximumJoinsPerQuery: Restrict the number of tables that can be used in a SELECT                                  |
| Low      | Max Long Line Size                 | OPT.ABAP.APTR.MaxLongLineSize               | MaxLongLineSize: Avoid width parameter LINE-SIZE greater than 255   |
| Medium   | Max Number DB Op                   | OPT.ABAP.APFR.MaxNumberDBOp                 | MaxNumberDBOp: Too many DB operations in a report or procedure  |
| Low      | Max One Append Struct              | OPT.ABAP.ASR.MaxOneAppendStruct             | MaxOneAppendStruct: Table or standard structure with multiple append structures                                   |
| Low      | Message Language                   | OPT.ABAP.ADR.MessageLanguage                | MessageLanguage: The messages must be translated into the necessary languages                                     |
| Low      | Message Param                      | OPT.ABAP.APBR.MessageParam                  | MessageParam: Check that messages have the correct number of parameters   |
| High     | Modified Input Parameter           | OPT.ABAP.RELIABILITY.ModifiedInputParameter | ModifiedInputParameter: Modification of input parameter passed by reference                                       |
| Info     | Move Instead Of Move Corresponding | OPT.ABAP.AGR.MoveInsteadOfMoveCorresponding | MoveInsteadOfMoveCorresponding: Use MOVE instead of MOVE-CORRESPONDING  |
| High     | Naming Components                  | OPT.ABAP.AWD.NamingComponents               | NamingComponents: To control the nomenclature of the components   |
| Low      | Naming Conventions                 | OPT.ABAP.ADR.NamingConventions              | NamingConventions: Standard naming conventions should be followed   |
| Low      | Nested Case Statement              | OPT.ABAP.AMR.NestedCaseStatement            | NestedCaseStatement: Avoid CASE sentences with many nested levels   |
| Low      | Nested If Statement                | OPT.ABAP.AMR.NestedIfStatement              | NestedIfStatement: Try to limit nested IF   |
| Medium   | Nested Loops                       | OPT.ABAP.AMR.NestedLoops                    | NestedLoops: Avoid using nested loops   |
| Medium   | Nested Only Data Def               | OPT.ABAP.AGR.NestedOnlyDataDef              | NestedOnlyDataDef: Avoid declaring a redundant nested structure   |
| Critical | Nested Select Statement            | OPT.ABAP.EFFICIENCY.NestedSelectStatement   | NestedSelectStatement: Avoid nested SELECT statements   |
| Critical | No Absolute Paths                  | OPT.ABAP.APTR.NoAbsolutePaths               | NoAbsolutePaths: There should not be an absolute path   |
| High     | No Access Model From Mths          | OPT.ABAP.AWD.NoAccessModelFromMths          | NoAccessModelFromMths: No direct access to assistance classes from Web Dynpro view controller methods             |



| Severity | Contrast rule                            | Engine rule ID  | Description   |
|----------|--|---|---|
| Medium   | No Append Sorted By                      | OPT.ABAP.APFR.NoAppendSortedBy                        | NoAppendSortedBy: Do not use APPEND ... SORTED BY   |
| High     | No Assert With Side Effects Condition    | OPT.ABAP.RELIABILITY.NoAssertWithSideEffectsCondition | NoAssertWithSideEffectsCondition: Avoid configurable ASSERTs with side-effects  |
| Critical | No Authorization Check Call Transaction  | OPT.ABAP.SEC.NoAuthorizationCheckCallTransaction      | NoAuthorizationCheckCallTransaction: Authorization check must be done explicitly before CALL TRANSACTION                                      |
| Critical | No Authorization Check RFC               | OPT.ABAP.SEC.NoAuthorizationCheckRFC                  | NoAuthorizationCheckRFC: Authorization check must be done explicitly in RFC-enabled functions   |
| High     | No Authorization Check SQL               | OPT.ABAP.SEC.NoAuthorizationCheckSQL                  | NoAuthorizationCheckSQL: Authorization check must be done explicitly on SQL statements  |
| High     | No Authorization Group4 Table            | OPT.ABAP.SEC.NoAuthorizationGroup4Table               | NoAuthorizationGroup4Table: Table without authorization group   |
| Critical | No Break Point Statements                | OPT.ABAP.APBR.NoBreakPointStatements                  | NoBreakPointStatements: Remove BREAK-POINT statements from production code  |
| Medium   | No Check Or Continue Within Select Loops | OPT.ABAP.APFR.NoCheckOrContinueWithinSelectLoops      | NoCheckOrContinueWithinSelectLoops: Do not use CHECK, EXIT or CONTINUE statements inside a SELECT loop  |
| High     | No Control Break Within Loop At Where    | OPT.ABAP.APBR.NoControlBreakWithinLoopAtWhere         | NoControlBreakWithinLoopAtWhere: Do not use WHERE/FROM/TO in LOOP AT with control level processing blocks (AT FIRST, AT NEW, AT END, AT LAST) |
| Low      | No Corresponding Fields                  | OPT.ABAP.APFR.NoCorrespondingFields                   | NoCorrespondingFields: Do not use CORRESPONDING FIELDS in SELECT *  |
| Medium   | No Data Definitions Within Events        | OPT.ABAP.AGR.NoDataDefinitionsWithinEvents            | NoDataDefinitionsWithinEvents: Avoid declarations inside an event block   |
| Medium   | No Data Or Object Creation Inside Loops  | OPT.ABAP.APFR.NoDataOrObjectCreationInsideLoops       | NoDataOrObjectCreationInsideLoops: Avoid creating objects or declaring data inside a loop   |
| Low      | No Dead Data Definitions                 | OPT.ABAP.AMR.NoDeadDataDefinitions                    | NoDeadDataDefinitions: In a program, all information defined is in use  |
| Info     | No Declared Field                        | OPT.ABAP.ASR.NoDeclaredField                          | NoDeclaredField: Avoid referencing undeclared fields in internal tables or structures   |
| High     | No Exec SQL Statements                   | OPT.ABAP.APTR.NoExecSqlStatements                     | NoExecSqlStatements: There should not be an EXEC SQL statements   |
| Info     | No Exist Context                         | OPT.ABAP.APBR.NoExistContext                          | NoExistContext: Do not use fields from non declared tables or structures  |
| Medium   | No Field As Operator                     | OPT.ABAP.ADR.NoFieldAsOperator                        | NoFieldAsOperator: Avoid using operators as field names   |
| Low      | No Hyphen In Name                        | OPT.ABAP.AGR.NoHyphenInName                           | NoHyphenInName: Not use hyphens in the name of the internal table fields  |
| Medium   | No Ids Other Type                        | OPT.ABAP.ADR.NoIdsOtherType                           | NoldsOtherType: Field name is identical to a primitive type but it is declared as another type  |

| Severity | Contrast rule                                  | Engine rule ID  | Description   |
|----------|--|---|---|
| Info     | No Literals                                    | OPT.ABAP.AMR.NoLiterals                               | NoLiterals: Do not use literals in the code   |
| Low      | No Long Ids                                    | OPT.ABAP.ADR.NoLongIds                                | NoLongIds: Do not use large identifier names  |
| Info     | No Lost Cursor                                 | OPT.ABAP.ASR.NoLostCursor                             | NoLostCursor: Avoid in a loop SELECT to call to a sentence because of which the cursor gets lost  |
| High     | No Over Write Sys Var                          | OPT.ABAP.AGR.NoOverWriteSysVar                        | NoOverWriteSysVar: Avoid overwrite system-variables   |
| Medium   | No Raise Out Of Function Group                 | OPT.ABAP.APBR.NoRaiseOutOfFunctionGroup               | NoRaiseOutOfFunctionGroup: RAISE exception statements inside improper processing block  |
| Medium   | No Select All                                  | OPT.ABAP.ASR.NoSelectAll                              | NoSelectAll: Avoid SELECT * in SQL queries  |
| High     | No Select Inside Loop                          | OPT.ABAP.APFR.NoSelectInsideLoop                      | NoSelectInsideLoop: Avoid include SELECT sentences inside a loop  |
| Medium   | No Sentence After Exit                         | OPT.ABAP.AGR.NoSentenceAfterExit                      | NoSentenceAfterExit: Avoid other sentences after STOP, LEAVE, PROGRAM, EXIT, RETURN, RAISE, REJECT or SUBMIT                                      |
| High     | Not In Subquery                                | OPT.ABAP.EFFICIENCY.NotInSubquery                     | NotInSubquery: Avoid NOT IN subquery in SELECT  |
| Critical | No Update Config Tables                        | OPT.ABAP.ASR.NoUpdateConfigTables                     | NoUpdateConfigTables: Avoid write operations on sensitive database tables from ABAP code  |
| High     | No Use S Y Uname                               | OPT.ABAP.AGR.NoUseSYUname                             | NoUseSYUname: Avoid using system variable SY-UNAME inside a condition   |
| High     | No Wildcards At The Beginning Of Like Literals | OPT.ABAP.APFR.NoWildcardsAtTheBeginningOfLikeLiterals | NoWildcardsAtTheBeginningOfLikeLiterals: Do not use wildcards (% or _) at the beginning of the literal used in LIKE comparisons in SQL statements |
| Medium   | Number View In W D                             | OPT.ABAP.AWD.NumberViewInWD                           | NumberViewInWD: Control the number of views   |
| Medium   | Obsolete Code                                  | OPT.ABAP.PORTABILITY.ObsoleteCode                     | ObsoleteCode: Obsolete code in SAP 7+   |
| Info     | One Statement Per Line                         | OPT.ABAP.AMR.OneStatementPerLine                      | OneStatementPerLine: Place each sentence in one line  |
| Low      | Only Client Fields In Append Str               | OPT.ABAP.ASR.OnlyClientFieldsInAppendStr              | OnlyClientFieldsInAppendStr: Always use custom fields in Append structures  |
| High     | Only One Commit And Rollback                   | OPT.ABAP.APFR.OnlyOneCommitAndRollback                | OnlyOneCommitAndRollback: There should be only one COMMIT and ROLLBACK inside a programme   |
| Medium   | Open Close Resources Only Once                 | OPT.ABAP.APFR.OpenCloseResourcesOnlyOnce              | OpenCloseResourcesOnlyOnce: Every resource (cursor or dataset) should be opened and closed only once  |
| Critical | Open Redirect                                  | OPT.ABAP.SEC.OpenRedirect                             | OpenRedirect: URL Redirection to Untrusted Site ('Open Redirect')   |
| Low      | Output File Extension                          | OPT.ABAP.AGR.OutputFileExtension                      | OutputFileExtension: Output files must have appropriate extensions  |
| Medium   | Output Files With Header                       | OPT.ABAP.AGR.OutputFilesWithHeader                    | OutputFilesWithHeader: Output datasets must have a header record  |
| High     | Overwrite System Fields                        | OPT.ABAP.SEC.OverwriteSystemFields                    | OverwriteSystemFields: Inadequate usage of ABAP System field  |

| Severity | Contrast rule                                  | Engine rule ID  | Description   |
|----------|--|---|---|
| High     | Password Management                            | OPT.ABAP.SEC.PasswordManagement                       | PasswordManagement: Avoid hard-coded or in-comment credentials (username / password) in code              |
| Critical | Path Manipulation                              | OPT.ABAP.SEC.PathManipulation                         | PathManipulation: External Control of File Name or Path   |
| Medium   | Path Output File                               | OPT.ABAP.AMR.PathOutputFile                           | PathOutputFile: Output files must be stored in file system  |
| Medium   | Percentage Of Comment Lines Per File           | OPT.ABAP.ADR.PercentageOfCommentLinesPerFile          | PercentageOfCommentLinesPerFile: Check the global amount of comment lines per file                        |
| Medium   | Percentage Of Comment Lines Per Method         | OPT.ABAP.MAINT.PercentageOfCommentLinesPerMethod      | PercentageOfCommentLinesPerMethod: Check the global amount of comment lines per method                    |
| Medium   | Recommendable Dynpro Size                      | OPT.ABAP.AWD.RecommendableDynproSize                  | RecommendableDynproSize: Use correct sizes in Web Dynpro fields   |
| Medium   | Recommend ALV with Report                      | OPT.ABAP.AGR.RecommendALVwithReport                   | RecommendALVwithReport: Use ALV (Abap List Viewer) instead of classic list generation in reports          |
| Low      | Recommend Case When Others                     | OPT.ABAP.AGR.RecommendCaseWhenOthers                  | RecommendCaseWhenOthers: WHEN OTHERS clause should appear in every CASE statement                         |
| Info     | Recommend Start Of Selection                   | OPT.ABAP.AGR.RecommendStartOfSelection                | RecommendStartOfSelection: START-OF-SELECTION event handler should appear in every ABAP report            |
| High     | Recommend Where With Indexes                   | OPT.ABAP.ASR.RecommendWhereWithIndexes                | RecommendWhereWithIndexes: Use indexed columns in WHERE condition on large tables                         |
| Critical | Regex Injection                                | OPT.ABAP.SEC.RegexInjection                           | RegexInjection: Prevent denial of service attack through malicious regular expression ('Regex Injection') |
| Medium   | Replace If With Case                           | OPT.ABAP.APFR.ReplacelfWithCase                       | ReplacelfWithCase: Replace IF ... ENDIF with CASE ... ENDCASE when possible                               |
| High     | Rfc Callback Attack                            | OPT.ABAP.SEC.RfcCallbackAttack                        | RfcCallbackAttack: RFC call without callback attack protection  |
| Critical | Rfc Destination Injection                      | OPT.ABAP.SEC.RfcDestinationInjection                  | RfcDestinationInjection: Destination injection in RFC call  |
| Medium   | Security Select Tables                         | OPT.ABAP.ASR.SecuritySelectTables                     | SecuritySelectTables: Avoid queries on sensitive tables from ABAP code                                    |
| Low      | Select Into Instead Of Select Appending        | OPT.ABAP.APFR.SelectIntoInsteadOfSelectAppending      | SelectIntoInsteadOfSelectAppending: Use SELECT + INTO instead of SELECT APPENDING                         |
| Low      | Select Into Table Instead Of Select End Select | OPT.ABAP.APFR.SelectIntoTableInsteadOfSelectEndSelect | SelectIntoTableInsteadOfSelectEndSelect: Do not use SELECT...ENDSELECT for loading an internal table      |
| Low      | Set Get Sys Param                              | OPT.ABAP.APBR.SetGetSysParam                          | SetGetSysParam: Use existing parameters in the system   |
| High     | Sort Before Removing Duplicates                | OPT.ABAP.RELIABILITY.SortBeforeRemovingDuplicates     | SortBeforeRemovingDuplicates: Sort internal tables before removing duplicates                             |
| Low      | Sort Instead Of Order By                       | OPT.ABAP.ASR.SortInsteadOfOrderBy                     | SortInsteadOfOrderBy: Use ABAP SORT instead of ORDER BY in SELECT   |

| Severity | Contrast rule                          | Engine rule ID                                  | Description  |
|----------|--|---|--|
| Critical | Sort Stmt In A Loop                    | OPT.ABAP.EFFICIENCY.SortStmtInALoop             | SortStmtInALoop: Avoid declaring SORT statements inside a LOOP                                     |
| Critical | SQL Injection                          | OPT.ABAP.SEC.SqlInjection                       | SqlInjection: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection') |
| Medium   | Stand Comment Form                     | OPT.ABAP.ADR.StandCommentForm                   | StandCommentForm: In the FORM it is advisable to use the comments with standard format             |
| High     | Submit Report                          | OPT.ABAP.AGR.SubmitReport                       | SubmitReport: Avoid too many SUBMIT calls in a report  |
| Low      | Submit Report Type1                    | OPT.ABAP.APBR.SubmitReportType1                 | SubmitReportType1: Avoid call reports that are not type 1  |
| Critical | Submit Stmt In A Loop                  | OPT.ABAP.EFFICIENCY.SubmitStmtInALoop           | SubmitStmtInALoop: Avoid declaring SUBMIT statements inside a LOOP                                 |
| Low      | Subroutine Definitions After Events    | OPT.ABAP.AGR.SubroutineDefinitionsAfterEvents   | SubroutineDefinitionsAfterEvents: Every subroutine should be declared after events                 |
| Low      | Suggest Append Lines Instead Of Append | OPT.ABAP.APFR.SuggestAppendLinesInsteadOfAppend | SuggestAppendLinesInsteadOfAppend: For efficiency, use APPEND LINES OF instead of APPEND           |
| Medium   | Suggest Others Exceptions              | OPT.ABAP.APBR.SuggestOthersExceptions           | SuggestOthersExceptions: Call with no OTHERS option in EXCEPTIONS                                  |
| High     | Suggest Select Where                   | OPT.ABAP.ASR.SuggestSelectWhere                 | SuggestSelectWhere: SELECT without WHERE   |
| Low      | Suggest Typed Parameters               | OPT.ABAP.AGR.SuggestTypedParameters             | SuggestTypedParameters: Avoid procedures with untyped or too generic type parameters               |
| High     | Suggest While Instead Of Do            | OPT.ABAP.APFR.SuggestWhileInsteadOfDo           | SuggestWhileInsteadOfDo: Use WHILE instead of unconditional DO loops                               |
| Low      | Too Many Attributes In A Class         | OPT.ABAP.MAINT.TooManyAttributesInAClass        | TooManyAttributesInAClass: Avoid declaring too many class attributes                               |
| Low      | Too Many Database Operations In Block  | OPT.ABAP.MAINT.TooManyDatabaseOperationsInBlock | TooManyDatabaseOperationsInBlock: Avoid too many database operations in a behavioral unit          |
| Low      | Too Many Lines By File                 | OPT.ABAP.MAINT.TooManyLinesByFile               | TooManyLinesByFile: Avoid files with too many lines  |
| Medium   | Too Nested Macro Calls                 | OPT.ABAP.MAINT.TooNestedMacroCalls              | TooNestedMacroCalls: Avoid too nested macro calls  |
| High     | Uncaught Exception In Rfc Call         | OPT.ABAP.RELIABILITY.UncaughtExceptionInRfcCall | UncaughtExceptionInRfcCall: Uncaught exception in RFC call   |
| Medium   | Unicode Programs                       | OPT.ABAP.ADR.UnicodePrograms                    | UnicodePrograms: The code must guard compatibility with UNICODE                                    |
| High     | Update Dbtable Without Where           | OPT.ABAP.RELIABILITY.UpdateDbtableWithoutWhere  | UpdateDbtableWithoutWhere: UPDATE on database table without WHERE                                  |
| High     | Update Delete Without Where            | OPT.ABAP.EFFICIENCY.UpdateDeleteWithoutWhere    | UpdateDeleteWithoutWhere: UPDATE / DELETE without WHERE  |
| Info     | Usages Of Sy Sysid                     | OPT.ABAP.SEC.UsagesOfSySysid                    | UsagesOfSySysid: Usage of sy-sysid (informative)   |

| Severity | Contrast rule                              | Engine rule ID                                    | Description   |
|----------|--|---|---|
| Info     | Usages Of Sy Uname                         | OPT.ABAP.SEC.UsagesOfSyUname                      | UsagesOfSyUname: Usage of sy-<br>uname (informative)  |
| Medium   | Use Attributes Controller Class            | OPT.ABAP.AWD.UseAttributesControllerClass         | UseAttributesControllerClass: Web<br>Dynpro controller classes must<br>have the attributes WDTTHIS and<br>WDCONTEXT |
| Medium   | Use Class Based Exceptions                 | OPT.ABAP.MAINT.UseClassBasedExceptions            | UseClassBasedExceptions: Use<br>class-based exception handling  |
| High     | Use For All Entries                        | OPT.ABAP.APFR.UseForAllEntries                    | UseForAllEntries: Ensure that internal<br>table in FOR ALL ENTRIES clause is<br>not empty                           |
| Medium   | Use Local Instead Of Tables In Subroutines | OPT.ABAP.AGR.UseLocalInsteadOfTablesInSubroutines | UseLocalInsteadOfTablesInSubroutines: Do not declare TABLES/NODES<br>in procedures, modules or event<br>blocks      |
| High     | Use Read With Binary Search If With Key    | OPT.ABAP.APFR.UseReadWithBinarySearchIfWithKey    | UseReadWithBinarySearchIfWithKey:<br>Use BINARY SEARCH with WITH<br>KEY when reading tables                         |
| High     | Warn Scroll                                | OPT.ABAP.AWD.WarnScroll                           | WarnScroll: Avoid Web Dynpro<br>elements with scrollingMode {}  |
| Low      | Warn Without Adobe Print Form              | OPT.ABAP.ADR.WarnWithoutAdobePrintForm            | WarnWithoutAdobePrintForm:<br>Warning if Print Forms is not in use<br>Adobe as form                                 |
| High     | Weak Hash Algorithm                        | OPT.ABAP.SEC.WeakHashAlgorithm                    | WeakHashAlgorithm: Weak<br>cryptographic hashes cannot<br>guarantee data integrity                                  |
| Low      | Where Clauses Without Not Or               | OPT.ABAP.ASR.WhereClausesWithoutNotOr             | WhereClausesWithoutNotOr: Avoid<br>NOT / OR operators inside WHERE<br>clauses in database operations                |
| Low      | Working With Report                        | OPT.ABAP.AGR.WorkingWithReport                    | WorkingWithReport: Avoid dynamic<br>operations (READ, INSERT or<br>DELETE) with reports                             |
| Low      | Working With Text Pool                     | OPT.ABAP.AGR.WorkingWithTextPool                  | WorkingWithTextPool: Avoid read,<br>insert or delete textpools  |

## ActionScript Scan rules

Contrast Scan supports these rules for ActionScript.

| Severity | Contrast rule                    | Engine rule ID   | Description  |
|----------|----------------------------------|--|--|
| Critical | Avoid Declaring Vars Without Var | OPT.ACTIONSCRIPT.EST_ACTIONSCRIPT.AvoidDeclaringVarsWithoutVar | AvoidDeclaringVarsWithoutVar:<br>Avoid declaring vars without<br>reserve word VAR before |
| Critical | End Sentences With Semicolon     | OPT.ACTIONSCRIPT.EST_ACTIONSCRIPT.EndSentencesWithSemicolon    | EndSentencesWithSemicolon:<br>Avoid sentences without<br>semicolon at the end            |
| Critical | Avoid Loop With Empty Body       | OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidLoopWithEmptyBody       | AvoidLoopWithEmptyBody: Avoid<br>empty loops   |
| Critical | Comp Life Cycle                  | OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.CompLifeCycle                | CompLifeCycle: Avoid overriding<br>certain methods                                       |
| Critical | No Keywords As Identifiers       | OPT.ACTIONSCRIPT.NOM_ACTIONSCRIPT.NoKeywordsAsIdentifiers      | NoKeywordsAsIdentifiers: Do not<br>use keywords as identifiers                           |

| Severity | Contrast rule                        | Engine rule ID  | Description   |
|----------|--------------------------------------|---|---|
| Critical | Avoid Declaring Inside Loops         | OPT.ACTIONSCRIPT.PER_ACTIONSCRIPT.AvoidDeclaringInsideLoops       | AvoidDeclaringInsideLoops: Avoid declaring variables inside loops                                 |
| Critical | Avoid Large Classes                  | OPT.ACTIONSCRIPT.PER_ACTIONSCRIPT.AvoidLargeClasses               | AvoidLargeClasses: Avoid large classes  |
| Critical | Avoid Large Constructors             | OPT.ACTIONSCRIPT.PER_ACTIONSCRIPT.AvoidLargeConstructors          | AvoidLargeConstructors: Avoid large constructors  |
| Critical | Avoid Large Functions                | OPT.ACTIONSCRIPT.PER_ACTIONSCRIPT.AvoidLargeFunctions             | AvoidLargeFunctions: Avoid large functions  |
| Critical | Avoid Many Conditionals              | OPT.ACTIONSCRIPT.PER_ACTIONSCRIPT.AvoidManyConditionals           | AvoidManyConditionals: Avoid many conditional sentences in the code                               |
| Critical | Avoid Mutiple Return                 | OPT.ACTIONSCRIPT.PER_ACTIONSCRIPT.AvoidMutipleReturn              | AvoidMutipleReturn: Avoid multiple RETURN statements inside a function                            |
| Critical | Avoid Nested Loops                   | OPT.ACTIONSCRIPT.PER_ACTIONSCRIPT.AvoidNestedLoops                | AvoidNestedLoops: Avoid using nested loops  |
| Critical | Declaring Array                      | OPT.ACTIONSCRIPT.PER_ACTIONSCRIPT.DeclaringArray                  | DeclaringArray: Declaring Arrays using new array instead of []                                    |
| Critical | No Use Set Style                     | OPT.ACTIONSCRIPT.PER_ACTIONSCRIPT.NoUseSetStyle                   | NoUseSetStyle: Avoid 'setStyle()' method  |
| Critical | Too Many Parameters In Function      | OPT.ACTIONSCRIPT.PER_ACTIONSCRIPT.TooManyParametersInFunction     | TooManyParametersInFunction: Too many parameters in a function                                    |
| Critical | Type Everything                      | OPT.ACTIONSCRIPT.PER_ACTIONSCRIPT.TypeEverything                  | TypeEverything: Every var, function, parameter and constant must be declared along with a type    |
| High     | Use Space Between Operators          | OPT.ACTIONSCRIPT.EST_ACTIONSCRIPT.UseSpaceBetwenOperators         | UseSpaceBetwenOperators: Put a single space around operators                                      |
| High     | Avoid Assignment in Condition        | OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidAssignmentinCondition      | AvoidAssignmentinCondition: Avoid a assignment operation in condition statements                  |
| High     | Avoid Empty Functions                | OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidEmptyFunctions             | AvoidEmptyFunctions: Avoid declaring empty functions  |
| High     | Avoid For With External Control Vars | OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidForWithExternalControlVars | AvoidForWithExternalControlVars: Avoid using external variables to loop control in FOR statements |
| High     | Avoid Unary Ops In Assign            | OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidUnaryOpsInAssign           | AvoidUnaryOpsInAssign: Avoid ternary operator in assignment statements (?:)                       |
| High     | Avoid Unused Function                | OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidUnusedFunction             | AvoidUnusedFunction: Avoid having declared unused functions                                       |
| High     | Avoid Unused Function Parameter      | OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidUnusedFunctionParameter    | AvoidUnusedFunctionParameter: Detect function parameter not used                                  |
| High     | Avoid Unused Local Var               | OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidUnusedLocalVar             | AvoidUnusedLocalVar: Detect local vars unused   |
| High     | If With Out Block                    | OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.IfWithOutBlock                  | IfWithOutBlock: Avoid using IF statements with empty body   |
| High     | No Update Loop In For Body           | OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.NoUpdateLoopInForBody           | NoUpdateLoopInForBody: Avoid to update control var inside FOR loop body                           |
| High     | Unused Constant                      | OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.UnusedConstant                  | UnusedConstant: Avoid unused private constant declarations  |
| High     | Avoid Numbers As Control Var         | OPT.ACTIONSCRIPT.PER_ACTIONSCRIPT.AvoidNumbersAsControlVar        | AvoidNumbersAsControlVar: Avoid declaring control variables as Numbers                            |
| High     | Avoid Popup Windows                  | OPT.ACTIONSCRIPT.PER_ACTIONSCRIPT.AvoidPopupWindows               | AvoidPopupWindows: Use javascript to open pop-up windows  |

| Severity | Contrast rule            | Engine rule ID   | Description   |
|----------|--------------------------|--|---|
| Info     | Document Every Function  | OPT.ACTIONSCRIPT.DOC_ACTIONSCRIPT.DocumentEveryFunction  | DocumentEveryFunction: Provide comments for functions                   |
| Low      | Code Document Percentage | OPT.ACTIONSCRIPT.DOC_ACTIONSCRIPT.CodeDocumentPercentage | CodeDocumentPercentage: Avoid files with a very low comment/code ratio  |
| Low      | Avoid Switch Many Cases  | OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidSwitchManyCases   | AvoidSwitchManyCases: Avoid too many CASE clauses in SWITCH statement   |
| Medium   | Class Naming Pattern     | OPT.ACTIONSCRIPT.NOM_ACTIONSCRIPT.ClassNamingPattern     | ClassNamingPattern: Class names must comply with the convention         |
| Medium   | Constant Naming Pattern  | OPT.ACTIONSCRIPT.NOM_ACTIONSCRIPT.ConstantNamingPattern  | ConstantNamingPattern: Constant names must comply with the convention   |
| Medium   | Function Naming Pattern  | OPT.ACTIONSCRIPT.NOM_ACTIONSCRIPT.FunctionNamingPattern  | FunctionNamingPattern: Function names must comply with the convention   |
| Medium   | Interface Naming Pattern | OPT.ACTIONSCRIPT.NOM_ACTIONSCRIPT.InterfaceNamingPattern | InterfaceNamingPattern: Interface names must comply with the convention |
| Medium   | Package Naming Pattern   | OPT.ACTIONSCRIPT.NOM_ACTIONSCRIPT.PackageNamingPattern   | PackageNamingPattern: Package names must comply with the convention     |
| Medium   | Variable Naming Pattern  | OPT.ACTIONSCRIPT.NOM_ACTIONSCRIPT.VariableNamingPattern  | VariableNamingPattern: Variable names must follow the conventions       |
| Medium   | Misuse Dynamic Filter    | OPT.ACTIONSCRIPT.PER_ACTIONSCRIPT.MisuseDynamicFilter    | MisuseDynamicFilter: Avoid declaring unused filters                     |

## ASP.NET Scan rules

Contrast Scan supports these rules for ASP.NET.

| Severity | Contrast rule                          | Engine rule ID                               | Description   |
|----------|--|--|---|
| Critical | Dangerous App Setting                  | OPT.ASPNET.DangerousAppSetting               | DangerousAppSetting: Dangerous application setting  |
| Critical | Too Broad CORS Policy                  | OPT.ASPNET.TooBroadCORSPolicy                | TooBroadCORSPolicy: CORS policy (Cross-Origin Resource Sharing) too broad   |
| Critical | CBII                                   | OPT.ASPNET.CBII                              | CBII: Use code-behind files   |
| Critical | Respect MVC                            | OPT.ASPNET.CBNC                              | CBNC: Respect MVC   |
| Critical | Enable View State Mac                  | OPT.ASPNET.EnableViewStateMac                | EnableViewStateMac: Do not set EnableViewStateMac {OWASP-2021: ['A5'], 'PCI-DSS': ['6.5.1']}                          |
| Critical | Cross Site Scripting                   | OPT.ASPNET.CrossSiteScripting                | CrossSiteScripting: Improper Neutralization of Input During Web Page Generation ('Cross-site Scripting')              |
| High     | Avoid Enabled Debug Mode               | OPT.ASPNET.AvoidEnabledDebugMode             | AvoidEnabledDebugMode: ASP.NET Misconfiguration: Creating Debug Binary  |
| High     | Clickjacking Protection                | OPT.ASPNET.ClickjackingProtection            | ClickjackingProtection: No clickjacking protection configured   |
| High     | Re DoS In Regular Expression Validator | OPT.ASPNET.ReDoSInRegularExpressionValidator | ReDoSInRegularExpressionValidator: Regular expression in RegularExpressionValidator may be used for denial of service |

| Severity | Contrast rule                          | Engine rule ID                                | Description   |
|----------|--|---|---|
| High     | Session Hijacking Misconfiguration     | OPT.ASPNET.SessionHijackingMisconfiguration   | SessionHijackingMisconfiguration: A misconfiguration makes easier performing Session hijacking attacks                    |
| High     | Trace Enabled                          | OPT.ASPNET.TraceEnabled                       | TraceEnabled: Trace information enabled and remotely accessible   |
| High     | Unprotected Roles In Cookies           | OPT.ASPNET.UnprotectedRolesInCookies          | UnprotectedRolesInCookies: Unprotected roles in cookies   |
| High     | WCF Audit Misconfiguration             | OPT.ASPNET.WCFAuditMisconfiguration           | WCFAuditMisconfiguration: Audit of security events misconfiguration in WCF  |
| High     | WCF Transport Security                 | OPT.ASPNET.WCFTransportSecurity               | WCFTransportSecurity: Do not use transport security mode in WCF   |
| High     | Avoid Impersonation                    | OPT.ASPNET.AvoidImpersonation                 | AvoidImpersonation: Avoid impersonation in ASP.Net configuration  |
| High     | HTTP Verb Tampering                    | OPT.ASPNET.HTTPVerbTampering                  | HTTPVerbTampering: Misconfiguration in authorization rules allowing HTTP Verb Tampering                                   |
| High     | Header Validation Misconfiguration     | OPT.ASPNET.HeaderValidationMisconfiguration   | HeaderValidationMisconfiguration: Unvalidated data in HTTP response header ('HTTP Response Splitting')                    |
| High     | Path Relative Stylesheet Import        | OPT.ASPNET.PathRelativeStylesheetImport       | PathRelativeStylesheetImport: Path-Relative Stylesheet Import.  |
| High     | Target Blank Vulnerability             | OPT.ASPNET.TargetBlankVulnerability           | TargetBlankVulnerability: Improper Neutralization of links to external sites  |
| High     | Credentials Misconfiguration           | OPT.ASPNET.CredentialsMisconfiguration        | CredentialsMisconfiguration: Password exposure in Web.config file   |
| High     | Prevent MIME Sniffing                  | OPT.ASPNET.PreventMIMESniffing                | PreventMIMESniffing: Prevent MIME sniffing  |
| Low      | Don't use masterpage files             | OPT.ASPNET.MP                                 | MP: Don't use masterpage files  |
| Low      | Form Without Captcha                   | OPT.ASPNET.FormWithoutCaptcha                 | FormWithoutCaptcha: Form without CAPTCHA  |
| Medium   | Authentication Forms Without SSL       | OPT.ASPNET.AuthenticationFormsWithoutSSL      | AuthenticationFormsWithoutSSL: If authentication is through Forms enable the sending of information through SSL           |
| Medium   | Avoid Disabled Validate Request        | OPT.ASPNET.AvoidDisabledValidateRequest       | AvoidDisabledValidateRequest: The value of ValidateRequest in pages must be set to true to prevent code injection attacks |
| Medium   | Avoid Disabled Validate Request Config | OPT.ASPNET.AvoidDisabledValidateRequestConfig | AvoidDisabledValidateRequestConfig: The validateRequest attribute value should be true to prevent code injection attacks  |
| Medium   | Avoid Send Cookies Unencrypted HTTP    | OPT.ASPNET.AvoidSendCookiesUnencryptedHTTP    | AvoidSendCookiesUnencryptedHTTP: Sending of cookies should be enabled only by HTTP  |
| Medium   | Avoid Send Cookies Without SSL         | OPT.ASPNET.AvoidSendCookiesWithoutSSL         | AvoidSendCookiesWithoutSSL: Send Cookies using SSL  |
| Medium   | Directory Browsing                     | OPT.ASPNET.DirectoryBrowsing                  | DirectoryBrowsing: Directory Browsing enabled   |
| Medium   | Forms Authentication Timeout           | OPT.ASPNET.FormsAuthenticacionTimeout         | FormsAuthenticacionTimeout: Set expiration timeout for authentication cookies   |
| Medium   | Service Metadata Visibility            | OPT.ASPNET.ServiceMetadataVisibility          | ServiceMetadataVisibility: Service metadata exposure  |



| Severity | Contrast rule                      | Engine rule ID                           | Description  |
|----------|------------------------------------|--|--|
| Medium   | WCF Avoid Enabled Debug            | OPT.ASPNET.WCFAvoidEnabledDebug          | WCFAvoidEnabledDebug: Avoid enabling WCF debug information                                   |
| Medium   | Avoid Empty Files                  | OPT.ASPNET.AvoidEmptyFiles               | AvoidEmptyFiles: Avoid empty files   |
| Medium   | Avoid Enabled View State Mode Page | OPT.ASPNET.AvoidEnabledViewStateModePage | AvoidEnabledViewStateModePage: Avoid enable ViewStateMode at page level                      |
| Medium   | Avoid Use Style Of Controls        | OPT.ASPNET.AvoidUseStyleOfControls       | AvoidUseStyleOfControls: Avoid using styles by tags attributes. Use the CssClass attribute   |
| Medium   | Enable Custom Error Page           | OPT.ASPNET.EnableCustomErrorPage         | EnableCustomErrorPage: ASP.NET Misconfiguration: Missing Custom Error Page                   |
| Medium   | Avoid Content Delivery Network     | OPT.ASPNET.AvoidContentDeliveryNetwork   | AvoidContentDeliveryNetwork: Do not use Content Delivery Network (CDN) for JavaScript code   |
| Medium   | Specify Integrity Attribute        | OPT.ASPNET.SpecifyIntegrityAttribute     | SpecifyIntegrityAttribute: Specify a integrity attribute on the <script> and <link> elements |
| Medium   | Credentials In Connection String   | OPT.ASPNET.CredentialsInConnectionString | CredentialsInConnectionString: Insufficiently protected credentials in connection strings    |
| Medium   | Persist Security Info True         | OPT.ASPNET.PersistSecurityInfoTrue       | PersistSecurityInfoTrue: Persist Security Info enabled in connection strings                 |

## ASP Scan rules

Contrast Scan supports these rules for ASP.

| Severity | Contrast rule             | Engine rule ID                         | Description  |
|----------|---------------------------|--|--|
| Critical | ASP Avoid Page Transfer   | OPT.ASP.ASP_FMT.ASP_AvoidPageTransfer  | ASP_AvoidPageTransfer: Avoid redirections between ASP pages  |
| Critical | ASP Naming Convention     | OPT.ASP.ASP_NAM.ASP_NamingConvention   | ASP_NamingConvention: Identifier names (variables, constants, procedures) in ASP must follow naming standard |
| Critical | ASP Page Name             | OPT.ASP.ASP_NAM.ASP_PageName           | ASP_PageName: ASP page names must follow a naming standard   |
| Critical | ASP SQL Injection         | OPT.ASP.ASP_SEC.ASP_SqlInjection       | ASP_SqlInjection: Checks for SQL injection vulnerabilities   |
| High     | ASP Avoid Document Write  | OPT.ASP.ASP_FMT.ASP_AvoidDocumentWrite | ASP_AvoidDocumentWrite: Insertion of HTML code from ASP file including document.write commands               |
| High     | ASP No Java Script        | OPT.ASP.ASP_FMT.ASP_NoJavaScript       | ASP_NoJavaScript: Do not include directly JavaScript functions in ASP pages                                  |
| High     | ASP Use Option Explicit   | OPT.ASP.ASP_FMT.ASP_UseOptionExplicit  | ASP_UseOptionExplicit: Option Explicit must be used in every ASP page  |
| High     | ASP Use Stored Procedures | OPT.ASP.ASP_UseStoredProcedures        | ASP_UseStoredProcedures: ASP pages must perform database operations using stored procedures                  |
| Info     | Use Header Comment        | OPT.ASP.ASP_DOC.UseHeaderComment       | UseHeaderComment: A proper comment must be placed at the top of every ASP page                               |
| Info     | ASP No Use HTML Comments  | OPT.ASP.ASP_FMT.ASP_NoUseHTMLComments  | ASP_NoUseHTMLComments: Do not use HTML comments  |

| Severity | Contrast rule                | Engine rule ID                            | Description   |
|----------|------------------------------|---|---|
| Low      | ASP Avoid Styles             | OPT.ASP.ASP_FMT.ASP_AvoidStyles           | ASP_AvoidStyles: Do not encode style information in HTML code in ASP pages    |
| Medium   | Avoid Data Base Access       | OPT.ASP.ASP_DB.AvoidDataBaseAccess        | AvoidDataBaseAccess: Avoid database access from ASP pages                     |
| Medium   | ASP Avoid Duplicate Files    | OPT.ASP.ASP_FMT.ASP_AvoidDuplicateFiles   | ASP_AvoidDuplicateFiles: Duplicated ASP pages in different places             |
| Medium   | ASP Avoid Empty Pages        | OPT.ASP.ASP_FMT.ASP_AvoidEmptyPages       | ASP_AvoidEmptyPages: Do not add empty ASP pages to the site                   |
| Medium   | ASP Iframes Without Src      | OPT.ASP.ASP_FMT.ASP_IframesWithoutSrc     | ASP_IframesWithoutSrc: No dejar el elemento iframes sin atributo src          |
| Medium   | ASP No Commented Java Script | OPT.ASP.ASP_FMT.ASP_NoCommentedJavaScript | ASP_NoCommentedJavaScript: Do not leave commented JavaScript code in ASP page |

## C# Scan rules

Contrast Scan supports these rules for C#.

| Severity | Contrast rule                                   | Engine rule ID   | Description   |
|----------|---|--|---|
| Critical | Too Much Origins Allowed                        | OPT.CSHARP.TooMuchOriginsAllowed                           | TooMuchOriginsAllowed: CORS policy (Cross origin resource sharing) too broad  |
| Critical | Avoid Exception Throwing In Binary Operators    | OPT.CSHARP.Csharp.AvoidExceptionThrowingInBinaryOperators  | AvoidExceptionThrowingInBinaryOperators: The override of the Equality binary operator should not throw an exception |
| Critical | Avoid Exception Throwing In Dispose Method      | OPT.CSHARP.Csharp.AvoidExceptionThrowingInDisposeMethod    | AvoidExceptionThrowingInDisposeMethod: Dispose method should not throw exception                                    |
| Critical | Avoid Exception Throwing In Equals Clause       | OPT.CSHARP.Csharp.AvoidExceptionThrowingInEqualsClause     | AvoidExceptionThrowingInEqualsClause: The override of Equals method should not throw exception                      |
| Critical | Avoid Exception Throwing In Get Hash Code       | OPT.CSHARP.Csharp.AvoidExceptionThrowingInGetHashCode      | AvoidExceptionThrowingInGetHashCode: The override of the GetHashCode method should not throw an exception           |
| Critical | Dispose Objects Before Losing Scope             | OPT.CSHARP.Csharp.DisposeObjectsBeforeLosingScope          | DisposeObjectsBeforeLosingScope: Dispose objects before losing scope  |
| Critical | Do Not Dispose Objects Multiple Times           | OPT.CSHARP.Csharp.DoNotDisposeObjectsMultipleTimes         | DoNotDisposeObjectsMultipleTimes: Possibility of multiple calls to Dispose over an object                           |
| Critical | Do Not Use Idle Process Priority                | OPT.CSHARP.Csharp.DoNotUseIdleProcessPriority              | DoNotUseIdleProcessPriority: Do not use idle process priority   |
| Critical | Mark I Serializable Types With Serializable     | OPT.CSHARP.Csharp.MarkISerializableTypesWithSerializable   | MarkISerializableTypesWithSerializable: Specify the Serializable attribute in ISerializable class                   |
| Critical | Mark Windows Forms Entry Points With Sta Thread | OPT.CSHARP.Csharp.MarkWindowsFormsEntryPointsWithStaThread | MarkWindowsFormsEntryPointsWithStaThread: Mark Windows Forms entry points with STA Thread                           |

| Severity | Contrast rule                            | Engine rule ID  | Description   |
|----------|--|---|---|
| Critical | Overriding Equal And Distinct Operators  | OPT.CSHARP.Csharp.OverridingEqualAndDistinctOperators | OverridingEqualAndDistinctOperators: Any that overloads operator Code Quality [] {}                           |
| Critical | Overriding Equals And Get Hash Code      | OPT.CSHARP.Csharp.OverridingEqualsAndGetHashCode      | OverridingEqualsAndGetHashCode: Any type that overrides GetHashCode method should also override Equals method |
| Critical | Null Dereference                         | OPT.CSHARP.NullDereference                            | NullDereference: NULL Pointer Dereference   |
| Critical | Path Traversal                           | OPT.CSHARP.PathTraversal                              | PathTraversal: Avoid non-neutralized user-controlled input composed in a pathname to resource                 |
| Critical | Reference Self Assigned                  | OPT.CSHARP.ReferenceSelfAssigned                      | ReferenceSelfAssigned: Reference is self assigned in assignment statement                                     |
| Critical | Same Conditional In If Else If           | OPT.CSHARP.SameConditionalInIfElseIf                  | SameConditionalInIfElseIf: Duplicated condition in if-else if statements                                      |
| Critical | Same Implementation In Conditional       | OPT.CSHARP.SameImplementationInConditional            | SameImplementationInConditional: Same implementation for different branches in a conditional statement        |
| Critical | Same Subexpression In Logical Expression | OPT.CSHARP.SameSubexpressionInLogicalExpression       | SameSubexpressionInLogicalExpression: Duplicated subexpression in logical expression                          |
| Critical | Accessibility Subversion Rule            | OPT.CSHARP.SEC.AccessibilitySubversionRule            | AccessibilitySubversionRule: .Net access restriction subverted (Reflection)                                   |
| Critical | Anonymous Ldap Bind                      | OPT.CSHARP.SEC.AnonymousLdapBind                      | AnonymousLdapBind: Access Control - Anonymous LDAP Bind   |
| Critical | Dangerous File Upload                    | OPT.CSHARP.SEC.DangerousFileUpload                    | DangerousFileUpload: Unrestricted Upload of File with Dangerous Type  |
| Critical | Code Injection                           | OPT.CSHARP.CodeInjection                              | CodeInjection: Improper Control of Generation of Code ('Code Injection')                                      |
| Critical | Code Injection With Deserialization      | OPT.CSHARP.CodeInjectionWithDeserialization           | CodeInjectionWithDeserialization: Dynamic code injection during object deserialization                        |
| Critical | Command Injection                        | OPT.CSHARP.CommandInjection                           | CommandInjection: Improper Neutralization of Special Elements used in an OS Command ('OS Command Injection')  |
| Critical | Static Database Connection               | OPT.CSHARP.SEC.StaticDatabaseConnection               | StaticDatabaseConnection: Static database connection / session  |
| Critical | Temporary Files Left                     | OPT.CSHARP.SEC.TemporaryFilesLeft                     | TemporaryFilesLeft: Temporary files not deleted   |
| Critical | Cross Site Scripting                     | OPT.CSHARP.CrossSiteScripting                         | CrossSiteScripting: Improper Neutralization of Input During Web Page Generation ('Cross Site Scripting')      |
| Critical | DoS Regexp                               | OPT.CSHARP.DoSRegexp                                  | DoSRegexp: Prevent denial of service attack through malicious regular expression                              |
| Critical | Ldap Injection                           | OPT.CSHARP.LdapInjection                              | LdapInjection: Avoid non-neutralized user-controlled input in LDAP search filters                             |
| Critical | Connection String Parameter Pollution    | OPT.CSHARP.SEC.ConnectionStringParameterPollution     | ConnectionStringParameterPollution: Connection string polluted with untrusted input                           |
| Critical | Http Parameter Pollution                 | OPT.CSHARP.SEC.HttpParameterPollution                 | HttpParameterPollution: HTTP parameter pollution (HPP)  |
| Critical | Http Splitting Rule                      | OPT.CSHARP.SEC.HttpSplittingRule                      | HttpSplittingRule: Improper neutralization of CR/LF Sequences in HTTP headers                                 |
| Critical | Mail Command Injection                   | OPT.CSHARP.SEC.MailCommandInjection                   | MailCommandInjection: Mail Command Injection  |

| Severity | Contrast rule                               | Engine rule ID   | Description  |
|----------|---|--|--|
| Critical | No SQL Injection                            | OPT.CSHARP.SEC.NoSQLInjection                            | NoSQLInjection: Improper neutralization of special elements in data query logic (NoSQL injection)  |
| Critical | Wrong Lock Usage                            | OPT.CSHARP.WrongLockUsage                                | WrongLockUsage: Wrong lock acquisition/release   |
| Critical | Process Control                             | OPT.CSHARP.SEC.ProcessControl                            | ProcessControl: Do not load executables or libraries from untrusted sources  |
| Critical | Registry Manipulation                       | OPT.CSHARP.SEC.RegistryManipulation                      | RegistryManipulation: Registry manipulation  |
| Critical | Server Side Request Forgery                 | OPT.CSHARP.ServerSideRequestForgery                      | ServerSideRequestForgery: Server-Side Request Forgery (SSRF)   |
| Critical | SQL Injection                               | OPT.CSHARP.SqlInjection                                  | SqlInjection: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection')   |
| Critical | Stored Cross Site Scripting                 | OPT.CSHARP.StoredCrossSiteScripting                      | StoredCrossSiteScripting: Web content generation from improper sanitized database data and escaped output (Stored Cross-site Scripting, XSS) |
| Critical | MVC Non Action Public Methods               | OPT.CSHARP.MVCNonActionPublicMethods                     | MVCNonActionPublicMethods: Protect public methods that are not action methods in controllers   |
| Critical | Weak Cryptographic Hash                     | OPT.CSHARP.WeakCryptographicHash                         | WeakCryptographicHash: Weak cryptographic hash   |
| Critical | Weak Key Size                               | OPT.CSHARP.WeakKeySize                                   | WeakKeySize: Weak cryptography, insufficient key length  |
| Critical | Weak Symmetric Encryption Algorithm         | OPT.CSHARP.WeakSymmetricEncryptionAlgorithm              | WeakSymmetricEncryptionAlgorithm: Weak symmetric encryption algorithm  |
| Critical | Weak Symmetric Encryption Mode Of Operation | OPT.CSHARP.WeakSymmetricEncryptionModeOfOperation        | WeakSymmetricEncryptionModeOfOperation: Do not use weak modes of operation with symmetric encryption   |
| High     | Plaintext Storage In A Cookie               | OPT.CSHARP.PlaintextStorageInACookie                     | PlaintextStorageInACookie: Cleartext Storage of Sensitive Information in a Cookie  |
| High     | Abstract Types Should Not Have Constructors | OPT.CSHARP.Csharp.AbstractTypesShouldNotHaveConstructors | AbstractTypesShouldNotHaveConstructors: Public abstract class with public constructors   |
| High     | Avoid Com Parameterized Constructors        | OPT.CSHARP.Csharp.AvoidComParameterizedConstructors      | AvoidComParameterizedConstructors: COM does not support parameterized constructors   |
| High     | Avoid Com Static Methods                    | OPT.CSHARP.Csharp.AvoidComStaticMethods                  | AvoidComStaticMethods: COM does not support static methods   |
| High     | Avoid Empty Catch Block                     | OPT.CSHARP.Csharp.AvoidEmptyCatchBlock                   | AvoidEmptyCatchBlock: Avoid empty catch blocks   |
| High     | Avoid Excessive Complexity                  | OPT.CSHARP.Csharp.AvoidExcessiveComplexity               | AvoidExcessiveComplexity: A method has excessive cyclomatic complexity   |
| High     | Avoid Excessive Locals                      | OPT.CSHARP.Csharp.AvoidExcessiveLocals                   | AvoidExcessiveLocals: To avoid to declare excessive local variables  |
| High     | Avoid Floating Point Equality               | OPT.CSHARP.Csharp.AvoidFloatingPointEquality             | AvoidFloatingPointEquality: Do not perform (in)equality operations over floating point variables   |
| High     | Avoid Inconditional Recursive Invocation    | OPT.CSHARP.Csharp.AvoidInconditionalRecursiveInvocation  | AvoidInconditionalRecursiveInvocation: Avoid recursive calls without a precondition  |

| Severity | Contrast rule                                   | Engine rule ID  | Description   |
|----------|---|---|---|
| High     | Avoid Out Parameters                            | OPT.CSHARP.Csharp.AvoidOutParameters                        | AvoidOutParameters: Public or protected methods must avoid ref/out parameters                               |
| High     | Avoid Overloads In Com Visible Interfaces       | OPT.CSHARP.Csharp.AvoidOverloadsInComVisibleInterfaces      | AvoidOverloadsInComVisibleInterfaces: Com visible interface declares overloaded methods                     |
| High     | Avoid Uncalled Private Code                     | OPT.CSHARP.Csharp.AvoidUncalledPrivateCode                  | AvoidUncalledPrivateCode: Avoid uncalled private code   |
| High     | Avoid Unused Private Fields                     | OPT.CSHARP.Csharp.AvoidUnusedPrivateFields                  | AvoidUnusedPrivateFields: Avoid unused private fields   |
| High     | Declare Event Handlers Correctly                | OPT.CSHARP.Csharp.DeclareEventHandlersCorrectly             | DeclareEventHandlersCorrectly: Declare Event Handlers Correctly   |
| High     | Do Not Assume Int Ptr Size Rule                 | OPT.CSHARP.Csharp.DoNotAssumeIntPtrSizeRule                 | DoNotAssumeIntPtrSizeRule: Do not downcast IntPtr or UIntPtr into a 32-bit or smaller value                 |
| High     | Do Not Declare Static Members On Generic Types  | OPT.CSHARP.Csharp.DoNotDeclareStaticMembersOnGenericTypes   | DoNotDeclareStaticMembersOnGenericTypes: Do not declare static members on generic types                     |
| High     | Do Not Declare Visible Instance Fields          | OPT.CSHARP.Csharp.DoNotDeclareVisibleInstanceFields         | DoNotDeclareVisibleInstanceFields: Avoid externally visible instance fields                                 |
| High     | Do Not Lock On This Or Types                    | OPT.CSHARP.Csharp.DoNotLockOnThisOrTypes                    | DoNotLockOnThisOrTypes: Do not lock on this, types, or string literals                                      |
| High     | Do Not Pass Types By Reference                  | OPT.CSHARP.Csharp.DoNotPassTypesByReference                 | DoNotPassTypesByReference: Do not pass types by reference   |
| High     | Exceptions Should Be Public                     | OPT.CSHARP.Csharp.ExceptionsShouldBePublic                  | ExceptionsShouldBePublic: Exceptions should be public   |
| High     | I Comparable Overriding Methods                 | OPT.CSHARP.Csharp.IComparableOverridingMethods              | IComparableOverridingMethods: Override methods on comparable types  |
| High     | Identifiers Should Not Match Keywords           | OPT.CSHARP.Csharp.IdentifiersShouldNotMatchKeywords         | IdentifiersShouldNotMatchKeywords: The identifiers must not be reserved words                               |
| High     | Initialize Reference Type Static Fields Inline  | OPT.CSHARP.Csharp.InitializeReferenceTypeStaticFieldsInline | InitializeReferenceTypeStaticFieldsInline: Initialize reference type static fields inline                   |
| High     | Mark Boolean P Invoke Arguments With Marshal As | OPT.CSHARP.Csharp.MarkBooleanPInvokeArgumentsWithMarshalAs  | MarkBooleanPInvokeArgumentsWithMarshalAs: Mark boolean P/Invoke arguments with MarshalAs attribute          |
| High     | Max Methods                                     | OPT.CSHARP.Csharp.MaxMethods                                | MaxMethods: Maximum allowed number of methods   |
| High     | Move P Invokes To Native Methods Class          | OPT.CSHARP.Csharp.MovePInvokesToNativeMethodsClass          | MovePInvokesToNativeMethodsClass: Move P Invokes to NativeMethods class                                     |
| High     | Nested Namespace Dependency                     | OPT.CSHARP.Csharp.NestedNamespaceDependency                 | NestedNamespaceDependency: Type dependency in nested namespace  |
| High     | Non Constant Fields Should Not Be Visible       | OPT.CSHARP.Csharp.NonConstantFieldsShouldNotBeVisible       | NonConstantFieldsShouldNotBeVisible: A public or protected static field is not constant nor is it read-only |

| Severity | Contrast rule                               | Engine rule ID  | Description   |
|----------|---|---|---|
| High     | Overloading Equals Value Types              | OPT.CSHARP.Csharp.OverloadingEqualsValueTypes           | OverloadingEqualsValueTypes: Overload Equals() method on value types  |
| High     | Remove Unused Locals                        | OPT.CSHARP.Csharp.RemoveUnusedLocals                    | RemoveUnusedLocals: Unused local variables  |
| High     | Review Useless Control Flow Rule            | OPT.CSHARP.Csharp.ReviewUselessControlFlowRule          | ReviewUselessControlFlowRule: Avoid empty code blocks   |
| High     | Specify Attribute Usage                     | OPT.CSHARP.Csharp.SpecifyAttributeUsage                 | SpecifyAttributeUsage: Specify AttributeUsage on your attributes  |
| High     | Suppress Finalize Correctly                 | OPT.CSHARP.Csharp.SuppressFinalizeCorrectly             | SuppressFinalizeCorrectly: Call GC.SuppressFinalize correctly   |
| High     | Variable Names Should Not Match Field Names | OPT.CSHARP.Csharp.VariableNamesShouldNotMatchFieldNames | VariableNamesShouldNotMatchFieldNames: Variable names should not match field names                              |
| High     | Hardcoded Absolute Path                     | OPT.CSHARP.HardcodedAbsolutePath                        | HardcodedAbsolutePath: Do not hardcode absolute paths   |
| High     | Null Arg In Equals                          | OPT.CSHARP.NullArgInEquals                              | NullArgInEquals: Null argument to object.Equals()   |
| High     | Resource Leak Database                      | OPT.CSHARP.ResourceLeakDatabase                         | ResourceLeakDatabase: Unreleased database resource  |
| High     | Resource Leak Ldap                          | OPT.CSHARP.ResourceLeakLdap                             | ResourceLeakLdap: Unreleased LDAP resource  |
| High     | Resource Leak Stream                        | OPT.CSHARP.ResourceLeakStream                           | ResourceLeakStream: Unreleased stream resource  |
| High     | Resource Leak Unmanaged                     | OPT.CSHARP.ResourceLeakUnmanaged                        | ResourceLeakUnmanaged: Unreleased unmanaged resource  |
| High     | Avoid Certificate Equals                    | OPT.CSHARP.SEC.AvoidCertificateEquals                   | AvoidCertificateEquals: Never use X509Certificate.Equals() in a security context                                |
| High     | Buffer Overflow                             | OPT.CSHARP.SEC.BufferOverflow                           | BufferOverflow: Potential memory corruption   |
| High     | Cookies In Security Decision                | OPT.CSHARP.SEC.CookiesInSecurityDecision                | CookiesInSecurityDecision: Reliance on Cookies without Validation and Integrity Checking in a Security Decision |
| High     | Improper Authentication                     | OPT.CSHARP.SEC.ImproperAuthentication                   | ImproperAuthentication: Avoid that a user can perform actions to which he does not have access                  |
| High     | Missing Standard Error Handling             | OPT.CSHARP.SEC.MissingStandardErrorHandling             | MissingStandardErrorHandling: Missing Standardized Error Handling Mechanism in ASP.Net                          |
| High     | Cross Site Request Forgery                  | OPT.CSHARP.CrossSiteRequestForgery                      | CrossSiteRequestForgery: Cross-Site Request Forgery (CSRF)  |
| High     | Setting Manipulation                        | OPT.CSHARP.SEC.SettingManipulation                      | SettingManipulation: Setting Manipulation   |
| High     | JSON Injection                              | OPT.CSHARP.JSONInjection                                | JSONInjection: Avoid using non-neutralized user-controlled input in JSON entities                               |
| High     | Unvalidated Asp Net Model                   | OPT.CSHARP.SEC.UnvalidatedAspNetModel                   | UnvalidatedAspNetModel: Unvalidated model MVC controller  |
| High     | User Controlled SQL Primary Key             | OPT.CSHARP.SEC.UserControlledSQLPrimaryKey              | UserControlledSQLPrimaryKey: Avoid using user controlled Primary Key into a query                               |
| High     | MVC Prevent Overposting Model Definition    | OPT.CSHARP.MVCPreventOverpostingModelDefinition         | MVCPreventOverpostingModelDefinition: Prevent over-posting attacks in model definition                          |

| Severity | Contrast rule   | Engine rule ID   | Description   |
|----------|---|--|---|
| High     | MVC Prevent Underposting Model Composition                          | OPT.CSHARP.MVCPreventUnderpostingModelComposition                      | MVCPreventUnderpostingModelComposition: Prevent under-posting attacks in model composition  |
| High     | MVC Prevent Underposting Model Definition                           | OPT.CSHARP.MVCPreventUnderpostingModelDefinition                       | MVCPreventUnderpostingModelDefinition: Prevent under-posting attacks in model definition  |
| High     | Open Redirect   | OPT.CSHARP.OpenRedirect  | OpenRedirect: URL Redirection to Untrusted Site ('Open Redirect')   |
| High     | Test For NaN Correctly  | OPT.CSHARP.TestForNaNCorrectly   | TestForNaNCorrectly: Test for NaN correctly   |
| High     | Cross Site History Manipulation                                     | OPT.CSHARP.SEC.CrossSiteHistoryManipulation                            | CrossSiteHistoryManipulation: Cross-Site History Manipulation (XSHM)  |
| High     | Transparent Methods Should Not Use Suppress Unmanaged Code Security | OPT.CSHARP.TransparentMethodsShouldNotUseSuppressUnmanagedCodeSecurity | TransparentMethodsShouldNotUseSuppressUnmanagedCodeSecurity: A transparent method should not have the attribute SuppressUnmanagedCodeSecurity |
| High     | Use Params For Variable Arguments                                   | OPT.CSHARP.UseParamsForVariableArguments                               | UseParamsForVariableArguments: A public or protected type contains a public or protected method that uses the VarArgs calling convention      |
| High     | Log Forging   | OPT.CSHARP.SEC.LogForging  | LogForging: Improper Output Neutralization in Logs  |
| High     | Resource Injection  | OPT.CSHARP.SEC.ResourceInjection                                       | ResourceInjection: Improper control of resource identifiers ("Resource Injection")  |
| High     | Trust Boundary Violation  | OPT.CSHARP.SEC.TrustBoundaryViolation                                  | TrustBoundaryViolation: Trust boundary violation  |
| High     | Unsafe Reflection   | OPT.CSHARP.SEC.UnsafeReflection  | UnsafeReflection: Use of Externally-Controlled Input to Select Classes or Code ('Unsafe Reflection')  |
| High     | XML Entity Injection  | OPT.CSHARP.SEC.XMLEntityInjection                                      | XMLEntityInjection: XML entity injection  |
| High     | XML Injection   | OPT.CSHARP.XMLInjection  | XMLInjection: XML Injection (aka Blind XPath Injection)   |
| High     | XPath Injection   | OPT.CSHARP.XPathInjection  | XPathInjection: Improper Neutralization of data within XPath Expressions ('XPath Injection')  |
| High     | XQuery Injection  | OPT.CSHARP.XQueryInjection   | XQueryInjection: Improper Neutralization of data within XQuery Expressions ('XQuery Injection')   |
| High     | XSLT Injection  | OPT.CSHARP.XSLTInjection   | XSLTInjection: Avoid using non-neutralized user-controlled input when creating XSL stylesheets  |
| High     | Review Visible Event Handlers                                       | OPT.CSHARP.Csharp.ReviewVisibleEventHandlers                           | ReviewVisibleEventHandlers: A public or protected event-handling method was detected  |
| High     | Information Exposure Through Error Message                          | OPT.CSHARP.SEC.InformationExposureThroughErrorMessage                  | InformationExposureThroughErrorMessage: Avoid sensitive information exposure through error messages   |
| High     | Insecure Email Transport  | OPT.CSHARP.SEC.InsecureEmailTransport                                  | InsecureEmailTransport: Insecure Mail Transport   |
| High     | Insecure Randomness   | OPT.CSHARP.InsecureRandomness  | InsecureRandomness: Standard pseudo-random number generators cannot withstand cryptographic attacks   |
| High     | Hardcoded Crypto Key  | OPT.CSHARP.SEC.HardcodedCryptoKey                                      | HardcodedCryptoKey: Use of Hard-coded Cryptographic Key   |
| High     | Hardcoded Salt  | OPT.CSHARP.SEC.HardcodedSalt   | HardcodedSalt: A hardcoded salt can compromise system security  |

| Severity | Contrast rule                                    | Engine rule ID  | Description  |
|----------|--|---|--|
| High     | Insecure Transport                               | OPT.CSHARP.SEC.InsecureTransport                          | InsecureTransport: Insecure transport  |
| High     | Proper Padding With Public Key Crypto            | OPT.CSHARP.SEC.ProperPaddingWithPublicKeyCrypto           | ProperPaddingWithPublicKeyCrypto: Use of RSA Algorithm without Optimal Asymmetric Encryption Padding (OAEP)  |
| High     | Server Insecure Transport                        | OPT.CSHARP.SEC.ServerInsecureTransport                    | ServerInsecureTransport: Insecure transport [HTTP servers]   |
| High     | Weak Encryption                                  | OPT.CSHARP.WeakEncryption                                 | WeakEncryption: Insufficient RSA key length  |
| Info     | Avoid Unneeded Calls On String                   | OPT.CSHARP.Csharp.AvoidUnneededCallsOnString              | AvoidUnneededCallsOnString: Avoid unnecessary calls on string objects  |
| Info     | Identifiers Should Have Correct Suffix           | OPT.CSHARP.Csharp.IdentifiersShouldHaveCorrectSuffix      | IdentifiersShouldHaveCorrectSuffix: An identifier does not have the correct suffix   |
| Info     | Identifiers Should Not Contain Underscores       | OPT.CSHARP.Csharp.IdentifiersShouldNotContainUnderscores  | IdentifiersShouldNotContainUnderscores: An identifier contains the underscore character  |
| Info     | Identifiers Should Not Have Incorrect Suffix     | OPT.CSHARP.Csharp.IdentifiersShouldNotHaveIncorrectSuffix | IdentifiersShouldNotHaveIncorrectSuffix: An identifier has an incorrect suffix   |
| Info     | Normalize Strings To Uppercase                   | OPT.CSHARP.Csharp.NormalizeStringsToUppercase             | NormalizeStringsToUppercase: Do not convert strings to lower-case  |
| Info     | Parameter Names Should Not Match Member Names    | OPT.CSHARP.Csharp.ParameterNamesShouldNotMatchMemberNames | ParameterNamesShouldNotMatchMemberNames: Parameter names should not match member names   |
| Info     | Property Type                                    | OPT.CSHARP.Csharp.PropertyType                            | PropertyType: A property must have a name similar to its type  |
| Info     | Use Exception Constructor                        | OPT.CSHARP.Csharp.UseExceptionConstructor                 | UseExceptionConstructor: Illegal exception throw: Exceptions must be created in separate methods   |
| Info     | Do Not Initialize Unnecessarily                  | OPT.CSHARP.DoNotInitializeUnnecessarily                   | DoNotInitializeUnnecessarily: Do not initialize variables unnecessarily  |
| Info     | Use Literals Where Appropriate                   | OPT.CSHARP.UseLiteralsWhereAppropriate                    | UseLiteralsWhereAppropriate: Do not declare static and readonly fields, that are initialized with a value  |
| Low      | Avoid Language Specific Type Names In Parameters | OPT.CSHARP.AvoidLanguageSpecificTypeNamesInParameters     | AvoidLanguageSpecificTypeNamesInParameters: Avoid names of parameters that contain language-specific type name, in public methods  |
| Low      | Avoid System Output Stream                       | OPT.CSHARP.AvoidSystemOutputStream                        | AvoidSystemOutputStream: Using Console.WriteLine or Console.Error rather than a dedicated logging interface, makes it more difficult to monitor behavior of the software |
| Low      | Avoid Type Names In Parameters                   | OPT.CSHARP.AvoidTypeNamesInParameters                     | AvoidTypeNamesInParameters: Avoid names of parameters that contain type's names, in public methods   |
| Low      | Avoid Unnecessary String Creation                | OPT.CSHARP.AvoidUnnecessaryStringCreation                 | AvoidUnnecessaryStringCreation: Avoid creating unnecessary strings through a call to System.String.ToLower or System.String.ToUpper                                      |



| Severity | Contrast rule  | Engine rule ID  | Description  |
|----------|--|---|--|
| Low      | Collection Properties Should Be Read Only                            | OPT.CSHARP.CollectionPropertiesShouldBeReadOnly                               | CollectionPropertiesShouldBeReadOnly: Collection properties should be read-only  |
| Low      | Consider Converting Method To Property                               | OPT.CSHARP.ConsiderConvertingMethodToProperty                                 | ConsiderConvertingMethodToProperty: Consider converting getter/setter methods to properties  |
| Low      | Attribute String Literals Should Parse Correctly                     | OPT.CSHARP.Csharp.AttributeStringLiteralsShouldParseCorrectly                 | AttributeStringLiteralsShouldParseCorrectly: Attribute's literal value should be correctly written   |
| Low      | Avoid Exceptions In Implicit Transformation                          | OPT.CSHARP.Csharp.AvoidExceptionsInImplicitTransformation                     | AvoidExceptionsInImplicitTransformation: Avoid throwing exceptions in implicit operators   |
| Low      | Avoid Long Methods   | OPT.CSHARP.Csharp.AvoidLongMethods  | AvoidLongMethods: Do not encode large methods  |
| Low      | Avoid Long Parameter Lists   | OPT.CSHARP.Csharp.AvoidLongParameterLists                                     | AvoidLongParameterLists: Do not encode methods with too many parameters  |
| Low      | Avoid Namespaces With Few Types                                      | OPT.CSHARP.Csharp.AvoidNamespacesWithFewTypes                                 | AvoidNamespacesWithFewTypes: Avoid namespaces with few types   |
| Low      | Avoid Non Stored Procedure Commands                                  | OPT.CSHARP.Csharp.AvoidNonStoredProcedureCommands                             | AvoidNonStoredProcedureCommands: Avoid using non stored-procedure database operations  |
| Low      | Avoid Type Get Type For Constant Strings                             | OPT.CSHARP.Csharp.AvoidTypeGetTypeForConstantStrings                          | AvoidTypeGetTypeForConstantStrings: Do not call Type.GetType() with constant string values   |
| Low      | Call Base Class Methods On I Serializable Types                      | OPT.CSHARP.Csharp.CallBaseClassMethodsOnISerializableTypes                    | CallBaseClassMethodsOnISerializableTypes: Call base class methods on ISerializable types   |
| Low      | Check New Exception Without Throwing                                 | OPT.CSHARP.Csharp.CheckNewExceptionWithoutThrowing                            | CheckNewExceptionWithoutThrowing: Exception instantiation not used   |
| Low      | Consider Custom Accessors For Non Visible Events Rule                | OPT.CSHARP.Csharp.ConsiderCustomAccessorsForNonVisibleEventsRule              | ConsiderCustomAccessorsForNonVisibleEventsRule: For non visible events, evaluate using custom accessors instead of default ones            |
| Low      | Delegates Passed To Native Code Must Include Exception Handling Rule | OPT.CSHARP.Csharp.DelegatesPassedToNativeCodeMustIncludeExceptionHandlingRule | DelegatesPassedToNativeCodeMustIncludeExceptionHandlingRule: Enclose with a catch handler entire block for delegates passed to native code |
| Low      | Do Not Cast Unnecessarily  | OPT.CSHARP.Csharp.DoNotCastUnnecessarily                                      | DoNotCastUnnecessarily: A method performs duplicate casts on one of its arguments or variables   |
| Low      | Do Not Destroy Stack Trace Rule                                      | OPT.CSHARP.Csharp.DoNotDestroyStackTraceRule                                  | DoNotDestroyStackTraceRule: Catch handlers should rethrow original exception instead of throwing the same exception                        |
| Low      | Do Not Hardcode Locale Specific Strings                              | OPT.CSHARP.Csharp.DoNotHardcodeLocaleSpecificStrings                          | DoNotHardcodeLocaleSpecificStrings: Do not hardcode locale specific strings  |

| Severity | Contrast rule  | Engine rule ID  | Description   |
|----------|--|---|---|
| Low      | Do Not Indirectly Expose Methods With Link Demands   | OPT.CSHARP.Csharp.DoNotIndirectlyExposeMethodsWithLinkDemands   | DoNotIndirectlyExposeMethodsWithLinkDemands: Do not indirectly expose methods with link demands   |
| Low      | Do Not Pass Literals As Localized Parameters         | OPT.CSHARP.Csharp.DoNotPassLiteralsAsLocalizedParameters        | DoNotPassLiteralsAsLocalizedParameters: String literal passed as parameter should be localizable  |
| Low      | Do Not Raise Exceptions In Unexpected Locations      | OPT.CSHARP.Csharp.DoNotRaiseExceptionsInUnexpectedLocations     | DoNotRaiseExceptionsInUnexpectedLocations: Do not raise exceptions in unexpected locations  |
| Low      | Do Not Use Thread Static With Instance Fields        | OPT.CSHARP.Csharp.DoNotUseThreadStaticWithInstanceFields        | DoNotUseThreadStaticWithInstanceFields: Do not use 'ThreadStatic' with instance fields  |
| Low      | Overloading Equals Reference Types                   | OPT.CSHARP.Csharp.OverloadingEqualsReferenceTypes               | OverloadingEqualsReferenceTypes: Do not overload equality operator on reference types   |
| Low      | Override Equals On Value Types                       | OPT.CSHARP.Csharp.OverrideEqualsOnValueTypes                    | OverrideEqualsOnValueTypes: A public virtual method does not override Equals  |
| Low      | Properties Should Not Return Arrays                  | OPT.CSHARP.Csharp.PropertiesShouldNotReturnArrays               | PropertiesShouldNotReturnArrays: Properties should not return arrays  |
| Low      | Property Names Should Not Match Get Methods          | OPT.CSHARP.Csharp.PropertyNamesShouldNotMatchGetMethods         | PropertyNamesShouldNotMatchGetMethods: Property names should not match get methods  |
| Low      | Review Unused Parameters                             | OPT.CSHARP.Csharp.ReviewUnusedParameters                        | ReviewUnusedParameters: Method parameters not used  |
| Low      | Specify Message Box Options                          | OPT.CSHARP.Csharp.SpecifyMessageBoxOptions                      | SpecifyMessageBoxOptions: Specify MessageBoxOptions   |
| Low      | Test For Empty Strings Using Length                  | OPT.CSHARP.Csharp.TestForEmptyStringsUsingLength                | TestForEmptyStringsUsingLength: Compare with empty string using 'Equals'  |
| Low      | Type Names Should Not Match Namespaces               | OPT.CSHARP.Csharp.TypeNamesShouldNotMatchNamespaces             | TypeNamesShouldNotMatchNamespaces: Type names should not match namespaces   |
| Low      | Types That Own Native Resources Should Be Disposable | OPT.CSHARP.Csharp.TypesThatOwnNativeResourcesShouldBeDisposable | TypesThatOwnNativeResourcesShouldBeDisposable: Types that own native resources should be disposable   |
| Low      | Use Constructors To Initialize Properties            | OPT.CSHARP.Csharp.UseConstructorsToInitializeProperties         | UseConstructorsToInitializeProperties: Initialize properties by using constructors  |
| Low      | Use Constructors To Set Properties                   | OPT.CSHARP.Csharp.UseConstructorsToSetProperties                | UseConstructorsToSetProperties: Set properties by using constructors with parameters  |
| Low      | Write Static Field From Instance Method              | OPT.CSHARP.Csharp.WriteStaticFieldFromInstanceMethod            | WriteStaticFieldFromInstanceMethod: Do not write in static fields from instance methods   |
| Low      | Disposable Types Should Declare Finalizer            | OPT.CSHARP.DisposableTypesShouldDeclareFinalizer                | DisposableTypesShouldDeclareFinalizer: A type that implements System.IDisposable and has unmanaged fields of unmanaged types, should have a finalizer |

| Severity | Contrast rule                                 | Engine rule ID                                      | Description   |
|----------|---|---|---|
| Low      | Do Not Assign Params Not Out Or Ref           | OPT.CSHARP.DoNotAssignParamsNotOutOrRef             | DoNotAssignParamsNotOutOrRef: Do not assign method parameters which are not marked as 'out' or 'ref'                              |
| Low      | Do Not Concatenate Strings Inside Loops       | OPT.CSHARP.DoNotConcatenateStringsInsideLoops       | DoNotConcatenateStringsInsideLoops: Do not concatenate string values inside loops   |
| Low      | Do Not Mark Enums With Flags                  | OPT.CSHARP.DoNotMarkEnumsWithFlags                  | DoNotMarkEnumsWithFlags: The values of an enumeration that has System.FlagsAttribute attribute, should be powers of two           |
| Low      | Do Not Prefix Enum Values With Type Name      | OPT.CSHARP.DoNotPrefixEnumValuesWithTypeName        | DoNotPrefixEnumValuesWithTypeName: Names of enumeration's members should not start with the enumeration's name                    |
| Low      | Identifiers Should Be Cased Correctly         | OPT.CSHARP.IdentifiersShouldBeCasedCorrectly        | IdentifiersShouldBeCasedCorrectly: Use correctly "pascal-case" and "camel-case" according to the agreement established            |
| Low      | Implement Serialization Constructors          | OPT.CSHARP.ImplementSerializationConstructors       | ImplementSerializationConstructors: A type that implements ISerializable, should implement a serialization constructor            |
| Low      | Implement Serialization Methods Correctly     | OPT.CSHARP.ImplementSerializationMethodsCorrectly   | ImplementSerializationMethodsCorrectly: Implement a correct signature for methods that handle serialization events                |
| Low      | Initialize Value Type Static Fields Inline    | OPT.CSHARP.InitializeValueTypeStaticFieldsInline    | InitializeValueTypeStaticFieldsInline: Avoid explicitly declare a static constructor  |
| Low      | Instantiate Argument Exceptions Correctly     | OPT.CSHARP.InstantiateArgumentExceptionsCorrectly   | InstantiateArgumentExceptionsCorrectly: Avoid calling default constructor of ArgumentException                                    |
| Low      | Operator Overloads Have Named Alternates      | OPT.CSHARP.OperatorOverloadsHaveNamedAlternates     | OperatorOverloadsHaveNamedAlternates: When a type overrides an operator, it is recommended to also override the alternate method  |
| Low      | Overload Operator Equals On Overriding Equals | OPT.CSHARP.OverloadOperatorEqualsOnOverridingEquals | OverloadOperatorEqualsOnOverridingEquals: When a type overrides System.Object.Equals method, it also should override the operator |
| Low      | Prefer Jagged Arrays Over Multidimensional    | OPT.CSHARP.PreferJaggedArraysOverMultidimensional   | PreferJaggedArraysOverMultidimensional: Do not declare multidimensional array   |
| Low      | Use Managed Equivalents Of Win32 Api          | OPT.CSHARP.UseManagedEquivalentsOfWin32Api          | UseManagedEquivalentsOfWin32Api: Use managed equivalents of Win32 API   |
| Low      | Constants Should Be Transparent               | OPT.CSHARP.ConstantsShouldBeTransparent             | ConstantsShouldBeTransparent: A field constant or an enumeration member should be transparent                                     |
| Low      | Information Exposure Through Debug Log        | OPT.CSHARP.SEC.InformationExposureThroughDebugLog   | InformationExposureThroughDebugLog: Avoid exposing sensible information through log   |
| Medium   | Unsafe Cookie Rule                            | OPT.CSHARP.SEC.UnsafeCookieRule                     | UnsafeCookieRule: Generate server-side cookies with adequate security properties  |
| Medium   | Avoid Null Reference Exception                | OPT.CSHARP.AvoidNullReferenceException              | AvoidNullReferenceException: Use of NullPointerException Catch to Detect Null Pointer Dereference                                 |
| Medium   | Avoid Readonly Mutable Types                  | OPT.CSHARP.AvoidReadonlyMutableTypes                | AvoidReadonlyMutableTypes: Do not declare externally visible read-only fields with mutable types                                  |

| Severity | Contrast rule   | Engine rule ID   | Description  |
|----------|---|--|--|
| Medium   | Call GC Keep Alive When Using a Native Resource         | OPT.CSHARP.CallGCKeepAliveWhenUsingaNativeResources          | CallGCKeepAliveWhenUsingaNativeResource: GC.KeepAlive should be called in methods that use unmanaged resources   |
| Medium   | Critical Types Must Not Participate In Type Equivalence | OPT.CSHARP.CriticalTypesMustNotParticipateInTypeEquivalence  | CriticalTypesMustNotParticipateInTypeEquivalence: SecurityCriticalAttribute should not be used in members, or types that participate in type equivalence |
| Medium   | Array Fields Should Not Be Read Only                    | OPT.CSHARP.Csharp.ArrayFieldsShouldNotBeReadOnly             | ArrayFieldsShouldNotBeReadOnly: Array fields should not be read only   |
| Medium   | Attribute Class Suffix                                  | OPT.CSHARP.Csharp.AttributeClassSuffix                       | AttributeClassSuffix: Attribute classes names must contain the 'Attribute' suffix  |
| Medium   | Avoid Calling Problematic Methods                       | OPT.CSHARP.Csharp.AvoidCallingProblematicMethods             | AvoidCallingProblematicMethods: Potentially dangerous call   |
| Medium   | Avoid Custom Application Exceptions                     | OPT.CSHARP.Csharp.AvoidCustomApplicationExceptions           | AvoidCustomApplicationExceptions: Classes that extend ApplicationException should not be used  |
| Medium   | Avoid Empty Constructors In Structs                     | OPT.CSHARP.Csharp.AvoidEmptyConstructorsInStructs            | AvoidEmptyConstructorsInStructs: Avoid empty constructors in structures  |
| Medium   | Avoid Indexers In Non Collection Classes                | OPT.CSHARP.Csharp.AvoidIndexersInNonCollectionClasses        | AvoidIndexersInNonCollectionClasses: Avoid indexers in non-collections classes   |
| Medium   | Avoid Large Methods                                     | OPT.CSHARP.Csharp.AvoidLargeMethods                          | AvoidLargeMethods: Avoid functions and methods with too many lines of code   |
| Medium   | Avoid Large Structure                                   | OPT.CSHARP.Csharp.AvoidLargeStructure                        | AvoidLargeStructure: Avoid creating too-large structures   |
| Medium   | Avoid Uninstantiated Internal Classes                   | OPT.CSHARP.Csharp.AvoidUninstantiatedInternalClasses         | AvoidUninstantiatedInternalClasses: Avoid uninstantiated internal classes  |
| Medium   | Avoid Unsealed Concrete Attributes Rule                 | OPT.CSHARP.Csharp.AvoidUnsealedConcreteAttributesRule        | AvoidUnsealedConcreteAttributesRule: Avoid attributes defined as unsealed but not abstract   |
| Medium   | Call Get Last Error Immediately After P Invoke          | OPT.CSHARP.Csharp.CallGetLastErrorImmediatelyAfterPInvoke    | CallGetLastErrorImmediatelyAfterPInvoke: GetLastError immediately after P/Invoke   |
| Medium   | Check New Thread Without Start                          | OPT.CSHARP.Csharp.CheckNewThreadWithoutStart                 | CheckNewThreadWithoutStart: Avoid creating unstarted threads   |
| Medium   | Clone Method Should Not Return Null                     | OPT.CSHARP.Csharp.CloneMethodShouldNotReturnNull             | CloneMethodShouldNotReturnNull: An overridden Clone() method should never return null  |
| Medium   | Collection Class Suffix                                 | OPT.CSHARP.Csharp.CollectionClassSuffix                      | CollectionClassSuffix: Collections classes names must end with the 'Collection' suffix   |
| Medium   | Collections Should Implement Generic Interface          | OPT.CSHARP.Csharp.CollectionsShouldImplementGenericInterface | CollectionsShouldImplementGenericInterface: Collections should implement the generic interface   |
| Medium   | Com Visible Type Base Types Should Be Com Visible       | OPT.CSHARP.Csharp.ComVisibleTypeBaseTypesShouldBeComVisible  | ComVisibleTypeBaseTypesShouldBeComVisible: COM visible type derive from a non COM visible type   |

| Severity | Contrast rule                                      | Engine rule ID   | Description  |
|----------|--|--|--|
| Medium   | Consider Passing Base Types As Parameters          | OPT.CSHARP.Csharp.ConsiderPassingBaseTypesAsParameters       | ConsiderPassingBaseTypesAsParameters: Consider passing base types as parameters                                |
| Medium   | Declare Types In Namespaces                        | OPT.CSHARP.Csharp.DeclareTypesInNamespaces                   | DeclareTypesInNamespaces: Declare type namespaces  |
| Medium   | Default Parameters Should Not Be Used              | OPT.CSHARP.Csharp.DefaultParametersShouldNotBeUsed           | DefaultParametersShouldNotBeUsed: Do not use default parameters  |
| Medium   | Disable Debugging Code Rule                        | OPT.CSHARP.Csharp.DisableDebuggingCodeRule                   | DisableDebuggingCodeRule: Avoid using Console.WriteLine  |
| Medium   | Disposable Fields Should Be Disposed               | OPT.CSHARP.Csharp.DisposableFieldsShouldBeDisposed           | DisposableFieldsShouldBeDisposed: Call Dispose method of fields that implements System.IDisposable             |
| Medium   | Do Not Call Overridable Methods In Constructors    | OPT.CSHARP.Csharp.DoNotCallOverridableMethodsInConstructors  | DoNotCallOverridableMethodsInConstructors: Virtual method call from constructor                                |
| Medium   | Do Not Catch General Exception Types               | OPT.CSHARP.Csharp.DoNotCatchGeneralExceptionTypes            | DoNotCatchGeneralExceptionTypes: Declaration of Catch for Generic Exception Types                              |
| Medium   | Do Not Declare Virtual Members In Sealed Types     | OPT.CSHARP.Csharp.DoNotDeclareVirtualMembersInSealedTypes    | DoNotDeclareVirtualMembersInSealedTypes: Do not declare virtual and not final members in sealed classes        |
| Medium   | Do Not Decrease Inherited Member Visibility        | OPT.CSHARP.Csharp.DoNotDecreaseInheritedMemberVisibility     | DoNotDecreaseInheritedMemberVisibility: Do not decrease inherited member visibility                            |
| Medium   | Do Not Ignore Method Results                       | OPT.CSHARP.Csharp.DoNotIgnoreMethodResults                   | DoNotIgnoreMethodResults: Do not ignore returning value of methods   |
| Medium   | Do Not Nest Generic Types In Member Signatures     | OPT.CSHARP.Csharp.DoNotNestGenericTypesInMemberSignatures    | DoNotNestGenericTypesInMemberSignatures: Do not nest generic types in externally visible member signatures     |
| Medium   | Do Not Raise Exceptions In Exception Clauses       | OPT.CSHARP.Csharp.DoNotRaiseExceptionsInExceptionClauses     | DoNotRaiseExceptionsInExceptionClauses: Do not raise exceptions in exception clauses                           |
| Medium   | Do Not Raise Reserved Exception Types              | OPT.CSHARP.Csharp.DoNotRaiseReservedExceptionTypes           | DoNotRaiseReservedExceptionTypes: Do not raise reserved exception types  |
| Medium   | Do Not Use Timers That Prevent Power State Changes | OPT.CSHARP.Csharp.DoNotUseTimersThatPreventPowerStateChanges | DoNotUseTimersThatPreventPowerStateChanges: Avoid timers that prevent power state changes                      |
| Medium   | Double Check Locking Rule                          | OPT.CSHARP.Csharp.DoubleCheckLockingRule                     | DoubleCheckLockingRule: Incorrect usage of double checking when implementing Single-Checked Locking pattern    |
| Medium   | Equality Operator If Plus Or Minus                 | OPT.CSHARP.Csharp.EqualityOperatorIfPlusOrMinus              | EqualityOperatorIfPlusOrMinus: Override equality operator if addition and subtraction operators are overridden |
| Medium   | Exception Class Suffix                             | OPT.CSHARP.Csharp.ExceptionClassSuffix                       | ExceptionClassSuffix: Exception classes must end with the 'Exception' suffix                                   |
| Medium   | Exception Constructors                             | OPT.CSHARP.Csharp.ExceptionConstructors                      | ExceptionConstructors: Classes that extend Exception must implement all standard constructors                  |

| Severity | Contrast rule                                    | Engine rule ID  | Description   |
|----------|--|---|---|
| Medium   | Implement IDisposable Correctly                  | OPT.CSHARP.Csharp.ImplementIDisposableCorrectly               | ImplementIDisposableCorrectly: Implement IDisposable correctly  |
| Medium   | Implement IDisposable With Finalize              | OPT.CSHARP.Csharp.ImplementIDisposableWithFinalize            | ImplementIDisposableWithFinalize: Implement Dispose method provided by IDisposable interface  |
| Medium   | Implement ISerializable Correctly                | OPT.CSHARP.Csharp.ImplementISerializableCorrectly             | ImplementISerializableCorrectly: Implement ISerializable correctly  |
| Medium   | Implement Standard Exception Constructors        | OPT.CSHARP.Csharp.ImplementStandardExceptionConstructors      | ImplementStandardExceptionConstructors: Implement standard exception constructors   |
| Medium   | Interface Name                                   | OPT.CSHARP.Csharp.InterfaceName                               | InterfaceName: Interface name format convention   |
| Medium   | Level2 Assemblies Should Not Contain Linkdemands | OPT.CSHARP.Csharp.Level2AssembliesShouldNotContainLinkdemands | Level2AssembliesShouldNotContainLinkdemands: A class or class member is using a LinkDemand in an application that is using Level 2 security |
| Medium   | Mark Members As Static                           | OPT.CSHARP.Csharp.MarkMembersAsStatic                         | MarkMembersAsStatic: A method that only accesses class members should be marked 'static'  |
| Medium   | Members Should Not Expose Certain Concrete Types | OPT.CSHARP.Csharp.MembersShouldNotExposeCertainConcreteTypes  | MembersShouldNotExposeCertainConcreteTypes: Members should not expose certain concrete types  |
| Medium   | Method Case                                      | OPT.CSHARP.Csharp.MethodCase                                  | MethodCase: Method names differ only in case within the same class  |
| Medium   | Namespace Case                                   | OPT.CSHARP.Csharp.NamespaceCase                               | NamespaceCase: Namespace names differ only in case  |
| Medium   | Naming Class Namespace                           | OPT.CSHARP.Csharp.NamingClassNamespace                        | NamingClassNamespace: Namespace name cannot match the name of one of its containing classes   |
| Medium   | Nested Types Should Not Be Visible               | OPT.CSHARP.Csharp.NestedTypesShouldNotBeVisible               | NestedTypesShouldNotBeVisible: An externally visible type contains an externally visible type declaration                                   |
| Medium   | Num Max Class By Namespace                       | OPT.CSHARP.Csharp.NumMaxClassByNamespace                      | NumMaxClassByNamespace: Avoid an excessive number of classes per package/namespace  |
| Medium   | Only Flags Enums Should Have Plural Names        | OPT.CSHARP.Csharp.OnlyFlagsEnumsShouldHavePluralNames         | OnlyFlagsEnumsShouldHavePluralNames: Externally visible enumeration ends in a plural word and is not marked with the Flags attribute        |
| Medium   | Operations Should Not Overflow                   | OPT.CSHARP.Csharp.OperationsShouldNotOverflow                 | OperationsShouldNotOverflow: Operations should not overflow   |
| Medium   | Parameter Case                                   | OPT.CSHARP.Csharp.ParameterCase                               | ParameterCase: Parameter names differ only in case in a method declaration  |
| Medium   | Pass System Obj Instead Of String                | OPT.CSHARP.Csharp.PassSystemObjInsteadOfString                | PassSystemObjInsteadOfString: Pass System.Uri objects instead of strings  |
| Medium   | Pointers Should Not Be Visible                   | OPT.CSHARP.Csharp.PointersShouldNotBeVisible                  | PointersShouldNotBeVisible: Pointers should not be visible  |
| Medium   | Properties Should Not Be Write Only              | OPT.CSHARP.Csharp.PropertiesShouldNotBeWriteOnly              | PropertiesShouldNotBeWriteOnly: Avoid write-only properties   |
| Medium   | Property Case                                    | OPT.CSHARP.Csharp.PropertyCase                                | PropertyCase: Property names within the same class differ only in case  |
| Medium   | Rethrow To Preserve Stack Details                | OPT.CSHARP.Csharp.RethrowToPreserveStackDetails               | RethrowToPreserveStackDetails: Do not rethrow exceptions explicitly   |

| Severity | Contrast rule                                    | Engine rule ID   | Description   |
|----------|--|--|---|
| Medium   | Set Locale For Data Types                        | OPT.CSHARP.Csharp.SetLocaleForDataTypes                      | SetLocaleForDataTypes: Set locale proper data types   |
| Medium   | Specify Culture Info                             | OPT.CSHARP.Csharp.SpecifyCultureInfo                         | SpecifyCultureInfo: Specify CultureInfo   |
| Medium   | Specify String Comparison                        | OPT.CSHARP.Csharp.SpecifyStringComparison                    | SpecifyStringComparison: Specify StringComparison   |
| Medium   | Static Holder Types Should Be Sealed             | OPT.CSHARP.Csharp.StaticHolderTypesShouldBeSealed            | StaticHolderTypesShouldBeSealed: Class containing only static members should be declared sealed   |
| Medium   | Static Holder Types Should Not Have Constructors | OPT.CSHARP.Csharp.StaticHolderTypesShouldNotHaveConstructors | StaticHolderTypesShouldNotHaveConstructors: Static holder types should not have constructors  |
| Medium   | Type Case  | OPT.CSHARP.Csharp.TypeCase                                   | TypeCase: Type names differ only in case  |
| Medium   | Types Should Not Extend Certain Base Types       | OPT.CSHARP.Csharp.TypesShouldNotExtendCertainBaseTypes       | TypesShouldNotExtendCertainBaseTypes: Types should not extend certain base types  |
| Medium   | Uri Parameters Should Not Be Strings             | OPT.CSHARP.Csharp.UriParametersShouldNotBeStrings            | UriParametersShouldNotBeStrings: URI parameters should not be strings   |
| Medium   | Uri Return Values Should Not Be Strings          | OPT.CSHARP.Csharp.UriReturnValuesShouldNotBeStrings          | UriReturnValuesShouldNotBeStrings: The return value of a method contains 'uri', 'Uri', 'urn', 'Urn', or 'Url', and returns a string             |
| Medium   | Use Generic Event Handler Instances              | OPT.CSHARP.Csharp.UseGenericEventHandlerInstances            | UseGenericEventHandlerInstances: Use generic event handler instances  |
| Medium   | Use Safe Handle To Encapsulate Native Resources  | OPT.CSHARP.Csharp.UseSafeHandleToEncapsulateNativeResources  | UseSafeHandleToEncapsulateNativeResources: Use of System.IntPtr   |
| Medium   | Validate Arguments Of Public Methods             | OPT.CSHARP.Csharp.ValidateArgumentsOfPublicMethods           | ValidateArgumentsOfPublicMethods: Check parameters of externally visible methods  |
| Medium   | Warn Of Assignations In Conditional Statements   | OPT.CSHARP.Csharp.WarnOfAssignationsInConditionalStatements  | WarnOfAssignationsInConditionalStatements: Assignment expression in an if condition   |
| Medium   | Classes Are Strongly Internally Coupled          | OPT.CSHARP.ClassesAreStronglyInternallyCoupled               | ClassesAreStronglyInternallyCoupled: Classes that are internally strongly coupled must be avoided   |
| Medium   | Dispose Methods Should Call Suppress Finalize    | OPT.CSHARP.DisposeMethodsShouldCallSuppressFinalize          | DisposeMethodsShouldCallSuppressFinalize: The Dispose method of a class that implements System.IDisposable should call GC.SuppressFinalize      |
| Medium   | Method Security Should Be Superset Of Type       | OPT.CSHARP.MethodSecurityShouldBeSupersetOfType              | MethodSecurityShouldBeSupersetOfType: Security of methods should be a subset of security of types   |
| Medium   | MVC Post In Controllers                          | OPT.CSHARP.MVCPostInControllers                              | MVCPostInControllers: Restrict allowed HTTP verbs for state-change operations in MVC controllers  |
| Medium   | Potential Infinite Loop                          | OPT.CSHARP.PotentialInfiniteLoop                             | PotentialInfiniteLoop: Loop with Unreachable Exit Condition ('Infinite Loop')   |
| Medium   | Provide Correct Arguments To Formatting Methods  | OPT.CSHARP.ProvideCorrectArgumentsToFormattingMethods        | ProvideCorrectArgumentsToFormattingMethods: The format argument passed to System.String.Format does not match with objects passed as parameters |



| Severity | Contrast rule   | Engine rule ID  | Description  |
|----------|---|---|--|
| Medium   | Provide Deserialization Methods For Optional Fields               | OPT.CSHARP.ProvideDeserializationMethodsForOptionalFields             | ProvideDeserializationMethodsForOptionalFields: Provide methods for the de-serialization of fields marked with OptionalFieldAttribute                      |
| Medium   | Review Declarative Security On Value Types                        | OPT.CSHARP.ReviewDeclarativeSecurityOnValueTypes                      | ReviewDeclarativeSecurityOnValueTypes: Avoid using declarative security in value types   |
| Medium   | Review Imperative Security  | OPT.CSHARP.ReviewImperativeSecurity                                   | ReviewImperativeSecurity: Avoid using imperative security whenever possible  |
| Medium   | Http Request Value Shadowing                                      | OPT.CSHARP.SEC.HttpRequestValueShadowing                              | HttpRequestValueShadowing: Request data is accessed in an ambiguous way, which can leave it open to attack   |
| Medium   | Main Method In Web Application                                    | OPT.CSHARP.SEC.MainMethodInWebApplication                             | MainMethodInWebApplication: Main() method is not allowed in web application  |
| Medium   | Avoid Host Name Checks  | OPT.CSHARP.SEC.AvoidHostNameChecks                                    | AvoidHostNameChecks: Avoid checks on host side hostname, that are not reliable due to DNS poisoning  |
| Medium   | System Information Leak   | OPT.CSHARP.SystemInformationLeak                                      | SystemInformationLeak: Exposure of System Data to an Unauthorized Control Sphere   |
| Medium   | Transparent Methods Must Not Call Native Code                     | OPT.CSHARP.TransparentMethodsMustNotCallNativeCode                    | TransparentMethodsMustNotCallNativeCode: A transparent method should not make calls to native code   |
| Medium   | Transparent Methods Must Not Handle Process Corrupting Exceptions | OPT.CSHARP.TransparentMethodsMustNotHandleProcessCorruptingExceptions | TransparentMethodsMustNotHandleProcessCorruptingExceptions: A transparent method must not have HandleProcessCorruptedStateExceptions attribute             |
| Medium   | Transparent Methods Should Not Be Protected With Link Demands     | OPT.CSHARP.TransparentMethodsShouldNotBeProtectedWithLinkDemands      | TransparentMethodsShouldNotBeProtectedWithLinkDemands: A transparent method should not require LinkDemand  |
| Medium   | Transparent Methods Should Not Demand                             | OPT.CSHARP.TransparentMethodsShouldNotDemand                          | TransparentMethodsShouldNotDemand: A transparent method should not require SecurityAction.Demand, and should not call CodeAccessPermission.Demand method   |
| Medium   | Transparent Methods Should Not Load Assemblies From Byte Arrays   | OPT.CSHARP.TransparentMethodsShouldNotLoadAssembliesFromByteArrays    | TransparentMethodsShouldNotLoadAssembliesFromByteArrays: A transparent method should not load an assembly from a byte array using the Assembly.Load method |
| Medium   | Type Link Demands Require Inheritance Demands                     | OPT.CSHARP.TypeLinkDemandsRequireInheritanceDemands                   | TypeLinkDemandsRequireInheritanceDemands: A public type protected with link demand requires inheritance demand   |
| Medium   | Unchecked Return Value  | OPT.CSHARP.UncheckedReturnValue                                       | UncheckedReturnValue: Unchecked return value.  |
| Medium   | Unchecked Input In Loop Condition                                 | OPT.CSHARP.UncheckedInputInLoopCondition                              | UncheckedInputInLoopCondition: Unchecked input in loop condition   |
| Medium   | Unused Private Method   | OPT.CSHARP.UnusedPrivateMethod  | UnusedPrivateMethod: Avoid unused private methods and constructors   |
| Medium   | Do Not Expose Fields In Secured Type                              | OPT.CSHARP.Csharp.DoNotExposeFieldsInSecuredType                      | DoNotExposeFieldsInSecuredType: Do not declare public types that are secured but also expose its fields  |



| Severity | Contrast rule                                 | Engine rule ID   | Description  |
|----------|---|--|--|
| Medium   | Review Suppress Unmanaged Code Security Usage | OPT.CSHARP.Csharp.ReviewSuppressUnmanagedCodeSecurityUsage | ReviewSuppressUnmanagedCodeSecurityUsage: Do not use the 'SuppressUnmanagedCodeSecurity' attribute   |
| Medium   | MVC Remove Version Header                     | OPT.CSHARP.MVCRemoveVersionHeader                          | MVCRemoveVersionHeader: Remove ASP.NET MVC version from HTTP headers   |
| Medium   | P Invokes Should Not Be Safe Critical         | OPT.CSHARP.PInvokesShouldNotBeSafeCritical                 | PInvokesShouldNotBeSafeCritical: A P/Invoke declaration should not have the SecuritySafeCritical attribute   |
| Medium   | Hardcoded Credential                          | OPT.CSHARP.SEC.HardcodedCredential                         | HardcodedCredential: Use of Hard-coded Credentials   |
| Medium   | Hardcoded Network Address                     | OPT.CSHARP.SEC.HardcodedNetworkAddress                     | HardcodedNetworkAddress: Network address should not be hardcoded   |
| Medium   | Plaintext Storage Of Password                 | OPT.CSHARP.SEC.PlaintextStorageOfPassword                  | PlaintextStorageOfPassword: Plaintext Storage of a Password  |
| Medium   | Serializable Class Containing Sensitive Data  | OPT.CSHARP.SEC.SerializableClassContainingSensitiveData    | SerializableClassContainingSensitiveData: Serializable Class Containing Sensitive Data   |
| Medium   | Secured Types Should Not Expose Fields        | OPT.CSHARP.SecuredTypesShouldNotExposeFields               | SecuredTypesShouldNotExposeFields: Types secured with Link Demands should not expose fields  |
| Medium   | Secure Serialization Constructors             | OPT.CSHARP.SecureSerializationConstructors                 | SecureSerializationConstructors: Serialized constructors should be protected with security demands   |
| Medium   | Transparency Annotations Should Not Conflict  | OPT.CSHARP.TransparencyAnnotationsShouldNotConflict        | TransparencyAnnotationsShouldNotConflict: The security attribute of a type should have the same transparency that the security attribute of the members that it contains |

## COBOL Scan rules

Contrast Scan supports these rules for COBOL.

| Severity | Contrast rule                       | Engine rule ID                             | Description   |
|----------|-------------------------------------|--|---|
| Critical | Avoid Access Not Indexed Table Big  | OPT.COBOLE.AvoidAccessNotIndexedTableBig   | AvoidAccessNotIndexedTableBig: Detected an access to a large table (no. of pages > { })   |
| Critical | Avoid Access Without Index Big      | OPT.COBOLE.AvoidAccessWithoutIndexBig      | AvoidAccessWithoutIndexBig: Detected access where there is no index fields reported in the WHERE on a large table size (number pages > { }) |
| Critical | Avoid As In SQL Sentence            | OPT.COBOLE.AvoidAsInSqlSentence            | AvoidAsInSqlSentence: It is not allowed the use of statements that include temporary tables defined using the AS clause                     |
| Critical | Avoid Call Other Section Paragraphs | OPT.COBOLE.AvoidCallOtherSectionParagraphs | AvoidCallOtherSectionParagraphs: Call a paragraph from other section  |
| Critical | Avoid Join With Cost Access         | OPT.COBOLE.AvoidJoinWithCostAccess         | AvoidJoinWithCostAccess: Not allowed to use JOIN containing costly accesses (R0, I0, MX) to one of the tables (no. pages > { })             |

| Severity | Contrast rule                       | Engine rule ID                                      | Description  |
|----------|-------------------------------------|---|--|
| Critical | Avoid Paragraphs Out Of Sections    | OPT.COBOL.AvoidParagraphsOutOfSections              | AvoidParagraphsOutOfSections: Avoid paragraphs outside of sections   |
| Critical | Check SQL Code After Sequence       | OPT.COBOL.CheckSqlCodeAfterSequence                 | CheckSqlCodeAfterSequence: Check return codes (SQLCODE -359 and / or -845) in SEQUENCE objects with NEXT VALUE or PREVIOUS VALUE                   |
| Critical | Check SQLcode When Rowset           | OPT.COBOL.CheckSqlcodeWhenRowset                    | CheckSqlcodeWhenRowset: Check rows and returned code (SQLCODE {}   |
| Critical | Check Value Occur                   | OPT.COBOL.CheckValueOccur                           | CheckValueOccur: When use MULTIROW, the value of 'n' in FOR n ROWS option, has to be less or equal to OCCURS in the table that receives the rowset |
| Critical | Call Paragraph                      | OPT.COBOL.COBBP.CallParagraph                       | CallParagraph: Uncalled paragraph/ section   |
| Critical | N D E S                             | OPT.COBOL.COD_COBOL.NDES                            | NDES: Do not divide PROCEDURE DIVISION into sections   |
| Critical | N R                                 | OPT.COBOL.COD_COBOL.NR                              | NR: Do not use RETURN inside EXEC CICS statements  |
| Critical | Avoid Collisions In Procedure Names | OPT.COBOL.FIA_COBOL.AvoidCollisionsInProcedureNames | AvoidCollisionsInProcedureNames: Avoid duplicated section names, or paragraph names in same section  |
| Critical | Close Open Files                    | OPT.COBOL.FIA_COBOL.CloseOpenFiles                  | CloseOpenFiles: Check that every opened file is closed   |
| Critical | Close Open Input Output Files       | OPT.COBOL.FIA_COBOL.CloseOpenInputOutputFiles       | CloseOpenInputOutputFiles: Check that every opened (input or output) file is closed  |
| Critical | Open Declared Files                 | OPT.COBOL.FIA_COBOL.OpenDeclaredFiles               | OpenDeclaredFiles: Check that every declared file is opened  |
| Critical | Read Or Write Open Files            | OPT.COBOL.FIA_COBOL.ReadOrWriteOpenFiles            | ReadOrWriteOpenFiles: Check that every opened file is read or written  |
| Critical | Last Rows Invalid Checks            | OPT.COBOL.LastRowsInvalidChecks                     | LastRowsInvalidChecks: Detected control of SQLCODE values ,ÄÄthat cannot be done.  |
| Critical | Last Rows Valid Checks              | OPT.COBOL.LastRowsValidChecks                       | LastRowsValidChecks: Missing control of SQLCODE values ,ÄÄneeded.  |
| Critical | M L S                               | OPT.COBOL.MAN_COBOL.MLS                             | MLS: Avoid exceeding maximum number of lines per Cobol program   |
| Critical | M S                                 | OPT.COBOL.MAN_COBOL.MS                              | MS: Use a single program exit point (STOP or GOBACK) per program   |
| Critical | D C                                 | OPT.COBOL.RG_COBOL.DC                               | DC: With DIVIDE or COMPUTE with a division, add ON SIZE ERROR to control potential division by zero  |
| Critical | F D S N                             | OPT.COBOL.RG_COBOL.FDSN                             | FDSN: Avoid FD without record descriptor   |
| Critical | L R S                               | OPT.COBOL.RG_COBOL.LRS                              | LRS: Use LABEL RECORD IS STANDARD in file descriptors (FD)   |
| Critical | N L F                               | OPT.COBOL.RG_COBOL.NLF                              | NLF: Avoid programmes with too many lines  |
| Critical | N U R                               | OPT.COBOL.RG_COBOL.NUR                              | NUR: Do not use REPORT clause  |
| Critical | Avoid Alter                         | OPT.COBOL.SEC.AvoidAlter                            | AvoidAlter: Avoid ALTER  |
| Critical | Cobol Access Control DLI            | OPT.COBOL.SEC.Cobol_AccessControlDLI                | Cobol_AccessControlDLI: Check user input used in DL/I (IMS) queries  |

| Severity | Contrast rule                   | Engine rule ID                                  | Description   |
|----------|---------------------------------|---|---|
| Critical | Cobol Access Control Database   | OPT.COBOL.SEC.Cobol_AccessControlDatabase       | Cobol_AccessControlDatabase: Authorization Bypass Through User-Controlled SQL Primary Key   |
| Critical | Dynamic Storage Leak Rule       | OPT.COBOL.SEC.DynamicStorageLeakRule            | DynamicStorageLeakRule: Potential dynamic storage area leak   |
| Critical | Illegal Values For Pointers     | OPT.COBOL.SEC.IllegalValuesForPointers          | IllegalValuesForPointers: Access of Uninitialized Pointer   |
| Critical | Path Traversal                  | OPT.COBOL.SEC.PathTraversal                     | PathTraversal: Avoid non-neutralized user-controlled input to be part of a pathname (file or directory) used in I/O operations  |
| Critical | Pointer Arithmetic              | OPT.COBOL.SEC.PointerArithmetic                 | PointerArithmetic: Avoid pointer arithmetic in Cobol  |
| Critical | Avoid Duplicated Queries        | OPT.COBOL.SQL_COBOL.AvoidDuplicatedQueries      | AvoidDuplicatedQueries: Avoid duplicated SQL statements   |
| Critical | Cursor For Update Where Current | OPT.COBOL.SQL_COBOL.CursorForUpdateWhereCurrent | CursorForUpdateWhereCurrent: If a CURSOR is declared FOR UPDATE, DELETE and UPDATE must be used with the WHERE CURRENT specification  |
| Critical | Detect Unaware Cross Joins      | OPT.COBOL.SQL_COBOL.DetectUnawareCrossJoins     | DetectUnawareCrossJoins: Do not make "unnoticed" cartesian products in queries  |
| Critical | Dont Select Known Fields        | OPT.COBOL.SQL_COBOL.DontSelectKnownFields       | DontSelectKnownFields: SELECT queries never should get fields used in the WHERE specification with {}   |
| Critical | Fetch And Declare Same Fields   | OPT.COBOL.SQL_COBOL.FetchAndDeclareSameFields   | FetchAndDeclareSameFields: The number of fields to retrieve specified in the DECLARE CURSOR statement must be the same as the number of fields specified in the FETCH statement |
| Critical | Avoid Correlated Sub Selects    | OPT.COBOL.SQL_COBOL.AvoidCorrelatedSubSelects   | AvoidCorrelatedSubSelects: Avoid nested SELECTs that use columns defined in outer SELECTs   |
| Critical | Cobol Access Control MQ         | OPT.COBOL.SEC.Cobol_AccessControlMQ             | Cobol_AccessControlMQ: Do not allow user input to control fields of MQSeries descriptor   |
| Critical | Cobol Process Control           | OPT.COBOL.SEC.Cobol_ProcessControl              | Cobol_ProcessControl: Avoid calling subprogram where its name could be controlled by user input   |
| Critical | Cobol Resource Injection        | OPT.COBOL.SEC.Cobol_ResourceInjection           | Cobol_ResourceInjection: Improper Control of Resource Identifiers ('Resource Injection')  |
| Critical | Cross Site Scripting            | OPT.COBOL.SEC.CrossSiteScripting                | CrossSiteScripting: Improper Neutralization of Input During Web Page Generation ('Cross-site Scripting')  |
| Critical | OS Command Injection            | OPT.COBOL.SEC.OSCommandInjection                | OSCommandInjection: Improper Neutralization of Special Elements used in an OS Command ('OS Command Injection')  |
| Critical | SQL Injection                   | OPT.COBOL.SEC.SqlInjection                      | SqlInjection: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection')  |
| Critical | Cobol Hardcoded Password        | OPT.COBOL.SEC.Cobol_HardcodedPassword           | Cobol_HardcodedPassword: Hardcoded passwords can compromise system security in a way that cannot be easily remedied   |

| Severity | Contrast rule                      | Engine rule ID                                    | Description   |
|----------|------------------------------------|---|---|
| Critical | HTTP Header Manipulation           | OPT.COBOL.SEC.HTTPHeaderManipulation              | HTTPHeaderManipulation: Unvalidated data in HTTP response header  |
| Critical | Check Crypto Return Code           | OPT.COBOL.SEC.CheckCryptoReturnCode               | CheckCryptoReturnCode: Validate return code for cryptographic operations                                    |
| High     | Avoid XML                          | OPT.COBOL.AvoidXML                                | AvoidXML: Do not use (read and parse) XML in a cobol program  |
| High     | Avoid XML Generate                 | OPT.COBOL.AvoidXMLGenerate                        | AvoidXMLGenerate: Do not generate XML in a cobol program  |
| High     | Link Xctl With Commarea Length     | OPT.COBOL.CICS.LinkXctlWithCommareaLength         | LinkXctlWithCommareaLength: Specify LENGTH with COMMAREA in CICS LINK/XCTL/RETURN commands                  |
| High     | Use Cics Explicit Error Handling   | OPT.COBOL.CICS.UseCicsExplicitErrorHandling       | UseCicsExplicitErrorHandling: In CICS commands, use error handling with RESP / NOHANDE and test result code |
| High     | I S E                              | OPT.COBOL.COBBP.ISE                               | ISE: Close each IF with END-IF  |
| High     | R I B                              | OPT.COBOL.COBBP.RIB                               | RIB: FD descriptor must specify BLOCK CONTAINS 0 RECORDS  |
| High     | C O B N O M Call Naming Convention | OPT.COBOL.COBNOM_CallNamingConvention             | COBNOM_CallNamingConvention: CALL naming conventions  |
| High     | Check File Status After I O        | OPT.COBOL.FIA_COBOL.CheckFileStatusAfterIO        | CheckFileStatusAfterIO: FILE STATUS should be checked after I/O operations                                  |
| High     | No Stmt After Program Termination  | OPT.COBOL.FIA_COBOL.NoStmtAfterProgramTermination | NoStmtAfterProgramTermination: There should be no statements following STOP RUN / GOBACK / EXIT PROGRAM     |
| High     | Use Field W S                      | OPT.COBOL.FIA_COBOL.UseFieldWS                    | UseFieldWS: Check that every field declared in WORKING-STORAGE is used                                      |
| High     | W O E V                            | OPT.COBOL.FIA_COBOL.WOEV                          | WOEV: Use WHEN OTHER in EVALUATE  |
| High     | C N P                              | OPT.COBOL.MAN_COBOL.CNP                           | CNP: Comment paragraphs and procedure sections  |
| High     | E I F A                            | OPT.COBOL.MAN_COBOL.EIFA                          | EIFA: Avoid nesting IF too deeply   |
| High     | I N V F                            | OPT.COBOL.MAN_COBOL.INVF                          | INV F: Avoid programs with high integration complexity  |
| High     | M N N                              | OPT.COBOL.MAN_COBOL.MNN                           | MNN: DISPLAY instruction with non-normalised message codes  |
| High     | N S T                              | OPT.COBOL.MAN_COBOL.NST                           | NST: Limit the number of executable sentences per Cobol program   |
| High     | P COM                              | OPT.COBOL.MAN_COBOL.PCOM                          | PCOM: Avoid programs with low code comments rate  |
| High     | P R C D                            | OPT.COBOL.MAN_COBOL.PRCD                          | PRCD: Avoid deeply nested flow-control sentences  |
| High     | R A C C                            | OPT.COBOL.MAN_COBOL.RACC                          | RACC: Avoid programs/routines with high cyclomatic complexity   |
| High     | S COM                              | OPT.COBOL.MAN_COBOL.SCOM                          | SCOM: Avoid sections with low comment percentage  |
| High     | Not Used Fields                    | OPT.COBOL.NotUsedFields                           | NotUsedFields: Unused fields retrieved in SELECT or FETCH statements  |
| High     | H I F I                            | OPT.COBOL.OYR_COBOL.HIFI                          | HIFI: Avoid high fan-in procedures  |
| High     | H I F O                            | OPT.COBOL.OYR_COBOL.HIFO                          | HIFO: Avoid high fan-out procedures   |

| Severity | Contrast rule                             | Engine rule ID  | Description   |
|----------|---|---|---|
| High     | Read Followed By At End Or Invalid Key    | OPT.COBOL.ReadFollowedByAtEndOrInvalidKey               | ReadFollowedByAtEndOrInvalidKey: READ statement without by AT END or INVALID KEY.   |
| High     | F C T                                     | OPT.COBOL.RG_COBOL.FCT                                  | FCT: Programs must have at least as many counters as tables and files declared in program                                 |
| High     | F S R                                     | OPT.COBOL.RG_COBOL.FSR                                  | FSR: Define FD as LABEL RECORD STANDARD, 0-record blocks, and recording mode fixed or variable                            |
| High     | G O T O                                   | OPT.COBOL.RG_COBOL.GOTO                                 | GOTO: Avoid GO TO statements in program logic   |
| High     | N T P                                     | OPT.COBOL.RG_COBOL.NTP                                  | NTP: Do not use PERFORM ... THRU  |
| High     | Call Parameter Mismatch                   | OPT.COBOL.SEC.CallParameterMismatch                     | CallParameterMismatch: Parameter mismatch in CALL   |
| High     | Avoid Declared Unopened Cursors           | OPT.COBOL.SQL_COBOL.AvoidDeclaredUnopenedCursors        | AvoidDeclaredUnopenedCursors: If a CURSOR is declared, it must be opened  |
| High     | Avoid Included Tables And Not Accessed    | OPT.COBOL.SQL_COBOL.AvoidIncludedTablesAndNotAccessed   | AvoidIncludedTablesAndNotAccessed: Avoid included table definitions, not accessed after in the programme body             |
| High     | Avoid Opened Unclosed Cursors             | OPT.COBOL.SQL_COBOL.AvoidOpenedUnclosedCursors          | AvoidOpenedUnclosedCursors: If a CURSOR is opened, it must be closed  |
| High     | Avoid Opened Unused Cursors               | OPT.COBOL.SQL_COBOL.AvoidOpenedUnusedCursors            | AvoidOpenedUnusedCursors: If a CURSOR is opened, it must be used  |
| High     | Check SQLcode Or Indicator Vars In Select | OPT.COBOL.SQL_COBOL.CheckSqlcodeOrIndicatorVarsInSelect | CheckSqlcodeOrIndicatorVarsInSelect: Check for NULL properly (use host variables in SQL sentence or check for SQLCODE {}) |
| High     | Control SQLcode After Exec SQL            | OPT.COBOL.SQL_COBOL.ControlSqlcodeAfterExecSql          | ControlSqlcodeAfterExecSql: SQLCODE value should be checked after each EXEC SQL statement                                 |
| High     | No Current Clause                         | OPT.COBOL.SQL_COBOL.NoCurrentClause                     | NoCurrentClause: SQL queries with CURRENT clause are heavy-weighted and must be used only when necessary                  |
| High     | Optimize Varchar Moves                    | OPT.COBOL.SQL_COBOL.OptimizeVarcharMoves                | OptimizeVarcharMoves: Control data size on VARCHAR columns  |
| High     | Avoid Union                               | OPT.COBOL.SQL_COBOL.AvoidUnion                          | AvoidUnion: Avoid selects with UNION  |
| High     | Use The As Keyword                        | OPT.COBOL.SQL_COBOL.UseTheAsKeyword                     | UseTheAsKeyword: Use AS keyword when establishing an alias to tables  |
| High     | Avoid Numeric References In By Clauses    | OPT.COBOL.SQL_COBOL.AvoidNumericReferencesInByClauses   | AvoidNumericReferencesInByClauses: Do not refer to column names with number indexes in * BY clauses                       |
| High     | No Accept From Untrusted Source           | OPT.COBOL.SEC.NoAcceptFromUntrustedSource               | NoAcceptFromUntrustedSource: Do not ACCEPT data from untrusted sources  |
| High     | No Active Debug                           | OPT.COBOL.SEC.NoActiveDebug                             | NoActiveDebug: Information Exposure Through Debug Information   |

| Severity | Contrast rule                             | Engine rule ID                                 | Description  |
|----------|---|--|--|
| High     | Weak Crypto Hash                          | OPT.COBOL.SEC.WeakCryptoHash                   | WeakCryptoHash: Weak cryptographic hashes cannot guarantee data integrity                                  |
| Info     | Access In Loop Not Used Index             | OPT.COBOL.AccessInLoopNotUsedIndex             | AccessInLoopNotUsedIndex: Access detected in a loop to a medium table (no. pages > {})                     |
| Info     | Avoid Accept From Console                 | OPT.COBOL.AvoidAcceptFromConsole               | AvoidAcceptFromConsole: Using ACCEPT FROM CONSOLE is not allowed   |
| Info     | Avoid Access Not Indexed Table Small      | OPT.COBOL.AvoidAccessNotIndexedTableSmall      | AvoidAccessNotIndexedTableSmall: Detected a small table access (no. pages < {})                            |
| Info     | Avoid Copy Procedure Division             | OPT.COBOL.AvoidCopyProcedureDivision           | AvoidCopyProcedureDivision: Using COPY in PROCEDURE DIVISION is not allowed                                |
| Info     | Avoid Distinct                            | OPT.COBOL.AvoidDistinct                        | AvoidDistinct: Avoid the DISTINCT operator   |
| Info     | Avoid Divide0                             | OPT.COBOL.AvoidDivide0                         | AvoidDivide0: Avoid division by 0  |
| Info     | Avoid If Numeric Alphabetic               | OPT.COBOL.AvoidIfNumericAlphabetic             | AvoidIfNumericAlphabetic: Avoid using IF NUMERIC and IF ALPHABETIC   |
| Info     | Avoid Include Procedure Division          | OPT.COBOL.AvoidIncludeProcedureDivision        | AvoidIncludeProcedureDivision: Using INCLUDE in PROCEDURE DIVISION is not allowed                          |
| Info     | Avoid Mix SQL Code                        | OPT.COBOL.AvoidMixSqlCode                      | AvoidMixSqlCode: In a control statement does not combine program variables with return codes (SQL-CODE)    |
| Info     | Avoid No Calified Vars                    | OPT.COBOL.AvoidNoCalifiedVars                  | AvoidNoCalifiedVars: Variable with repeated ID detected  |
| Info     | Avoid No Rewind In Sequential Files       | OPT.COBOL.AvoidNoRewindInSequentialFiles       | AvoidNoRewindInSequentialFiles: Do not use NO REWIND clause in sequential files                            |
| Info     | Avoid Recover Equal Fields                | OPT.COBOL.AvoidRecoverEqualFields              | AvoidRecoverEqualFields: Avoid recovering fields that are conditioned by equal                             |
| Info     | Avoid Repeat Calls                        | OPT.COBOL.AvoidRepeatCalls                     | AvoidRepeatCalls: Avoid calling to the same routine several times  |
| Info     | Avoid Search Small Working                | OPT.COBOL.AvoidSearchSmallWorking              | AvoidSearchSmallWorking: For seeking in tables WORKING with less than 50 elements use the SEARCH statement |
| Info     | Avoid Sentence According Size Table Small | OPT.COBOL.AvoidSentenceAccordingSizeTableSmall | AvoidSentenceAccordingSizeTableSmall: Detected a statement on a small table (No. pages < {})               |
| Info     | Change Cursor To Select                   | OPT.COBOL.ChangeCursorToSelect                 | ChangeCursorToSelect: Defined cursor can be transformed into a SELECT                                      |
| Info     | Check88 Vars                              | OPT.COBOL.Check88Vars                          | Check88Vars: It is recommended using level 88 for variables used in conditional statements                 |
| Info     | Check Cols Not Modify                     | OPT.COBOL.CheckColsNotModify                   | CheckColsNotModify: Do not put columns whose value has not been changed in the UPDATE statement            |

| Severity | Contrast rule                      | Engine rule ID                           | Description   |
|----------|------------------------------------|--|---|
| Info     | Check Complete Insert              | OPT.COBOL.CheckCompleteInsert            | CheckCompleteInsert: The INSERT statement should be coded with all the variables and in the same order as defined in DECLARE              |
| Info     | Check Cursor For Update            | OPT.COBOL.CheckCursorForUpdate           | CheckCursorForUpdate: The columns retrieved in the FOR UPDATE clause must match those specified in the SET clause of the WHERE CURRENT OF |
| Info     | Check Delete For Update            | OPT.COBOL.CheckDeleteForUpdate           | CheckDeleteForUpdate: When using cursors, to delete rows with DELETE WHERE CURRENT OF, the FOR UPDATE clause must have a single column    |
| Info     | Check Fetch And Cursor             | OPT.COBOL.CheckFetchAndCursor            | CheckFetchAndCursor: The FETCH statement must include the same columns in the same order they appear in the statement of the cursor       |
| Info     | Check File Operations              | OPT.COBOL.CheckFileOperations            | CheckFileOperations: Do not use OPEN, READ, and WRITE operations more than once in a program  |
| Info     | Check Filestatus After File Access | OPT.COBOL.CheckFilestatusAfterFileAccess | CheckFilestatusAfterFileAccess: Check the FILE STATUS variable after each file access   |
| Info     | Check List Prefetch                | OPT.COBOL.CheckListPrefetch              | CheckListPrefetch: LIST PREFETCH has been detected in DB2 access  |
| Info     | Check Type Operations              | OPT.COBOL.CheckTypeOperations            | CheckTypeOperations: Fields involved in arithmetic operations must be defined as COMP or COMP-3 and have the same length                  |
| Info     | Check Updt For Updt                | OPT.COBOL.CheckUpdtForUpdt               | CheckUpdtForUpdt: The updated columns with UPDATE must be the same as declared in the FOR UPDATE clause                                   |
| Info     | Check Working Structure            | OPT.COBOL.CheckWorkingStructure          | CheckWorkingStructure: WORKING tables must be defined at the end of the WORKING and before the declaration of cursors                     |
| Info     | C S I M                            | OPT.COBOL.COBBP.CSIM                     | CSIM: Do not use comparison symbols, use the corresponding name instead   |
| Info     | S O C                              | OPT.COBOL.COBBP.SOC                      | SOC: A single OPEN / CLOSE per file   |
| Info     | N O Don't use masterpage files     | OPT.COBOL.COD_COBOL.NOMP                 | NOMP: Paragraph names must begin with a user-specified prefix   |
| Info     | N O M S                            | OPT.COBOL.COD_COBOL.NOMS                 | NOMS: Procedural section names must follow naming convention  |
| Info     | N P A R                            | OPT.COBOL.COD_COBOL.NPAR                 | NPAR: Paragraph names must follow naming convention   |
| Info     | N V W S                            | OPT.COBOL.COD_COBOL.NVWS                 | NVWS: The names of the variables and constants of the WORKING-STORAGE must follow the user-specified prefixes                             |
| Info     | Cols Should Be Used                | OPT.COBOL.ColsShouldBeUsed               | ColsShouldBeUsed: All columns declared in the SELECT of a cursor defined WITH ROWSET POSITIONING must be used later in the program        |
| Info     | Control Num Rows                   | OPT.COBOL.ControlNumRows                 | ControlNumRows: When use the MULTIROW option, rowset size should never be more than 200 rows  |

| Severity | Contrast rule                    | Engine rule ID                        | Description   |
|----------|----------------------------------|---------------------------------------|---|
| Info     | Count Valid Lines                | OPT.COBOL.CountValidLines             | CountValidLines: Small programs, with less than a certain number of lines, are recommended                          |
| Info     | Cursors At The End Of Working    | OPT.COBOL.CursorsAtTheEndOfWorking    | CursorsAtTheEndOfWorking: NULL indicator, for SQL, must be PIC S9 (4) COMP  |
| Info     | Display At End                   | OPT.COBOL.DisplayAtEnd                | DisplayAtEnd: Using DISPLAY is only allowed by program end or ABEND   |
| Info     | Do Not Include SQLca Without Db2 | OPT.COBOL.DoNotIncludeSqlcaWithoutDb2 | DoNotIncludeSqlcaWithoutDb2: Exclude SQLCA if no DB2 accesses in the program  |
| Info     | Do Not Use Comp2                 | OPT.COBOL.DoNotUseComp2               | DoNotUseComp2: Using COMP-2 is not allowed  |
| Info     | Do Not Use Dclgen At Level01     | OPT.COBOL.DoNotUseDclgenAtLevel01     | DoNotUseDclgenAtLevel01: It is not allowed the use of DCLGEN to Level 01  |
| Info     | Do Not Use Filler At Level01     | OPT.COBOL.DoNotUseFillerAtLevel01     | DoNotUseFillerAtLevel01: Use of FILLER at level 01 is not recommended   |
| Info     | Do Not Use Linage Clause         | OPT.COBOL.DoNotUseLinageClause        | DoNotUseLinageClause: Use of clause LINAGE is not allowed   |
| Info     | Do Not Use Many Files            | OPT.COBOL.DoNotUseManyFiles           | DoNotUseManyFiles: The use of more than 10 files in a program is not allowed  |
| Info     | Do Not Use Select To Check A Row | OPT.COBOL.DoNotUseSelectToCheckARow   | DoNotUseSelectToCheckARow: Do not use SELECT / FETCH to verify the existence of a row for later reading or updating |
| Info     | Do Not Use Static Calls Routines | OPT.COBOL.DoNotUseStaticCallsRoutines | DoNotUseStaticCallsRoutines: Do not make calls to routines statically   |
| Info     | Duplicated Data Access           | OPT.COBOL.DuplicatedDataAccess        | DuplicatedDataAccess: Duplicated SQL accesses were detected   |
| Info     | B T A                            | OPT.COBOL.FIA_COBOL.BTA               | BTA: Do not use TEST AFTER inside a loop  |
| Info     | C E R M                          | OPT.COBOL.FIA_COBOL.CERM              | CERM: Adjust type and length of source and target in a MOVE statement   |
| Info     | D E C P                          | OPT.COBOL.FIA_COBOL.DCEP              | DECP: DECIMAL POINT IS COMMA must be specified  |
| Info     | I I N I                          | OPT.COBOL.FIA_COBOL.IINI              | IINI: Variable initialization with INITIALIZE   |
| Info     | M E R G                          | OPT.COBOL.FIA_COBOL.MERG              | MERG: Avoid MERGE statement   |
| Info     | N O S R                          | OPT.COBOL.FIA_COBOL.NOSR              | NOSR: Use GOBACK instead of STOP RUN  |
| Info     | File Without Filestatus          | OPT.COBOL.FileWithoutFilestatus       | FileWithoutFilestatus: File definition without FILESTATUS or FILESTATUS bad defined                                 |
| Info     | Group Open And Close             | OPT.COBOL.GroupOpenAndClose           | GroupOpenAndClose: Opening and closing files should be grouped in one OPEN and CLOSE                                |
| Info     | Incorrect Indicator Defined      | OPT.COBOL.IncorrectIndicatorDefined   | IncorrectIndicatorDefined: NULL indicator, for SQL, must be PIC S9 (4) COMP   |
| Info     | Initialize Var Level01           | OPT.COBOL.InitializeVarLevel01        | InitializeVarLevel01: Use of INITIALIZE is recommended for variables level 01                                       |
| Info     | C I N W                          | OPT.COBOL.MAN_COBOL.CINW              | CINW: Use standard naming for WORKING-STORAGE variables   |



| Severity | Contrast rule               | Engine rule ID                     | Description   |
|----------|-----------------------------|------------------------------------|---|
| Info     | C M F D                     | OPT.COBOLEMAN_COBOLECMFD           | CMFD: Before an FD (file descriptor) it is mandatory to add a comment explaining the file purpose and encoded information |
| Info     | E D P                       | OPT.COBOLEMAN_COBOLEEDP            | EDP: Avoid program descriptions larger than N lines   |
| Info     | I D O P                     | OPT.COBOLEMAN_COBOLEIDOP           | IDOP: Indent properly instruction operands  |
| Info     | I I T                       | OPT.COBOLEMAN_COBOLEIIT            | IIT: Add a prefix for Cobol tables and a suffix for their indexes   |
| Info     | I R T                       | OPT.COBOLEMAN_COBOLEIRT            | IRT: Naming convention for structured tables and their records  |
| Info     | L F D                       | OPT.COBOLEMAN_COBOLELFD            | LFD: Leave a blank line between file descriptors (FD)   |
| Info     | L I S E                     | OPT.COBOLEMAN_COBOLELISE           | LISE: Avoid too long procedural sections  |
| Info     | L P R E                     | OPT.COBOLEMAN_COBOLELPRE           | LPRE: Paragraph name length should be between certain limits  |
| Info     | L T E R                     | OPT.COBOLEMAN_COBOLELTER           | LTER: Use capital letters for code  |
| Info     | M N M X                     | OPT.COBOLEMAN_COBOLEMNMX           | MNMX: Use uppercase for code and lowercase for comments   |
| Info     | M S E C                     | OPT.COBOLEMAN_COBOLEMSEC           | MSEC: Avoid programs with too many procedural sections  |
| Info     | N C M A                     | OPT.COBOLEMAN_COBOLENCMA           | NCMA: Avoid commas for separating parameters in DISPLAY statements  |
| Info     | N C S W                     | OPT.COBOLEMAN_COBOLENCWS           | NCSW: Avoid nesting EVALUATE too deeply   |
| Info     | N R E G                     | OPT.COBOLEMAN_COBOLENREG           | NREG: FD records naming convention  |
| Info     | O V W S                     | OPT.COBOLEMAN_COBOLEOVWS           | OVWS: WORKING-STORAGE variables must follow a particular order  |
| Info     | P D E S                     | OPT.COBOLEMAN_COBOLEPDES           | PDES: Document program in code comments before PROGRAM-ID   |
| Info     | P I F                       | OPT.COBOLEMAN_COBOLEPIF            | PIF: Limit the number of sentences in IF or ELSE blocks   |
| Info     | P I N I                     | OPT.COBOLEMAN_COBOLEPINI           | PINI: The first paragraph in PROCEDURE DIVISION must follow a standard name   |
| Info     | P L I N                     | OPT.COBOLEMAN_COBOLEPLIN           | PLIN: PIC clauses should be properly aligned  |
| Info     | P P A R                     | OPT.COBOLEMAN_COBOLEPPAR           | PPAR: Paragraphs must contain an empty end line with a single dot   |
| Info     | P R I D                     | OPT.COBOLEMAN_COBOLEPRID           | PRID: PROGRAM-ID must be the same as the program name (filename, without extension)                                       |
| Info     | P W E                       | OPT.COBOLEMAN_COBOLEPWE            | PWE: Use PERFORM instead of EVALUATE ... WHEN with many nested lines  |
| Info     | V L I N                     | OPT.COBOLEMAN_COBOLEVLIN           | VLIN: Literals of the VALUE clauses for each level in data declarations should be aligned                                 |
| Info     | No Optional In File Control | OPT.COBOLE.NoOptionalInFileControl | NoOptionalInFileControl: The OPTIONAL clause is not allowed in FILE-CONTROL   |
| Info     | Obligatory End Read         | OPT.COBOLE.ObligatoryEndRead       | ObligatoryEndRead: Each READ must be ended with its corresponding END-READ  |
| Info     | Obligatory End Search       | OPT.COBOLE.ObligatoryEndSearch     | ObligatoryEndSearch: Each SEARCH must be ended with its corresponding END-SEARCH  |

| Severity | Contrast rule                    | Engine rule ID                               | Description  |
|----------|----------------------------------|--|--|
| Info     | B I U S                          | OPT.COBOLO.YR_COBOLO.BIUS                    | BIUS: Do not use BINARY, COMP or COMP-4 with variables/constants with more than 10 digits  |
| Info     | C D I N                          | OPT.COBOLO.YR_COBOLO.CDIN                    | CDIN: Always CALL subprograms passing parameters BY REFERENCE  |
| Info     | C O P Y                          | OPT.COBOLO.YR_COBOLO.COPY                    | COPY: Standard copybooks must be included  |
| Info     | D U P                            | OPT.COBOLO.YR_COBOLO.DUP                     | DUP: Avoid DISPLAY...UPON CONSOLE  |
| Info     | I N D B                          | OPT.COBOLO.YR_COBOLO.INDB                    | INDB: Variables used as table indexes must be of type S9(2) COMP or S9(4) COMP   |
| Info     | M C O R                          | OPT.COBOLO.YR_COBOLO.MCOR                    | MCOR: Avoid CORRESPONDING clause in MOVE, ADD and SUBTRACT statements  |
| Info     | N C P Y                          | OPT.COBOLO.YR_COBOLO.NCPY                    | NCPY: Avoid including copybooks not present in a standard set  |
| Info     | N D I S                          | OPT.COBOLO.YR_COBOLO.NDIS                    | NDIS: Avoid arithmetic operations on DISPLAY variables   |
| Info     | N N S                            | OPT.COBOLO.YR_COBOLO.NNS                     | NNS: Avoid usage of NEXT SENTENCE  |
| Info     | N O R E                          | OPT.COBOLO.YR_COBOLO.NORE                    | NORE: Do not use RELEASE   |
| Info     | Ocurrences Table Elements        | OPT.COBOLO.YR_COBOLO.OcurrencesTableElements | OcurrencesTableElements: Optimize access to table elements   |
| Info     | P A R N                          | OPT.COBOLO.YR_COBOLO.PARN                    | PARN: Avoid routines with too many parameters  |
| Info     | P D I M                          | OPT.COBOLO.YR_COBOLO.PDIM                    | PDIM: With PACKED-DECIMAL / COMP-3, use less than 16 digits, and even (for signed) or odd (for unsigned) digits                          |
| Info     | S I B Y                          | OPT.COBOLO.YR_COBOLO.SIBY                    | SIBY: Use SYNCHRONIZED with binary (BINARY,COMP,COMP-4 and COMP-5) fields  |
| Info     | S O R T                          | OPT.COBOLO.YR_COBOLO.SORT                    | SORT: Avoid SORT statement   |
| Info     | T I M E                          | OPT.COBOLO.YR_COBOLO.TIME                    | TIME: Access only once to system variables DATE, DAY, DAY-OF-WEEK, TIME, CENTURY-DATE, CENTURY-DAY, CURRENT-DATE                         |
| Info     | Perform Times With Memory Tables | OPT.COBOLO.PerformTimesWithMemoryTables      | PerformTimesWithMemoryTables: Using PERFORM N TIMES is only allowed with in-memory tables  |
| Info     | Perform Thru With Exit           | OPT.COBOLO.PerformThruWithExit               | PerformThruWithExit: Each PERFORM THRU must have its corresponding paragraph with EXIT   |
| Info     | A P I C                          | OPT.COBOLO.RG_COBOLO.APIC                    | APIC: Use parenthesis in PIC clauses instead of repeated XX, AA or 99  |
| Info     | C L A U                          | OPT.COBOLO.RG_COBOLO.CLAU                    | CLAU: Do not include deprecated paragraphs in IDENTIFICATION DIVISION (like DATE-COMPILED, DATE-WRITTEN, INSTALLATION, AUTHOR, SECURITY) |
| Info     | C P I C                          | OPT.COBOLO.RG_COBOLO.CPIC                    | CPIC: Use PIC instead of PICTURE   |
| Info     | F N F                            | OPT.COBOLO.RG_COBOLO.FNF                     | FNF: Use a specific level and data name for the first entry in WORKING-STORAGE SECTION   |
| Info     | I N B Y                          | OPT.COBOLO.RG_COBOLO.INBY                    | INBY: Use INDEXED BY clause with Cobol tables (fields with OCCURS)   |

| Severity | Contrast rule                         | Engine rule ID                             | Description   |
|----------|---------------------------------------|--|---|
| Info     | M V D                                 | OPT.COBOL.RG_COBOL.MVD                     | MVD: Do not use MOVE with constant literals, use a named constant field instead   |
| Info     | N77                                   | OPT.COBOL.RG_COBOL.N77                     | N77: Do not use 77 levels   |
| Info     | N I                                   | OPT.COBOL.RG_COBOL.NI                      | NI: Use odd levels for data entries in WORKING-STORAGE SECTION  |
| Info     | N L P                                 | OPT.COBOL.RG_COBOL.NLP                     | NLP: Do not use literals in PROCEDURE DIVISION sentences  |
| Info     | N N IV                                | OPT.COBOL.RG_COBOL.NNIV                    | NNIV: In DATA DIVISION, all data entry levels should be 01 or multiple of 5   |
| Info     | N P N T                               | OPT.COBOL.RG_COBOL.NPNT                    | NPNT: Do not write dots in sentences that do not require them   |
| Info     | N T H N                               | OPT.COBOL.RG_COBOL.NTHN                    | NTHN: Do not use THEN in an IF sentence   |
| Info     | Section End Doesnt Exist              | OPT.COBOL.SectionEndDoesntExist            | SectionEndDoesntExist: Section end does not exist   |
| Info     | SQL Statements Not Executed           | OPT.COBOL.SqlStatementsNotExecuted         | SqlStatementsNotExecuted: Existence of SQL statements that are not executed   |
| Info     | Too Much Call                         | OPT.COBOL.TooMuchCall                      | TooMuchCall: Exceeded the maximum allowed number of calls to routines   |
| Info     | Use Index Field To Check A Row        | OPT.COBOL.UseIndexFieldToCheckARow         | UseIndexFieldToCheckARow: If you need to know whether there is a row, search it selecting a field that is index   |
| Info     | Use Varying Only With Tables          | OPT.COBOL.UseVaryingOnlyWithTables         | UseVaryingOnlyWithTables: Using PERFORM VARYING is only allowed with inmemory tables  |
| Info     | Avoid Non Qualified Joins             | OPT.COBOL.SQL_COBOL.AvoidNonQualifiedJoins | AvoidNonQualifiedJoins: Make the type of join explicit  |
| Info     | Cobol Password In Comment             | OPT.COBOL.SEC.Cobol_PasswordInComment      | Cobol_PasswordInComment: Avoid placing passwords and other sensitive info in code comments  |
| Info     | Cobol Privacy Violation               | OPT.COBOL.SEC.Cobol_PrivacyViolation       | Cobol_PrivacyViolation: Exposure of Private Information ('Privacy Violation')   |
| Low      | Access In Loop More Than One Index    | OPT.COBOL.AccessInLoopMoreThanOneIndex     | AccessInLoopMoreThanOneIndex: Access detected in a loop which use more than one index to resolve the access to a table (no. pages >   |
| Low      | Access In Loop Without Index          | OPT.COBOL.AccessInLoopWithoutIndex         | AccessInLoopWithoutIndex: Access detected in a loop in which there are not informed index fields in a table WHERE (no. pages >  |
| Low      | Avoid Select With Low Conditions      | OPT.COBOL.AvoidSelectWithLowConditions     | AvoidSelectWithLowConditions: Avoid using 'SELECT function' with low discrimininity conditions in WHERE clause  |
| Low      | Avoid Access Not Indexed Table Medium | OPT.COBOL.AvoidAccessNotIndexedTableMedium | AvoidAccessNotIndexedTableMedium: Detected an access to a table size medium (7 < no. pages < 10.000) in which the first index fields or DB2 can not use them are not reported |
| Low      | Avoid Access Without Index Medium     | OPT.COBOL.AvoidAccessWithoutIndexMedium    | AvoidAccessWithoutIndexMedium: Access is detected in which there is no index fields in the WHERE informed on a medium size table (7 < no. pages < 10.000)                     |

| Severity | Contrast rule                              | Engine rule ID                                  | Description   |
|----------|--|---|---|
| Low      | Avoid Big Tables                           | OPT.COBOL.AvoidBigTables                        | AvoidBigTables: Definition of a table in LINKAGE or WORKING with a very large size or too many elements   |
| Low      | Avoid Bulk Updates In A Sentence           | OPT.COBOL.AvoidBulkUpdatesInASentence           | AvoidBulkUpdatesInASentence: It is not allowed bulk updates using a SQL statement   |
| Low      | Avoid Cancel                               | OPT.COBOL.AvoidCancel                           | AvoidCancel: Using clause CANCEL is not allowed   |
| Low      | Avoid On Size Error                        | OPT.COBOL.AvoidOnSizeError                      | AvoidOnSizeError: Do not use ON SIZE ERROR  |
| Low      | Avoid Select Ast Check Rows                | OPT.COBOL.AvoidSelectAstCheckRows               | AvoidSelectAstCheckRows: Do not use SELECT COUNT(*) to verify the existence of rows   |
| Low      | Avoid Sentence According Size Table Medium | OPT.COBOL.AvoidSentenceAccordingSizeTableMedium | AvoidSentenceAccordingSizeTableMedium: Detected a sentence with a medium sized table (7 < no. pages < 10.000) that uses more than one index to resolve access     |
| Low      | Avoid Sentence According Size Table Big    | OPT.COBOL.AvoidSentenceAccordingSizeTableBig    | AvoidSentenceAccordingSizeTableBig: Detected a sentence with a big table (No. pages > {})   |
| Low      | Check Cursor Instead Of Statements         | OPT.COBOL.CheckCursorInsteadOfStatements        | CheckCursorInsteadOfStatements: Use CURSOR FOR UPDATE instead SELECT and UPDATE/DELETE  |
| Low      | Check Cursor Positioning Fetch             | OPT.COBOL.CheckCursorPositionningFetch          | CheckCursorPositionningFetch: If a cursor is defined WITH ROWSET POSITIONING, the FETCH for that cursor must be defined with the NEXT ROWSET clause and viceversa |
| Low      | Check Deq After Enq                        | OPT.COBOL.CheckDeqAfterEnq                      | CheckDeqAfterEnq: When the ENQ command is used it must issue the DEQ command as soon as possible  |
| Low      | Check Func Columns                         | OPT.COBOL.CheckFuncColumns                      | CheckFuncColumns: It is not allowed to use functions on columns in the WHERE clause of SQL statements   |
| Low      | Check Func Host Vars In Where              | OPT.COBOL.CheckFuncHostVarsInWhere              | CheckFuncHostVarsInWhere: It is not allowed to use functions on HOST variables in the WHERE clause of SQL statements  |
| Low      | Check Low Volume Tables Very Accessed      | OPT.COBOL.CheckLowVolumeTablesVeryAccessed      | CheckLowVolumeTablesVeryAccessed : DB2 tables of low volume and very accessed must be copied in WORKING at the beginning of the program execution                 |
| Low      | Check Order Sentences                      | OPT.COBOL.CheckOrderSentences                   | CheckOrderSentences: The statement triggers a process management DB2 expensive due to the high number of selected rows  |
| Low      | Check Return In Cics                       | OPT.COBOL.CheckReturnInCics                     | CheckReturnInCics: Always check the return code of CICS statements to avoid ABENDs in transactions  |
| Low      | Check Search At End                        | OPT.COBOL.CheckSearchAtEnd                      | CheckSearchAtEnd: In the SEARCH statement, use the AT END clause  |
| Low      | Check Vars To Read                         | OPT.COBOL.CheckVarsToRead                       | CheckVarsToRead: Do not use in READ the file record, or a WORKING variable smaller than the file record.  |
| Low      | Check Vars To Write                        | OPT.COBOL.CheckVarsToWrite                      | CheckVarsToWrite: Do not use in WRITE the file record, or a WORKING variable greater than the record size.  |

| Severity | Contrast rule                             | Engine rule ID  | Description  |
|----------|---|---|--|
| Low      | Check Where Like                          | OPT.COBOL.CheckWhereLike                                  | CheckWhereLike: Avoid using LIKE '%' and LIKE ' _'   |
| Low      | Check Write Stmt                          | OPT.COBOL.CheckWriteStmt                                  | CheckWriteStmt: Do not use AFTER or BEFORE in WRITE operation  |
| Low      | IP L                                      | OPT.COBOL.COBBP.IPL                                       | IPL: One statement per line  |
| Low      | P V A C                                   | OPT.COBOL.COBBP.PVAC                                      | PVAC: Avoid empty paragraphs   |
| Low      | C I N                                     | OPT.COBOL.COD_COBOL.CIN                                   | CIN: Called subprogram name should follow naming convention  |
| Low      | Data Division                             | OPT.COBOL.COD_COBOL.DataDivision                          | DataDivision: There are data definitions outside DATA DIVISION   |
| Low      | Working Storage Var Names                 | OPT.COBOL.COD_COBOL.WorkingStorageVarNames                | WorkingStorageVarNames: WORKING STORAGE variables and constants name format  |
| Low      | Type Time                                 | OPT.COBOL.COD_COBOL.TypeTime                              | TypeTime: TIMESTAMP and TIME variables format  |
| Low      | Do Not Open In Bucle                      | OPT.COBOL.DoNotOpenInBucle                                | DoNotOpenInBucle: Avoid multiple Open/Close for the same file in the program   |
| Low      | Do Not Repeat Access                      | OPT.COBOL.DoNotRepeatAccess                               | DoNotRepeatAccess: Recover data from a table using a single access to it   |
| Low      | Do Not Use Return Code                    | OPT.COBOL.DoNotUseReturnCode                              | DoNotUseReturnCode: Not allowed to use the RETURN-CODE variable  |
| Low      | Do Not Use Rewrite In Sequential          | OPT.COBOL.DoNotUseRewriteInSequential                     | DoNotUseRewriteInSequential: You are not allowed to use REWRITE on sequential files  |
| Low      | C B U C                                   | OPT.COBOL.FIA_COBOL.CBUC                                  | CBUC: Do not use equal as end-loop condition   |
| Low      | C F D                                     | OPT.COBOL.MAN_COBOL.CFD                                   | CFD: Use COPYs for file/sort record definitions  |
| Low      | F L C B                                   | OPT.COBOL.MAN_COBOL.FLCB                                  | FLCB: Separate paragraphs with empty comments  |
| Low      | I A I D                                   | OPT.COBOL.MAN_COBOL.IAID                                  | IAID: Include AUTHOR field in Division Identification  |
| Low      | I I E                                     | OPT.COBOL.MAN_COBOL.IIE                                   | IIE: Avoid incorrect ELSE indentation  |
| Low      | I I I                                     | OPT.COBOL.MAN_COBOL.III                                   | III: Use correct indentation within IF statements  |
| Low      | I I R                                     | OPT.COBOL.MAN_COBOL.IIR                                   | IIR: Indent READ statements properly   |
| Low      | I I R W                                   | OPT.COBOL.MAN_COBOL.IIRW                                  | IIRW: Indent REWRITE statements properly   |
| Low      | I I W                                     | OPT.COBOL.MAN_COBOL.IIW                                   | IIW: Indent WRITE sentences properly   |
| Low      | N C F D                                   | OPT.COBOL.MAN_COBOL.NCFD                                  | NCFD: Do not use COPYs for file/sort descriptors   |
| Low      | Register Validation With Select           | OPT.COBOL.RegisterValidationWithSelect                    | RegisterValidationWithSelect: Validating if a record exists by SELECT  |
| Low      | W D                                       | OPT.COBOL.RG_COBOL.WD                                     | WD: Working-storage section definitions order  |
| Low      | Avoid Insert Without Fields Specification | OPT.COBOL.SQL_COBOL.AvoidInsertWithoutFieldsSpecification | AvoidInsertWithoutFieldsSpecification: Every INSERT statement must include the field specification (i.e : INSERT INTO table(column1,column2) VALUES (value1,value2)) |
| Low      | Avoid Qualified Tables In Queries         | OPT.COBOL.SQL_COBOL.AvoidQualifiedTablesInQueries         | AvoidQualifiedTablesInQueries: Table names should not be qualified in queries  |
| Low      | Qualified Tables In Queries               | OPT.COBOL.SQL_COBOL.QualifiedTablesInQueries              | QualifiedTablesInQueries: Every table referenced in the query must be qualified  |

| Severity | Contrast rule                       | Engine rule ID                                    | Description   |
|----------|-------------------------------------|---|---|
| Low      | Use Search All                      | OPT.COBOL.UseSearchAll                            | UseSearchAll: For seeking in tables WORKING with more than 50 elements use the SEARCH ALL statement               |
| Medium   | Close Statements With Nested Body   | OPT.COBOL.COBBP.CloseStatementsWithNestedBody     | CloseStatementsWithNestedBody: Close statements that may include code blocks with explicit END delimiter          |
| Medium   | To End Paragraph                    | OPT.COBOL.COBBP.ToEndParagraph                    | ToEndParagraph: Check that top-level paragraphs have an exit paragraph  |
| Medium   | Avoid Arithmetic Operations In If   | OPT.COBOL.FIA_COBOL.AvoidArithmeticOperationsInIf | AvoidArithmeticOperationsInIf: Check that there are no arithmetic operations in the condition for IF statements   |
| Medium   | Obligatory End Evaluate             | OPT.COBOL.FIA_COBOL.ObligatoryEndEvaluate         | ObligatoryEndEvaluate: Check that every EVALUATE is closed by an END-EVALUATE                                     |
| Medium   | Avoid Explicit Data In Linkage      | OPT.COBOL.MAN_COBOL.AvoidExplicitDataInLinkage    | AvoidExplicitDataInLinkage: LINKAGE SECTION should not contain explicit data description entries                  |
| Medium   | Avoid Procedural Copybook           | OPT.COBOL.MAN_COBOL.AvoidProceduralCopybook       | AvoidProceduralCopybook: Avoid including copybooks to share procedural code                                       |
| Medium   | Avoid Too Deep Perform Chains       | OPT.COBOL.MAN_COBOL.AvoidTooDeepPerformChains     | AvoidTooDeepPerformChains: Avoid too deep PERFORM chains  |
| Medium   | C C A L                             | OPT.COBOL.MAN_COBOL.CCAL                          | CCAL: Document all program calls immediately before the call  |
| Medium   | Copy Book With Data Or Procedures   | OPT.COBOL.MAN_COBOL.CopyBookWithDataOrProcedures  | CopyBookWithDataOrProcedures: Copybooks should contain data definitions or procedural code only                   |
| Medium   | H I C E                             | OPT.COBOL.MAN_COBOL.HICE                          | HICE: Avoid programs with too many GOTO   |
| Medium   | I N 0 1                             | OPT.COBOL.MAN_COBOL.IN01                          | IN01: Comment any top-level variable (level 01)   |
| Medium   | N A M I N G<br>P R O G R A<br>M I D | OPT.COBOL.MAN_COBOL.NAMINGPROGRAMID               | NAMINGPROGRAMID: Program name must follow a naming standard   |
| Medium   | P I C                               | OPT.COBOL.MAN_COBOL.PIC                           | PIC: Program name variables in CALL statements must follow naming convention                                      |
| Medium   | Reference Modifier                  | OPT.COBOL.OYR_COBOL.ReferenceModifier             | ReferenceModifier: Position and length variables in VAR(position:length) should have short binary types           |
| Medium   | V O D T                             | OPT.COBOL.OYR_COBOL.VODT                          | VODT: Do not perform arithmetic operations on variables of different types  |
| Medium   | C W S V                             | OPT.COBOL.RG_COBOL.CWSV                           | CWSV: Avoid entries in WORKING-STORAGE SECTION without initial value  |
| Medium   | D P I C                             | OPT.COBOL.RG_COBOL.DPIC                           | DPIC: Include DECIMAL-POINT IS COMMA when there is at least one edited field or constant decimal in the programme |
| Medium   | I F W                               | OPT.COBOL.RG_COBOL.IFW                            | IFW: Convention for working end and beginning   |
| Medium   | N E P                               | OPT.COBOL.RG_COBOL.NEP                            | NEP: Do not use EXIT  |
| Medium   | Cobol System Information Leak       | OPT.COBOL.SEC.Cobol_SystemInformationLeak         | Cobol_SystemInformationLeak: Avoid dumping system info (typically for debugging) in production code               |

| Severity | Contrast rule                   | Engine rule ID                               | Description  |
|----------|---------------------------------|--|--|
| Medium   | Poor Error Handling             | OPT.COBOL.SEC.PoorErrorHandling              | PoorErrorHandling: Ignoring error conditions may allow an attacker to induce unexpected behavior unnoticed |
| Medium   | Avoid Natural Joins             | OPT.COBOL.SQL_COBOL.AvoidNaturalJoins        | AvoidNaturalJoins: NATURAL JOINS are buggy and unmaintenable   |
| Medium   | Avoid Select Asterisk           | OPT.COBOL.SQL_COBOL.AvoidSelectAsterisk      | AvoidSelectAsterisk: Do not use SELECT *   |
| Medium   | Prefer On Over Using            | OPT.COBOL.SQL_COBOL.PreferOnOverUsing        | PreferOnOverUsing: Replace Using clause for its equivalent On counterpart                                  |
| Medium   | Detect Implicit Joins           | OPT.COBOL.SQL_COBOL.DetectImplicitJoins      | DetectImplicitJoins: Never use implicit JOINS  |
| Medium   | Avoid Too Many Joins            | OPT.COBOL.SQL_COBOL.AvoidTooManyJoins        | AvoidTooManyJoins: Avoid queries with too many JOINS   |
| Medium   | Avoid Queries On Many Tables    | OPT.COBOL.SQL_COBOL.AvoidQueriesOnManyTables | AvoidQueriesOnManyTables: Avoid JOIN queries referencing too many tables                                   |
| Medium   | Avoid Nested Selects            | OPT.COBOL.SQL_COBOL.AvoidNestedSelects       | AvoidNestedSelects: Avoid nested selects   |
| Medium   | Cobol Password With Weak Crypto | OPT.COBOL.SEC.Cobol_PasswordWithWeakCrypto   | Cobol_PasswordWithWeakCrypto: Weak Cryptography for Passwords  |

## CPP Scan rules

Contrast Scan supports these rules for CPP.

| Severity | Contrast rule  | Engine rule ID             | Description  |
|----------|--|----------------------------|--|
| Critical | Avoid Comp Diff Types  | OPT.CPP.AvoidCompDiffTypes | AvoidCompDiffTypes: Do not compare variables of different basic types  |
| Critical | Adding or subtracting an integer to a pointer if resulting value does not refer to a valid array element | OPT.CPP.CERTC.ARR38        | ARR38: Do not add or subtract an integer to a pointer if the resulting value does not refer to a valid array element |
| Critical | NULL Pointer Dereference   | OPT.CPP.CERTC.EXP34        | EXP34: NULL Pointer Dereference  |
| Critical | Do not access freed memory   | OPT.CPP.CERTC.MEM30        | MEM30: Do not access freed memory (Use of freed memory)  |
| Critical | Freeing Memory not on the Heap   | OPT.CPP.CERTC.MEM34        | MEM34: Free of Memory not on the Heap  |
| Critical | Do not replace secure functions with less secure functions   | OPT.CPP.CERTC.PRE09        | PRE09: Do not replace secure functions with less secure functions  |
| Critical | Signal Handler Use of a Non-reentrant Function   | OPT.CPP.CERTC.SIG30        | SIG30: Signal Handler Use of a Non-reentrant Function  |
| Critical | Signal Handler Use of a Non-reentrant Function   | OPT.CPP.CERTC.SIG32        | SIG32: Signal Handler Use of a Non-reentrant Function  |

| Severity | Contrast rule   | Engine rule ID  | Description  |
|----------|---|---|--|
| Critical | Guarantee that storage for strings has sufficient space           | OPT.CPP.CERTC.STR31                                   | STR31: Guarantee that storage for strings space for character data and the null terminator   |
| Critical | Size wide character strings correctly                             | OPT.CPP.CERTC.STR33                                   | STR33: Size wide character strings correctly   |
| Critical | Do not copy data from an unbounded source to a fixed-length array | OPT.CPP.CERTC.STR35                                   | STR35: Do not copy data from an unbounded source to a fixed-length array   |
| Critical | Destructors Must Be Noexcept                                      | OPT.CPP.COREGL.DestructorsMustBeNoexcept              | DestructorsMustBeNoexcept: Destructor must be noexcept.  |
| Critical | Multiple Mutexes Acquired On Separate Locks                       | OPT.CPP.COREGL.MultipleMutexesAcquiredOnSeparateLocks | MultipleMutexesAcquiredOnSeparateLocks: Multiple mutexes should be acquired in a single lock   |
| Critical | Temporary RAIIObj   | OPT.CPP.COREGL.TemporaryRAIIObj                       | TemporaryRAIIObj: Temporary RAII objects should be managed by RAII   |
| Critical | Wait Without Condition  | OPT.CPP.COREGL.WaitWithoutCondition                   | WaitWithoutCondition: Call to "std::condition_variable::wait()" without a condition  |
| Critical | Check Return In Public Functions                                  | OPT.CPP.CheckReturnInPublicFunctions                  | CheckReturnInPublicFunctions: Functions should return a pointer or reference to local variables  |
| Critical | Number Args In Calls Must Match Formal Params                     | OPT.CPP.MISRAC.NumberArgsInCallsMustMatchFormalParams | NumberArgsInCallsMustMatchFormalParams: MISRAC 16.6: The number of arguments passed to a function shall match the number of parameters           |
| Critical | Avoid Throw Exception In Destructor                               | OPT.CPP.AvoidThrowExceptionInDestructor               | AvoidThrowExceptionInDestructor: Never throw an exception from a destructor  |
| Critical | Braces In Array Delete  | OPT.CPP.BracesInArrayDelete                           | BracesInArrayDelete: Arrays allocated with "new[]" must be deallocated with "delete[]"   |
| Critical | Class With New Must Define Copy Cons And Assignment Op            | OPT.CPP.ClassWithNewMustDefineCopyConsAndAssignmentOp | ClassWithNewMustDefineCopyConsAndAssignmentOp: Classes that allocate memory in data members must define copy constructor and assignment operator |
| Critical | No Base Class Without Virtual Destructor                          | OPT.CPP.NoBaseClassWithoutVirtualDestructor           | NoBaseClassWithoutVirtualDestructor: Derivatives must have a virtual destructor in every base class.   |
| Critical | No Global Objects In Const And Destr                              | OPT.CPP.NoGlobalObjectsInConstAndDestr                | NoGlobalObjectsInConstAndDestr: Avoid using global objects in constructors and destructors   |
| Critical | No Member In Class Definition                                     | OPT.CPP.NoMemberInClassDefinition                     | NoMemberInClassDefinition: No member functions should be defined within the class definition   |
| Critical | No Virtual Method Calls In Const Or Destr                         | OPT.CPP.NoVirtualMethodCallsInConstOrDestr            | NoVirtualMethodCallsInConstOrDestr: Avoid calling virtual functions from constructors or destructors   |
| Critical | Virtual Destructor If Virtual Method                              | OPT.CPP.VirtualDestructorIfVirtualMethod              | VirtualDestructorIfVirtualMethod: Avoid classes with at least one virtual method and without a virtual destructor                                |



| Severity | Contrast rule                                | Engine rule ID                                 | Description   |
|----------|--|--|---|
| Critical | Write Operator Delete With Operator New      | OPT.CPP.WriteOperatorDeleteWithOperatorNew     | WriteOperatorDeleteWithOperatorNew: Im 'delete' if there is 'new' implemented                         |
| Critical | Anonymous Ldap Bind                          | OPT.CPP.SEC.AnonymousLdapBind                  | AnonymousLdapBind: Access Control - An LDAP Bind  |
| Critical | Path Traversal                               | OPT.CPP.SEC.PathTraversal                      | PathTraversal: Avoid non-neutralized user- input composed in a pathname to a resource                 |
| Critical | Static Database Connection                   | OPT.CPP.SEC.StaticDatabaseConnection           | StaticDatabaseConnection: Static database connection / session  |
| Critical | Unsafe Chroot                                | OPT.CPP.SEC.UnsafeChroot                       | UnsafeChroot: Unsafe chroot call.   |
| Critical | Exclude unsanitized input                    | OPT.CPP.CERTC.FIO30                            | FIO30: Exclude unsanitized user input from strings  |
| Critical | Sanitize data passed to sensitive subsystems | OPT.CPP.CERTC.STR02                            | STR02: Sanitize data passed to sensitive subsystems   |
| Critical | Connection String Parameter Pollution        | OPT.CPP.SEC.ConnectionStringParameterPollution | ConnectionStringParameterPollution: Connection string polluted with untrusted input                   |
| Critical | DoS Regexp                                   | OPT.CPP.SEC.DoSRegexp                          | DoSRegexp: Prevent denial of service attack using a malicious regular expression ('Regexp Injection') |
| Critical | Ldap Injection                               | OPT.CPP.SEC.LdapInjection                      | LdapInjection: Avoid non-neutralized user- input in LDAP search filters                               |
| Critical | No SQL Injection                             | OPT.CPP.SEC.NoSQLInjection                     | NoSQLInjection: Improper neutralization of special elements in data query logic (NoSQL injection)     |
| Critical | Process Control                              | OPT.CPP.SEC.ProcessControl                     | ProcessControl: Do not load executables or libraries from untrusted sources                           |
| Critical | SQL Injection                                | OPT.CPP.SEC.SqlInjection                       | SqlInjection: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection')    |
| Critical | Xml Entity Injection                         | OPT.CPP.SEC.XmlEntityInjection                 | XmlEntityInjection: XML entity injection  |
| Critical | Hardcoded Crypto Key                         | OPT.CPP.SEC.HardcodedCryptoKey                 | HardcodedCryptoKey: Hardcoded cryptographic key   |
| High     | Avoid Auto Ptr                               | OPT.CPP.AvoidAutoPtr                           | AvoidAutoPtr: Avoid auto_ptr.   |
| High     | Avoid Calling Too Many Other Components      | OPT.CPP.AvoidCallingTooManyOtherComponents     | AvoidCallingTooManyOtherComponents: Avoid components calling too many other components                |
| High     | Avoid Excessive Nested Statements            | OPT.CPP.AvoidExcessiveNestedStatements         | AvoidExcessiveNestedStatements: Avoid excessive control flow statements nesting depth                 |
| High     | Avoid Object Instantiation Into Loops        | OPT.CPP.AvoidObjectInstantiationIntoLoops      | AvoidObjectInstantiationIntoLoops: Avoid object instantiation into loops                              |
| High     | Avoid Signal Management Functions            | OPT.CPP.AvoidSignalManagementFunctions         | AvoidSignalManagementFunctions: Avoid using signal management functions                               |
| High     | Avoid Structures                             | OPT.CPP.AvoidStructures                        | AvoidStructures: Avoid using certain kinds of objects (struct, union, VARIANT)                        |
| High     | Avoid Too Complex Functions                  | OPT.CPP.AvoidTooComplexFunctions               | AvoidTooComplexFunctions: Avoid using functions with high cyclomatic complexity values                |
| High     | Avoid Too Complex Programs                   | OPT.CPP.AvoidTooComplexPrograms                | AvoidTooComplexPrograms: Avoid using programs with high cyclomatic complexity values                  |

| Severity | Contrast rule  | Engine rule ID      | Description  |
|----------|--|---------------------|--|
| High     | Do not apply the sizeof operator to a pointer when taking the size of an array | OPT.CPP.CERTC.ARR01 | ARR01: Do not apply the sizeof operator to a pointer when taking the size of an array                  |
| High     | Guarantee that copies are made into storage of sufficient size                 | OPT.CPP.CERTC.ARR33 | ARR33: Guarantee that copies are made into storage of sufficient size                                  |
| High     | Assumptions about the size of an environment variable                          | OPT.CPP.CERTC.ENV01 | ENV01: Do not make assumptions about the size of an environment variable                               |
| High     | Terminating Atexit handler by returning  | OPT.CPP.CERTC.ENV32 | ENV32: No atexit handler should terminate the program other than by returning                          |
| High     | Use of sizeof() on a Pointer Type  | OPT.CPP.CERTC.EXP01 | EXP01: Use of sizeof() on a Pointer Type   |
| High     | Use of Uninitialized Variable  | OPT.CPP.CERTC.EXP33 | EXP33: Use of Uninitialized Variable   |
| High     | Functions using file names for identification                                  | OPT.CPP.CERTC.FIO01 | FIO01: Be careful using functions that use file names for identification                               |
| High     | Do not assume a new-line character is read when using fgets()                  | OPT.CPP.CERTC.FIO36 | FIO36: Do not assume a new-line character is read when using fgets()                                   |
| High     | Do not assume character data has been read                                     | OPT.CPP.CERTC.FIO37 | FIO37: Do not assume character data has been read  |
| High     | Check number of bits in shift operations                                       | OPT.CPP.CERTC.INT34 | INT34: In shift operations, do not shift a negative number of bits or more bits than exist in the type |
| High     | Allocate and free memory in the same module                                    | OPT.CPP.CERTC.MEM00 | MEM00: Allocate and free memory in the same module at the same level of abstraction                    |
| High     | Only Free allocated memory once  | OPT.CPP.CERTC.MEM31 | MEM31: Free dynamically allocated memory only once (Double Free)                                       |
| High     | Detect and handle memory allocation errors                                     | OPT.CPP.CERTC.MEM32 | MEM32: Detect and handle memory allocation errors  |
| High     | Race condition with link following   | OPT.CPP.CERTC.POS35 | POS35: Race Condition Enabling Link Following  |
| High     | Observe correct revocation order while relinquishing privileges                | OPT.CPP.CERTC.POS36 | POS36: Observe correct revocation order while relinquishing privileges                                 |

| Severity | Contrast rule   | Engine rule ID                                  | Description   |
|----------|---|---|---|
| High     | Improper Check for Dropped Privileges   | OPT.CPP.CERTC.POS37                             | POS37: Improper Check for Dropped Privileges  |
| High     | Macro replacement lists should be parenthesized                                 | OPT.CPP.CERTC.PRE02                             | PRE02: Macro replacement lists should be parenthesized  |
| High     | Avoid using signals to implement normal functionality                           | OPT.CPP.CERTC.SIG02                             | SIG02: Avoid using signals to implement normal functionality  |
| High     | Ensure strtok() leaves the parse string unchanged                               | OPT.CPP.CERTC.STR06                             | STR06: Do not assume that strtok() leaves string unchanged  |
| High     | Use TR 24731 for remediation of existing string manipulation                    | OPT.CPP.CERTC.STR07                             | STR07: Use TR 24731 for remediation of existing string manipulation code  |
| High     | Null-terminate byte strings as required   | OPT.CPP.CERTC.STR32                             | STR32: Null-terminate byte strings as required  |
| High     | Do not specify the bound of a character array initialized with a string literal | OPT.CPP.CERTC.STR36                             | STR36: Do not specify the bound of a character array initialized with a string literal  |
| High     | Avoid Lock Unlock On Mutex  | OPT.CPP.COREGL.AvoidLockUnlockOnMutex           | AvoidLockUnlockOnMutex: Avoid manually locking/unlocking on mutexes, instead of using RAII                                    |
| High     | Call Depends On Arguments Eval Order  | OPT.CPP.COREGL.CallDependsOnArgumentsEvalOrder  | CallDependsOnArgumentsEvalOrder: Call functions in the evaluation order of the arguments.                                     |
| High     | Detached Thread   | OPT.CPP.COREGL.DetachedThread                   | DetachedThread: Detached thread found.  |
| High     | Dont Heap Allocate Movable Result   | OPT.CPP.COREGL.DontHeapAllocateMovableResult    | DontHeapAllocateMovableResult: Return a stack-allocated object instead of a heap-allocated one, if it has a move constructor. |
| High     | Generic Exception Throw   | OPT.CPP.COREGL.GenericExceptionThrow            | GenericExceptionThrow: Do not throw generic exceptions.   |
| High     | Move Swap Should Be No Except   | OPT.CPP.COREGL.MoveSwapShouldBeNoExcept         | MoveSwapShouldBeNoExcept: Move constructors should use assignment operator and swap functions should use noexcept.            |
| High     | Suspicious Rvalue Forward Reference   | OPT.CPP.COREGL.SuspiciousRvalueForwardReference | SuspiciousRvalueForwardReference: Suspicious rvalue forwarding / rvalue reference.  |
| High     | Correct Use Memory Leaks  | OPT.CPP.CorrectUseMemoryLeaks                   | CorrectUseMemoryLeaks: Allocated memory should be released in same scope  |
| High     | Dont Use Memory Function  | OPT.CPP.DontUseMemoryFunction                   | DontUseMemoryFunction: Do not use malloc, realloc or free   |
| High     | Global Var Not Used Locally   | OPT.CPP.GlobalVarNotUsedLocally                 | GlobalVarNotUsedLocally: Global variables should be used  |
| High     | Implicit Type Conversion  | OPT.CPP.ImplicitTypeConversion                  | ImplicitTypeConversion: Avoid function calls with implicit type conversions   |

| Severity | Contrast rule                                       | Engine rule ID  | Description   |
|----------|---|---|---|
| High     | Local Vars With Global Names                        | OPT.CPP.LocalVarsWithGlobalNames                            | LocalVarsWithGlobalNames: Avoid using the same name with global and local variables   |
| High     | Avoid File Scope When Accessed From Single Function | OPT.CPP.MISRAC.AvoidFileScopeWhenAccessedFromSingleFunction | AvoidFileScopeWhenAccessedFromSingleFunction: MISRA 8.7: Objects shall be defined at block scope if they are only accessed from within a single function                |
| High     | Avoid Recursive Functions                           | OPT.CPP.MISRAC.AvoidRecursiveFunctions                      | AvoidRecursiveFunctions: MISRA 16.2: Functions shall not call themselves, either directly or indirectly   |
| High     | Do Not Check Float Equal Not Equal                  | OPT.CPP.MISRAC.DoNotCheckFloatEqualNotEqual                 | DoNotCheckFloatEqualNotEqual: MISRA 17.4: Floating-point expressions shall not be tested for equality or inequality   |
| High     | Do Not Use Dynamic Heap Allocation                  | OPT.CPP.MISRAC.DoNotUseDynamicHeapAllocation                | DoNotUseDynamicHeapAllocation: MISRA 12.1: Dynamic heap allocation shall not be used  |
| High     | Do Not Use Reserved Name As Identifier              | OPT.CPP.MISRAC.DoNotUseReservedNameAsIdentifier             | DoNotUseReservedNameAsIdentifier: MISRA 12.1: Names of standard library macros, objects and functions shall not be reused   |
| High     | Do Not Use Reserved Name As Macro Name              | OPT.CPP.MISRAC.DoNotUseReservedNameAsMacroName              | DoNotUseReservedNameAsMacroName: MISRA 12.1: Reserved identifiers, macros and functions in the standard library shall not be defined, redefined or used                 |
| High     | Do Not Use Setjmp Longjmp                           | OPT.CPP.MISRAC.DoNotUseSetjmpLongjmp                        | DoNotUseSetjmpLongjmp: MISRA 20.7: The setjmp macro and the longjmp function shall not be used  |
| High     | Do Not Use Signal Handling Functions                | OPT.CPP.MISRAC.DoNotUseSignalHandlingFunctions              | DoNotUseSignalHandlingFunctions: MISRA 20.8: The signal handling facilities of signal.h shall not be used   |
| High     | Do Not Use Stdio Functions                          | OPT.CPP.MISRAC.DoNotUseStdioFunctions                       | DoNotUseStdioFunctions: MISRA 20.9: The standard output library stdio.h shall not be used in production code  |
| High     | Do Not Use Time Functions                           | OPT.CPP.MISRAC.DoNotUseTimeFunctions                        | DoNotUseTimeFunctions: MISRA 20.12: The standard time handling functions of library time.h shall not be used  |
| High     | Enclose In Parentheses Macro Args                   | OPT.CPP.MISRAC.EncloseInParenthesesMacroArgs                | EncloseInParenthesesMacroArgs: MISRA 12.1: The definition of a function-like macro each parameter shall be enclosed in parentheses                                      |
| High     | Explicit Type For Vars Functions                    | OPT.CPP.MISRAC.ExplicitTypeForVarsFunctions                 | ExplicitTypeForVarsFunctions: MISRA 8.2: The type of an object or function is declared or defined shall be explicitly stated  |
| High     | Function Macro Invoked With All Arguments           | OPT.CPP.MISRAC.FunctionMacroInvokedWithAllArguments         | FunctionMacroInvokedWithAllArguments: MISRA 12.1: A function-like macro shall not be invoked with fewer arguments   |
| High     | Identifiers Must Not Exceed 31 Chars                | OPT.CPP.MISRAC.IdentifiersMustNotExceed31Chars              | IdentifiersMustNotExceed31Chars: MISRA 12.1: Identifiers (internal and external) shall not have a significance of more than 31 characters                               |
| High     | Initialise Auto Variables Before Use                | OPT.CPP.MISRAC.InitialiseAutoVariablesBeforeUse             | InitialiseAutoVariablesBeforeUse: MISRA 9.5: Automatic variables shall have been assigned a value before being used   |
| High     | Initialization For Array Structs Must Match Layout  | OPT.CPP.MISRAC.InitializationForArrayStructsMustMatchLayout | InitializationForArrayStructsMustMatchLayout: MISRA 9.2: Braces shall be used to indicate and maintain the structure of the non-zero initialisation of array structures |
| High     | Proper Bit Field Struct                             | OPT.CPP.MISRAC.ProperBitFieldStruct                         | ProperBitFieldStruct: MISRA 3.5: Bit-fields should use int type and not be mixed with other types   |

| Severity | Contrast rule  | Engine rule ID   | Description  |
|----------|--|--|--|
| High     | Single Definition For External Linkage Identifiers             | OPT.CPP.MISRAC.SingleDefinitionForExternalLinkageIdentifiers | SingleDefinitionForExternalLinkageIdentifiers: 8.9: An identifier with external linkage shall have one definition              |
| High     | Multiple Inclusion Prevention Guard                            | OPT.CPP.MultipleInclusionPreventionGuard                     | MultipleInclusionPreventionGuard: Multiple guard for headers   |
| High     | No Specify Unix Names In Include                               | OPT.CPP.NoSpecifyUnixNamesInInclude                          | NoSpecifyUnixNamesInInclude: Do not use path names in #include directives  |
| High     | Non Goto Statement   | OPT.CPP.NonGotoStatement                                     | NonGotoStatement: Do not use goto statement  |
| High     | Remove Unused Methods  | OPT.CPP.RemoveUnusedMethods                                  | RemoveUnusedMethods: Remove unused methods   |
| High     | Unspecified Parameters   | OPT.CPP.UnspecifiedParameters                                | UnspecifiedParameters: Avoid definition of functions (variable number of parameters)   |
| High     | Avoid Multiple Inheritance                                     | OPT.CPP.AvoidMultipleInheritance                             | AvoidMultipleInheritance: Avoid Classes with inheritance   |
| High     | Avoid Public Data Member                                       | OPT.CPP.AvoidPublicDataMember                                | AvoidPublicDataMember: Avoid public data members   |
| High     | Dont Use Stdio Lib   | OPT.CPP.DontUseStdioLib                                      | DontUseStdioLib: Do not use the stdio.h library, use iostream.h instead  |
| High     | Law Of Big Three   | OPT.CPP.LawOfBigThree  | LawOfBigThree: If one of (destructor, copy constructor, copy assignment operator) is defined, the other two should be defined. |
| High     | Remove Unused Members  | OPT.CPP.RemoveUnusedMembers                                  | RemoveUnusedMembers: Remove private members not used   |
| High     | Hardcoded Absolute Path  | OPT.CPP.PORT.HardcodedAbsolutePath                           | HardcodedAbsolutePath: Do not hardcode absolute paths  |
| High     | Calling system() if you do not need a command processor        | OPT.CPP.CERTC.ENV04  | ENV04: Do not call system() if you do not need a command processor   |
| High     | Use int to capture the return value of character I/O functions | OPT.CPP.CERTC.FIO34  | FIO34: Use int to capture the return value of character I/O functions  |
| High     | Temporary File created with Incorrect Permissions              | OPT.CPP.CERTC.FIO43  | FIO43: Creation of Temporary File in Directory with Incorrect Permissions  |
| High     | Avoid Vararg Functions   | OPT.CPP.MISRAC.AvoidVarargFunctions                          | AvoidVarargFunctions: MISRA 16.1: Functions shall be defined with a variable number of arguments                               |
| High     | Resource Injection   | OPT.CPP.SEC.ResourceInjection                                | ResourceInjection: Improper control of resource identifiers ("Resource Injection")   |
| High     | Hardcoded Salt   | OPT.CPP.SEC.HardcodedSalt                                    | HardcodedSalt: Use of hardcoded salt   |
| High     | Insufficient Key Size  | OPT.CPP.SEC.InsufficientKeySize                              | InsufficientKeySize: Weak cryptography, insufficient key length  |
| High     | Weak Cryptographic Hash  | OPT.CPP.SEC.WeakCryptographicHash                            | WeakCryptographicHash: Weak cryptographic hash   |
| High     | Weak Encryption  | OPT.CPP.SEC.WeakEncryption                                   | WeakEncryption: Weak symmetric encryption  |
| Info     | Avoid Braces Same Line   | OPT.CPP.AvoidBracesSameLine                                  | AvoidBracesSameLine: Write curly brackets on separate line   |

| Severity | Contrast rule                              | Engine rule ID                                 | Description   |
|----------|--|--|---|
| Info     | Avoid Numeric Values                       | OPT.CPP.AvoidNumericValues                     | AvoidNumericValues: Avoid numeric constants   |
| Info     | Avoid Question Mark                        | OPT.CPP.AvoidQuestionMark                      | AvoidQuestionMark: Avoid ?: ternary operator  |
| Info     | Break In Loops                             | OPT.CPP.BreakInLoops                           | BreakInLoops: Do not use break statements   |
| Info     | Avoid Explicit New Delete                  | OPT.CPP.COREGL.AvoidExplicitNewDelete          | AvoidExplicitNewDelete: Avoid new and delete operators  |
| Info     | Class Naming Convention                    | OPT.CPP.ClassNamingConvention                  | ClassNamingConvention: Names for struct / class / namespace items must follow a naming convention                                   |
| Info     | Constant Naming Convention                 | OPT.CPP.ConstantNamingConvention               | ConstantNamingConvention: Global constants must follow a naming convention  |
| Info     | Data Member Naming Convention              | OPT.CPP.DataMemberNamingConvention             | DataMemberNamingConvention: Data member names must follow a naming convention   |
| Info     | Forbidden Functions                        | OPT.CPP.ForbiddenFunctions                     | ForbiddenFunctions: Avoid use of discouraged functions  |
| Info     | At Most One Break In Loop                  | OPT.CPP.MISRAC.AtMostOneBreakInLoop            | AtMostOneBreakInLoop: MISRA 14.6: For each loop statement there shall be at most one break statement used for loop termination      |
| Info     | Avoid Trigraphs                            | OPT.CPP.MISRAC.AvoidTrigraphs                  | AvoidTrigraphs: MISRA 4.2: Trigraphs shall not be used  |
| Info     | Do Not Comment Out Source Code             | OPT.CPP.MISRAC.DoNotCommentOutSourceCode       | DoNotCommentOutSourceCode: MISRA 2.2: No part of code should not be commented out   |
| Info     | Explicit Check Against Zero                | OPT.CPP.MISRAC.ExplicitCheckAgainstZero        | ExplicitCheckAgainstZero: MISRA 13.2: Tests against zero should be made explicit, unless the operand is effectively Boolean         |
| Info     | Include Not After Statements               | OPT.CPP.MISRAC.IncludeNotAfterStatements       | IncludeNotAfterStatements: MISRA 19.1: #include directives should only be preceded in a file by preprocessor directives or comments |
| Info     | Macros Naming Convention                   | OPT.CPP.MacrosNamingConvention                 | MacrosNamingConvention: Macros naming convention  |
| Info     | Maximum Line Size                          | OPT.CPP.MaximumLineSize                        | MaximumLineSize: MaxLineSize: Do not use long code lines  |
| Info     | Method Naming Convention                   | OPT.CPP.MethodNamingConvention                 | MethodNamingConvention: Functions / class methods naming convention   |
| Info     | Methods Comment Code Ratio                 | OPT.CPP.MethodsCommentCodeRatio                | MethodsCommentCodeRatio: Avoid functions with low comment code ratio  |
| Info     | Parenthesized Functions                    | OPT.CPP.ParenthesizedFunctions                 | ParenthesizedFunctions: Write sizeof and cast expressions in parentheses  |
| Info     | Space Indentation                          | OPT.CPP.SpaceIndentation                       | SpaceIndentation: Allow spaces before and after operators   |
| Info     | Typedef Naming Convention                  | OPT.CPP.TypedefNamingConvention                | TypedefNamingConvention: Names for typedef declared types must follow a naming convention   |
| Info     | Use Blocks                                 | OPT.CPP.UseBlocks                              | UseBlocks: Use blocks in conditional and loop statements  |
| Info     | Use Setters                                | OPT.CPP.UseSetters                             | UseSetters: Do not perform direct instance variable assignments in constructors   |
| Low      | Avoid Dependency Cycles Between Namespaces | OPT.CPP.AvoidDependencyCyclesBetweenNamespaces | AvoidDependencyCyclesBetweenNamespaces: Avoid cyclic dependencies between namespaces  |

| Severity | Contrast rule   | Engine rule ID  | Description   |
|----------|---|---|---|
| Low      | Avoid Many Parameters Function                            | OPT.CPP.AvoidManyParametersFunction                     | AvoidManyParametersFunction: Avoid functions with too many parameters   |
| Low      | Avoid One Case Switch                                     | OPT.CPP.AvoidOneCaseSwitch                              | AvoidOneCaseSwitch: Avoid switch statements with a low number of case conditions  |
| Low      | Use consistent array notation across all source files     | OPT.CPP.CERTC.ARR31                                     | ARR31: Use consistent array notation across all source files  |
| Low      | Use bitwise operators only on unsigned operands           | OPT.CPP.CERTC.INT13                                     | INT13: Use bitwise operators only on unsigned operands  |
| Low      | Do not use vfork()  | OPT.CPP.CERTC.POS33                                     | POS33: Do not use vfork()   |
| Low      | Prefer inline or static functions to function-like macros | OPT.CPP.CERTC.PRE00                                     | PRE00: Prefer inline or static functions to function-like macros  |
| Low      | Check Names Definition And Declaration                    | OPT.CPP.CheckNamesDefinitionAndDeclaration              | CheckNamesDefinitionAndDeclaration: For functions, check parameter names in function definition and declaration   |
| Low      | Class Comment Code Ratio                                  | OPT.CPP.ClassCommentCodeRatio                           | ClassCommentCodeRatio: Avoid classes, unions with low comment/code ratio  |
| Low      | Dont Compare Pointer To Null                              | OPT.CPP.DontComparePointerToNull                        | DontComparePointerToNull: Do not compare pointers to NULL, use 0 instead  |
| Low      | Dont Compare Pointer To Zero                              | OPT.CPP.DontComparePointerToZero                        | DontComparePointerToZero: Do not compare pointers to zero, use NULL instead   |
| Low      | Including Header File                                     | OPT.CPP.IncludingHeaderFile                             | IncludingHeaderFile: Avoid implementation files that include a header file with the same name   |
| Low      | Initialization Instead Assignment                         | OPT.CPP.InitializationInsteadAssignment                 | InitializationInsteadAssignment: Always use initialization instead of assignment  |
| Low      | Avoid Single Line Comments                                | OPT.CPP.MISRAC.AvoidSingleLineComments                  | AvoidSingleLineComments: MISRA 2.2: Comments on single line comments (//...) shall not be used  |
| Low      | Avoid Unreachable Code                                    | OPT.CPP.MISRAC.AvoidUnreachableCode                     | AvoidUnreachableCode: MISRA 14.1: The execution of unreachable code shall be avoided  |
| Low      | Case With Break   | OPT.CPP.MISRAC.CaseWithBreak                            | CaseWithBreak: MISRA 15.2: An unconditional break statement shall terminate every non-empty case of a switch  |
| Low      | Comment Should Not Contain Open Comment Chars             | OPT.CPP.MISRAC.CommentShouldNotContainOpenCommentChars  | CommentShouldNotContainOpenCommentChars: MISRA 2.3: A comment shall not contain the characters /* or */   |
| Low      | Declare Const Pointer Param If Unchanged Value            | OPT.CPP.MISRAC.DeclareConstPointerParamIfUnchangedValue | DeclareConstPointerParamIfUnchangedValue: MISRA 16.7: A pointer parameter in a function shall be declared as pointer to const if the pointer is not modified to modify the addressed object |
| Low      | Do Not Def Undef Macros In Blocks                         | OPT.CPP.MISRAC.DoNotDefUndefMacrosInBlocks              | DoNotDefUndefMacrosInBlocks: MISRA 19.2: Macros shall not be defined or undefined within a block  |
| Low      | Do Not Use Atof Atoi Atol                                 | OPT.CPP.MISRAC.DoNotUseAtofAtoiAtol                     | DoNotUseAtofAtoiAtol: MISRA 20.10: The functions atof, atoi and atol from library stdlib.h shall not be used  |
| Low      | Explicit Size In Extern Arrays                            | OPT.CPP.MISRAC.ExplicitSizeInExternArrays               | ExplicitSizeInExternArrays: MISRA 8.12: Variables declared with external linkage, its size shall be explicitly or defined implicitly by initialization                                      |

| Severity | Contrast rule                                       | Engine rule ID  | Description  |
|----------|---|---|--|
| Low      | Function Pointer Casts                              | OPT.CPP.MISRAC.FunctionPointerCasts                           | FunctionPointerCasts: MISRA 11.1: Conversion shall not be performed between a pointer to a function and any type other than an integral type                   |
| Low      | If Else If Must End With Else                       | OPT.CPP.MISRAC.IfElseIfMustEndWithElse                        | IfElseIfMustEndWithElse: MISRA 14.10: All 'if' constructs shall be terminated with an else   |
| Low      | If Else Statements Must Use Braces                  | OPT.CPP.MISRAC.IfElseStatementsMustUseBraces                  | IfElseStatementsMustUseBraces: MISRA 14.11: 'if' statements must use braces  |
| Low      | Logical Expression With Primary Expression Operands | OPT.CPP.MISRAC.LogicalExpressionWithPrimaryExpressionOperands | LogicalExpressionWithPrimaryExpressionOperands: MISRA 12.5: The operands of a logical && shall be primary-expressions  |
| Low      | Loops Should Use Braces                             | OPT.CPP.MISRAC.LoopsShouldUseBraces                           | LoopsShouldUseBraces: MISRA 14.8: Loop bodies shall be delimited by braces to delimit loop body  |
| Low      | Max Two Pointer Indirections                        | OPT.CPP.MISRAC.MaxTwoPointerIndirections                      | MaxTwoPointerIndirections: MISRA 17.5: Indirection objects should contain no more than 2 levels of indirection   |
| Low      | No Pointer Arithmetic Except Array Index            | OPT.CPP.MISRAC.NoPointerArithmeticExceptArrayIndex            | NoPointerArithmeticExceptArrayIndex: MISRA 11.7: Array indexing shall be the only allowed form of pointer arithmetic   |
| Low      | No Side Effects In Right Operand Of Logical Op      | OPT.CPP.MISRAC.NoSideEffectsInRightOperandOfLogicalOp         | NoSideEffectsInRightOperandOfLogicalOp: MISRA 12.4: Right-hand operands of a logical && shall not contain side effects   |
| Low      | Switch Must Have Braces                             | OPT.CPP.MISRAC.SwitchMustHaveBraces                           | SwitchMustHaveBraces: MISRA 14.8: Switch statements must use braces  |
| Low      | Use Static For Internal Linkage Identifiers         | OPT.CPP.MISRAC.UseStaticForInternalLinkageIdentifiers         | UseStaticForInternalLinkageIdentifiers: MISRA 12.6: Use static storage specifier for definitions / declarations of objects and functions with internal linkage |
| Low      | One Statement Per Line                              | OPT.CPP.OneStatementPerLine                                   | OneStatementPerLine: Only one statement per line   |
| Low      | Only One Return                                     | OPT.CPP.OnlyOneReturn   | OnlyOneReturn: Only one 'return' statement per function  |
| Low      | Parent Class Doesnot Reference Child Classes        | OPT.CPP.ParentClassDoesnotReferenceChildClasses               | ParentClassDoesnotReferenceChildClasses: A base class does not reference any of its child classes  |
| Low      | Specify Return Type                                 | OPT.CPP.SpecifyReturnType                                     | SpecifyReturnType: Explicit specification of return type of a function   |
| Low      | Variables Never Used                                | OPT.CPP.VariablesNeverUsed                                    | VariablesNeverUsed: Local variables never used   |
| Low      | Private Data Members                                | OPT.CPP.PrivateDataMembers                                    | PrivateDataMembers: Max number of private data members   |
| Low      | Private Methods                                     | OPT.CPP.PrivateMethods  | PrivateMethods: Max number of private methods  |
| Low      | Protected Data Members                              | OPT.CPP.ProtectedDataMembers                                  | ProtectedDataMembers: Max number of protected data members   |
| Low      | Protected Methods                                   | OPT.CPP.ProtectedMethods                                      | ProtectedMethods: Max number of protected methods  |
| Low      | Specify Section Order                               | OPT.CPP.SpecifySectionOrder                                   | SpecifySectionOrder: In containers (class, struct, union) declare members in a certain access order  |
| Medium   | Avoid Global Vars                                   | OPT.CPP.AvoidGlobalVars                                       | AvoidGlobalVars: Avoid using global variables  |
| Medium   | Avoid Large Methods                                 | OPT.CPP.AvoidLargeMethods                                     | AvoidLargeMethods: Avoid functions and methods with too many lines of code   |



| Severity | Contrast rule   | Engine rule ID  | Description   |
|----------|---|---|---|
| Medium   | Avoid Volatile Vars   | OPT.CPP.AvoidVolatileVars                               | AvoidVolatileVars: Do not use volatile variables  |
| Medium   | Do not form or use out-of-bounds pointers or array subscripts on arrays | OPT.CPP.CERTC.ARR30                                     | ARR30: Do not form or use out-of-bounds array subscripts on arrays.                         |
| Medium   | Allowing loops to iterate beyond the end of an array                    | OPT.CPP.CERTC.ARR35                                     | ARR35: Do not allow loops to iterate beyond an array  |
| Medium   | Allowing loops to iterate beyond the end of an array                    | OPT.CPP.CERTC.ARR35_bis                                 | ARR35: Do not allow loops to iterate beyond an array  |
| Medium   | Detect and handle input/output errors                                   | OPT.CPP.CERTC.FIO33                                     | FIO33: Detect and handle input/output errors in undefined behavior                          |
| Medium   | Evaluate integer expressions  | OPT.CPP.CERTC.INT35                                     | INT35: Evaluate integer expressions in a loop before comparing or assigning to that size    |
| Medium   | Use realloc() to resize dynamically allocated arrays                    | OPT.CPP.CERTC.MEM08                                     | MEM08: Use realloc() only to resize dynamically allocated arrays                            |
| Medium   | Incorrect Calculation of Buffer Size                                    | OPT.CPP.CERTC.MEM35                                     | MEM35: Incorrect Calculation of Buffer Size   |
| Medium   | Use the readlink() function properly                                    | OPT.CPP.CERTC.POS30                                     | POS30: Use the readlink() function properly   |
| Medium   | Use parentheses within macros around parameter names                    | OPT.CPP.CERTC.PRE01                                     | PRE01: Use parentheses within macros around parameter names                                 |
| Medium   | Wrap multistatement macros in a do-while loop                           | OPT.CPP.CERTC.PRE10                                     | PRE10: Wrap multistatement macros in a do-while loop  |
| Medium   | Catch Exceptions By Reference   | OPT.CPP.COREGL.CatchExceptionsByReference               | CatchExceptionsByReference: Exceptions should always be caught by reference.                |
| Medium   | Generic Exception Catch   | OPT.CPP.COREGL.GenericExceptionCatch                    | GenericExceptionCatch: Do not catch generic exceptions.                                     |
| Medium   | Polimorphic Class Should Suppress Copying                               | OPT.CPP.COREGL.PolimorphicClassShouldSuppressCopying    | PolimorphicClassShouldSuppressCopying: Polymorphic class should suppress copying            |
| Medium   | Use Make Factories For Creating Smart Pointers                          | OPT.CPP.COREGL.UseMakeFactoriesForCreatingSmartPointers | UseMakeFactoriesForCreatingSmartPointers: Use factory functions for creating smart pointers |
| Medium   | Dont Convert Const To Non Const   | OPT.CPP.DontConvertConstToNonConst                      | DontConvertConstToNonConst: Never convert a const to a non-const                            |

| Severity | Contrast rule                                     | Engine rule ID   | Description   |
|----------|---|--|---|
| Medium   | Include Headers Only                              | OPT.CPP.IncludeHeadersOnly                               | IncludeHeadersOnly: Avoid using #include which are not header files   |
| Medium   | All Macro Identifiers Defined Before Use          | OPT.CPP.MISRAC.AllMacroIdentifiersDefinedBeforeUse       | AllMacroIdentifiersDefinedBeforeUse: MISRA 12.1: macro identifiers in preprocessor directives shall be defined before use, except in #ifdef and #ifndef directives and defined() operator |
| Medium   | Arithmetic On Pointers To Array                   | OPT.CPP.MISRAC.ArithmeticOnPointersToArray               | ArithmeticOnPointersToArray: MISRA 17.1: arithmetic shall only be applied to pointers to an array or array element  |
| Medium   | Avoid Assignment In Boolean Expressions           | OPT.CPP.MISRAC.AvoidAssignmentInBooleanExpressions       | AvoidAssignmentInBooleanExpressions: MISRA 12.11: Assignment operators shall not be used in expressions that yield a boolean value  |
| Medium   | Avoid Comma Operator                              | OPT.CPP.MISRAC.AvoidCommaOperator                        | AvoidCommaOperator: MISRA 12.10: The comma operator shall not be used   |
| Medium   | Avoid Continue Statement                          | OPT.CPP.MISRAC.AvoidContinueStatement                    | AvoidContinueStatement: MISRA 14.5: continue statement must not be used   |
| Medium   | Avoid Goto Statement                              | OPT.CPP.MISRAC.AvoidGotoStatement                        | AvoidGotoStatement: MISRA 14.4: Goto statement must not be used   |
| Medium   | Avoid Non Null Statements Without Effect          | OPT.CPP.MISRAC.AvoidNonNullStatementsWithoutEffect       | AvoidNonNullStatementsWithoutEffect: MISRA 12.12: non-null statements shall either have at least one side-effect however executed, or cause control flow to change                        |
| Medium   | Avoid Non Standard Chars In Header Filenames      | OPT.CPP.MISRAC.AvoidNonStandardCharsInHeaderFilenames    | AvoidNonStandardCharsInHeaderFilenames: MISRA 19.2: Non-standard characters should not be used in header file names in #include directives  |
| Medium   | Avoid Non Standard Escape Sequences               | OPT.CPP.MISRAC.AvoidNonStandardEscapeSequences           | AvoidNonStandardEscapeSequences: MISRA 19.3: character constants, only those escape sequences defined in ISO C Standard shall be used   |
| Medium   | Avoid Octal Constants                             | OPT.CPP.MISRAC.AvoidOctalConstants                       | AvoidOctalConstants: MISRA 7.1: Octal constants (other than zero) and octal escape sequences shall not be used  |
| Medium   | Avoid Undef Directive                             | OPT.CPP.MISRAC.AvoidUndefDirective                       | AvoidUndefDirective: MISRA 19.6: #undef directive shall not be used   |
| Medium   | Avoid Unnecessary External Linkage                | OPT.CPP.MISRAC.AvoidUnnecessaryExternalLinkage           | AvoidUnnecessaryExternalLinkage: MISRA 12.13: declarations and definitions of objects or functions of file scope shall have internal linkage unless external linkage is required          |
| Medium   | Compare Pointers When On Same Array               | OPT.CPP.MISRAC.ComparePointersWhenOnSameArray            | ComparePointersWhenOnSameArray: MISRA 11.7: > [!('MISRA-C': ['17.3'])]  |
| Medium   | Declare Functions At File Scope                   | OPT.CPP.MISRAC.DeclareFunctionsAtFileScope               | DeclareFunctionsAtFileScope: MISRA 8.6: Functions shall be declared at file scope   |
| Medium   | Declare No Parameters Function As Void            | OPT.CPP.MISRAC.DeclareNoParametersFunctionAsVoid         | DeclareNoParametersFunctionAsVoid: MISRA 12.11: Functions with no parameters shall be declared with parameter type void   |
| Medium   | Do Not Mix Inc Dec Operators With Other Operators | OPT.CPP.MISRAC.DoNotMixIncDecOperatorsWithOtherOperators | DoNotMixIncDecOperatorsWithOtherOperators: MISRA 12.13: The increment (++) and decrement (--) operators shall not be mixed with other operators in a single expression                    |
| Medium   | Do Not Modify Loop Variable In Body               | OPT.CPP.MISRAC.DoNotModifyLoopVariableInBody             | DoNotModifyLoopVariableInBody: MISRA 12.13: Variables being used within a for loop for iteration counting shall not be modified in the loop body  |
| Medium   | Do Not Use Abort Exit Getenv System               | OPT.CPP.MISRAC.DoNotUseAbortExitGetenvSystem             | DoNotUseAbortExitGetenvSystem: MISRA 19.4: library functions abort, exit, getenv and system shall not be used   |

| Severity | Contrast rule                               | Engine rule ID  | Description  |
|----------|---|---|--|
| Medium   | Do Not Use Errno                            | OPT.CPP.MISRAC.DoNotUseErrno                          | DoNotUseErrno: MISRA 20.5: The error in variable errno shall not be used   |
| Medium   | Do Not Use Offsetof                         | OPT.CPP.MISRAC.DoNotUseOffsetof                       | DoNotUseOffsetof: MISRA 20.6: The macro offsetof, shall not be used  |
| Medium   | Do Not Use Underlying Bit Rep Of Float      | OPT.CPP.MISRAC.DoNotUseUnderlyingBitRepOfFloat        | DoNotUseUnderlyingBitRepOfFloat: MISRA 20.7: Underlying bit representations of floating-point types shall not be used  |
| Medium   | Document Pragma Directives                  | OPT.CPP.MISRAC.DocumentPragmaDirectives               | DocumentPragmaDirectives: MISRA 3.4: A #pragma directive shall be documented and its effect shall be described   |
| Medium   | Encapsulate Assembly                        | OPT.CPP.MISRAC.EncapsulateAssembly                    | EncapsulateAssembly: MISRA 2.1: Assembly code shall be encapsulated and isolated   |
| Medium   | Evaluation Order Independence               | OPT.CPP.MISRAC.EvaluationOrderIndependence            | EvaluationOrderIndependence: MISRA 12.1: The order of evaluation of an expression shall be the same under all circumstances that the standard permits  |
| Medium   | Float Implicit Conversions                  | OPT.CPP.MISRAC.FloatImplicitConversions               | FloatImplicitConversions: MISRA 10.2: The value of an expression of floating type shall not be implicitly converted to a different underlying type   |
| Medium   | For Control Expression With Float Objects   | OPT.CPP.MISRAC.ForControlExpressionWithFloatObjects   | ForControlExpressionWithFloatObjects: MISRA 12.2: The controlling expression of a for statement shall not contain any objects of floating type   |
| Medium   | For Loop Expressions For Loop Control       | OPT.CPP.MISRAC.ForLoopExpressionsForLoopControl       | ForLoopExpressionsForLoopControl: MISRA 12.3: A for statement shall have three expressions of a for statement shall be used only with loop control   |
| Medium   | Functions Should Have Single Return At End  | OPT.CPP.MISRAC.FunctionsShouldHaveSingleReturnAtEnd   | FunctionsShouldHaveSingleReturnAtEnd: MISRA 2.2: Functions shall have a single point of exit at the end of the function  |
| Medium   | Identifiers Must Not Hide Outer Definitions | OPT.CPP.MISRAC.IdentifiersMustNotHideOuterDefinitions | IdentifiersMustNotHideOuterDefinitions: MISRA 2.3: Identifiers in an inner scope shall not hide outer ones by reusing the same name  |
| Medium   | Integer Implicit Conversions                | OPT.CPP.MISRAC.IntegerImplicitConversions             | IntegerImplicitConversions: MISRA 10.1: The value of an expression of integer type shall not be implicitly converted to a different underlying type  |
| Medium   | Macro Expansion Check                       | OPT.CPP.MISRAC.MacroExpansionCheck                    | MacroExpansionCheck: MISRA 19.4: C macro expansion shall only expand to safe constructions   |
| Medium   | Name Parameters In Function Prototypes      | OPT.CPP.MISRAC.NameParametersInFunctionPrototypes     | NameParametersInFunctionPrototypes: MISRA 2.4: Names shall be given for all parameters in function prototypes  |
| Medium   | Object Pointer Casts                        | OPT.CPP.MISRAC.ObjectPointerCasts                     | ObjectPointerCasts: MISRA 11.2: Conversions shall not be performed between a pointer to an object type other than an integral type, another pointer to object type, or a pointer to void             |
| Medium   | Proper Cast Complex Float Expression        | OPT.CPP.MISRAC.ProperCastComplexFloatExpression       | ProperCastComplexFloatExpression: MISRA 11.3: The value of a complex expression of floating type shall be cast to a floating type narrower or of the same width                                      |
| Medium   | Proper Cast Complex Integer Expression      | OPT.CPP.MISRAC.ProperCastComplexIntegerExpression     | ProperCastComplexIntegerExpression: MISRA 11.4: The value of a complex expression of integer type shall only be cast to a type of same signedness and width as the underlying type of the expression |
| Medium   | Same Function Declaration And Definition    | OPT.CPP.MISRAC.SameFunctionDeclarationAndDefinition   | SameFunctionDeclarationAndDefinition: MISRA 2.5: For each function parameter the type in the declaration and definition shall be identical, and return type shall also be identical                  |
| Medium   | Sizeof Expr With Side Effects               | OPT.CPP.MISRAC.SizeofExprWithSideEffects              | SizeofExprWithSideEffects: MISRA 12.3: The sizeof operator shall not be used on expressions that have side effects   |

| Severity | Contrast rule                            | Engine rule ID                                     | Description  |
|----------|--|--|--|
| Medium   | Switch With Default                      | OPT.CPP.MISRAC.SwitchWithDefault                   | SwitchWithDefault: MISRA 15.3: Avoid switch statements without a default clause  |
| Medium   | Switch Without Case Should Be Refactored | OPT.CPP.MISRAC.SwitchWithoutCaseShouldBeRefactored | SwitchWithoutCaseShouldBeRefactored: MISRA 15.3: Switch statements without any case shall be refactored                                      |
| Medium   | Tag Unique Identifier                    | OPT.CPP.MISRAC.TagUniqueIdentifier                 | TagUniqueIdentifier: MISRA 5.4: A tag name shall be a unique identifier  |
| Medium   | Typedef Unique Identifier                | OPT.CPP.MISRAC.TypedefUniqueIdentifier             | TypedefUniqueIdentifier: MISRA 5.3: A typedef name shall be a unique identifier  |
| Medium   | Unsigned Bitwise Operands                | OPT.CPP.MISRAC.UnsignedBitwiseOperands             | UnsignedBitwiseOperands: MISRA 12.7: Bitwise operators shall not be applied to operands of an unsigned type if the underlying type is signed |
| Medium   | Num Max Class By Namespace               | OPT.CPP.NumMaxClassByNamespace                     | NumMaxClassByNamespace: Avoid an excessive number of classes per package/namespace   |
| Medium   | Remove Unused Param                      | OPT.CPP.RemoveUnusedParam                          | RemoveUnusedParam: Remove unused parameters from functions   |
| Medium   | Avoid Inline Constructor And Destructor  | OPT.CPP.AvoidInlineConstructorAndDestructor        | AvoidInlineConstructorAndDestructor: Avoid inline constructors and destructors   |
| Medium   | Constant Member Functions                | OPT.CPP.ConstantMemberFunctions                    | ConstantMemberFunctions: Member functions that do not modify state should be declared constant   |
| Medium   | Dont Use Cast                            | OPT.CPP.DontUseCast                                | DontUseCast: Do not use explicit type conversions (casts), excluding C++ cast operators  |
| Medium   | No Specify Member Data In Class          | OPT.CPP.NoSpecifyMemberDataInClass                 | NoSpecifyMemberDataInClass: Never specify protected member data in a class   |
| Medium   | Non Constant Reference From Function     | OPT.CPP.NonConstantReferenceFromFunction           | NonConstantReferenceFromFunction: Non-constant references from public functions  |
| Medium   | Potential Infinite Loop                  | OPT.CPP.PotentialInfiniteLoop                      | PotentialInfiniteLoop: Loop with Unreachable Condition ('Infinite Loop')   |
| Medium   | Too Many Constructors                    | OPT.CPP.TooManyConstructors                        | TooManyConstructors: Avoid classes with too many constructors  |
| Medium   | Too Many Data Members                    | OPT.CPP.TooManyDataMembers                         | TooManyDataMembers: Avoid classes with too many data members   |
| Medium   | Too Many Methods                         | OPT.CPP.TooManyMethods                             | TooManyMethods: Avoid classes with too many methods  |
| Medium   | Obsolete Function                        | OPT.CPP.PORT.ObsoleteFunction                      | ObsoleteFunction: Do not use deprecated functions.   |
| Medium   | Hardcoded Username Password              | OPT.CPP.SEC.HardcodedUsernamePassword              | HardcodedUsernamePassword: Use of Hardcoded Credentials  |
| Medium   | Insecure Randomness                      | OPT.CPP.SEC.InsecureRandomness                     | InsecureRandomness: Standard pseudo-random number generators cannot withstand cryptographic attacks  |

## C Scan rules

Contrast Scan supports these rules for C.

| Severity | Engine rule ID           | Contrast rule         | Description   |
|----------|--------------------------|-----------------------|---|
| Critical | OPT.C.AvoidCompDiffTypes | Avoid Comp Diff Types | AvoidCompDiffTypes: Do not compare variables with different basic types |

| Severity | Engine rule ID                                      | Contrast rule  | Description   |
|----------|---|--|---|
| Critical | OPT.C.CERTC.ARR38                                   | Adding or subtracting an integer to a pointer if resulting value does not refer to a valid array element | ARR38: Do not add or subtract an integer to a pointer if resulting value does not refer to a valid array element                      |
| Critical | OPT.C.CERTC.EXP34                                   | NULL Pointer Dereference   | EXP34: NULL Pointer Dereference   |
| Critical | OPT.C.CERTC.MEM30                                   | Do not access freed memory   | MEM30: Do not access freed memory (Use a free)  |
| Critical | OPT.C.CERTC.MEM34                                   | Freeing Memory not on the Heap   | MEM34: Free of Memory not on the Heap   |
| Critical | OPT.C.CERTC.PRE09                                   | Do not replace secure functions with less secure functions   | PRE09: Do not replace secure functions with less secure functions   |
| Critical | OPT.C.CERTC.SIG30                                   | Signal Handler Use of a Non-reentrant Function   | SIG30: Signal Handler Use of a Non-reentrant Function   |
| Critical | OPT.C.CERTC.SIG32                                   | Signal Handler Use of a Non-reentrant Function   | SIG32: Signal Handler Use of a Non-reentrant Function   |
| Critical | OPT.C.CERTC.STR31                                   | Guarantee that storage for strings has sufficient space  | STR31: Guarantee that storage for strings has sufficient space for character data and the null terminator                             |
| Critical | OPT.C.CERTC.STR33                                   | Size wide character strings correctly  | STR33: Size wide character strings correctly  |
| Critical | OPT.C.CERTC.STR35                                   | Do not copy data from an unbounded source to a fixed-length array  | STR35: Do not copy data from an unbounded source to a fixed-length array  |
| Critical | OPT.C.CheckReturnInPublicFunctions                  | Check Return In Public Functions   | CheckReturnInPublicFunctions: Functions should return a pointer or reference to local variables                                       |
| Critical | OPT.C.MISRAC.NumberArgsInCallsMustMatchFormalParams | Number Args In Calls Must Match Formal Params  | NumberArgsInCallsMustMatchFormalParams: MISRA 16.6: The number of arguments passed to a function shall match the number of parameters |
| Critical | OPT.C.SEC.AnonymousLdapBind                         | Anonymous Ldap Bind  | AnonymousLdapBind: Access Control - Anonymous LDAP Bind   |
| Critical | OPT.C.SEC.PathTraversal                             | Path Traversal   | PathTraversal: Avoid non-neutralized user-controlled input composed in a pathname to access a resource                                |
| Critical | OPT.C.SEC.StaticDatabaseConnection                  | Static Database Connection   | StaticDatabaseConnection: Static database connection / session  |
| Critical | OPT.C.SEC.UnsafeChroot                              | Unsafe Chroot  | UnsafeChroot: Unsafe chroot call.   |
| Critical | OPT.C.CERTC.FIO30                                   | Exclude unsanitized input  | FIO30: Exclude unsanitized user input from file strings   |

| Severity | Engine rule ID                               | Contrast rule  | Description  |
|----------|--|--|--|
| Critical | OPT.C.CERTC.STR02                            | Sanitize data passed to sensitive subsystems                                   | STR02: Sanitize data passed to sensitive subsystems  |
| Critical | OPT.C.SEC.ConnectionStringParameterPollution | ConnectionStringParameterPollution: Connection String Parameter Pollution      | ConnectionStringParameterPollution: Connection string polluted with untrusted input                  |
| Critical | OPT.C.SEC.DoSRegexp                          | DoS Regexp   | DoSRegexp: Prevent denial of service attack through malicious regular expression ('Regex Injection') |
| Critical | OPT.C.SEC.LdapInjection                      | Ldap Injection   | LdapInjection: Avoid non-neutralized user-controlled input in LDAP search filters                    |
| Critical | OPT.C.SEC.NoSQLInjection                     | No SQL Injection   | NoSQLInjection: Improper neutralization of special elements in data query logic (NoSQL injection)    |
| Critical | OPT.C.SEC.ProcessControl                     | Process Control  | ProcessControl: Do not load executables or libraries from untrusted sources                          |
| Critical | OPT.C.SEC.SqlInjection                       | SQL Injection  | SqlInjection: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection')   |
| Critical | OPT.C.SEC.XmlEntityInjection                 | Xml Entity Injection   | XmlEntityInjection: XML entity injection   |
| Critical | OPT.C.SEC.HardcodedCryptoKey                 | Hardcoded Crypto Key   | HardcodedCryptoKey: Hardcoded cryptographic keys   |
| High     | OPT.C.AvoidSignalManagementFunctions         | Avoid Signal Management Functions  | AvoidSignalManagementFunctions: Avoid using signal management functions                              |
| High     | OPT.C.AvoidStructures                        | Avoid Structures   | AvoidStructures: Avoid using certain kinds of aggregate objects (struct, union, VARIANT)             |
| High     | OPT.C.CERTC.ARR01                            | Do not apply the sizeof operator to a pointer when taking the size of an array | ARR01: Do not apply the sizeof operator to a pointer when taking the size of an array                |
| High     | OPT.C.CERTC.ARR33                            | Guarantee that copies are made into storage of sufficient size                 | ARR33: Guarantee that copies are made into storage of sufficient size                                |
| High     | OPT.C.CERTC.ENV01                            | Assumptions about the size of an environment variable                          | ENV01: Do not make assumptions about the size of an environment variable                             |
| High     | OPT.C.CERTC.ENV32                            | Terminating Atexit handler by returning  | ENV32: No atexit handler should terminate in any way other than by returning                         |
| High     | OPT.C.CERTC.EXP01                            | Use of sizeof() on a Pointer Type  | EXP01: Use of sizeof() on a Pointer Type   |
| High     | OPT.C.CERTC.EXP33                            | Use of Uninitialized Variable  | EXP33: Use of Uninitialized Variable   |
| High     | OPT.C.CERTC.FIO01                            | Functions using file names for identification                                  | FIO01: Be careful using functions that use file names for identification                             |
| High     | OPT.C.CERTC.FIO36                            | Do not assume a new-line character is read when using fgets()                  | FIO36: Do not assume a new-line character is read when using fgets()                                 |

| Severity | Engine rule ID              | Contrast rule   | Description  |
|----------|-----------------------------|---|--|
| High     | OPT.C.CERTC.FIO37           | Do not assume character data has been read                                      | FIO37: Do not assume character data has been read  |
| High     | OPT.C.CERTC.INT34           | Check number of bits in shift operations  | INT34: In shift operations, do not shift a negative number of bits or more bits than exist in the left operand |
| High     | OPT.C.CERTC.MEM00           | Allocate and free memory in the same module                                     | MEM00: Allocate and free memory in the same module at the same level of abstraction                            |
| High     | OPT.C.CERTC.MEM31           | Only Free allocated memory once   | MEM31: Free dynamically allocated memory exactly once (Double Free)  |
| High     | OPT.C.CERTC.MEM32           | Detect and handle memory allocation errors                                      | MEM32: Detect and handle memory allocation errors  |
| High     | OPT.C.CERTC.POS35           | Race condition with link following  | POS35: Race Condition Enabling Link Following  |
| High     | OPT.C.CERTC.POS36           | Observe correct revocation order while relinquishing privileges                 | POS36: Observe correct revocation order while relinquishing privileges   |
| High     | OPT.C.CERTC.POS37           | Improper Check for Dropped Privileges   | POS37: Improper Check for Dropped Privileges   |
| High     | OPT.C.CERTC.PRE02           | Macro replacement lists should be parenthesized                                 | PRE02: Macro replacement lists should be parenthesized   |
| High     | OPT.C.CERTC.SIG02           | Avoid using signals to implement normal functionality                           | SIG02: Avoid using signals to implement normal functionality   |
| High     | OPT.C.CERTC.STR06           | Ensure strtok() leaves the parse string unchanged                               | STR06: Do not assume that strtok() leaves the parse string unchanged   |
| High     | OPT.C.CERTC.STR07           | Use TR 24731 for remediation of existing string manipulation                    | STR07: Use TR 24731 for remediation of existing string manipulation code                                       |
| High     | OPT.C.CERTC.STR32           | Null-terminate byte strings as required   | STR32: Null-terminate byte strings as required   |
| High     | OPT.C.CERTC.STR36           | Do not specify the bound of a character array initialized with a string literal | STR36: Do not specify the bound of a character array initialized with a string literal                         |
| High     | OPT.C.CorrectUseMemoryLeaks | Correct Use Memory Leaks  | CorrectUseMemoryLeaks: Allocated memory be released in same scope  |
| High     | OPT.C.DontUseMemoryFunction | Dont Use Memory Function  | DontUseMemoryFunction: Do not use malloc, calloc, realloc or free  |

| Severity | Engine rule ID  | Contrast rule                                       | Description  |
|----------|---|---|--|
| High     | OPT.C.GlobalVarNotUsedLocally                             | Global Var Not Used Locally                         | GlobalVarNotUsedLocally: Global variables not locally used   |
| High     | OPT.C.ImplicitTypeConversion                              | Implicit Type Conversion                            | ImplicitTypeConversion: Avoid function calls that cause implicit type conversions  |
| High     | OPT.C.LocalVarsWithGlobalNames                            | Local Vars With Global Names                        | LocalVarsWithGlobalNames: Avoid using the name with global and local variables   |
| High     | OPT.C.MISRAC.AvoidFileScopeWhenAccessedFromSingleFunction | Avoid File Scope When Accessed From Single Function | AvoidFileScopeWhenAccessedFromSingleFunction: MISRA 8.7: Objects shall be defined at block level if they are only accessed from within a single function             |
| High     | OPT.C.MISRAC.AvoidRecursiveFunctions                      | Avoid Recursive Functions                           | AvoidRecursiveFunctions: MISRA 16.2: Functions shall not call themselves, either directly or indirectly  |
| High     | OPT.C.MISRAC.DoNotCheckFloatEqualNotEqual                 | Do Not Check Float Equal Not Equal                  | DoNotCheckFloatEqualNotEqual: MISRA 13.6: Floating-point expressions shall not be tested for equality or inequality  |
| High     | OPT.C.MISRAC.DoNotUseDynamicHeapAllocation                | Do Not Use Dynamic Heap Allocation                  | DoNotUseDynamicHeapAllocation: MISRA 20.1: Dynamic heap allocation shall not be used   |
| High     | OPT.C.MISRAC.DoNotUseReservedNameAsIdentifier             | Do Not Use Reserved Name As Identifier              | DoNotUseReservedNameAsIdentifier: MISRA 20.1: The names of standard library macros, objects, and functions shall not be reused                                       |
| High     | OPT.C.MISRAC.DoNotUseReservedNameAsMacroName              | Do Not Use Reserved Name As Macro Name              | DoNotUseReservedNameAsMacroName: MISRA 20.1: Reserved identifiers, macros and functions in the standard library shall not be defined, redefined, or undefined        |
| High     | OPT.C.MISRAC.DoNotUseSetjmpLongjmp                        | Do Not Use Setjmp Longjmp                           | DoNotUseSetjmpLongjmp: MISRA 20.7: The setjmp macro and the longjmp function shall not be used   |
| High     | OPT.C.MISRAC.DoNotUseSignalHandlingFunctions              | Do Not Use Signal Handling Functions                | DoNotUseSignalHandlingFunctions: MISRA 20.8: The signal handling facilities of signal.h shall not be used  |
| High     | OPT.C.MISRAC.DoNotUseStdioFunctions                       | Do Not Use Stdio Functions                          | DoNotUseStdioFunctions: MISRA 20.9: The input and output library stdio.h shall not be used in production code  |
| High     | OPT.C.MISRAC.DoNotUseTimeFunctions                        | Do Not Use Time Functions                           | DoNotUseTimeFunctions: MISRA 20.12: The time handling functions of library time.h shall not be used  |
| High     | OPT.C.MISRAC.EncloseInParanthesesMacroArgs                | Enclose In Parantheses Macro Args                   | EncloseInParanthesesMacroArgs: MISRA 19.1: In the definition of a function-like macro each parameter shall be enclosed in parentheses                                |
| High     | OPT.C.MISRAC.ExplicitTypeForVarsFunctions                 | Explicit Type For Vars Functions                    | ExplicitTypeForVarsFunctions: MISRA 8.2: Whenever an object or function is declared or defined, its type shall be explicitly stated                                  |
| High     | OPT.C.MISRAC.FunctionMacroInvokedWithAllArguments         | Function Macro Invoked With All Arguments           | FunctionMacroInvokedWithAllArguments: MISRA 19.8: A function-like macro shall not be invoked without all of its arguments  |
| High     | OPT.C.MISRAC.IdentifiersMustNotExceed31Chars              | Identifiers Must Not Exceed 31 Chars                | IdentifiersMustNotExceed31Chars: MISRA 5.1: Identifiers (internal and external) shall not rely on the significance of more than 31 characters                        |
| High     | OPT.C.MISRAC.InitialiseAutoVariablesBeforeUse             | Initialise Auto Variables Before Use                | InitialiseAutoVariablesBeforeUse: MISRA 9.1: Automatic variables shall have been assigned a value before being used  |
| High     | OPT.C.MISRAC.InitializationForArrayStructsMustMatchLayout | Initialization For Array Structs Must Match Layout  | InitializationForArrayStructsMustMatchLayout: MISRA 9.2: Braces shall be used to indicate a match the structure of the non-zero initialisation arrays and structures |



| Severity | Engine rule ID   | Contrast rule  | Description   |
|----------|--|--|---|
| High     | OPT.C.MISRAC.ProperBitFieldsStruct                         | Proper Bit Field Struct  | ProperBitFieldsStruct: MISRA 3.5: Bit-fields in should use int type and not be mixed with non fields                      |
| High     | OPT.C.MISRAC.SingleDefinitionForExternalLinkageIdentifiers | Single Definition For External Linkage Identifiers             | SingleDefinitionForExternalLinkageIdentifiers: MISRA 8.9: An identifier with external linkage have exactly one definition |
| High     | OPT.C.MultipleInclusionPreventionGuard                     | Multiple Inclusion Prevention Guard                            | MultipleInclusionPreventionGuard: Multiple inclusion guard for headers  |
| High     | OPT.C.NoSpecifyUnixNamesInInclude                          | No Specify Unix Names In Include                               | NoSpecifyUnixNamesInInclude: Do not use absolute path names in #include directives  |
| High     | OPT.C.NonGotoStatement                                     | Non Goto Statement   | NonGotoStatement: Do not use goto statement   |
| High     | OPT.C.RemoveUnusedMethods                                  | Remove Unused Methods  | RemoveUnusedMethods: Remove unused functions  |
| High     | OPT.C.UnspecifiedParameters                                | Unspecified Parameters   | UnspecifiedParameters: Avoid definition of var functions (variable number of parameters)                                  |
| High     | OPT.C.PORT.HardcodedAbsolutePath                           | Hardcoded Absolute Path  | HardcodedAbsolutePath: Do not hardcode absolute paths   |
| High     | OPT.C.CERTC.ENV04  | Calling system() if you do not need a command processor        | ENV04: Do not call system() if you do not need a command processor  |
| High     | OPT.C.CERTC.FIO34  | Use int to capture the return value of character I/O functions | FIO34: Use int to capture the return value of character I/O functions   |
| High     | OPT.C.CERTC.FIO43  | Temporary File created with Incorrect Permissions              | FIO43: Creation of Temporary File in Directory with Incorrect Permissions   |
| High     | OPT.C.MISRAC.AvoidVarargFunctions                          | Avoid Vararg Functions   | AvoidVarargFunctions: MISRA 16.1: Function not be defined with a variable number of arguments                             |
| High     | OPT.C.SEC.ResourceInjection                                | Resource Injection   | ResourceInjection: Improper control of resource identifiers ("Resource Injection")  |
| High     | OPT.C.SEC.HardcodedSalt                                    | Hardcoded Salt   | HardcodedSalt: Use of hardcoded salt  |
| High     | OPT.C.SEC.InsufficientKeySize                              | Insufficient Key Size  | InsufficientKeySize: Weak cryptography, insufficient key length   |
| High     | OPT.C.SEC.WeakCryptographicHash                            | Weak Cryptographic Hash  | WeakCryptographicHash: Weak cryptographic hash  |
| High     | OPT.C.SEC.WeakEncryption                                   | Weak Encryption  | WeakEncryption: Weak symmetric encryption algorithm   |
| Info     | OPT.C.AvoidBracesSameLine                                  | Avoid Braces Same Line   | AvoidBracesSameLine: Write curly brackets { on separate line  |
| Info     | OPT.C.AvoidNumericValues                                   | Avoid Numeric Values   | AvoidNumericValues: Avoid numeric constant code   |
| Info     | OPT.C.AvoidQuestionMark                                    | Avoid Question Mark  | AvoidQuestionMark: Avoid ?: ternary operator  |
| Info     | OPT.C.BreakInLoops   | Break In Loops   | BreakInLoops: Do not use break statement in loops   |
| Info     | OPT.C.ClassNamingConvention                                | Class Naming Convention  | ClassNamingConvention: Names for struct / union / class / namespace items must follow a naming convention                 |

| Severity | Engine rule ID                         | Contrast rule   | Description   |
|----------|--|---|---|
| Info     | OPT.C.ConstantNamingConvention         | Constant Naming Convention                                | ConstantNamingConvention: Global constant naming convention   |
| Info     | OPT.C.DataMemberNamingConvention       | Data Member Naming Convention                             | DataMemberNamingConvention: Data member naming convention   |
| Info     | OPT.C.ForbiddenFunctions               | Forbidden Functions                                       | ForbiddenFunctions: Avoid use of discouraged functions  |
| Info     | OPT.C.MISRAC.AtMostOneBreakInLoop      | At Most One Break In Loop                                 | AtMostOneBreakInLoop: MISRA 14.6: For any iteration statement there shall be at most one statement used for loop termination              |
| Info     | OPT.C.MISRAC.AvoidTrigraphs            | Avoid Trigraphs   | AvoidTrigraphs: MISRA 4.2: Trigraphs shall not be used  |
| Info     | OPT.C.MISRAC.DoNotCommentOutSourceCode | Do Not Comment Out Source Code                            | DoNotCommentOutSourceCode: MISRA 2.4: Sections of code should not be commented out  |
| Info     | OPT.C.MISRAC.ExplicitCheckAgainstZero  | Explicit Check Against Zero                               | ExplicitCheckAgainstZero: MISRA 13.2: Tests for a value against zero should be made explicit, unless the operand is effectively Boolean   |
| Info     | OPT.C.MISRAC.IncludeNotAfterStatements | Include Not After Statements                              | IncludeNotAfterStatements: MISRA 19.1: #include directives should only be preceded in a file by other preprocessor directives or comments |
| Info     | OPT.C.MacrosNamingConvention           | Macros Naming Convention                                  | MacrosNamingConvention: Macros naming convention  |
| Info     | OPT.C.MaximunLineSize                  | Maximun Line Size   | MaximunLineSize: MaxLineSize: Do not use long code lines  |
| Info     | OPT.C.MethodNamingConvention           | Method Naming Convention                                  | MethodNamingConvention: Functions / class methods naming convention   |
| Info     | OPT.C.MethodsCommentCodeRatio          | Methods Comment Code Ratio                                | MethodsCommentCodeRatio: Avoid functions with low comment code ratio  |
| Info     | OPT.C.ParenthesizedFunctions           | Parenthesized Functions                                   | ParenthesizedFunctions: Write sizeof and return with parenthesis  |
| Info     | OPT.C.SpaceIndentation                 | Space Indentation   | SpaceIndentation: Allow spaces before and after operators   |
| Info     | OPT.C.TypedefNamingConvention          | Typedef Naming Convention                                 | TypedefNamingConvention: Names for typedef declared types must follow a naming convention   |
| Info     | OPT.C.UseBlocks                        | Use Blocks  | UseBlocks: Use blocks in conditional and iteration statements   |
| Low      | OPT.C.AvoidManyParametersFunction      | Avoid Many Parameters Function                            | AvoidManyParametersFunction: Avoid functions with too many parameters   |
| Low      | OPT.C.AvoidOneCaseSwitch               | Avoid One Case Switch                                     | AvoidOneCaseSwitch: Avoid switch statements with a low number of case conditions  |
| Low      | OPT.C.CERTC.ARR31                      | Use consistent array notation across all source files     | ARR31: Use consistent array notation across all source files  |
| Low      | OPT.C.CERTC.INT13                      | Use bitwise operators only on unsigned operands           | INT13: Use bitwise operators only on unsigned operands  |
| Low      | OPT.C.CERTC.POS33                      | Do not use vfork()  | POS33: Do not use vfork()   |
| Low      | OPT.C.CERTC.PRE00                      | Prefer inline or static functions to function-like macros | PRE00: Prefer inline or static functions to function-like macros  |

| Severity | Engine rule ID  | Contrast rule                                       | Description  |
|----------|---|---|--|
| Low      | OPT.C.CheckNamesDefinitionAndDeclaration                    | Check Names Definition And Declaration              | CheckNamesDefinitionAndDeclaration: Form parameters names in function definition and declaration   |
| Low      | OPT.C.ClassCommentCodeRatio                                 | Class Comment Code Ratio                            | ClassCommentCodeRatio: Avoid classes, structures, unions with low comment/code ratio   |
| Low      | OPT.C.DontComparePointerToNull                              | Dont Compare Pointer To Null                        | DontComparePointerToNull: Do not compare pointer to NULL, use 0 instead  |
| Low      | OPT.C.DontComparePointerToZero                              | Dont Compare Pointer To Zero                        | DontComparePointerToZero: Do not compare pointer to zero, use NULL instead   |
| Low      | OPT.C.IncludingHeaderFile                                   | Including Header File                               | IncludingHeaderFile: Avoid implementation files do not include a header file with the same name  |
| Low      | OPT.C.InitializationInsteadAssignment                       | Initialization Instead Assignment                   | InitializationInsteadAssignment: Always use initialization instead of assignment   |
| Low      | OPT.C.MISRAC.AvoidSingleLineComments                        | Avoid Single Line Comments                          | AvoidSingleLineComments: MISRA 2.2: C99 single line comments (//...) shall not be used   |
| Low      | OPT.C.MISRAC.AvoidUnreachableCode                           | Avoid Unreachable Code                              | AvoidUnreachableCode: MISRA 14.1: There shall be no unreachable code   |
| Low      | OPT.C.MISRAC.CaseWithBreak                                  | Case With Break                                     | CaseWithBreak: MISRA 15.2: An unconditional break statement shall terminate every non-empty case clause of a switch  |
| Low      | OPT.C.MISRAC.CommentShouldNotContainOpenCommentChars        | Comment Should Not Contain Open Comment Chars       | CommentShouldNotContainOpenCommentChars: MISRA 2.3: A comment shall not contain the string /*  |
| Low      | OPT.C.MISRAC.DeclareConstPointerParamIfUnchangedValue       | Declare Const Pointer Param If Unchanged Value      | DeclareConstPointerParamIfUnchangedValue: MISRA 16.7: A pointer parameter in a function should be declared as pointer to const if the pointer is not used to modify the addressed object |
| Low      | OPT.C.MISRAC.DoNotDefUndefMacrosInBlocks                    | Do Not Def Undef Macros In Blocks                   | DoNotDefUndefMacrosInBlocks: MISRA 19.5: Macros shall not be defined or undefined within a block   |
| Low      | OPT.C.MISRAC.DoNotUseAtofAtoiAtol                           | Do Not Use Atof Atoi Atol                           | DoNotUseAtofAtoiAtol: MISRA 20.10: The library functions atof, atoi and atol from library stdlib.h shall not be used   |
| Low      | OPT.C.MISRAC.ExplicitSizeInExternArrays                     | Explicit Size In Extern Arrays                      | ExplicitSizeInExternArrays: MISRA 8.12: When an array is declared with external linkage, its size shall be stated explicitly or defined implicitly by a static initialization            |
| Low      | OPT.C.MISRAC.FunctionPointerCasts                           | Function Pointer Casts                              | FunctionPointerCasts: MISRA 11.1: Conversions shall not be performed between a pointer to a function and any type other than an integral type  |
| Low      | OPT.C.MISRAC.IfElseIfMustEndWithElse                        | If Else If Must End With Else                       | IfElseIfMustEndWithElse: MISRA 14.10: All if-else-if constructs shall be terminated with an else clause  |
| Low      | OPT.C.MISRAC.IfElseStatementsMustUseBraces                  | If Else Statements Must Use Braces                  | IfElseStatementsMustUseBraces: MISRA 14.11: if-else statements must use braces   |
| Low      | OPT.C.MISRAC.LogicalExpressionWithPrimaryExpressionOperands | Logical Expression With Primary Expression Operands | LogicalExpressionWithPrimaryExpressionOperands: MISRA 12.5: The operands of a logical && or    shall be primary-expressions  |
| Low      | OPT.C.MISRAC.LoopsShouldUseBraces                           | Loops Should Use Braces                             | LoopsShouldUseBraces: MISRA 14.8: Loops shall use braces to delimit loop body  |
| Low      | OPT.C.MISRAC.MaxTwoPointerIndirections                      | Max Two Pointer Indirections                        | MaxTwoPointerIndirections: MISRA 17.5: Declaration of objects should contain no more than 2 levels of pointer indirection  |

| Severity | Engine rule ID                                      | Contrast rule   | Description  |
|----------|---|---|--|
| Low      | OPT.C.MISRAC.NoPointerArithmeticExceptArrayIndex    | No Pointer Arithmetic Except Array Index                                | NoPointerArithmeticExceptArrayIndex: MISRA 12.4: Array indexing shall be the only allowed form of pointer arithmetic   |
| Low      | OPT.C.MISRAC.NoSideEffectsInRightOperandOfLogicalOp | No Side Effects In Right Operand Of Logical Op                          | NoSideEffectsInRightOperandOfLogicalOp: MISRA 12.4: Right-hand operands of a logical && or    operator shall not contain side effects                          |
| Low      | OPT.C.MISRAC.SwitchMustHaveBraces                   | Switch Must Have Braces   | SwitchMustHaveBraces: MISRA 14.8: Switch statements must use braces  |
| Low      | OPT.C.MISRAC.UseStaticForInternalLinkageIdentifiers | Use Static For Internal Linkage Identifiers                             | UseStaticForInternalLinkageIdentifiers: MISRA 12.3: Use static storage specifier for definitions / declarations of objects and functions with internal linkage |
| Low      | OPT.C.OneStatementPerLine                           | One Statement Per Line  | OneStatementPerLine: Only one statement per line   |
| Low      | OPT.C.OnlyOneReturn                                 | Only One Return   | OnlyOneReturn: Only one 'return' statement per function  |
| Low      | OPT.C.SpecifyReturnType                             | Specify Return Type   | SpecifyReturnType: Explicit specification of the return type of a function   |
| Low      | OPT.C.VariablesNeverUsed                            | Variables Never Used  | VariablesNeverUsed: Local variables never used   |
| Medium   | OPT.C.AvoidGlobalVars                               | Avoid Global Vars   | AvoidGlobalVars: Avoid using global variables  |
| Medium   | OPT.C.AvoidLargeMethods                             | Avoid Large Methods   | AvoidLargeMethods: Avoid functions and methods with too many lines of code   |
| Medium   | OPT.C.AvoidVolatileVars                             | Avoid Volatile Vars   | AvoidVolatileVars: Do not use volatile variables   |
| Medium   | OPT.C.CERTC.ARR30                                   | Do not form or use out-of-bounds pointers or array subscripts on arrays | ARR30: Do not form or use out-of-bounds pointers or array subscripts on arrays.  |
| Medium   | OPT.C.CERTC.ARR35                                   | Allowing loops to iterate beyond the end of an array                    | ARR35: Do not allow loops to iterate beyond the end of an array  |
| Medium   | OPT.C.CERTC.ARR35_bis                               | Allowing loops to iterate beyond the end of an array                    | ARR35: Do not allow loops to iterate beyond the end of an array  |
| Medium   | OPT.C.CERTC.FIO33                                   | Detect and handle input/output errors                                   | FIO33: Detect and handle input/output errors resulting in undefined behavior   |
| Medium   | OPT.C.CERTC.INT35                                   | Evaluate integer expressions  | INT35: Evaluate integer expressions in a larger size before comparing or assigning to that size  |
| Medium   | OPT.C.CERTC.MEM08                                   | Use realloc() to resize dynamically allocated arrays                    | MEM08: Use realloc() only to resize dynamically allocated arrays   |
| Medium   | OPT.C.CERTC.MEM35                                   | Incorrect Calculation of Buffer Size                                    | MEM35: Incorrect Calculation of Buffer Size.   |
| Medium   | OPT.C.CERTC.POS30                                   | Use the readlink() function properly                                    | POS30: Use the readlink() function properly  |

| Severity | Engine rule ID                                      | Contrast rule  | Description  |
|----------|---|--|--|
| Medium   | OPT.C.CERTC.PRE01                                   | Use parentheses within macros around parameter names | PRE01: Use parentheses within macros around parameter names  |
| Medium   | OPT.C.CERTC.PRE10                                   | Wrap multistatement macros in a do-while loop        | PRE10: Wrap multistatement macros in a do-loop   |
| Medium   | OPT.C.DontConvertConstToNonConst                    | Dont Convert Const To Non Const                      | DontConvertConstToNonConst: Never convert const to a non-const   |
| Medium   | OPT.C.IncludeHeadersOnly                            | Include Headers Only                                 | IncludeHeadersOnly: Avoid using #include without which are not header files  |
| Medium   | OPT.C.MISRAC.AllMacroIdentifiersDefinedBeforeUse    | All Macro Identifiers Defined Before Use             | AllMacroIdentifiersDefinedBeforeUse: MISRA C89 7.1: All macro identifiers in preprocessor directives shall be defined before use, except in #ifdef and #ifndef directives and defined() operator |
| Medium   | OPT.C.MISRAC.ArithmeticOnPointersToArray            | Arithmetic On Pointers To Array                      | ArithmeticOnPointersToArray: MISRA 17.1: Pointer arithmetic shall only be applied to pointers that address an array or array element   |
| Medium   | OPT.C.MISRAC.AvoidAssignmentInBooleanExpressions    | Avoid Assignment In Boolean Expressions              | AvoidAssignmentInBooleanExpressions: MISRA 13.1: Assignment operators shall not be used in expressions that yield a boolean value  |
| Medium   | OPT.C.MISRAC.AvoidCommaOperator                     | Avoid Comma Operator                                 | AvoidCommaOperator: MISRA 12.10: The comma operator shall not be used  |
| Medium   | OPT.C.MISRAC.AvoidContinueStatement                 | Avoid Continue Statement                             | AvoidContinueStatement: MISRA 14.5: continue statement must not be used  |
| Medium   | OPT.C.MISRAC.AvoidGotoStatement                     | Avoid Goto Statement                                 | AvoidGotoStatement: MISRA 14.4: Goto statements must not be used   |
| Medium   | OPT.C.MISRAC.AvoidNonNullStatementsWithoutEffect    | Avoid Non Null Statements Without Effect             | AvoidNonNullStatementsWithoutEffect: MISRA 14.2: All non-null statements shall either have at least one side-effect however executed, or cause control flow to change                            |
| Medium   | OPT.C.MISRAC.AvoidNonStandardCharsInHeaderFileNames | Avoid Non Standard Chars In Header FileNames         | AvoidNonStandardCharsInHeaderFileNames: MISRA 19.2: Non-standard characters should not occur in header file names in #include directives   |
| Medium   | OPT.C.MISRAC.AvoidNonStandardEscapeSequences        | Avoid Non Standard Escape Sequences                  | AvoidNonStandardEscapeSequences: MISRA 19.3: For character constants, only those escape sequences defined in ISO C Standard shall be used  |
| Medium   | OPT.C.MISRAC.AvoidOctalConstants                    | Avoid Octal Constants                                | AvoidOctalConstants: MISRA 7.1: Octal constants (other than zero) and octal escape sequences shall not be used   |
| Medium   | OPT.C.MISRAC.AvoidUndefDirective                    | Avoid Undef Directive                                | AvoidUndefDirective: MISRA 19.6: #undef shall not be used  |
| Medium   | OPT.C.MISRAC.AvoidUnnecessaryExternalLinkage        | Avoid Unnecessary External Linkage                   | AvoidUnnecessaryExternalLinkage: MISRA 8.1: declarations and definitions of objects or functions at file scope shall have internal linkage unless external linkage is required                   |
| Medium   | OPT.C.MISRAC.ComparePointersWhenOnSameArray         | Compare Pointers When On Same Array                  | ComparePointersWhenOnSameArray: MISRA 17.3: >, >=, <, <=, !=, ==, [], [], [], [] MISRA-C': ['17.3']  |
| Medium   | OPT.C.MISRAC.DeclareFunctionsAtFileScope            | Declare Functions At File Scope                      | DeclareFunctionsAtFileScope: MISRA 8.6: Functions shall be declared at file scope  |

| Severity | Engine rule ID   | Contrast rule                                     | Description  |
|----------|--|---|--|
| Medium   | OPT.C.MISRAC.DeclareNoParametersFunctionAsVoid         | Declare No Parameters Function As Void            | DeclareNoParametersFunctionAsVoid: MISRA 2.2: Functions with no parameters shall be declared with parameter type void  |
| Medium   | OPT.C.MISRAC.DoNotMixIncDecOperatorsWithOtherOperators | Do Not Mix Inc Dec Operators With Other Operators | DoNotMixIncDecOperatorsWithOtherOperators: MISRA 12.13: The increment (++) and decrement (--) operators shall not be mixed with other operators in an expression                                     |
| Medium   | OPT.C.MISRAC.DoNotModifyLoopVariableInBody             | Do Not Modify Loop Variable In Body               | DoNotModifyLoopVariableInBody: MISRA 13.3: Variables being used within a for loop for iteration counting shall not be modified in the loop body  |
| Medium   | OPT.C.MISRAC.DoNotUseAbortExitGetenvSystem             | Do Not Use Abort Exit Getenv System               | DoNotUseAbortExitGetenvSystem: MISRA 20.5: The library functions abort, exit, getenv and system from library stdlib.h shall not be used  |
| Medium   | OPT.C.MISRAC.DoNotUseErrno                             | Do Not Use Errno                                  | DoNotUseErrno: MISRA 20.5: The error indicator variable errno shall not be used  |
| Medium   | OPT.C.MISRAC.DoNotUseOffsetof                          | Do Not Use Offsetof                               | DoNotUseOffsetof: MISRA 20.6: The macro offsetof, in stddef.h, shall not be used   |
| Medium   | OPT.C.MISRAC.DoNotUseUnderlyingBitRepOfFloat           | Do Not Use Underlying Bit Rep Of Float            | DoNotUseUnderlyingBitRepOfFloat: MISRA 11.2: Underlying bit representations of floating-point values shall not be used   |
| Medium   | OPT.C.MISRAC.DocumentPragmaDirectives                  | Document Pragma Directives                        | DocumentPragmaDirectives: MISRA 3.4: All uses of the #pragma directive shall be documented and explained   |
| Medium   | OPT.C.MISRAC.EncapsulateAssembly                       | Encapsulate Assembly                              | EncapsulateAssembly: MISRA 2.1: Assembly language shall be encapsulated and isolated   |
| Medium   | OPT.C.MISRAC.EvaluationOrderIndependence               | Evaluation Order Independence                     | EvaluationOrderIndependence: MISRA 12.2: The value of an expression shall be the same under the order of evaluation that the standard permits  |
| Medium   | OPT.C.MISRAC.FloatImplicitConversions                  | Float Implicit Conversions                        | FloatImplicitConversions: MISRA 10.2: The value of an expression of floating type shall not be implicitly converted to a different underlying type   |
| Medium   | OPT.C.MISRAC.ForControlExpressionWithFloatObjects      | For Control Expression With Float Objects         | ForControlExpressionWithFloatObjects: MISRA 13.4: The controlling expression of a for statement shall not contain any objects of floating type   |
| Medium   | OPT.C.MISRAC.ForLoopExpressionsForLoopControl          | For Loop Expressions For Loop Control             | ForLoopExpressionsForLoopControl: MISRA 16.3: The three expressions of a for statement shall be concerned only with loop control   |
| Medium   | OPT.C.MISRAC.FunctionsShouldHaveSingleReturnAtEnd      | Functions Should Have Single Return At End        | FunctionsShouldHaveSingleReturnAtEnd: MISRA 14.7: Functions shall have a single point of exit at the end of the function   |
| Medium   | OPT.C.MISRAC.IdentifiersMustNotHideOuterDefinitions    | Identifiers Must Not Hide Outer Definitions       | IdentifiersMustNotHideOuterDefinitions: MISRA 23.2: Identifiers in an inner scope shall not hide outer scope ones by reusing the same name   |
| Medium   | OPT.C.MISRAC.IntegerImplicitConversions                | Integer Implicit Conversions                      | IntegerImplicitConversions: MISRA 10.1: The value of an expression of integer type shall not be implicitly converted to a different underlying type  |
| Medium   | OPT.C.MISRAC.MacroExpansionCheck                       | Macro Expansion Check                             | MacroExpansionCheck: MISRA 19.4: C macro expansion shall only expand to safe constructions   |
| Medium   | OPT.C.MISRAC.NameParametersInFunctionPrototypes        | Name Parameters In Function Prototypes            | NameParametersInFunctionPrototypes: MISRA 16.3: Names shall be given for all parameters in function prototype  |
| Medium   | OPT.C.MISRAC.ObjectPointerCasts                        | Object Pointer Casts                              | ObjectPointerCasts: MISRA 11.2: Conversion shall not be performed between a pointer to an object type and any type other than an integral type, another pointer to object type, or a pointer to void |

| Severity | Engine rule ID                                    | Contrast rule                            | Description   |
|----------|---|--|---|
| Medium   | OPT.C.MISRAC.ProperCastComplexFloatExpression     | Proper Cast Complex Float Expression     | ProperCastComplexFloatExpression: MISRA 10.3: The value of a complex expression of floating point type shall only be cast to a floating type narrower than the original type and of the same size |
| Medium   | OPT.C.MISRAC.ProperCastComplexIntegerExpression   | Proper Cast Complex Integer Expression   | ProperCastComplexIntegerExpression: MISRA 10.3: The value of a complex expression of integer type shall only be cast to a type of signedness no wider than the underlying type of the expression  |
| Medium   | OPT.C.MISRAC.SameFunctionDeclarationAndDefinition | Same Function Declaration And Definition | SameFunctionDeclarationAndDefinition: MISRA 8.3: For each function parameter the type in the declaration and definition shall be identical, and the return types shall also be identical          |
| Medium   | OPT.C.MISRAC.SizeofExprWithSideEffects            | Sizeof Expr With Side Effects            | SizeofExprWithSideEffects: MISRA 12.3: The sizeof operator shall not be used on expressions that contain side effects   |
| Medium   | OPT.C.MISRAC.SwitchWithDefault                    | Switch With Default                      | SwitchWithDefault: MISRA 15.3: Avoid switch statements without a default clause   |
| Medium   | OPT.C.MISRAC.SwitchWithoutCaseShouldBeRefactored  | Switch Without Case Should Be Refactored | SwitchWithoutCaseShouldBeRefactored: MISRA 15.5: Switch statements without any case shall be refactored   |
| Medium   | OPT.C.MISRAC.TagUniqueIdentifier                  | Tag Unique Identifier                    | TagUniqueIdentifier: MISRA 5.4: A tag name shall be a unique identifier   |
| Medium   | OPT.C.MISRAC.TypedefUniqueIdentifier              | Typedef Unique Identifier                | TypedefUniqueIdentifier: MISRA 5.3: A typedef name shall be a unique identifier   |
| Medium   | OPT.C.MISRAC.UnsignedBitwiseOperands              | Unsigned Bitwise Operands                | UnsignedBitwiseOperands: MISRA 12.7: Bitwise operators shall not be applied to operands whose underlying type is signed   |
| Medium   | OPT.C.PotentialInfiniteLoop                       | Potential Infinite Loop                  | PotentialInfiniteLoop: Loop with Unreachable Condition ('Infinite Loop')  |
| Medium   | OPT.C.RemoveUnusedParam                           | Remove Unused Param                      | RemoveUnusedParam: Remove unused parameters in functions  |
| Medium   | OPT.C.PORT.ObsoleteFunction                       | Obsolete Function                        | ObsoleteFunction: Do not use deprecated or obsolete functions.  |
| Medium   | OPT.C.SEC.HardcodedUsernamePassword               | Hardcoded Username Password              | HardcodedUsernamePassword: Use of Hard-coded Credentials  |
| Medium   | OPT.C.SEC.InsecureRandomness                      | Insecure Randomness                      | InsecureRandomness: Standard pseudo-random number generators cannot withstand cryptographic attacks   |

## Go Scan rules

Contrast Scan supports these rules for Go.

| Severity | Contrast rule            | Engine rule ID                        | Description   |
|----------|--------------------------|---------------------------------------|---|
| Critical | Insecure SSL             | OPT.GO.SECURITY.InsecureSSL           | InsecureSSL: Insecure SSL configuration   |
| Critical | Too Much Origins Allowed | OPT.GO.SECURITY.TooMuchOriginsAllowed | TooMuchOriginsAllowed: CORS policy (Cross-origin resource sharing) too broad          |
| Critical | Anonymous Ldap Bind      | OPT.GO.SECURITY.AnonymousLdapBind     | AnonymousLdapBind: Access Control - Anonymous LDAP Bind                               |
| Critical | Forbidden Call           | OPT.GO.SECURITY.ForbiddenCall         | ForbiddenCall: Dangerous function called.   |
| Critical | Code Injection           | OPT.GO.SECURITY.CodeInjection         | CodeInjection: Avoid non-neutralized user-controlled input in dynamic code evaluation |

| Severity | Contrast rule                         | Engine rule ID                                     | Description   |
|----------|---------------------------------------|--|---|
| Critical | Command Injection                     | OPT.GO.SECURITY.CommandInjection                   | CommandInjection: Improper Neutralization of Special Elements used in an OS Command ('OS Command Injection')    |
| Critical | Connection String Parameter Pollution | OPT.GO.SECURITY.ConnectionStringParameterPollution | ConnectionStringParameterPollution: Connection string polluted with untrusted input                             |
| Critical | Cross Site Scripting                  | OPT.GO.SECURITY.CrossSiteScripting                 | CrossSiteScripting: Improper Neutralization of Input During Web Page Generation ('Cross-site Scripting')        |
| Critical | Http Splitting                        | OPT.GO.SECURITY.HttpSplitting                      | HttpSplitting: Improper Neutralization of CRLF Sequences in HTTP Headers ('HTTP Response Splitting')            |
| Critical | Ldap Injection                        | OPT.GO.SECURITY.LdapInjection                      | LdapInjection: Avoid non-neutralized user-controlled input in LDAP search filters                               |
| Critical | Mail Command Injection                | OPT.GO.SECURITY.MailCommandInjection               | MailCommandInjection: Mail Command Injection  |
| Critical | No SQL Injection                      | OPT.GO.SECURITY.NoSQLInjection                     | NoSQLInjection: Improper neutralization of special elements in data query logic (NoSQL injection)               |
| Critical | Process Control                       | OPT.GO.SECURITY.ProcessControl                     | ProcessControl: Do not load executables or libraries from untrusted sources                                     |
| Critical | Regex Injection                       | OPT.GO.SECURITY.RegexInjection                     | RegexInjection: Prevent denial of service attack through malicious regular expression ('Regex Injection')       |
| Critical | Same Origin Method Execution          | OPT.GO.SECURITY.SameOriginMethodExecution          | SameOriginMethodExecution: Same Origin Method Execution (SOME)  |
| Critical | Path Traversal                        | OPT.GO.SECURITY.PathTraversal                      | PathTraversal: Avoid non-neutralized user-controlled input composed in a pathname to a resource                 |
| Critical | SQL Injection                         | OPT.GO.SECURITY.SqlInjection                       | SqlInjection: Avoid SQL code formed with non neutralized user input (vulnerable to SQL Injection attacks)       |
| Critical | XPath Injection                       | OPT.GO.SECURITY.XPathInjection                     | XPathInjection: Avoid XPath expressions formed with non neutralized user input                                  |
| Critical | Password In Redirect                  | OPT.GO.SECURITY.PasswordInRedirect                 | PasswordInRedirect: Password Management - Password in Redirect  |
| Critical | Hardcoded Crypto Key                  | OPT.GO.SECURITY.HardcodedCryptoKey                 | HardcodedCryptoKey: Hardcoded cryptographic keys  |
| Critical | Non Random IV With CBC Mode           | OPT.GO.SECURITY.NonRandomIVWithCBCMode             | NonRandomIVWithCBCMode: Not using a Random IV with CBC Mode   |
| Critical | Weak Cryptographic Hash               | OPT.GO.SECURITY.WeakCryptographicHash              | WeakCryptographicHash: Weak cryptographic hashes cannot guarantee data integrity                                |
| Critical | Weak Encryption                       | OPT.GO.SECURITY.WeakEncryption                     | WeakEncryption: Weak symmetric encryption algorithm   |
| High     | Insufficient Session Expiration       | OPT.GO.SECURITY.InsufficientSessionExpiration      | InsufficientSessionExpiration: Checks that session expiration interval does not exceed a limit                  |
| High     | Cookies In Security Decision          | OPT.GO.SECURITY.CookiesInSecurityDecision          | CookiesInSecurityDecision: Reliance on Cookies without Validation and Integrity Checking in a Security Decision |
| High     | Cross Site Request Forgery            | OPT.GO.SECURITY.CrossSiteRequestForgery            | CrossSiteRequestForgery: Cross-site request forgery (CSRF)  |
| High     | Http Parameter Pollution              | OPT.GO.SECURITY.HttpParameterPollution             | HttpParameterPollution: HTTP parameter pollution (HPP)  |



| Severity | Contrast rule                   | Engine rule ID                              | Description   |
|----------|---------------------------------|---|---|
| High     | JSON Injection                  | OPT.GO.SECURITY.JSONInjection               | JSONInjection: Avoid using non-neutralized user-controlled input into JSON entities - JSON Injection  |
| High     | Log Forging                     | OPT.GO.SECURITY.LogForging                  | LogForging: Improper Output Neutralization for Logs   |
| High     | Open Redirect                   | OPT.GO.SECURITY.OpenRedirect                | OpenRedirect: URL Redirection to Untrusted Site ('Open Redirect')   |
| High     | Resource Injection              | OPT.GO.SECURITY.ResourceInjection           | ResourceInjection: Improper control of resource identifiers ("Resource Injection")  |
| High     | Server Side Request Forgery     | OPT.GO.SECURITY.ServerSideRequestForgery    | ServerSideRequestForgery: Creation of requests from a vulnerable server using untrusted input (server side request forgery, SSRF)           |
| High     | Trust Boundary Violation        | OPT.GO.SECURITY.TrustBoundaryViolation      | TrustBoundaryViolation: Trust boundary violation  |
| High     | Unsafe Reflection               | OPT.GO.SECURITY.UnsafeReflection            | UnsafeReflection: Use of Externally-Controlled Input to Select Classes or Code ('Unsafe Reflection')  |
| High     | Xslt Injection                  | OPT.GO.SECURITY.XsltInjection               | XsltInjection: XML Injection (aka Blind XPath Injection)  |
| High     | User Controlled SQL Primary Key | OPT.GO.SECURITY.UserControlledSQLPrimaryKey | UserControlledSQLPrimaryKey: Avoid using an user controlled Primary Key into a query  |
| High     | Hardcoded Ip                    | OPT.GO.SECURITY.HardcodedIp                 | HardcodedIp: Do not write IP address in source code   |
| High     | Hardcoded Salt                  | OPT.GO.SECURITY.HardcodedSalt               | HardcodedSalt: A hardcoded salt can compromise system security  |
| High     | Insecure Transport              | OPT.GO.SECURITY.InsecureTransport           | InsecureTransport: Insecure transport   |
| High     | Insufficient Key Size           | OPT.GO.SECURITY.InsufficientKeySize         | InsufficientKeySize: Weak cryptography, insufficient key length   |
| High     | Server Insecure Transport       | OPT.GO.SECURITY.ServerInsecureTransport     | ServerInsecureTransport: Insecure transport in HTTP servers   |
| Low      | Password In Comments            | OPT.GO.SECURITY.PasswordInComments          | PasswordInComments: Storing passwords or password details in plaintext anywhere in the system or system code can compromise system security |
| Medium   | Plaintext Storage In A Cookie   | OPT.GO.SECURITY.PlaintextStorageInACookie   | PlaintextStorageInACookie: Cleartext Storage of Sensitive Information in a Cookie   |
| Medium   | Unsafe Cookie                   | OPT.GO.SECURITY.UnsafeCookie                | UnsafeCookie: Generate server-side cookies with adequate security properties  |
| Medium   | Unreachable Code                | OPT.GO.RELIABILITY.UnreachableCode          | UnreachableCode: Unreachable ("dead") code.   |
| Medium   | Avoid Native Calls              | OPT.GO.SECURITY.AvoidNativeCalls            | AvoidNativeCalls: Avoid calls from GO to C native code  |
| Medium   | Execution After Redirect        | OPT.GO.SECURITY.ExecutionAfterRedirect      | ExecutionAfterRedirect: Execution After Redirect (EAR)  |
| Medium   | Avoid Host Name Checks          | OPT.GO.SECURITY.AvoidHostNameChecks         | AvoidHostNameChecks: Avoid checks on client-side hostname, that are not reliable due to DNS poisoning                                       |
| Medium   | Format String Injection         | OPT.GO.SECURITY.FormatStringInjection       | FormatStringInjection: Exclude unsanitized user input from format strings   |
| Medium   | Potential Blocker Stmt          | OPT.GO.SECURITY.PotentialBlockerStmt        | PotentialBlockerStmt: Review statements that could lead to a resource exhaustion.   |

| Severity | Contrast rule                               | Engine rule ID  | Description   |
|----------|---|---|---|
| Medium   | Potential Infinite Loop                     | OPT.GO.SECURITY.PotentialInfiniteLoop                   | PotentialInfiniteLoop: Loop with Unreachable Exit Condition ('Infinite Loop')                       |
| Medium   | Profiling Endpoint Exposed                  | OPT.GO.SECURITY.ProfilingEndpointExposed                | ProfilingEndpointExposed: Profiling endpoint automatically exposed                                  |
| Medium   | Unchecked Input In Loop Condition           | OPT.GO.SECURITY.UncheckedInputInLoopCondition           | UncheckedInputInLoopCondition: Unchecked input in loop condition                                    |
| Medium   | Hardcoded Username Password                 | OPT.GO.SECURITY.HardcodedUsernamePassword               | HardcodedUsernamePassword: Use of Hard-coded Credentials  |
| Medium   | JSON P Hijacking                            | OPT.GO.SECURITY.JSONPHijacking                          | JSONPHijacking: Sensitive information exposed through JSONP   |
| Medium   | Password In Configuration File              | OPT.GO.SECURITY.PasswordInConfigurationFile             | PasswordInConfigurationFile: Use of credentials into configuration file                             |
| Medium   | Plaintext Storage Of Password               | OPT.GO.SECURITY.PlaintextStorageOfPassword              | PlaintextStorageOfPassword: Plaintext Storage of a Password   |
| Medium   | Privacy Violation                           | OPT.GO.SECURITY.PrivacyViolation                        | PrivacyViolation: Exposure of Private Information ('Privacy Violation')                             |
| Medium   | Serializable Type Containing Sensitive Data | OPT.GO.SECURITY.SerializableTypeContainingSensitiveData | SerializableTypeContainingSensitiveData: Serializable Type Containing Sensitive Data                |
| Medium   | Insecure Randomness                         | OPT.GO.SECURITY.InsecureRandomness                      | InsecureRandomness: Standard pseudo-random number generators cannot withstand cryptographic attacks |

## HTML Scan rules

Contrast Scan supports these rules for HTML.

| Severity | Contrast rule                               | Engine rule ID  | Description   |
|----------|---|---|---|
| Critical | Sandbox Allow Scripts And Same Origin       | OPT.HTML.SandboxAllowScriptsAndSameOrigin             | SandboxAllowScriptsAndSameOrigin: Unsafe sandbox with allow-scripts and allow-same-origin |
| Critical | Avoid Long Scripts In Pages                 | OPT.HTML.FORMATO.AvoidLongScriptsInPages              | AvoidLongScriptsInPages: Avoid long js scripts  |
| Critical | All HTML pages must be in the / docs folder | OPT.HTML.OPTIMYTH_HTML.DOCS                           | DOCS: ALL html pages must be in the / docs folder   |
| Critical | Defer In Script Tag                         | OPT.HTML.OPTIMYTH_HTML.DeferInScriptTag               | DeferInScriptTag: Use of defer attribute in script tags                                   |
| Critical | Link To Js                                  | OPT.HTML.OPTIMYTH_HTML.LinkToJs                       | LinkToJs: Too many references to external JavaScript files                                |
| Critical | Script Tag Position                         | OPT.HTML.OPTIMYTH_HTML.ScriptTagPosition              | ScriptTagPosition: 'script' tag inside 'body' tag   |
| Critical | Separate Content And Presentation           | OPT.HTML.OPTIMYTH_HTML.SeparateContentAndPresentation | SeparateContentAndPresentation: Do not use JavaScript event handlers in html tags         |
| Critical | Pages should not exceed 100Kb               | OPT.HTML.OPTIMYTH_HTML.TAM                            | TAM: CAPTIONVALIGNb   |
| Critical | Missing Password Field Masking              | OPT.HTML.MissingPasswordFieldMasking                  | MissingPasswordFieldMasking: Password input field is not masked                           |
| Critical | Password In Http Get                        | OPT.HTML.PasswordInHttpGet                            | PasswordInHttpGet: Password in GET FORM   |

| Severity | Contrast rule                               | Engine rule ID                        | Description  |
|----------|---|---------------------------------------|--|
| High     | Path Relative Stylesheet Import             | OPT.HTML.PathRelativeStylesheetImport | PathRelativeStylesheetImport: Path-Relative Stylesheet Import.               |
| High     | Target Blank Vulnerability                  | OPT.HTML.TargetBlankVulnerability     | TargetBlankVulnerability: Improper Neutralization of links to external sites |
| Info     | Form Validation Off                         | OPT.HTML.FormValidationOff            | FormValidationOff: Form validation disabled                                  |
| Info     | SIZE attribute required in BASEFONT element | OPT.HTML.FORMATO.BFS                  | BFS: SIZE attribute required in BASEFONT element                             |
| Info     | ACTION attribute required                   | OPT.HTML.FORMULARIOS.ACTN             | ACTN: ACTION attribute required  |
| Info     | ALT attribute required                      | OPT.HTML.FORMULARIOS.ALT2             | ALT2: ALT attribute required   |
| Info     | Wrong TYPE attribute value                  | OPT.HTML.FORMULARIOS.BTPE             | BTPE: Wrong TYPE attribute value   |
| Info     | NAME attribute required                     | OPT.HTML.FORMULARIOS.NAME             | NAME: NAME attribute is required   |
| Info     | TEXTAREA COLS attribute is required         | OPT.HTML.FORMULARIOS.TACO             | TACO: The TEXTAREA COLS attribute is missed                                  |
| Info     | TEXTAREA ROWS attribute is required         | OPT.HTML.FORMULARIOS.TARO             | TARO: TEXTAREA element without ROWS attribute                                |
| Info     | VALUE attribute required                    | OPT.HTML.FORMULARIOS.VALU             | VALU: VALUE attribute not found  |
| Info     | HEIGHT and WIDTH attributes required        | OPT.HTML.GENERALES.HEWI               | HEWI: HEIGHT and WIDTH attributes required                                   |
| Info     | BLINK element found                         | OPT.HTML.GENERALES.NOBLINK            | NOBLINK: BLINK element found   |
| Info     | MARQUEE element found                       | OPT.HTML.GENERALES.NOMARQUEE          | NOMARQUEE: MARQUEE element found   |
| Info     | SRC attribute not found                     | OPT.HTML.GENERALES.SRCC               | SRCC: SRC attribute not found  |
| Info     | Incorrect TYPE attribute in OL element      | OPT.HTML.LISTAS.TYPEOL                | TYPEOL: Incorrect TYPE attribute in ol element                               |
| Info     | Incorrect TYPE attribute in UL element      | OPT.HTML.LISTAS.TYPEUL                | TYPEUL: Incorrect TYPE attribute in ul element                               |
| Info     | FRAMEBORDER incorrect                       | OPT.HTML.MARCOS.FRAMEBORDER           | FRAMEBORDER: Incorrect FRAMEBORDER   |
| Info     | FRAMESET ROWS or COLS attribute missing     | OPT.HTML.MARCOS.FRCR                  | FRCR: FRAMESET attributes missed   |
| Info     | SCROLLING attribute incorrect               | OPT.HTML.MARCOS.SCROLLING             | SCROLLING: SCROLLING attribute has an incorrect value                        |
| Info     | No header comment found                     | OPT.HTML.OPTIMYTH_HTML.CBCR           | CBCR: Use a header comment for every page                                    |
| Info     | Incorrect VALIGN attribute                  | OPT.HTML.TABLAS.CAPTIONVALIGN         | CAPTIONVALIGN: incorrect VALIGN attribute                                    |
| Info     | Incorrect CLEAR attribute                   | OPT.HTML.TEXTO.BRCLEAR                | BRCLEAR: Incorrect CLEAR attribute   |
| Info     | ALT attribute required                      | OPT.HTML.VARIOUS.ALT1                 | ALT1: ALT attribute required   |
| Info     | ALT attribute required                      | OPT.HTML.VARIOUS.ALT3                 | ALT3: ALT attribute required   |
| Info     | Area Shape                                  | OPT.HTML.VARIOUS.AreaShape            | AreaShape: incorrect SHAPE attribute   |

| Severity | Contrast rule                             | Engine rule ID                                 | Description  |
|----------|---|--|--|
| Info     | AREA coordinates not defined              | OPT.HTML.VARIOUS.CAREA                         | CAREA: AREA coordinates non defined  |
| Info     | PARAM VALUE attribute required E T Y P E  | OPT.HTML.VARIOUS.PARAMVALUETYPE                | PARAMVALUETYPE: Wrong or not specified VALUETYPE   |
| Info     | Incomplete A element                      | OPT.HTML.VINCULOS.AINCOMPLETO                  | AINCOMPLETO: Incomplete A element  |
| Info     | LINK without title attribute              | OPT.HTML.VINCULOS.TLINK                        | TLINK: Link without 'title' attribute.   |
| Low      | Form Without Captcha                      | OPT.HTML.FormWithoutCaptcha                    | FormWithoutCaptcha: Form without CAPTCHA   |
| Low      | Add Label For Input Field                 | OPT.HTML.AddLabelForInputField                 | AddLabelForInputField: Add a label element for every input element                           |
| Low      | File Upload Enabled                       | OPT.HTML.FileUploadEnabled                     | FileUploadEnabled: File upload enabled   |
| Low      | Nested Divs                               | OPT.HTML.NestedDivs                            | NestedDivs: Avoid using too many nested div elements   |
| Low      | Use descriptive comments                  | OPT.HTML.OPTIMYTH_HTML.CMNT                    | CMNT: Use descriptive comments in the pages  |
| Low      | No Javascript                             | OPT.HTML.OPTIMYTH_HTML.NoJavascript            | NoJavascript: Javascript code within html file   |
| Medium   | Specify Integrity Attribute               | OPT.HTML.SpecifyIntegrityAttribute             | SpecifyIntegrityAttribute: Specify a integrity attribute on the <script> and <link> elements |
| Medium   | Avoid Inline Styles                       | OPT.HTML.AvoidInlineStyles                     | AvoidInlineStyles: Avoid inline styles declaration   |
| Medium   | Avoid Size Attribute On Input Fields      | OPT.HTML.AvoidSizeAttributeOnInputFields       | AvoidSizeAttributeOnInputFields: Avoid size attribute on input fields                        |
| Medium   | Embed Youtube Videos Using Iframe         | OPT.HTML.EmbedYoutubeVideosUsingIframe         | EmbedYoutubeVideosUsingIframe: Embed Youtube videos into an iFrame                           |
| Medium   | Obsolete Attributes                       | OPT.HTML.ObsoleteAttributes                    | ObsoleteAttributes: Avoid using HTML 5 obsolete attributes                                   |
| Medium   | Obsolete Elements                         | OPT.HTML.ObsoleteElements                      | ObsoleteElements: Avoid using HTML 5 obsolete elements                                       |
| Medium   | Use external CSS files                    | OPT.HTML.OPTIMYTH_HTML.EUCSS                   | EUCSS: Limited use of CSS stylesheets in HTML pages  |
| Medium   | Noscript Tag                              | OPT.HTML.OPTIMYTH_HTML.NoscriptTag             | NoscriptTag: Use of noscript tag   |
| Medium   | Provide Fallbacks For Multimedia Elements | OPT.HTML.ProvideFallbacksForMultimediaElements | ProvideFallbacksForMultimediaElements: Provide fallback for multimedia elements              |
| Medium   | Scripts At The Bottom                     | OPT.HTML.ScriptsAtTheBottom                    | ScriptsAtTheBottom: Put scripts at the bottom of the html body                               |
| Medium   | Specify Character Encoding                | OPT.HTML.SpecifyCharacterEncoding              | SpecifyCharacterEncoding: Indicate the character encoding used                               |
| Medium   | Specify Lang Attribute                    | OPT.HTML.SpecifyLangAttribute                  | SpecifyLangAttribute: Specify a lang attribute on the root <html> element                    |
| Medium   | Stylesheets At The Top                    | OPT.HTML.StylesheetsAtTheTop                   | StylesheetsAtTheTop: Avoid importing styles in the html body                                 |
| Medium   | Use Doc Type                              | OPT.HTML.UseDocType                            | UseDocType: Always include a doctype declaration   |
| Medium   | Use Link For C S S Resources              | OPT.HTML.UseLinkForCSSResources                | UseLinkForCSSResources: Avoid using @import for CSS resources                                |
| Medium   | Use S E O Relevant Meta Tags              | OPT.HTML.UseSEORElevantMetaTags                | UseSEORElevantMetaTags: Use relevant html meta tags for search engines                       |

| Severity | Contrast rule                        | Engine rule ID                                  | Description  |
|----------|--------------------------------------|---|--|
| Medium   | Should Use Content Security Policy   | OPT.HTML.CORDOVA.ShouldUseContentSecurityPolicy | ShouldUseContentSecurityPolicy: Add a CSP to every page                          |
| Medium   | Autocomplete On For Sensitive Fields | OPT.HTML.AutocompleteOnForSensitiveFields       | AutocompleteOnForSensitiveFields: Autocomplete enabled for sensitive form fields |

## Informix Scan rules

Contrast Scan supports these rules for Informix.

| Severity | Contrast rule                          | Engine rule ID                                 | Description   |
|----------|--|--|---|
| Critical | Avoid Correlated Sub Selects           | OPT.INFORMIX.AvoidCorrelatedSubSelects         | AvoidCorrelatedSubSelects: Avoid nested SELECTs that use columns defined in outer SELECTs   |
| Critical | Cursor For Update Where Current        | OPT.INFORMIX.CursorForUpdateWhereCurrent       | CursorForUpdateWhereCurrent: If a CURSOR is declared FOR UPDATE, DELETE and UPDATE must be used with the WHERE CURRENT specification  |
| Critical | Detect Unaware Cross Joins             | OPT.INFORMIX.DetectUnawareCrossJoins           | DetectUnawareCrossJoins: Do not make "unnoticed" cartesian products in queries  |
| Critical | Dont Select Known Fields               | OPT.INFORMIX.DontSelectKnownFields             | DontSelectKnownFields: SELECT queries never should get fields used in the WHERE specification with {}   |
| Critical | Fetch And Declare Same Fields          | OPT.INFORMIX.FetchAndDeclareSameFields         | FetchAndDeclareSameFields: The number of fields to retrieve specified in the DECLARE CURSOR statement must be the same as the number of fields specified in the FETCH statement |
| High     | Avoid Declared Unopened Cursors        | OPT.INFORMIX.AvoidDeclaredUnopenedCursors      | AvoidDeclaredUnopenedCursors: If a CURSOR is declared, it must be opened  |
| High     | Avoid Numeric References In By Clauses | OPT.INFORMIX.AvoidNumericReferencesInByClauses | AvoidNumericReferencesInByClauses: Do not refer to column names with number indexes in * BY clauses   |
| High     | Avoid Opened Unclosed Cursors          | OPT.INFORMIX.AvoidOpenedUnclosedCursors        | AvoidOpenedUnclosedCursors: If a CURSOR is opened, it must be closed  |
| High     | Avoid Opened Unused Cursors            | OPT.INFORMIX.AvoidOpenedUnusedCursors          | AvoidOpenedUnusedCursors: If a CURSOR is opened, it must be used  |
| High     | Avoid Union                            | OPT.INFORMIX.AvoidUnion                        | AvoidUnion: Avoid selects with UNION  |
| High     | No Current Clause                      | OPT.INFORMIX.NoCurrentClause                   | NoCurrentClause: SQL queries with CURRENT clause are heavy-weighted and must be used only when necessary  |
| High     | Unused Local Var                       | OPT.INFORMIX.UnusedLocalVar                    | UnusedLocalVar: Avoid unused local variables  |
| High     | Unused Parameter                       | OPT.INFORMIX.UnusedParameter                   | UnusedParameter: Avoid unused function or procedure parameter   |

| Severity | Contrast rule                             | Engine rule ID                                     | Description  |
|----------|---|--|--|
| High     | Use The As Keyword                        | OPT.INFORMIX.UseTheAsKeyword                       | UseTheAsKeyword: Use AS keyword when establishing an alias to tables   |
| Info     | Avoid Concat Operator                     | OPT.INFORMIX.AvoidConcatOperator                   | AvoidConcatOperator: Do not use concatenation operator   |
| Info     | Avoid Non Declared Cursor                 | OPT.INFORMIX.AvoidNonDeclaredCursor                | AvoidNonDeclaredCursor: Use of cursor not previously declared  |
| Low      | Avoid Goto Statement                      | OPT.INFORMIX.AvoidGotoStatement                    | AvoidGotoStatement: Avoid using GOTO statement   |
| Low      | Avoid Host Operations                     | OPT.INFORMIX.AvoidHostOperations                   | AvoidHostOperations: Do not perform arithmetic operations in the WHERE clause  |
| Low      | Avoid Insert Without Fields Specification | OPT.INFORMIX.AvoidInsertWithoutFieldsSpecification | AvoidInsertWithoutFieldsSpecification: Every INSERT statement must include the field specification (i.e : INSERT INTO table(column1,column2) VALUES (value1,value2)) |
| Low      | Avoid Scroll Cursors                      | OPT.INFORMIX.AvoidScrollCursors                    | AvoidScrollCursors: Avoid scroll cursors when possible   |
| Low      | Avoid Update Asterisk                     | OPT.INFORMIX.AvoidUpdateAsterisk                   | AvoidUpdateAsterisk: Avoid UPDATE with asterisk target   |
| Low      | Avoid Whenever                            | OPT.INFORMIX.AvoidWhenever                         | AvoidWhenever: Do not use WHENEVER clause  |
| Low      | Check Simple Condition                    | OPT.INFORMIX.CheckSimpleCondition                  | CheckSimpleCondition: Simplify WHERE clause conditions   |
| Low      | Dead Code                                 | OPT.INFORMIX.DeadCode                              | DeadCode: Check and remove unreachable code  |
| Low      | Do Not Use Negation In Where              | OPT.INFORMIX.DoNotUseNegationInWhere               | DoNotUseNegationInWhere: Do not use negation operator  |
| Low      | Else In Case Statement                    | OPT.INFORMIX.ElseInCaseStatement                   | ElseInCaseStatement: Include an ELSE clause in CASE statements   |
| Low      | Insert Cursor In Loop                     | OPT.INFORMIX.InsertCursorInLoop                    | InsertCursorInLoop: Use INSERT cursors within loops  |
| Low      | Nested If Statements                      | OPT.INFORMIX.NestedIfStatements                    | NestedIfStatements: Avoid too deep IF statements nesting   |
| Low      | One SQL Statement Per Line                | OPT.INFORMIX.OneSQLStatementPerLine                | OneSQLStatementPerLine: Only write a SQL statement per line  |
| Low      | Too Many Cases In Case                    | OPT.INFORMIX.TooManyCasesInCase                    | TooManyCasesInCase: Avoid a high number of WHEN clauses in a CASE statement  |
| Low      | Too Many Lines In Function                | OPT.INFORMIX.TooManyLinesInFunction                | TooManyLinesInFunction: Avoid functions or procedures with too many lines  |
| Low      | Use Let Instead Of Initialize             | OPT.INFORMIX.UseLetInsteadOfInitialize             | UseLetInsteadOfInitialize: Use LET instead of INITIALIZE   |
| Medium   | Avoid Natural Joins                       | OPT.INFORMIX.AvoidNaturalJoins                     | AvoidNaturalJoins: NATURAL JOINS are buggy and unmaintenable   |
| Medium   | Avoid Nested Selects                      | OPT.INFORMIX.AvoidNestedSelects                    | AvoidNestedSelects: Avoid nested selects   |
| Medium   | Avoid Queries On Many Tables              | OPT.INFORMIX.AvoidQueriesOnManyTables              | AvoidQueriesOnManyTables: Avoid JOIN queries referencing too many tables   |
| Medium   | Avoid Select Asterisk                     | OPT.INFORMIX.AvoidSelectAsterisk                   | AvoidSelectAsterisk: Do not use SELECT *   |

| Severity | Contrast rule                    | Engine rule ID                            | Description  |
|----------|----------------------------------|---|--|
| Medium   | Avoid Too Many Joins             | OPT.INFORMIX.AvoidTooManyJoins            | AvoidTooManyJoins: Avoid queries with too many JOINS                             |
| Medium   | Fully Qualified Names In Columns | OPT.INFORMIX.FullyQualifiedNamesInColumns | FullyQualifiedNamesInColumns: Use qualified names when referring to column names |

## Java Scan rules

Contrast Scan supports these rules for Java.

| Severity | Contrast rule                            | Engine rule ID   | Description  |
|----------|--|--|--|
| Critical | Use Authenticated SOAP Messages          | OPT.JAVA.JAX.UseAuthenticatedSOAPMessages              | UseAuthenticatedSOAPMessages: Use SOAP messages authentication   |
| Critical | Use Encrypted SOAP Messages              | OPT.JAVA.JAX.UseEncryptedSOAPMessages                  | UseEncryptedSOAPMessages: Use encrypted SOAP messages  |
| Critical | Use Signed SOAP Messages                 | OPT.JAVA.JAX.UseSignedSOAPMessages                     | UseSignedSOAPMessages: Use signed SOAP messages  |
| Critical | Acegi Insecure Channel Mixing Rule       | OPT.JAVA.SEC_JAVA.AcegiInsecureChannelMixingRule       | AcegiInsecureChannelMixingRule: Acegi Misconfiguration - Insecure Channel Mixing                                 |
| Critical | Insecure SSL                             | OPT.JAVA.SEC_JAVA.InsecureSSL                          | InsecureSSL: Insecure SSL configuration  |
| Critical | Too Much Origins Allowed Rule            | OPT.JAVA.SEC_JAVA.TooMuchOriginsAllowedRule            | TooMuchOriginsAllowedRule: CORS policy (Cross-origin resource sharing) too broad                                 |
| Critical | Android SQL Injection                    | OPT.JAVA.ANDROID.AndroidSQLInjection                   | AndroidSQLInjection: Avoid SQL code formed with non neutralized user input                                       |
| Critical | Content Provider Uri Injection           | OPT.JAVA.ANDROID.ContentProviderUriInjection           | ContentProviderUriInjection: Content Provider URI Injection  |
| Critical | Dynamically Loading Code                 | OPT.JAVA.ANDROID.DynamicallyLoadingCode                | DynamicallyLoadingCode: Discourage dynamically loading code  |
| Critical | Intent Manipulation                      | OPT.JAVA.ANDROID.IntentManipulation                    | IntentManipulation: Intent Manipulation  |
| Critical | Javascript Enabled                       | OPT.JAVA.ANDROID.JavascriptEnabled                     | JavascriptEnabled: Enabling JavaScript is not recommended  |
| Critical | Javascript Interface Annotation          | OPT.JAVA.ANDROID.JavascriptInterfaceAnnotation         | JavascriptInterfaceAnnotation: Potential code injection via WebView.addJavaScriptInterface()                     |
| Critical | Code Injection Rule                      | OPT.JAVA.SEC_JAVA.CodeInjectionRule                    | CodeInjectionRule: Dynamic code injection in scripting API   |
| Critical | Code Injection With Deserialization Rule | OPT.JAVA.SEC_JAVA.CodeInjectionWithDeserializationRule | CodeInjectionWithDeserializationRule: Dynamic code injection during XML / JSON deserialization                   |
| Critical | Command Injection Rule                   | OPT.JAVA.SEC_JAVA.CommandInjectionRule                 | CommandInjectionRule: Improper Neutralization of Special Elements used in an OS Command ('OS Command Injection') |
| Critical | Connection String Parameter Pollution    | OPT.JAVA.SEC_JAVA.ConnectionStringParameterPollution   | ConnectionStringParameterPollution: Connection string polluted with untrusted input                              |

| Severity | Contrast rule                                   | Engine rule ID                                   | Description  |
|----------|---|--|--|
| Critical | Never Use Identifier In Equals Hashcode         | OPT.HIBERNATE.NeverUseIdentifierInEqualsHashCode | NeverUseIdentifierInEqualsHashCode: Never ever use the database identifier in equals() and hashCode()                  |
| Critical | Rollback Transaction On Exception               | OPT.HIBERNATE.RollbackTransactionOnException     | RollbackTransactionOnException: Rollback transactions if an exception occurs   |
| Critical | Static Inner Persistent Classes                 | OPT.HIBERNATE.StaticInnerPersistentClasses       | StaticInnerPersistentClasses: If an inner class is persistent, it should be static                                     |
| Critical | Access to persistence layer from Struts Actions | OPT.JAVA.ACTIONS.ALPA                            | ALPA: Access to persistence layer from Struts Actions  |
| Critical | N A E A   | OPT.JAVA.ACTIONS.NAEA                            | NAEA: Do not use non final instance fields in Actions  |
| Critical | Activity Start At Broadcast Intent              | OPT.JAVA.ANDROID.ActivityStartAtBroadcastIntent  | ActivityStartAtBroadcastIntent: Activity Start in response to broadcast Intent   |
| Critical | Cross Site Scripting Rule                       | OPT.JAVA.SEC_JAVA.CrossSiteScriptingRule         | CrossSiteScriptingRule: Improper Neutralization of Input During Web Page Generation ('Cross-site Scripting')           |
| Critical | Http Splitting Rule                             | OPT.JAVA.SEC_JAVA.HttpSplittingRule              | HttpSplittingRule: Improper Neutralization of CRLF Sequences in HTTP Headers ('HTTP Response Splitting')               |
| Critical | I Batis SQL Injection Rule                      | OPT.JAVA.SEC_JAVA.iBatisSqlInjectionRule         | iBatisSqlInjectionRule: Improper Neutralization of Special Elements used in an SQL Command in iBatis ('SQL Injection') |
| Critical | Ldap Injection Rule                             | OPT.JAVA.SEC_JAVA.LdapInjectionRule              | LdapInjectionRule: Avoid non-neutralized user-controlled input in LDAP search filters                                  |
| Critical | Mail Command Injection                          | OPT.JAVA.SEC_JAVA.MailCommandInjection           | MailCommandInjection: Mail Command Injection   |
| Critical | No SQL Injection                                | OPT.JAVA.SEC_JAVA.NoSQLInjection                 | NoSQLInjection: Improper neutralization of special elements in data query logic (NoSQL injection)                      |
| Critical | Process Control Rule                            | OPT.JAVA.SEC_JAVA.ProcessControlRule             | ProcessControlRule: Library loaded from untrusted source   |
| Critical | Regex Injection Rule                            | OPT.JAVA.SEC_JAVA.RegexInjectionRule             | RegexInjectionRule: Prevent denial of service attack through malicious regular expression ('Regex Injection')          |
| Critical | Privilege Escalation Attack                     | OPT.JAVA.ANDROID.PrivilegeEscalationAttack       | PrivilegeEscalationAttack: Don't allow applications to execute code using other applications privileges                |
| Critical | Same Origin Method Execution                    | OPT.JAVA.SEC_JAVA.SameOriginMethodExecution      | SameOriginMethodExecution: Same Origin Method Execution (SOME)   |
| Critical | Server Side Request Forgery Rule                | OPT.JAVA.SEC_JAVA.ServerSideRequestForgeryRule   | ServerSideRequestForgeryRule: Server-Side Request Forgery (SSRF)   |
| Critical | Spring View Manipulation                        | OPT.JAVA.SEC_JAVA.SpringViewManipulation         | SpringViewManipulation: Spring View Manipulation   |
| Critical | S Q L Resources                                 | OPT.JAVA.ANDROID.SQLResources                    | SQLResources: Close SQL resources when finishing using   |
| Critical | SQL Injection Rule                              | OPT.JAVA.SEC_JAVA.SqlInjectionRule               | SqlInjectionRule: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection')                 |
| Critical | B L N C   | OPT.JAVA.BEANS.BLNC                              | BLNC: Use appropriate signatures for all listener methods in JavaBeans   |
| Critical | Avoid Assign In For                             | OPT.JAVA.BUC.AvoidAssignInFor                    | AvoidAssignInFor: Avoid assigning values to variables inside for loops   |
| Critical | Avoid Reuse Var                                 | OPT.JAVA.BUC.AvoidReuseVar                       | AvoidReuseVar: Avoid reusing the control variables in nested loops   |



| Severity | Contrast rule                       | Engine rule ID                                | Description  |
|----------|-------------------------------------|---|--|
| Critical | Float Double Comparison             | OPT.JAVA.COMP.FloatDoubleComparison           | FloatDoubleComparison: Avoid using Code Quality[{'CERT-J': ['NUM07-J']}]   |
| Critical | Avoid Call AWT From Servlet         | OPT.JAVA.COMPDAT.AvoidCallAWTFromServlet      | AvoidCallAWTFromServlet: Avoid calling Java.awt.* from servlet code  |
| Critical | Avoid Call Swing From Servlet       | OPT.JAVA.COMPDAT.AvoidCallSwingFromServlet    | AvoidCallSwingFromServlet: Avoid calling Javax.swing.* from any servlet  |
| Critical | Avoid Return In Constructors        | OPT.JAVA.CONST.AvoidReturnInConstructors      | AvoidReturnInConstructors: Avoid constructors with return types  |
| Critical | Avoid Declare Matrix Volatile       | OPT.JAVA.DECL.AvoidDeclareMatrixVolatile      | AvoidDeclareMatrixVolatile: Do not declare an array field as volatile  |
| Critical | Avoid Inaccessible Class            | OPT.JAVA.DECL.AvoidInaccessibleClass          | AvoidInaccessibleClass: Avoid inaccessible classes   |
| Critical | Avoid Break Continue In Labels      | OPT.JAVA.ESTRUC.AvoidBreakContinueInLabels    | AvoidBreakContinueInLabels: Avoid using continue and break with labels   |
| Critical | Avoid Call Sound From Servlet       | OPT.JAVA.EXAC.AvoidCallSoundFromServlet       | AvoidCallSoundFromServlet: Avoid calling Javax.sound.* from any servlet code   |
| Critical | Avoid Throw Null Pointer Exceptions | OPT.JAVA.EXCP.AvoidThrowNullPointerExceptions | AvoidThrowNullPointerExceptions: Avoid launching NullPointerExceptions   |
| Critical | Avoid Remove Action Listener        | OPT.JAVA.FIN.AvoidRemoveActionListener        | AvoidRemoveActionListener: Avoid removing listeners in finalize() methods  |
| Critical | A B C L                             | OPT.JAVA.FMETODOS.ABCL                        | ABCL: Avoid usage of break/continue sentences with a label   |
| Critical | A GC                                | OPT.JAVA.GC.AGC                               | AGC: Do not call to GC with System.gc()  |
| Critical | I F F                               | OPT.JAVA.GC.IFF                               | IFF: Call super.finalize() in the finally block of finalize() methods  |
| Critical | Avoid Await Outside Brackets        | OPT.JAVA.HEB.AvoidAwaitOutsideBrackets        | AvoidAwaitOutsideBrackets: Avoid using the method await() of the class java.util.concurrent.locks.Condition class outside a while loop |
| Critical | Avoid Call Wait                     | OPT.JAVA.HEB.AvoidCallWait                    | AvoidCallWait: Avoid calling wait() on an object java.util.concurrent.locks.Condition  |
| Critical | Avoid Runnable Without Run          | OPT.JAVA.HEB.AvoidRunnableWithoutRun          | AvoidRunnableWithoutRun: Avoid implementing Runnable without a run() method  |
| Critical | Run With Synchronize                | OPT.JAVA.HEB.RunWithSynchronize               | RunWithSynchronize: Always use 'synchronized' with the run() methods   |
| Critical | Avoid Load Library                  | OPT.JAVA.J2EE.AvoidLoadLibrary                | AvoidLoadLibrary: Avoid calling java.lang.System.loadLibrary() or java.lang.Runtime.loadLibrary()                                      |
| Critical | Avoid Set Security Manager          | OPT.JAVA.J2EE.AvoidSetSecurityManager         | AvoidSetSecurityManager: Avoid calling java.lang.System.setSecurityManager()   |
| Critical | Avoid Protected Native Methods      | OPT.JAVA.J2SE.AvoidProtectedNativeMethods     | AvoidProtectedNativeMethods: Avoid protected native methods  |
| Critical | Avoid Public Native Methods         | OPT.JAVA.J2SE.AvoidPublicNativeMethods        | AvoidPublicNativeMethods: Avoid public native methods  |
| Critical | Avoid Invalid Exception Handling    | OPT.JAVA.JAX.AvoidInvalidExceptionHandling    | AvoidInvalidExceptionHandling: Perform a exception handling conforming to JAX-WS specifications  |

| Severity | Contrast rule                                      | Engine rule ID  | Description  |
|----------|--|---|--|
| Critical | Avoid Web Method Annotation In Endpoint Interfaces | OPT.JAVA.JAX.AvoidWebMethodAnnotationInEndpointInterfaces | AvoidWebMethodAnnotationInEndpointInterfaces: Avoid using @WebMethod annotation in endpoint interfaces methods       |
| Critical | Xml Entity Injection Rule                          | OPT.JAVA.SEC_JAVA.XmlEntityInjectionRule                  | XmlEntityInjectionRule: XML entity injection   |
| Critical | Avoid Data Submission To Non Editable Field        | OPT.JAVA.SPRING.AvoidDataSubmissionToNonEditableField     | AvoidDataSubmissionToNonEditableField: Avoid data submissions to non editable fields                                 |
| Critical | D S L V  | OPT.JAVA.JDBC.DSLV  | DSLVS: Do not create Datasource variables in local methods   |
| Critical | S E T P S  | OPT.JAVA.JDBC.SETPS                                       | SETPS: PreparedStatement parameter values must be defined before executing the query                                 |
| Critical | Set Up J Unit                                      | OPT.JAVA.JUNIT_JAVA.SetUpJUnit                            | SetUpJUnit: Always overwrite the method setUp() in each test case of JUnits  |
| Critical | Avoid Call Thread From Servlet                     | OPT.JAVA.MAN.AvoidCallThreadFromServlet                   | AvoidCallThreadFromServlet: Avoid calling java.lang.Thread from any servlet  |
| Critical | Avoid Call Finalize                                | OPT.JAVA.MEM.AvoidCallFinalize                            | AvoidCallFinalize: Avoid calling finalize() except in the finally block of the method finalize()                     |
| Critical | Avoid Garbage Collector                            | OPT.JAVA.MEM.AvoidGarbageCollector                        | AvoidGarbageCollector: Avoid invoking the garbage collector  |
| Critical | Avoid Publicfinalize                               | OPT.JAVA.MEM.AvoidPublicfinalize                          | AvoidPublicfinalize: Do not declare finalize() public  |
| Critical | A S I  | OPT.JAVA.PB.ASI   | ASI: Possible confusion between assignment and comparison in a conditional expression                                |
| Critical | M A I L  | OPT.JAVA.PB.MAIL  | MAIL: Avoid usages of javax.mail.*   |
| Critical | N A M I N G  | OPT.JAVA.PB.NAMING  | NAMING: Avoid naming non-constructor methods with the same name as its class   |
| Critical | T L S  | OPT.JAVA.PB.TLS   | TLS: Avoid using text tags in statements   |
| Critical | Avoid Call Applet From Servlet                     | OPT.JAVA.RECBAS.AvoidCallAppletFromServlet                | AvoidCallAppletFromServlet: Avoid calling java.applet.* from the finalize() method of a servlet                      |
| Critical | Avoid Call Class Loader From Servlet               | OPT.JAVA.RECBAS.AvoidCallClassLoaderFromServlet           | AvoidCallClassLoaderFromServlet: Avoid calling java.lang.ClassLoader from finalize() method of a servlet             |
| Critical | Avoid Call Context From Servlet                    | OPT.JAVA.RECBAS.AvoidCallContextFromServlet               | AvoidCallContextFromServlet: Avoid calling javax.naming.Context from the finalize() method of a servlet              |
| Critical | Avoid Call Driver From Servlet                     | OPT.JAVA.RECBAS.AvoidCallDriverFromServlet                | AvoidCallDriverFromServlet: Avoid calling java.sql.Driver from the finalize() method of a servlet                    |
| Critical | Avoid Call I O From Servlet                        | OPT.JAVA.RECBAS.AvoidCallIOFromServlet                    | AvoidCallIOFromServlet: Avoid calling java.io.* from the finalize() method of a servlet                              |
| Critical | Avoid Call Lang Ref From Servlet                   | OPT.JAVA.RECBAS.AvoidCallLangRefFromServlet               | AvoidCallLangRefFromServlet: Avoid calling java.lang.ref.* from finalize() method of a servlet                       |
| Critical | Avoid Call Port Rem Obj From Servlet               | OPT.JAVA.RECBAS.AvoidCallPortRemObjFromServlet            | AvoidCallPortRemObjFromServlet: Avoid calling javax.rmi.PortableRemoteObject from the finalize() method of a servlet |
| Critical | Avoid Call Runnable From Servlet                   | OPT.JAVA.RECBAS.AvoidCallRunnableFromServlet              | AvoidCallRunnableFromServlet: Avoid calling java.lang.Runnable from the finalize() method of a servlet               |
| Critical | Avoid Call Security From Servlet                   | OPT.JAVA.RECBAS.AvoidCallSecurityFromServlet              | AvoidCallSecurityFromServlet: Avoid calling java.security.* from finalize() method of a servlet                      |
| Critical | Avoid Call Transaction From Servlet                | OPT.JAVA.RECBAS.AvoidCallTransactionFromServlet           | AvoidCallTransactionFromServlet: Avoid calling javax.transaction.* from the finalize() method of a servlet           |

| Severity | Contrast rule                                | Engine rule ID  | Description   |
|----------|--|---|---|
| Critical | Avoid Get Declared Method                    | OPT.JAVA.REFL.AvoidGetDeclaredMethod                      | AvoidGetDeclaredMethod: Avoid calling java.lang.Class.getDeclaredMethod()                           |
| Critical | Avoid Get Field                              | OPT.JAVA.REFL.AvoidGetField                               | AvoidGetField: Avoid calling java.lang.Class.getField()   |
| Critical | Avoid Get Method                             | OPT.JAVA.REFL.AvoidGetMethod                              | AvoidGetMethod: Avoid calling the method getMethod() from java.lang.Class                           |
| Critical | Avoid Call Compiler From Servlet             | OPT.JAVA.RENDESC.AvoidCallCompilerFromServlet             | AvoidCallCompilerFromServlet: Avoid calling java.lang.Compiler from any servlet                     |
| Critical | Avoid Call Reflect From Servlet              | OPT.JAVA.RENDESC.AvoidCallReflectFromServlet              | AvoidCallReflectFromServlet: Avoid calling Java.lang.reflect.* from any servlet                     |
| Critical | Avoid Call Runtime From Servlet              | OPT.JAVA.RENDESC.AvoidCallRuntimeFromServlet              | AvoidCallRuntimeFromServlet: Avoid calling java.lang.Runtime from any servlet                       |
| Critical | Avoid Call Thread Group From Servlet         | OPT.JAVA.RENDESC.AvoidCallThreadGroupFromServlet          | AvoidCallThreadGroupFromServlet: Avoid calling java.lang.ThreadGroup from any servlet               |
| Critical | Avoid Call Zip From Servlet                  | OPT.JAVA.RENDESC.AvoidCallZipFromServlet                  | AvoidCallZipFromServlet: Avoid calling Java.util.zip.* from any servlet                             |
| Critical | E A O F                                      | OPT.JAVA.RGME.EAOF  | EAOF: Do not access a class field too many times  |
| Critical | Dont Use Keywords                            | OPT.JAVA.RGP.DontUseKeywords                              | DontUseKeywords: Do not use keywords in later versions of the language                              |
| Critical | E N V  | OPT.JAVA.RGP.ENV  | ENV: Avoid using System.getenv()  |
| Critical | E R A  | OPT.JAVA.RGP.ERA  | ERA: Avoid absolute paths   |
| Critical | E X E C                                      | OPT.JAVA.RGP.EXEC   | EXEC: Avoid using Runtime.exec()  |
| Critical | N A T V                                      | OPT.JAVA.RGP.NATV   | NATV: Avoid user-defined native methods   |
| Critical | P E E R                                      | OPT.JAVA.RGP.PEER   | PEER: Avoid using java.awt.peer.* interfaces  |
| Critical | Accessibility Subversion Rule                | OPT.JAVA.SEC_JAVA.AccessibilitySubversionRule             | AccessibilitySubversionRule: Java access restriction subverted (Reflection)                         |
| Critical | Acegi Run As Authentication Replacement Rule | OPT.JAVA.SEC_JAVA.AcegiRunAsAuthenticationReplacementRule | AcegiRunAsAuthenticationReplacementRule: Acegi Misconfiguration - Run-As Authentication Replacement |
| Critical | Anonymous Ldap Bind Rule                     | OPT.JAVA.SEC_JAVA.AnonymousLdapBindRule                   | AnonymousLdapBindRule: Access Control - Anonymous LDAP Bind   |
| Critical | Path Traversal Rule                          | OPT.JAVA.SEC_JAVA.PathTraversalRule                       | PathTraversalRule: Avoid non-neutralized user-controlled input composed in a pathname to a resource |
| Critical | Spring Unrestricted Request Mapping          | OPT.JAVA.SEC_JAVA.SpringUnrestrictedRequestMapping        | SpringUnrestrictedRequestMapping: Spring CSRF unrestricted RequestMapping.                          |
| Critical | Static Database Connection                   | OPT.JAVA.SEC_JAVA.StaticDatabaseConnection                | StaticDatabaseConnection: Static database connection / session                                      |
| Critical | Avoid Add Container Himself                  | OPT.JAVA.SENT.AvoidAddContainerHimself                    | AvoidAddContainerHimself: Avoid adding a container itself   |
| Critical | Avoid Incorrect Increase                     | OPT.JAVA.SENT.AvoidIncorrectIncrease                      | AvoidIncorrectIncrease: Avoid assigning a post increment to itself                                  |
| Critical | Avoid Invoke Exit                            | OPT.JAVA.SENT.AvoidInvokeExit                             | AvoidInvokeExit: Do not call System.exit()  |
| Critical | Avoid Invoke Run Finalizers On Exit          | OPT.JAVA.SENT.AvoidInvokeRunFinalizersOnExit              | AvoidInvokeRunFinalizersOnExit: Avoid calling java.lang.System.runFinalizersOnExit()                |

| Severity | Contrast rule                          | Engine rule ID                                      | Description  |
|----------|--|---|--|
| Critical | Not Use Label Sentences                | OPT.JAVA.SENT.NotUseLabelSentences                  | NotUseLabelSentences: Do not use labels  |
| Critical | Declare Constructor For Externalizable | OPT.JAVA.SERI.DeclareConstructorForExternalizable   | DeclareConstructorForExternalizable: Always declare a constructor for a class that implements java.io.Externalizable |
| Critical | Read Resolve Return Object             | OPT.JAVA.SERI.ReadResolveReturnObject               | ReadResolveReturnObject: Always have a return type of java.lang.Object() in the methods readResolve()                |
| Critical | S B L                                  | OPT.JAVA.STR.SBL                                    | SBL: Remove toString method when using StringBuffer/StringBuilder to obtain string size                              |
| Critical | Avoid Sun Star                         | OPT.JAVA.SUN.AvoidSunStar                           | AvoidSunStar: Avoid using sun.*  |
| Critical | Avoid Label Switch Sentences           | OPT.JAVA.SWITCH.AvoidLabelSwitchSentences           | AvoidLabelSwitchSentences: Avoid using text labels in switch commands  |
| Critical | A U T Y                                | OPT.JAVA.TRS.AUTY                                   | AUTY: Avoid using Thread.yield   |
| Critical | C S F S                                | OPT.JAVA.TRS.CSFS                                   | CSFS: Do not cause deadlocks by calling synchronized method from another synchronized method                         |
| Critical | N S Y N                                | OPT.JAVA.TRS.NSYN                                   | NSYN: Avoid calling wait, notify or notifyAll out of a synchronized context  |
| Critical | T H R D                                | OPT.JAVA.TRS.THRD                                   | THRD: Avoid calling Thread.resume(), Thread.stop(), Thread.suspend(), or Runtime.runFinalizersOnExit()               |
| Critical | Android Sticky Broadcast               | OPT.JAVA.ANDROID.AndroidStickyBroadcast             | AndroidStickyBroadcast: Avoid Sticky Broadcast   |
| Critical | Receiver Without Permission            | OPT.JAVA.ANDROID.ReceiverWithoutPermission          | ReceiverWithoutPermission: Missing broadcast permission when register a receiver                                     |
| Critical | SMS Monitoring                         | OPT.JAVA.ANDROID.SMSMonitoring                      | SMSMonitoring: Don't use SMS for data input or command   |
| Critical | Password In Redirect Rule              | OPT.JAVA.SEC_JAVA.PasswordInRedirectRule            | PasswordInRedirectRule: Password Management - Password in Redirect   |
| Critical | Use A Safe Cipher                      | OPT.JAVA.ANDROID.UseASafeCipher                     | UseASafeCipher: Avoid using cipher in ECB mode, or without specifying the mode                                       |
| Critical | Hardcoded Crypto Key                   | OPT.JAVA.SEC_JAVA.HardcodedCryptoKey                | HardcodedCryptoKey: Hardcoded cryptographic keys   |
| Critical | Non Random IV With CBC Mode            | OPT.JAVA.SEC_JAVA.NonRandomIVWithCBCMode            | NonRandomIVWithCBCMode: Not using a Random IV with CBC Mode  |
| Critical | Weak Cryptographic Hash Rule           | OPT.JAVA.SEC_JAVA.WeakCryptographicHashRule         | WeakCryptographicHashRule: Weak cryptographic hash   |
| Critical | Weak Encryption Rule                   | OPT.JAVA.SEC_JAVA.WeakEncryptionRule                | WeakEncryptionRule: Weak symmetric encryption algorithm  |
| High     | Do Not Release Debuggable Apps         | OPT.JAVA.ANDROID.DoNotReleaseDebuggableApps         | DoNotReleaseDebuggableApps: Do not release debuggable apps   |
| High     | Prevent Backup Vulnerability           | OPT.JAVA.ANDROID.PreventBackupVulnerability         | PreventBackupVulnerability: Inadequate backup configuration  |
| High     | Dynamic Method Invocation              | OPT.JAVA.SEC_JAVA.DynamicMethodInvocation           | DynamicMethodInvocation: Dynamic method invocation in Struts 2   |
| High     | Insufficient Session Expiration Rule   | OPT.JAVA.SEC_JAVA.InsufficientSessionExpirationRule | InsufficientSessionExpirationRule: Checks that session expiration interval is positive and does not exceed a limit   |

| Severity | Contrast rule  | Engine rule ID  | Description   |
|----------|--|---|---|
| High     | Play Security Misconfiguration                       | OPT.JAVA.SEC_JAVA.PlaySecurityMisconfiguration                  | PlaySecurityMisconfiguration: Security misconfiguration in Play framework.  |
| High     | Web Xml Security Misconfigurations Rule              | OPT.JAVA.SEC_JAVA.WebXmlSecurityMisconfigurationsRule           | WebXmlSecurityMisconfigurationsRule: Avoid misconfiguring security properties in web.xml descriptor                 |
| High     | Prevent Exposition Of All Repositories               | OPT.JAVA.SPRING.PreventExpositionOfAllRepositories              | PreventExpositionOfAllRepositories: Avoid exposing all repositories as REST resources                               |
| High     | Bind Parameters In Queries                           | OPT.HIBERNATE.BindParametersInQueries                           | BindParametersInQueries: Use bind (or named) parameters in HQL and native SQL queries                               |
| High     | Mock Location  | OPT.JAVA.ANDROID.MockLocation                                   | MockLocation: Avoid using a mock location provider  |
| High     | Package Manager Get Signatures                       | OPT.JAVA.ANDROID.PackageManagerGetSignatures                    | PackageManagerGetSignatures: Potential Multiple Certificate Exploit   |
| High     | Avoid Multiple Entities Mapped To Same Table         | OPT.HIBERNATE.AvoidMultipleEntitiesMappedToSameTable            | AvoidMultipleEntitiesMappedToSameTable: Avoid more than one entity mapped to same database table                    |
| High     | Classes Should Be Their Own Proxy                    | OPT.HIBERNATE.ClassesShouldBeTheirOwnProxy                      | ClassesShouldBeTheirOwnProxy: Every persistent class should be its own proxy  |
| High     | Close Sessions Where Opened                          | OPT.HIBERNATE.CloseSessionsWhereOpened                          | CloseSessionsWhereOpened: Close sessions in the method where they are opened  |
| High     | Declare Private Identifier Setter                    | OPT.HIBERNATE.DeclarePrivateIdentifierSetter                    | DeclarePrivateIdentifierSetter: The setter method for an identifier property (id or composite-id) should be private |
| High     | Declare Type For Date Property                       | OPT.HIBERNATE.DeclareTypeForDateProperty                        | DeclareTypeForDateProperty: Declare type for java.util.Date property in configuration file                          |
| High     | Implement Zero Argument Constructor                  | OPT.HIBERNATE.ImplementZeroArgumentConstructor                  | ImplementZeroArgumentConstructor: Implement a zero-argument constructor for persistent classes                      |
| High     | Invalid Property Type Mapping                        | OPT.HIBERNATE.InvalidPropertyTypeMapping                        | InvalidPropertyTypeMapping: Map a Hibernate property type only to the corresponding Java type                       |
| High     | Referenced Class Not Defined                         | OPT.HIBERNATE.ReferencedClassNotDefined                         | ReferencedClassNotDefined: Classes referenced in the configuration file (*.hbm.xml) should be declared              |
| High     | Aapt Crash   | OPT.JAVA.ANDROID.AaptCrash                                      | AaptCrash: Avoid defining styles with dynamically generated identifiers   |
| High     | Adapter View Children                                | OPT.JAVA.ANDROID.AdapterViewChildren                            | AdapterViewChildren: AdapterViews cannot have children in xml   |
| High     | Always Canonicalize URL Received By Content Provider | OPT.JAVA.ANDROID.AlwaysCanonicalizeURLReceivedByContentProvider | AlwaysCanonicalizeURLReceivedByContentProvider: Avoid improper access to application data                           |
| High     | Cross Site Request Forgery Rule                      | OPT.JAVA.SEC_JAVA.CrossSiteRequestForgeryRule                   | CrossSiteRequestForgeryRule: Cross-site request forgery (CSRF)  |
| High     | Call Super First On Init                             | OPT.JAVA.ANDROID.CallSuperFirstOnInit                           | CallSuperFirstOnInit: Be sure super method is called first on initialization methods                                |

| Severity | Contrast rule                             | Engine rule ID  | Description  |
|----------|---|---|--|
| High     | Call Super Last On End                    | OPT.JAVA.ANDROID.CallSuperLastOnEnd                     | CallSuperLastOnEnd: Ensure that on finalization methods, super method is called at the end of the method |
| High     | External Control Of Configuration Setting | OPT.JAVA.SEC_JAVA.ExternalControlOfConfigurationSetting | ExternalControlOfConfigurationSetting: External Control of System or Configuration Setting               |
| High     | Device Admin                              | OPT.JAVA.ANDROID.DeviceAdmin                            | DeviceAdmin: Check if receiver acts like a device admin  |
| High     | Http Parameter Pollution Rule             | OPT.JAVA.SEC_JAVA.HttpParameterPollutionRule            | HttpParameterPollutionRule: HTTP parameter pollution (HPP)   |
| High     | Dont Use Config                           | OPT.JAVA.ANDROID.DontUseConfig                          | DontUseConfig: Avoid using deprecated android.util.Config  |
| High     | Dont Use Find View By Id Repeatedly       | OPT.JAVA.ANDROID.DontUseFindViewByIdRepeatedly          | DontUseFindViewByIdRepeatedly: Avoid repeatedly calling to findViewById() with the same identifier       |
| High     | Duplicate Ids                             | OPT.JAVA.ANDROID.DuplicateIds                           | DuplicateIds: Avoid duplicated ids within the same layout  |
| High     | JSON Injection                            | OPT.JAVA.SEC_JAVA.JSONInjection                         | JSONInjection: Avoid using non-neutralized user controlled input into JSON entities - JSON Injection     |
| High     | Log Forging                               | OPT.JAVA.SEC_JAVA.LogForging                            | LogForging: Improper Output Neutralization for Logs  |
| High     | Grant All Uris                            | OPT.JAVA.ANDROID.GrantAllUris                           | GrantAllUris: Avoid sharing root path  |
| High     | Incorrect Wake Lock Usage                 | OPT.JAVA.ANDROID.IncorrectWakeLockUsage                 | IncorrectWakeLockUsage: Make sure WakeLock is liberated  |
| High     | Illegal Resource Ref                      | OPT.JAVA.ANDROID.IllegalResourceRef                     | IllegalResourceRef: Checks versionCode and versionName are literals                                      |
| High     | Open Redirect Rule                        | OPT.JAVA.SEC_JAVA.OpenRedirectRule                      | OpenRedirectRule: URL Redirection to Untrusted Site ('Open Redirect')                                    |
| High     | Missing Super Call                        | OPT.JAVA.ANDROID.MissingSuperCall                       | MissingSuperCall: Check super method is called into the implementation                                   |
| High     | Reflected File Download                   | OPT.JAVA.SEC_JAVA.ReflectedFileDownload                 | ReflectedFileDownload: Improper Neutralization of Input leads to Reflected File Download                 |
| High     | Nested Scrolling                          | OPT.JAVA.ANDROID.NestedScrolling                        | NestedScrolling: Avoid scrolling widgets with scrolling widgets children                                 |
| High     | Resource Injection                        | OPT.JAVA.SEC_JAVA.ResourceInjection                     | ResourceInjection: Improper control of resource identifiers ("Resource Injection")                       |
| High     | Reference Type                            | OPT.JAVA.ANDROID.ReferenceType                          | ReferenceType: Alias and resource types have to be the same  |
| High     | Resource As Color                         | OPT.JAVA.ANDROID.ResourceAsColor                        | ResourceAsColor: Avoid method calls using color id directly as parameter                                 |
| High     | Resource Cycle                            | OPT.JAVA.ANDROID.ResourceCycle                          | ResourceCycle: Cycles can't exist in resources definition  |
| High     | Scroll View Size                          | OPT.JAVA.ANDROID.ScrollViewSize                         | ScrollViewSize: Check layout_width and layout_height attributes for ScrollView children                  |
| High     | Sd Card Path                              | OPT.JAVA.ANDROID.SdCardPath                             | SdCardPath: Avoid hardcoded references to SD card path   |
| High     | Scroll View Count                         | OPT.JAVA.ANDROID.ScrollViewCount                        | ScrollViewCount: Check ScrollViews just have one children  |
| High     | Text View Edits                           | OPT.JAVA.ANDROID.TextViewEdits                          | TextViewEdits: Check if TextView is correctly used   |
| High     | Use Check Permission                      | OPT.JAVA.ANDROID.UseCheckPermission                     | UseCheckPermission: Use the result of a permission check   |
| High     | Use Serialization Judiciously             | OPT.JAVA.ANDROID.UseSerializationJudiciously            | UseSerializationJudiciously: Discourage use of Serialization, use JSON instead                           |
| High     | Uses Min Sdk Attributes                   | OPT.JAVA.ANDROID.UsesMinSdkAttributes                   | UsesMinSdkAttributes: Check required API level are specified   |

| Severity | Contrast rule                               | Engine rule ID                                 | Description  |
|----------|---|--|--|
| High     | Wrong View Cast                             | OPT.JAVA.ANDROID.WrongViewCast                 | WrongViewCast: Type check for views with an assigned id  |
| High     | Wait Sleep In Activit                       | OPT.JAVA.ANDROID.WaitSleepInActivit            | WaitSleepInActivit: Avoid using Thread.wait or Thread.sleep in Activity  |
| High     | J D B C                                     | OPT.JAVA.BEANS.JDBC                            | JDBC: Avoid JDBC use in Bean classes   |
| High     | S Z B L                                     | OPT.JAVA.BEANS.SZBL                            | SZBL: Verify that beans implements java.io.Serializable  |
| High     | Avoid Use Replace Methods Rule              | OPT.JAVA.CADCAR.AvoidUseReplaceMethodsRule     | AvoidUseReplaceMethodsRule: Do not use '.' in String methods expecting a regular expression                      |
| High     | P J D C C                                   | OPT.JAVA.CDCI.PJDCC                            | PJDCC: Provide Javadoc comments for public classes and interfaces  |
| High     | S Y N                                       | OPT.JAVA.CFFSERVLET.SYN                        | SYN: Minimize synchronization in Servlets  |
| High     | C T N L                                     | OPT.JAVA.CMETRICS.CTNL                         | CTNL: Avoid classes / interfaces with too many lines of code   |
| High     | N O F                                       | OPT.JAVA.CMETRICS.NOF                          | NOF: Maximum allowed number of fields  |
| High     | N O M                                       | OPT.JAVA.CMETRICS.NOM                          | NOM: Maximum allowed number of methods   |
| High     | T C C                                       | OPT.JAVA.CMETRICS.TCC                          | TCC: Cyclomatic complexity   |
| High     | A A I                                       | OPT.JAVA.CNU.AAI                               | AAI: Avoid unnecessary modifiers in an interface   |
| High     | D I   | OPT.JAVA.CNU.DI                                | DI: Avoid duplicated imports   |
| High     | E I   | OPT.JAVA.CNU.EI                                | EI: Avoid excessive import lines   |
| High     | E P N U                                     | OPT.JAVA.CNU.EPNU                              | EPNU: Avoid unused parameters  |
| High     | E V N U                                     | OPT.JAVA.CNU.EVNU                              | EVNU: Avoid unused local variables   |
| High     | P F   | OPT.JAVA.CNU.PF                                | PF: Avoid unused private fields  |
| High     | P M   | OPT.JAVA.CNU.PM                                | PM: Avoid unused private methods and constructors  |
| High     | U I   | OPT.JAVA.CNU.UI                                | UI: Avoid unused imports   |
| High     | E I S                                       | OPT.JAVA.COL.EIS                               | EIS: Avoid concurrently iterations over a collection   |
| High     | Equals Hash Code                            | OPT.JAVA.COMP.EqualsHashCode                   | EqualsHashCode: Always overwrite java.lang.Object.equals() and java.lang.Object.hashCode()                       |
| High     | Method Equals                               | OPT.JAVA.COMP.MethodEquals                     | MethodEquals: Make sure the method name is equals() and not equal  |
| High     | Avoid Return Object                         | OPT.JAVA.CONV.AvoidReturnObject                | AvoidReturnObject: Avoid returning Java.lang.Object, instead convert it to a specific type                       |
| High     | Avoid Method Invok Only Super Method        | OPT.JAVA.DECL.AvoidMethodInvokOnlySuperMethod  | AvoidMethodInvokOnlySuperMethod: Avoid methods that invoke only overwritten supermethods                         |
| High     | Avoid Not Use Field                         | OPT.JAVA.DECL.AvoidNotUseField                 | AvoidNotUseField: Avoid unused fields  |
| High     | Correct Hash Code                           | OPT.JAVA.DECL.CorrectHashCode                  | CorrectHashCode: Make sure the hashCode() method is spelled correctly  |
| High     | Correct To String                           | OPT.JAVA.DECL.CorrectToString                  | CorrectToString: Make sure the name of the method is toString() and not toStringing()                            |
| High     | Declare Equals Method Of Compareable        | OPT.JAVA.DECL.DeclareEqualsMethodOfCompareable | DeclareEqualsMethodOfCompareable: Always declare equals() method in a class that implements java.lang.Comparable |
| High     | Signature Standard Equals                   | OPT.JAVA.DECL.SignatureStandardEquals          | SignatureStandardEquals: Always use the standard signature for equals methods                                    |
| High     | Make your clone() method final for security | OPT.JAVA.DECLARA.CLONE                         | CLONE: Declare clone() throws CloneNotSupportedException for Cloneable clas                                      |



| Severity | Contrast rule                         | Engine rule ID                                  | Description  |
|----------|---------------------------------------|---|--|
| High     | Trust Boundary Violation Rule         | OPT.JAVA.SEC_JAVA.TrustBoundaryViolationRule    | TrustBoundaryViolationRule: Trust boundary violation   |
| High     | U C C                                 | OPT.JAVA.DECLARA.UCC                            | UCC: Private constructors in class with static members   |
| High     | Avoid Remote Exception                | OPT.JAVA.EJB.AvoidRemoteException               | AvoidRemoteException: Throw RemoteException from methods of remote interfaces  |
| High     | Dont Avoid Remote Exception           | OPT.JAVA.EJB.DontAvoidRemoteException           | DontAvoidRemoteException: Do not throw an 'java.rmi.RemoteException' for methods of local interfaces                         |
| High     | Public Constructor Without Parameters | OPT.JAVA.EJB.PublicConstructorWithoutParameters | PublicConstructorWithoutParameters: Every EJB class should have a public constructor with no parameters                      |
| High     | Reuse EJB Home Instances              | OPT.JAVA.EJB.ReuseEJBHomeInstances              | ReuseEJBHomeInstances: Always reuse EJBHome instances  |
| High     | Avoid New Throwable                   | OPT.JAVA.EXCP.AvoidNewThrowable                 | AvoidNewThrowable: Avoid creating new instances of java.lang.Throwable   |
| High     | Avoid Null Pointer Exception          | OPT.JAVA.EXCP.AvoidNullPointerException         | AvoidNullPointerException: Avoid capturing NullPointerExceptions   |
| High     | Avoid Throw Error                     | OPT.JAVA.EXCP.AvoidThrowError                   | AvoidThrowError: Avoid throwing java.lang.Error  |
| High     | Avoid Throw Runtime Excetions         | OPT.JAVA.EXCP.AvoidThrowRuntimeExcetions        | AvoidThrowRuntimeExcetions: Avoid throwing RuntimeExceptions   |
| High     | Avoid Empty Methods Finalize          | OPT.JAVA.FIN.AvoidEmptyMethodsFinalize          | AvoidEmptyMethodsFinalize: Avoid empty finalize() methods  |
| High     | Avoid Overload Finalize               | OPT.JAVA.FIN.AvoidOverloadFinalize              | AvoidOverloadFinalize: Avoid overloading the method finalize()   |
| High     | Dont Call Finalize                    | OPT.JAVA.FIN.DontCallFinalize                   | DontCallFinalize: Never call finalize() explicitly   |
| High     | N C A C                               | OPT.JAVA.FMETODOS.NCAC                          | NCAC: Do not call an abstract method from a constructor in abstract classes  |
| High     | O V E R R I D E                       | OPT.JAVA.FMETODOS.OVERRIDE                      | OVERRIDE: Override Object.equals ()when you override Object.hashCode ()  |
| High     | A U T P                               | OPT.JAVA.GC.AUTP                                | AUTP: Avoid unnecessary temporal wrapping objects when converting primitive data to String                                   |
| High     | D U D                                 | OPT.JAVA.GC.DUD                                 | DUD: Avoid using Date[], use long[] instead  |
| High     | F C F                                 | OPT.JAVA.GC.FCF                                 | FCF: Call super.finalize() from finalize()   |
| High     | O S T M                               | OPT.JAVA.GC.OSTM                                | OSTM: Prevent potential memory leaks in ObjectOutputStreams by calling reset () or close ()                                  |
| High     | S T V                                 | OPT.JAVA.GC.STV                                 | STV: Avoid static collections; they can grow without bounds  |
| High     | Avoid Call Interrupted Object         | OPT.JAVA.HEB.AvoidCallInterruptedObject         | AvoidCallInterruptedObject: Avoid calling Thread.interrupted() on an arbitrary Thread  |
| High     | Avoid Call Run                        | OPT.JAVA.HEB.AvoidCallRun                       | AvoidCallRun: Avoid calling Thread.run()   |
| High     | Avoid Sleep Inside While              | OPT.JAVA.HEB.AvoidSleepInsideWhile              | AvoidSleepInsideWhile: Avoid using while() and sleep(), instead use wait() and notify()                                      |
| High     | Avoid Synchronized Blocks Notify      | OPT.JAVA.HEB.AvoidSynchronizedBlocksNotify      | AvoidSynchronizedBlocksNotify: Avoid synchronised blocks that have an invocation to notify() or notifyAll() as the statement |
| High     | Avoid Synchronized Object Lock        | OPT.JAVA.HEB.AvoidSynchronizedObjectLock        | AvoidSynchronizedObjectLock: Avoid the synchronization of objects java.util.concurrent.locks.Lock                            |



| Severity | Contrast rule                              | Engine rule ID                                      | Description   |
|----------|--|---|---|
| High     | Avoid Thread Destroy                       | OPT.JAVA.HEB.AvoidThreadDestroy                     | AvoidThreadDestroy: Avoid calling java.lang.Thread.destroy  |
| High     | Avoid Static Instance Class Without Fields | OPT.JAVA.INIC.AvoidStaticInstanceClassWithoutFields | AvoidStaticInstanceClassWithoutFields: Avoid creating new objects in static initializers before a static fields have been initialized |
| High     | A M I                                      | OPT.JAVA.INICIA.AMI                                 | AMI: Avoid initializations of several variables with the same value in a line   |
| High     | N F S                                      | OPT.JAVA.INICIA.NFS                                 | NFS: Do not use non-final static fields during the initialization   |
| High     | S F  | OPT.JAVA.INICIA.SF                                  | SF: Initialize all static fields  |
| High     | Avoid System Out Err                       | OPT.JAVA.IO.AvoidSystemOutErr                       | AvoidSystemOutErr: Use specialized library instead of System.out or System.err for logging  |
| High     | C S  | OPT.JAVA.IO.CS                                      | CS: Close input and output resources in finally blocks  |
| High     | Dont Use Print Stack Trace                 | OPT.JAVA.IO.DontUsePrintStackTrace                  | DontUsePrintStackTrace: Do not use the printStackTrace method   |
| High     | F I L B U F                                | OPT.JAVA.IO.FILBUF                                  | FILBUF: All input/output resources must have a flow with buffer   |
| High     | S I E                                      | OPT.JAVA.IO.SIE                                     | SIE: Avoid System.err.print() or Sytem.err.println statements   |
| High     | S I O                                      | OPT.JAVA.IO.SIO                                     | SIO: Avoid System.out.println() or System.out.print() statements  |
| High     | Avoid Security Manager                     | OPT.JAVA.J2EE.AvoidSecurityManager                  | AvoidSecurityManager: Avoid using java.lang.SecurityManager   |
| High     | Avoid Set Property                         | OPT.JAVA.J2EE.AvoidSetProperty                      | AvoidSetProperty: Avoid calling java.security.Security.setProperty()  |
| High     | Dont Extend Class Loader                   | OPT.JAVA.J2SE.DontExtendClassLoader                 | DontExtendClassLoader: Do not allowed inheriting from java.lang.ClassLoader   |
| High     | Final Class Extends Permission             | OPT.JAVA.J2SE.FinalClassExtendsPermission           | FinalClassExtendsPermission: A class that extends from java.security.Permission should be final                                       |
| High     | Unsafe Reflection                          | OPT.JAVA.SEC_JAVA.UnsafeReflection                  | UnsafeReflection: Use of Externally-Controlled Input to Select Classes or Code ('Unsafe Reflection')                                  |
| High     | XPath Injection Rule                       | OPT.JAVA.SEC_JAVA.XPathInjectionRule                | XPathInjectionRule: Improper Neutralization of Data within XPath Expressions ('XPath Injection')                                      |
| High     | Xslt Injection                             | OPT.JAVA.SEC_JAVA.XsltInjection                     | XsltInjection: XML Injection (aka Blind XPath Injection)  |
| High     | Use Cache With Idempotent And Safe Methods | OPT.JAVA.JAX.UseCacheWithIdempotentAndSafeMethods   | UseCacheWithIdempotentAndSafeMethods: Use cache along with idempotent and safe HTTP methods   |
| High     | Validate Endpoint Business Methods         | OPT.JAVA.JAX.ValidateEndpointBusinessMethods        | ValidateEndpointBusinessMethods: Endpoint implementation class business methods must follow some requirements                         |
| High     | Validate Endpoint Implementation Class     | OPT.JAVA.JAX.ValidateEndpointImplementationClass    | ValidateEndpointImplementationClass: Endpoint implementation classes must follow some requirements                                    |
| High     | C D B C                                    | OPT.JAVA.JDBC.CDBC                                  | CDBC: Close JDBC connections in finally blocks  |
| High     | U P C                                      | OPT.JAVA.JDBC.UPC                                   | UPC: Use a connection pool  |
| High     | Avoid Constructors Config Tests            | OPT.JAVA.JUNIT_JAVA.AvoidConstructorsConfigTests    | AvoidConstructorsConfigTests: Do not use constructors to set up test cases  |
| High     | C E L                                      | OPT.JAVA.LOOP.CEL                                   | CEL: Avoid using method calls in a loop   |
| High     | L O O P 2                                  | OPT.JAVA.LOOP.LOOP2                                 | LOOP2: Do not instantiate temporal Objects in loops bodies  |

| Severity | Contrast rule                   | Engine rule ID                           | Description   |
|----------|---------------------------------|--|---|
| High     | P I                             | OPT.JAVA.LOOP.PI                         | PI: Avoid problematic constructions in a while loop   |
| High     | S Y N                           | OPT.JAVA.LOOP.SYN                        | SYN: Avoid calling synchronized methods/blocks in a loop  |
| High     | T R Y                           | OPT.JAVA.LOOP.TRY                        | TRY: Avoid using try statements in loops  |
| High     | Avoid Empty Jar Zip             | OPT.JAVA.MEM.AvoidEmptyJarZip            | AvoidEmptyJarZip: Avoid creating empty JAR and ZIP  |
| High     | Avoid Throw Inside Finally      | OPT.JAVA.MEM.AvoidThrowInsideFinally     | AvoidThrowInsideFinally: Avoid the command throws within finally  |
| High     | L E V E L                       | OPT.JAVA.OOP.LEVEL                       | LEVEL: Avoid too many levels of nested inner classes  |
| High     | A E C B                         | OPT.JAVA.PB.AECB                         | AECB: Avoid catch blocks with empty bodies  |
| High     | C L P                           | OPT.JAVA.PB.CLP                          | CLP: Avoid casting primitive data types to lower precision  |
| High     | D C F                           | OPT.JAVA.PB.DCF                          | DCF: Avoid comparing floating point types   |
| High     | D C P                           | OPT.JAVA.PB.DCP                          | DCP: Avoid using the + string concatenation operator to concatenate numbers; use it only to add numbers             |
| High     | D N I F                         | OPT.JAVA.PB.DNIF                         | DNIF: Avoid nested IF sentences with too many levels  |
| High     | D S U P                         | OPT.JAVA.PB.DSUP                         | DSUP: Place default clause at the end of a switch - case  |
| High     | E M S I                         | OPT.JAVA.PB.EMI                          | EMI: Avoid empty static blocks  |
| High     | E Q L                           | OPT.JAVA.PB.EQL                          | EQL: Use getClass() in the equals() method implementation   |
| High     | E Q L2                          | OPT.JAVA.PB.EQL2                         | EQL2: Use instanceof within an equals() method implementation   |
| High     | E S B L                         | OPT.JAVA.PB.ESBL                         | ESBL: Avoid empty synchronized blocks   |
| High     | F E B                           | OPT.JAVA.PB.FEB                          | FEB: Avoid 'for' and 'while' sentences with empty bodies  |
| High     | F L V A                         | OPT.JAVA.PB.FLVA                         | FLVA: Do not assign loop control variables in the body of a for loop  |
| High     | I E B                           | OPT.JAVA.PB.IEB                          | IEB: Avoid if statements with empty bodies  |
| High     | M A I N                         | OPT.JAVA.PB.MAIN                         | MAIN: Use the method name main() only for the entry point method  |
| High     | Don't use masterpage files C    | OPT.JAVA.PB.MPC                          | MPC: Avoid parameter method names that provoke conflicts with class members names                                   |
| High     | N D C                           | OPT.JAVA.PB.NDC                          | NDC: Avoid defining direct or indirect subclasses of Error and Throwable  |
| High     | N X R E                         | OPT.JAVA.PB.NXRE                         | NXRE: Avoid defining direct or indirect subclasses of RuntimeException  |
| High     | Non Heritable Exception Classes | OPT.JAVA.PB.NonHeritableExceptionClasses | NonHeritableExceptionClasses: Do not define exceptions that inherit from the specified classes                      |
| High     | P D S                           | OPT.JAVA.PB.PDS                          | PDS: Provide 'default' label for each switch statement  |
| High     | S B C                           | OPT.JAVA.PB.SBC                          | SBC: Avoid using a switch structure with a bad case statement   |
| High     | S B D F                         | OPT.JAVA.PB.SBDF                         | SBDF: Provide a break or return statement for the default label in a switch   |
| High     | U E I2                          | OPT.JAVA.PB.UEI2                         | UEI2: Use equals() when comparing Strings   |
| High     | U F S T                         | OPT.JAVA.PB.UFST                         | UFST: Avoid unconditional If blocks   |
| High     | Avoid File Separators           | OPT.JAVA.PORT.AvoidFileSeparators        | AvoidFileSeparators: Avoid writing directly in the code directory separators in order to create a java.io.File file |

| Severity | Contrast rule                               | Engine rule ID                                     | Description  |
|----------|---|--|--|
| High     | Avoid Implement Peer Interfaces             | OPT.JAVA.PORT.AvoidImplementPeerInterfaces         | AvoidImplementPeerInterfaces: Avoid implementing java.awt.peer interfaces                    |
| High     | Avoid Call Bean From Servlet                | OPT.JAVA.RECBAS.AvoidCallBeanFromServlet           | AvoidCallBeanFromServlet: Avoid calling Java.beans.* from the finalize() method of a servlet |
| High     | Avoid Call SQL From Servlet                 | OPT.JAVA.RECBAS.AvoidCallSQLFromServlet            | AvoidCallSQLFromServlet: Avoid calling Javax.sql.* from finalize() method of a servlet       |
| High     | Avoid Get Declared Field                    | OPT.JAVA.REFL.AvoidGetDeclaredField                | AvoidGetDeclaredField: Avoid calling java.lang.Class.getDeclaredField                        |
| High     | Avoid Call Driver Manager From Servlet      | OPT.JAVA.RENDESC.AvoidCallDriverManagerFromServlet | AvoidCallDriverManagerFromServlet: Avoid calling java.sql.DriverManager from a servlet       |
| High     | Avoid Call Process From Servlet             | OPT.JAVA.RENDESC.AvoidCallProcessFromServlet       | AvoidCallProcessFromServlet: Avoid calling java.lang.Process from any servlet                |
| High     | Avoid Call System From Servlet              | OPT.JAVA.RENDESC.AvoidCallSystemFromServlet        | AvoidCallSystemFromServlet: Avoid calling java.lang.System from any servlet                  |
| High     | P J D C F                                   | OPT.JAVA.RGD.PJDCF                                 | PJDCF: Provide Javadoc comments for public fields  |
| High     | A S F I                                     | OPT.JAVA.RGM.ASFI                                  | ASFI: Redecare a class with only abstract methods and static final fields as an interface    |
| High     | C T O R                                     | OPT.JAVA.RGM.CTOR                                  | CTOR: Avoid calling non-final, non-static and non-private methods from constructors          |
| High     | M S F                                       | OPT.JAVA.RGM.MSF                                   | MSF: Avoid using too many 'non-final static' fields  |
| High     | N U O T                                     | OPT.JAVA.RGM.NUOT                                  | NUOT: Do not use the ternary operator  |
| High     | A R L L                                     | OPT.JAVA.RGME.ARLL                                 | ARLL: Do not access arrays 'length' property in a loop condition                             |
| High     | A G Q S                                     | OPT.JAVA.RGOR.AGQS                                 | AGQS: Avoid getQueryString(), using getParameter()   |
| High     | A M C O                                     | OPT.JAVA.RGOR.AMCO                                 | AMCO: Avoid using repeated cast over the same object or variable (Max 3 cast of every type)  |
| High     | Dont Use Reflection                         | OPT.JAVA.RGOR.DontUseReflection                    | DontUseReflection: Avoid the use of reflection   |
| High     | E I O F                                     | OPT.JAVA.RGOR.EIOF                                 | EIOF: Avoid if/else-if chains performing type testing  |
| High     | S D F                                       | OPT.JAVA.RGOR.SDF                                  | SDF: Date format class java.text.SimpleDateFormat spends many resources                      |
| High     | Avoid Runtime And System Classes            | OPT.JAVA.RGP.AvoidRuntimeAndSystemClasses          | AvoidRuntimeAndSystemClasses: Do not use Runtime and System classes                          |
| High     | Do not use applets in an application client | OPT.JAVA.RGS.NUA                                   | NUA: Do not use applets in an application client layer                                       |
| High     | Transient fields in Serializable classes    | OPT.JAVA.RGS.SER                                   | SER: 'Transient' fields in 'Serializable' classes  |
| High     | Avoid EJB Explicit Server Socket            | OPT.JAVA.SEC_JAVA.AvoidEJBExplicitServerSocket     | AvoidEJBExplicitServerSocket: EJB Bad Practices: Use of Sockets                              |
| High     | Avoid EJB Explicit Thread Management        | OPT.JAVA.SEC_JAVA.AvoidEJBExplicitThreadManagement | AvoidEJBExplicitThreadManagement: Avoid explicit thread management in EJB                    |

| Severity | Contrast rule   | Engine rule ID   | Description  |
|----------|---|--|--|
| High     | Avoid J2EE Jvm Exit                                       | OPT.JAVA.SEC_JAVA.AvoidJ2EEJvmExit                               | AvoidJ2EEJvmExit: Avoid JVM shutdown code in J2EE applications   |
| High     | Cookies In Security Decision                              | OPT.JAVA.SEC_JAVA.CookiesInSecurityDecision                      | CookiesInSecurityDecision: Reliance on Cookies without Validation and Integrity Checking in a Security Decision                            |
| High     | Database Access Control Rule                              | OPT.JAVA.SEC_JAVA.DatabaseAccessControlRule                      | DatabaseAccessControlRule: Avoid queries in the database except from the specific classes  |
| High     | J2ee File Disclosure Rule                                 | OPT.JAVA.SEC_JAVA.J2eeFileDisclosureRule                         | J2eeFileDisclosureRule: File disclosure in server side J2EE forward/include  |
| High     | Not Overridable Method Rule                               | OPT.JAVA.SEC_JAVA.NotOverridableMethodRule                       | NotOverridableMethodRule: Not overridable method   |
| High     | Race Condition Format Flaw                                | OPT.JAVA.SEC_JAVA.RaceConditionFormatFlaw                        | RaceConditionFormatFlaw: Concurrent Execution using Shared Resource with Improper Synchronization ('Race Condition')                       |
| High     | Race Condition Servlet                                    | OPT.JAVA.SEC_JAVA.RaceConditionServlet                           | RaceConditionServlet: Race Condition in a Java Servlet   |
| High     | Security Check In Overridable Method Rule                 | OPT.JAVA.SEC_JAVA.SecurityCheckInOverridableMethodRule           | SecurityCheckInOverridableMethodRule: Methods that perform a security check must be declared private or final                              |
| High     | Spring No Anti Xss Configuration                          | OPT.JAVA.SEC_JAVA.SpringNoAntiXssConfiguration                   | SpringNoAntiXssConfiguration: Use defaultHtmlEscape {'OWASP-2021': ['A5'], 'WASC': ['08'], 'PCI-DSS': ['6.5.7'], 'ASVS-v4.0.2': ['3.4.5']} |
| High     | Unhandled SSL Exception Rule                              | OPT.JAVA.SEC_JAVA.UnhandledSSLExceptionRule                      | UnhandledSSLExceptionRule: Unhandled SSL exception   |
| High     | User Controlled SQL Primary Key                           | OPT.JAVA.SEC_JAVA.UserControlledSQLPrimaryKey                    | UserControlledSQLPrimaryKey: Avoid using an user controlled Primary Key into a query   |
| High     | Avoid Call Next In Has Next                               | OPT.JAVA.SENT.AvoidCallNextInHasNext                             | AvoidCallNextInHasNext: Avoid calling next() in hasNext()  |
| High     | Avoid Call Set Size Inside Component Resized              | OPT.JAVA.SENT.AvoidCallSetSizeInsideComponentResized             | AvoidCallSetSizeInsideComponentResized: Avoid calling the setSize() from within componentResized()   |
| High     | Avoid Empty Sentences Switch                              | OPT.JAVA.SENT.AvoidEmptySentencesSwitch                          | AvoidEmptySentencesSwitch: Avoid empty switch statements   |
| High     | Avoid Declare Method Read Object                          | OPT.JAVA.SERI.AvoidDeclareMethodReadObject                       | AvoidDeclareMethodReadObject: Avoid declaring the method readObject() as synchronized  |
| High     | Avoid Serializable Classes                                | OPT.JAVA.SERI.AvoidSerializableClasses                           | AvoidSerializableClasses: Avoid non-serializable classes with inner classes serializable   |
| High     | Always Use Ids As Bean Identifiers                        | OPT.JAVA.SPRING.AlwaysUseIdsAsBeanIdentifiers                    | AlwaysUseIdsAsBeanIdentifiers: Use beans id attribute as beans identifiers   |
| High     | Avoid Beans With The Same Id Across Different Descriptors | OPT.JAVA.SPRING.AvoidBeansWithTheSameIdAcrossDiferentDescriptors | AvoidBeansWithTheSameIdAcrossDiferentDescriptors: Ensure beans id attribute is unique across all the XML configuration files               |
| High     | Avoid Hardcoding Null                                     | OPT.JAVA.SPRING.AvoidHardcodingNull                              | AvoidHardcodingNull: Avoid initializing properties or parameters with a hardcoded null   |

| Severity | Contrast rule   | Engine rule ID  | Description   |
|----------|---|---|---|
| High     | Avoid Retrieving More Than One Batch At Time            | OPT.JAVA.SPRING.AvoidRetrievingMoreThanOneBatchAtTime           | AvoidRetrievingMoreThanOneBatchAtTime: Avoid retrieving more than one batch of items at time                          |
| High     | Avoid Using Default Package With Auto Scanning          | OPT.JAVA.SPRING.AvoidUsingDefaultPackageWithAutoScanning        | AvoidUsingDefaultPackageWithAutoScanning: Avoid using the default package when using the auto scan                    |
| High     | Avoid Wildcards When Loading Resource From Class Path   | OPT.JAVA.SPRING.AvoidWildcardsWhenLoadingResourceFromClassPath  | AvoidWildcardsWhenLoadingResourceFromClassPath: Avoid using the * wildcard when loading a resource from the classpath |
| High     | Enable Auto Configuration Annotation Must Be Unique     | OPT.JAVA.SPRING.EnableAutoConfigurationAnnotationMustBeUnique   | EnableAutoConfigurationAnnotationMustBeUnique: EnableAutoConfiguration annotation must be unique                      |
| High     | Refer Imported Resources To The Classpath               | OPT.JAVA.SPRING.ReferImportedResourcesToTheClasspath            | ReferImportedResourcesToTheClasspath: Refer imported resources to the classpath                                       |
| High     | Use A Proper Base Package When Using Component Scanning | OPT.JAVA.SPRING.UseAProperBasePackageWhenUsingComponentScanning | UseAProperBasePackageWhenUsingComponentScanning: Use a proper base package when using component scanning              |
| High     | Use A Top Package For Main Application Class            | OPT.JAVA.SPRING.UseATopPackageForMainApplicationClass           | UseATopPackageForMainApplicationClass: Main application class must belong to a root package                           |
| High     | Use Constructor Based Dependency Injection              | OPT.JAVA.SPRING.UseConstructorBasedDependencyInjection          | UseConstructorBasedDependencyInjection: Use constructor based dependency injection                                    |
| High     | A C D O   | OPT.JAVA.STR.ACDO   | ACDO: Prevents the use of some ones of the String class constructors  |
| High     | P C T S   | OPT.JAVA.STR.PCTS   | PCTS: Use charAt() instead of startsWith() for comparisons of one character   |
| High     | S T O S   | OPT.JAVA.STR.STOS   | STOS: Avoid using toString method in a String   |
| High     | Usb In Loop   | OPT.JAVA.STR.UsbInLoop  | UsbInLoop: Avoid using the concatenation operator of strings +{ }   |
| High     | U S C   | OPT.JAVA.STR.USC  | USC: Avoid using StringBuffer to store a String that is never modified  |
| High     | Switch Fully Covers Enumeration                         | OPT.JAVA.SWITCH.SwitchFullyCoversEnumeration                    | SwitchFullyCoversEnumeration: Use a default statement and as many case statements as existing enumeration elements    |
| High     | A N F   | OPT.JAVA.TRS.ANF  | ANF: Avoid using notify, use notifyAll() instead  |
| High     | Avoid using variables of type java.lang.ThreadGroup     | OPT.JAVA.TRS.AUTG   | AUTG: Avoid using variables of type java.lang.ThreadGroup   |
| High     | M R U N   | OPT.JAVA.TRS.MRUN   | MRUN: Give Thread subclasses a run() method   |
| High     | N S M   | OPT.JAVA.TRS.NSM  | NSM: Avoid using synchronized modifier in the method declaration  |
| High     | Avoid Ejs   | OPT.JAVA.WEBS.AvoidEjs  | AvoidEjs: Avoid using the package com.ibm.ejs.  |

| Severity | Contrast rule                              | Engine rule ID   | Description  |
|----------|--|--|--|
| High     | Avoid Ws                                   | OPT.JAVA.WEBS.AvoidWs                                    | AvoidWs: Avoid using Avoid using com.ibm.ws and com.ibm.websphere packages   |
| High     | Context Sensitive Data Is Kept Secure      | OPT.JAVA.ANDROID.ContextSensitiveDataIsKeptSecure        | ContextSensitiveDataIsKeptSecure: Avoid improper access to data created by the context   |
| High     | N IP                                       | OPT.JAVA.DECLARA.NIP                                     | NIP: Do not write IP address in source code  |
| High     | Avoid Exposing All Endpoint Public Methods | OPT.JAVA.JAX.AvoidExposingAllEndpointPublicMethods       | AvoidExposingAllEndpointPublicMethods: Specify an endpoint interface to avoid exposing all the public methods                          |
| High     | Information Exposure Through Error Message | OPT.JAVA.SEC_JAVA.InformationExposureThroughErrorMessage | InformationExposureThroughErrorMessage: Avoid sensitive information exposure through error messages                                    |
| High     | Packaged Private Key                       | OPT.JAVA.ANDROID.PackagedPrivateKey                      | PackagedPrivateKey: Avoid package private key files  |
| High     | Secure Random                              | OPT.JAVA.ANDROID.SecureRandom                            | SecureRandom: Do not use SecureRandom with a fixed seed  |
| High     | Hardcoded Salt Rule                        | OPT.JAVA.SEC_JAVA.HardcodedSaltRule                      | HardcodedSaltRule: A hardcoded salt can compromise system security   |
| High     | Inadequate Padding Rule                    | OPT.JAVA.SEC_JAVA.InadequatePaddingRule                  | InadequatePaddingRule: Inadequate padding  |
| High     | Insecure Randomness Rule                   | OPT.JAVA.SEC_JAVA.InsecureRandomnessRule                 | InsecureRandomnessRule: Standard pseudo-random number generators cannot withstand cryptographic attacks                                |
| High     | Insecure Transport                         | OPT.JAVA.SEC_JAVA.InsecureTransport                      | InsecureTransport: Insecure transport  |
| High     | Insufficient Key Size Rule                 | OPT.JAVA.SEC_JAVA.InsufficientKeySizeRule                | InsufficientKeySizeRule: Weak cryptography, insufficient key length  |
| Info     | Dont Modify Access Security                | OPT.JAVA.EJB.DontModifyAccessSecurity                    | DontModifyAccessSecurity: Do not access or modify java.security configuration objects (Policy Security, Provider, Principal, KeyStore) |
| Info     | Action names must end in Action            | OPT.JAVA.ACTIONS.BNMC                                    | BNMC: Action names must end in Action  |
| Info     | Use a defined package for Actions          | OPT.JAVA.ACTIONS.MAUB                                    | MAUB: Use a defined package for Actions  |
| Info     | Avoid Actions with a simple forward        | OPT.JAVA.ACTIONS.OROP                                    | OROP: Avoid Actions with a simple forward  |
| Info     | Declare unique exception for Actions       | OPT.JAVA.ACTIONS.THME                                    | THME: Declare Action methods with a unique exception type thrown   |
| Info     | Avoid Creating Unnecessary Objects         | OPT.JAVA.ANDROID.AvoidCreatingUnnecessaryObjects         | AvoidCreatingUnnecessaryObjects: Avoid creating string   |
| Info     | Avoid Internal Getter Setter               | OPT.JAVA.ANDROID.AvoidInternalGetterSetter               | AvoidInternalGetterSetter: Avoid internal use of getter/setter   |
| Info     | Private Inner Class Access                 | OPT.JAVA.ANDROID.PrivateInnerClassAccess                 | PrivateInnerClassAccess: Consider package instead of private access with private inner classes   |
| Info     | Use Value Of                               | OPT.JAVA.ANDROID.UseValueOf                              | UseValueOf: Avoid wrapper classes constructor calls  |
| Info     | E Q U A L                                  | OPT.JAVA.BEANS.EQUAL                                     | EQUAL: Override Object.equals() method in JavaBean classes   |
| Info     | Avoid Call To String                       | OPT.JAVA.CADCAR.AvoidCallToString                        | AvoidCallToString: Avoid calling toString () on String objects   |

| Severity | Contrast rule                                 | Engine rule ID  | Description   |
|----------|---|---|---|
| Info     | M D J D T                                     | OPT.JAVA.CDCI.MDJDT                                   | MDJDT: Use the @deprecated tag in Javadoc comments for classes and interfaces                           |
| Info     | M J J D T                                     | OPT.JAVA.CDCI.MJJDT                                   | MJJDT: Use the @since tag in Javadoc comments for classes and interfaces                                |
| Info     | M S J D T                                     | OPT.JAVA.CDCI.MSJDT                                   | MSJDT: Use the @see tag in Javadoc comments for classes and interfaces                                  |
| Info     | P J D C C4                                    | OPT.JAVA.CDCI.PJDCC4                                  | PJDCC4: Provide Javadoc comments for private classes and interfaces                                     |
| Info     | M R D C2                                      | OPT.JAVA.CDM.MRDC2                                    | MRDC2: Use the @return tag in Javadoc comments for protected methods                                    |
| Info     | M R D C4                                      | OPT.JAVA.CDM.MRDC4                                    | MRDC4: Use the @return tag in Javadoc comments for private methods                                      |
| Info     | P A R A M2                                    | OPT.JAVA.CDM.PARAM2                                   | PARAM2: Use the @param tag in Javadoc comments for each parameter of protected methods                  |
| Info     | P A R A M4                                    | OPT.JAVA.CDM.PARAM4                                   | PARAM4: Use the @param tag in Javadoc comments for each parameter of private methods                    |
| Info     | T H R O W2                                    | OPT.JAVA.CDM.THROW2                                   | THROW2: Use the @throws or @exception tags in Javadoc comments of protected methods                     |
| Info     | T H R O W4                                    | OPT.JAVA.CDM.THROW4                                   | THROW4: Use the @throws or @exception tags in Javadoc comments of private methods                       |
| Info     | C R T E                                       | OPT.JAVA.CFFEJB.CRTE                                  | CRTE: Declare ejbCreate() methods public, but neither static nor final                                  |
| Info     | F N D M                                       | OPT.JAVA.CFFEJB.FNDM                                  | FNDM: Declare finder methods public and neither final nor static  |
| Info     | P C R T E                                     | OPT.JAVA.CFFEJB.PCRTE                                 | PCRTE: Declare public 'ejbPostCreate()' method but never static nor final                               |
| Info     | A L B L                                       | OPT.JAVA.CNOM.ALBL                                    | ALBL: Justify the opening and closing braces in code blocks   |
| Info     | E L E M                                       | OPT.JAVA.CNOM.ELEM                                    | ELEM: All elements (variables, methods and constructors) in a Java type should follow a naming standard |
| Info     | I F V   | OPT.JAVA.CNOM.IFV                                     | IFV: Use all uppercase letters for the names of fields in an interface                                  |
| Info     | N N M A                                       | OPT.JAVA.CNOM.NNMA                                    | NNMA: Follow a naming standard for Java packages  |
| Info     | Avoid Short If Else                           | OPT.JAVA.COND.AvoidShortIfElse                        | AvoidShortIfElse: Avoid using if else statements in short conditions                                    |
| Info     | Avoid Unnecessary Constructor                 | OPT.JAVA.CONST.AvoidUnnecessaryConstructor            | AvoidUnnecessaryConstructor: Avoid unnecessary constructors   |
| Info     | Avoid Local Variables Differ Upper Lower Case | OPT.JAVA.CONV.AvoidLocalVariablesDifferUpperLowerCase | AvoidLocalVariablesDifferUpperLowerCase: Avoid variable names that differ in only the case              |
| Info     | Avoid Same Class Field Names                  | OPT.JAVA.CONV.AvoidSameClassFieldNames                | AvoidSameClassFieldNames: Avoid classes and fields with the same name                                   |
| Info     | Avoid Short Class Names                       | OPT.JAVA.CONV.AvoidShortClassNames                    | AvoidShortClassNames: Avoid class names that are less than 5 characters                                 |
| Info     | Use Correct Format Inner Classes              | OPT.JAVA.CONV.UseCorrectFormatInnerClasses            | UseCorrectFormatInnerClasses: Avoid incorrect name format of inner classes                              |
| Info     | Use Is If Return Boolean                      | OPT.JAVA.CONV.UselsIfReturnBoolean                    | UselsIfReturnBoolean: Only add the prefix 'is' to method name if it returns a Boolean                   |
| Info     | Avoid Declare Fields Only Null                | OPT.JAVA.DECL.AvoidDeclareFieldsOnlyNull              | AvoidDeclareFieldsOnlyNull: Avoid declaring fields that are only ever null                              |

| Severity | Contrast rule                                     | Engine rule ID  | Description   |
|----------|---|---|---|
| Info     | Avoid Declare Method Final And Static             | OPT.JAVA.DECL.AvoidDeclareMethodFinalAndStatic          | AvoidDeclareMethodFinalAndStatic: Do not declare static methods as final  |
| Info     | Avoid Declare Method Private And Final            | OPT.JAVA.DECL.AvoidDeclareMethodPrivateAndFinal         | AvoidDeclareMethodPrivateAndFinal: Avoid declaring private methods as final                                       |
| Info     | Dont Extend Object                                | OPT.JAVA.DECL.DontExtendObject                          | DontExtendObject: Make sure that classes do not explicitly inherit 'java.lang.Object'                             |
| Info     | Signature Standard To String                      | OPT.JAVA.DECL.SignatureStandardToString                 | SignatureStandardToString: Always declare the toString() with the standard signature                              |
| Info     | C H A I N   | OPT.JAVA.DECLARA.CHAIN                                  | CHAIN: With multiple (overloaded) constructors, use 'this' to call more generic constructors inside constructors  |
| Info     | I Don't use masterpage files T2                   | OPT.JAVA.DECLARA.IMPT2                                  | IMPT2: Use wild cards when importing a class  |
| Info     | Leave A White Space Between Arguments             | OPT.JAVA.DECLARA.LeaveAWhiteSpaceBetweenArguments       | LeaveAWhiteSpaceBetweenArguments: Leave a white space between arguments   |
| Info     | O C C   | OPT.JAVA.DECLARA.OCC                                    | OCC: Checks code organization inside a .java file   |
| Info     | Avoid Incorrect Format Of Final Fields            | OPT.JAVA.DEN.AvoidIncorrectFormatOfFinalFields          | AvoidIncorrectFormatOfFinalFields: Avoid incorrect name format in the final static fields                         |
| Info     | Avoid Incorrect Format Of Final Non Static Fields | OPT.JAVA.DEN.AvoidIncorrectFormatOfFinalNonStaticFields | AvoidIncorrectFormatOfFinalNonStaticFields: Avoid incorrect name format in static non-final fields                |
| Info     | Avoid Incorrect Format Of Local Vars              | OPT.JAVA.DEN.AvoidIncorrectFormatOfLocalVars            | AvoidIncorrectFormatOfLocalVars: Avoid incorrect name format in local variables                                   |
| Info     | Avoid Incorrect Format Of Non Static Fields       | OPT.JAVA.DEN.AvoidIncorrectFormatOfNonStaticFields      | AvoidIncorrectFormatOfNonStaticFields: Avoid incorrect name format in the non-static fields                       |
| Info     | Avoid Use Of Dollar In Names                      | OPT.JAVA.DEN.AvoidUseOfDollarInNames                    | AvoidUseOfDollarInNames: Avoid using dollar signs in the names of classes, methods or variables                   |
| Info     | Interfaces Start With Capital                     | OPT.JAVA.DEN.InterfacesStartWithCapital                 | InterfacesStartWithCapital: Always start an interface name with a capital letter                                  |
| Info     | Method Not Start With Lowercase Or Under Score    | OPT.JAVA.DEN.MethodNotStartWithLowercaseOrUnderScore    | MethodNotStartWithLowercaseOrUnderScore: Always follow the java method naming conventions                         |
| Info     | Start Class Name Capital                          | OPT.JAVA.DEN.StartClassNameCapital                      | StartClassNameCapital: Always start a class name with a capital letter  |
| Info     | Avoid Load Library EJB                            | OPT.JAVA.EJB.AvoidLoadLibraryEJB                        | AvoidLoadLibraryEJB: Do not load native libraries in a class of Enterprise JavaBean                               |
| Info     | Declare Static Final Class EJB                    | OPT.JAVA.EJB.DeclareStaticFinalClassEJB                 | DeclareStaticFinalClassEJB: Always declare the EntityBeans static fields as final                                 |
| Info     | Ejb Create Enterprise Java Bean                   | OPT.JAVA.EJB.EjbCreateEnterpriseJavaBean                | EjbCreateEnterpriseJavaBean: Always implements at least one ejbCreate () method in a class of Enterprise JavaBean |
| Info     | Ejb Create No Parameter                           | OPT.JAVA.EJB.EjbCreateNoParameter                       | EjbCreateNoParameter: Do not have parameters for the method ejbCreate() of the MessageDrivenBean classes          |



| Severity | Contrast rule                                | Engine rule ID                                     | Description   |
|----------|--|--|---|
| Info     | Ejb Create Post Create                       | OPT.JAVA.EJB.EjbCreatePostCreate                   | EjbCreatePostCreate: EntityBeans should one ejbPostCreate() method per ejbCreate() method                                   |
| Info     | Ejb Post Create Entity Bean                  | OPT.JAVA.EJB.EjbPostCreateEntityBean               | EjbPostCreateEntityBean: EntityBeans must implement at least one method ejbPostCreate()                                     |
| Info     | Method Void Ejb Create                       | OPT.JAVA.EJB.MethodVoidEjbCreate                   | MethodVoidEjbCreate: Avoid non-empty return type of the methods ejbCreate() in classes of SessionBean and MessageDrivenBean |
| Info     | Method Void Ejb Post Create                  | OPT.JAVA.EJB.MethodVoidEjbPostCreate               | MethodVoidEjbPostCreate: Avoid non-empty return type of methods ejbPostCreate() in Enterprise JavaBean classes              |
| Info     | Use Capitals For Final Fields                | OPT.JAVA.EJB.UseCapitalsForFinalFields             | UseCapitalsForFinalFields: Declare fields with names in capital letters as final  |
| Info     | Define Classes Exceptions As Final           | OPT.JAVA.EXCP.DefineClassesExceptionsAsFinal       | DefineClassesExceptionsAsFinal: Always declare user-defined exceptions as final   |
| Info     | L L  | OPT.JAVA.FMETODOS.LL                               | LL: Too long code lines   |
| Info     | N S A B                                      | OPT.JAVA.FMETODOS.NSAB                             | NSAB: Do not place statements on the same line as {opening brace  |
| Info     | S A O P                                      | OPT.JAVA.FMETODOS.SAOP                             | SAOP: Enforce number of space character(s) on each side of an assignment operator using one only line                       |
| Info     | S C  | OPT.JAVA.FMETODOS.SC                               | SC: Enforce number of space character(s) after the opening parenthesis '(' in a conditional statement                       |
| Info     | S M C  | OPT.JAVA.FMETODOS.SMC                              | SMC: Place a single space character between a method name and the opening ( parenthesis                                     |
| Info     | Avoid Extend Thread                          | OPT.JAVA.HEB.AvoidExtendThread                     | AvoidExtendThread: Avoid extending java.lang.Thread   |
| Info     | Avoid Link Operator Assign                   | OPT.JAVA.INIC.AvoidLinkOperatorAssign              | AvoidLinkOperatorAssign: Avoid creating assignment chains   |
| Info     | Avoid Get Context                            | OPT.JAVA.J2EE.AvoidGetContext                      | AvoidGetContext: Avoid calling java.security.AccessController.getContext()  |
| Info     | Avoid Get Security Manager                   | OPT.JAVA.J2EE.AvoidGetSecurityManager              | AvoidGetSecurityManager: Avoid calling java.lang.System.getSecurityManager()  |
| Info     | Javadoc Location                             | OPT.JAVA.JDOC.JavadocLocation                      | JavadocLocation: Avoid putting non-Javadoc comments between Javadoc and class / method declarations                         |
| Info     | Javadoc Param Rule                           | OPT.JAVA.JDOC.JavadocParamRule                     | JavadocParamRule: Always provide the tag @param in the correct order for public and protected methods                       |
| Info     | Javadoc Reg Exp Rule                         | OPT.JAVA.JDOC.JavadocRegExpRule                    | JavadocRegExpRule: Do not use the tag @exception in the Javadoc comments for the exceptions thrown                          |
| Info     | Format Subclass Junit Test Case              | OPT.JAVA.JUNIT_JAVA.FormatSubclassJUnitTestCase    | FormatSubclassJUnitTestCase: Avoid incorrect name format Junit TestCase subclasses  |
| Info     | Start Test Class Name Test Suite             | OPT.JAVA.JUNIT_JAVA.StartTestClassNamedTestSuite   | StartTestClassNamedTestSuite: Avoid incorrect name format TestSuite classes   |
| Info     | Avoid Call Ceil With Int Converted To Double | OPT.JAVA.MAT.AvoidCallCeilWithIntConvertedToDouble | AvoidCallCeilWithIntConvertedToDouble: Avoid passing integer type to Math.ceil() / Math.floor() / Math.round()              |
| Info     | Avoid Switch Case Break Without Comment      | OPT.JAVA.PB.AvoidSwitchCaseBreakWithoutComment     | AvoidSwitchCaseBreakWithoutComment: Check if there is a switch with a case without break and without comments               |

| Severity | Contrast rule  | Engine rule ID  | Description  |
|----------|--|---|--|
| Info     | Comment Every Variable                               | OPT.JAVA.RGD.CommentEveryVariable                           | CommentEveryVariable: Comment every variable   |
| Info     | P J D C F4   | OPT.JAVA.RGD.PJDCF4   | PJDCF4: Provide Javadoc comments for private fields  |
| Info     | P J D C M2   | OPT.JAVA.RGD.PJDCM2   | PJDCM2: Provide Javadoc comments for protected methods   |
| Info     | P J D C M4   | OPT.JAVA.RGD.PJDCM4   | PJDCM4: Provide Javadoc comments for private methods   |
| Info     | Dont Use Servlets                                    | OPT.JAVA.RGM.DontUseServlets                                | DontUseServlets: Do not use servlets   |
| Info     | P F L  | OPT.JAVA.RGM.PFL  | PFL: Use for loops instead of while  |
| Info     | S D I  | OPT.JAVA.RGM.SDI  | SDI: Use blank lines to separate import blocks   |
| Info     | ESAPI Banned Rule                                    | OPT.JAVA.SEC_JAVA.ESAPIBannedRule                           | ESAPIBannedRule: Avoid dangerous J2EE API, use replacements from security-focused libraries (like OWASP ESAPI) |
| Info     | Avoid Return Sentences Method Void                   | OPT.JAVA.SENT.AvoidReturnSentencesMethodVoid                | AvoidReturnSentencesMethodVoid: Avoid unnecessary return commands in void methods                              |
| Info     | Avoid Using Do While                                 | OPT.JAVA.SENT.AvoidUsingDoWhile                             | AvoidUsingDoWhile: Avoid using do-while statements   |
| Info     | Version U I D Field                                  | OPT.JAVA.SERI.serialVersionUIDField                         | serialVersionUIDField: Serializable classes should always have a final static serialVersionUID field           |
| Info     | Use Package Declaration                              | OPT.JAVA.SWITCH.UsePackageDeclaration                       | UsePackageDeclaration: Always use a package declaration  |
| Info     | Password In Comment Rule                             | OPT.JAVA.SEC_JAVA.PasswordInCommentRule                     | PasswordInCommentRule: Avoid hard-coded or in-comment passwords in code  |
| Low      | Avoid Field Access Strategy                          | OPT.HIBERNATE.AvoidFieldAccessStrategy                      | AvoidFieldAccessStrategy: Use accessor methods (getter/setter) for property access                             |
| Low      | Collection Getter And Setter Must Return Same Object | OPT.HIBERNATE.CollectionGetterAndSetterMustReturnSameObject | CollectionGetterAndSetterMustReturnSameObject: Collection getter and setter must return same object            |
| Low      | Declare Identifier Property                          | OPT.HIBERNATE.DeclareIdentifierProperty                     | DeclareIdentifierProperty: Declare identifier property/properties on persistent classes                        |
| Low      | Externalize Queries                                  | OPT.HIBERNATE.ExternalizeQueries                            | ExternalizeQueries: Externalize query strings as named queries   |
| Low      | Implement Equals Hash Code In Components             | OPT.HIBERNATE.ImplementEqualsHashCodeInComponents           | ImplementEqualsHashCodeInComponents: Implement equals() and hashCode() for components and composite elements   |
| Low      | Select Before Update With Update Trigger             | OPT.HIBERNATE.SelectBeforeUpdateWithUpdateTrigger           | SelectBeforeUpdateWithUpdateTrigger: Check select-before-update attribute matches UPDATE trigger               |
| Low      | Use Named Identifier                                 | OPT.HIBERNATE.UseNamedIdentifier                            | UseNamedIdentifier: You should always specify a name attribute for identifiers in Hibernate                    |
| Low      | Use Proper Subclass Strategy                         | OPT.HIBERNATE.UseProperSubclassStrategy                     | UseProperSubclassStrategy: Use proper subclass strategy according to the number of subclass properties         |
| Low      | Do not manually treat exceptions in Actions          | OPT.JAVA.ACTIONS.AUTC                                       | AUTC: Do not manually treat exceptions in Actions  |
| Low      | Don't use public methods in Actions                  | OPT.JAVA.ACTIONS.NMTP                                       | NMTP: Do not use public methods in Actions   |

| Severity | Contrast rule                              | Engine rule ID                                  | Description   |
|----------|--|---|---|
| Low      | Avoid Using Floating Point                 | OPT.JAVA.ANDROID.AvoidUsingFloatingPoint        | AvoidUsingFloatingPoint: Avoid Using Floating-Point   |
| Low      | Keep XML Layout Hierarchy Flat             | OPT.JAVA.ANDROID.KeepXMLLayoutHierarchyFlat     | KeepXMLLayoutHierarchyFlat: Check the depth of the layout                                       |
| Low      | Suspicious Import                          | OPT.JAVA.ANDROID.SuspiciousImport               | SuspiciousImport: Check android.R package is used   |
| Low      | Use Enhanced For Loop                      | OPT.JAVA.ANDROID.UseEnhancedForLoop             | UseEnhancedForLoop: Consider using enhanced for-each loop                                       |
| Low      | Use Primitive For Numbers                  | OPT.JAVA.ANDROID.UsePrimitiveForNumbers         | UsePrimitiveForNumbers: Use primitive types instead of Number objects                           |
| Low      | Use Sparse Arrays                          | OPT.JAVA.ANDROID.UseSparseArrays                | UseSparseArrays: Use SparseArray instead of a Map with Integer keys                             |
| Low      | Avoid Cyclic Dependencies Between Packages | OPT.JAVA.AvoidCyclicDependenciesBetweenPackages | AvoidCyclicDependenciesBetweenPackages: Avoid cyclic dependencies between packages              |
| Low      | Avoid Assign In While                      | OPT.JAVA.BUC.AvoidAssignInWhile                 | AvoidAssignInWhile: Avoid assignments in while do-while loop condition                          |
| Low      | Avoid Call Loop                            | OPT.JAVA.BUC.AvoidCallLoop                      | AvoidCallLoop: Avoid the invocations of method within conditional loop statements               |
| Low      | Avoid Continue                             | OPT.JAVA.BUC.AvoidContinue                      | AvoidContinue: Avoid using the command continue   |
| Low      | Avoid List Contains                        | OPT.JAVA.BUC.AvoidListContains                  | AvoidListContains: Avoid calling contains inside a loop   |
| Low      | Avoid Call Objects Sub String              | OPT.JAVA.CADCAR.AvoidCallObjectsSubString       | AvoidCallObjectsSubString: Avoid calling substring(0) on a String object                        |
| Low      | Avoid Check Index Of Positive              | OPT.JAVA.CADCAR.AvoidCheckIndexOfPositive       | AvoidCheckIndexOfPositive: Avoid checking if String.indexOf() is a positive value               |
| Low      | Avoid Concat String                        | OPT.JAVA.CADCAR.AvoidConcatString               | AvoidConcatString: Declare a non-constant string as a StringBuffer                              |
| Low      | M A J D T                                  | OPT.JAVA.CDCI.MAJDT                             | MAJDT: Use the @author tag in Javadoc comments for classes and interfaces                       |
| Low      | M V J D T                                  | OPT.JAVA.CDCI.MVJDT                             | MVJDT: Use the @version tag in Javadoc comments for classes and interfaces                      |
| Low      | P J D C C2                                 | OPT.JAVA.CDCI.PJDCC2                            | PJDCC2: Provide Javadoc comments for protected classes and interfaces                           |
| Low      | M R D C                                    | OPT.JAVA.CDM.MRDC                               | MRDC: Use the @return tag in Javadoc comments for public methods                                |
| Low      | T S M J T                                  | OPT.JAVA.CDM.TSMJT                              | TSMJT: Provide Javadoc comment for toString() methods   |
| Low      | V M C R                                    | OPT.JAVA.CDM.VMCR                               | VMCR: Avoid the @return Javadoc tag in void methods   |
| Low      | B M S S                                    | OPT.JAVA.CFFEJB.BMSS                            | BMSS: Serialization of fields of a 'Bean' class   |
| Low      | Declare Public Clone                       | OPT.JAVA.CLON.DeclarePublicClone                | DeclarePublicClone: Always declare clone() as public  |
| Low      | T R E T                                    | OPT.JAVA.CMETRICS.TRET                          | TRET: Follow the limit for number of return statements  |
| Low      | C V N                                      | OPT.JAVA.CNOM.CVN                               | CVN: Requires that Variable names of one character must be only used for their conventional use |
| Low      | G E T B                                    | OPT.JAVA.CNOM.GETB                              | GETB: Requires that boolean getter methods names start with 'is', 'can', 'has', or 'have'       |
| Low      | L C I N                                    | OPT.JAVA.CNOM.LCIN                              | LCIN: Avoid class or interface names too long   |
| Low      | N U P R                                    | OPT.JAVA.CNOM.NUPR                              | NUPR: Do not use reserved words inside Java identifiers   |
| Low      | S E T A                                    | OPT.JAVA.CNOM.SETA                              | SETA: Setter methods convention   |

| Severity | Contrast rule                             | Engine rule ID                                     | Description   |
|----------|---|--|---|
| Low      | U S F                                     | OPT.JAVA.CNOM.USF                                  | USF: Avoid lowercase in static and final field names  |
| Low      | D I L                                     | OPT.JAVA.CNU.DIL                                   | DIL: Do not explicitly import the java.lang.* package   |
| Low      | Avoid Declare Many Constructors           | OPT.JAVA.COMPJ.AvoidDeclareManyConstructors        | AvoidDeclareManyConstructors: Avoid declaring too many constructors   |
| Low      | Avoid Null Pointer                        | OPT.JAVA.COND.AvoidNullPointer                     | AvoidNullPointer: If/else can generate NullPointerExceptions  |
| Low      | Protected Constructor In Abstract Class   | OPT.JAVA.CONST.ProtectedConstructorInAbstractClass | ProtectedConstructorInAbstractClass: Only declare 'protected' constructors for abstract classes                   |
| Low      | Avoid Method Name Differ Upper Lower Case | OPT.JAVA.CONV.AvoidMethodNameDifferUpperLowerCase  | AvoidMethodNameDifferUpperLowerCase: Avoid method names that differ only in the case                              |
| Low      | Array List Instead Of Vector              | OPT.JAVA.DECL.ArrayListInsteadOfVector             | ArrayListInsteadOfVector: Always use ArrayList instead of Vector  |
| Low      | Avoid Empty Classes                       | OPT.JAVA.DECL.AvoidEmptyClasses                    | AvoidEmptyClasses: Avoid empty classes or interfaces  |
| Low      | Avoid Implement Protected Final Class     | OPT.JAVA.DECL.AvoidImplementProtectedFinalClass    | AvoidImplementProtectedFinalClass: Avoid implementing protected fields in a final class                           |
| Low      | Avoid Use Class Interface Or Abstract     | OPT.JAVA.DECL.AvoidUseClassInterfaceOrAbstract     | AvoidUseClassInterfaceOrAbstract: Avoid using abstract classes or interfaces in order to declare common constants |
| Low      | Avoid Use Static No Final                 | OPT.JAVA.DECL.AvoidUseStaticNoFinal                | AvoidUseStaticNoFinal: Avoid non-final static fields during initialisation  |
| Low      | Avoid Using Same Variable Names           | OPT.JAVA.DECL.AvoidUsingSameVariableNames          | AvoidUsingSameVariableNames: Avoid using variables with the same name   |
| Low      | L In Long Object Value                    | OPT.JAVA.DECL.LInLongObjectValue                   | LInLongObjectValue: Always add a suffix to numeric literals in upper case (L instead of l)                        |
| Low      | A S I                                     | OPT.JAVA.DECLARA.ASI                               | ASI: Make methods static if they do not use instance class members  |
| Low      | C C P A                                   | OPT.JAVA.DECLARA.CCPA                              | CCPA: Each public class must be declared in a separate file   |
| Low      | C L S                                     | OPT.JAVA.DECLARA.CLS                               | CLS: Define constants on the left side of comparisons   |
| Low      | C R S                                     | OPT.JAVA.DECLARA.CRS                               | CRS: Place constants on the right side of comparisons   |
| Low      | Define Every Variable In A Line           | OPT.JAVA.DECLARA.DefineEveryVariableInALine        | DefineEveryVariableInALine: Define every variable in a line   |
| Low      | Define Privacy Fields                     | OPT.JAVA.DECLARA.DefinePrivacyFields               | DefinePrivacyFields: Define every field private or protected  |
| Low      | I S A C F                                 | OPT.JAVA.DECLARA.ISACF                             | ISACF: Avoid interfaces that only define constants  |
| Low      | Separate Declarations And Statements      | OPT.JAVA.DECLARA.SeparateDeclarationsAndStatements | SeparateDeclarationsAndStatements: Separate declarations and statements   |
| Low      | U C D C                                   | OPT.JAVA.DECLARA.UCDC                              | UCDC: Provide a by default private constructor in utility classes   |

| Severity | Contrast rule                                | Engine rule ID                                      | Description   |
|----------|--|---|---|
| Low      | Avoid Incorrect Format Of Non Static Methods | OPT.JAVA.DEN.AvoidIncorrectFormatOfNonStaticMethods | AvoidIncorrectFormatOfNonStaticMethods: Avoid the incorrect naming of non-static methods  |
| Low      | Declare Bean Class Public                    | OPT.JAVA.EJB.DeclareBeanClassPublic                 | DeclareBeanClassPublic: Always declare bean classes as public   |
| Low      | Declare Method Ejb Find Public               | OPT.JAVA.EJB.DeclareMethodEjbFindPublic             | DeclareMethodEjbFindPublic: Always declare ejbFindXX methods as public, non static and non final  |
| Low      | Avoid Text Field                             | OPT.JAVA.ESUI.AvoidTextField                        | AvoidTextField: Avoid using java.awt.TextField  |
| Low      | Avoid Block Catch Return                     | OPT.JAVA.EXCP.AvoidBlockCatchReturn                 | AvoidBlockCatchReturn: Do not use return statements inside catch blocks   |
| Low      | Avoid Excp Catch                             | OPT.JAVA.EXCP.AvoidExcpCatch                        | AvoidExcpCatch: Do not note an exception or throw an exception in a catch block   |
| Low      | Avoid Excp Exception                         | OPT.JAVA.EXCP.AvoidExcpException                    | AvoidExcpException: Avoid capturing java.lang.Exception exceptions  |
| Low      | Avoid New Error                              | OPT.JAVA.EXCP.AvoidNewError                         | AvoidNewError: Avoid creating new instances of java.lang.Error  |
| Low      | Next Emit No Such Element Exception          | OPT.JAVA.EXCP.NextEmitNoSuchElementException        | NextEmitNoSuchElementException: Always make sure that the method 'next()' in an Iterator class can be cast java.util.NoSuchElementException |
| Low      | Avoid Unnecessary Finalize                   | OPT.JAVA.FIN.AvoidUnnecessaryFinalize               | AvoidUnnecessaryFinalize: Avoid unnecessary finalize() method   |
| Low      | A I O C                                      | OPT.JAVA.FMETODOS.AIOC                              | AIOC: Do not use instanceof to distinguish between exceptions   |
| Low      | D E E M                                      | OPT.JAVA.FMETODOS.DEEM                              | DEEM: Leave at least a blank line between methods   |
| Low      | M I N D                                      | OPT.JAVA.FMETODOS.MIND                              | MIND: Indent code properly  |
| Low      | N C E  | OPT.JAVA.FMETODOS.NCE                               | NCE: Avoid Exception, RuntimeException or Throwable in catch or throw statements  |
| Low      | O S P L                                      | OPT.JAVA.FMETODOS.OSPL                              | OSPL: Write one statement per line  |
| Low      | S B R  | OPT.JAVA.FMETODOS.SBR                               | SBR: Simplify code returning boolean  |
| Low      | U P  | OPT.JAVA.FMETODOS.UP                                | UP: Avoid unnecessary parenthesis in return statements  |
| Low      | Avoid Call Interrupted Run                   | OPT.JAVA.HEB.AvoidCallInterruptedRun                | AvoidCallInterruptedRun: Avoid calling Thread.currentThread().interrupted() on the run() method of a thread                                 |
| Low      | C S I  | OPT.JAVA.INICIA.CSI                                 | CSI: Use constructors than initialize all the fields in a class   |
| Low      | Avoid Too Long Resource Names                | OPT.JAVA.JAX.AvoidTooLongResourceNames              | AvoidTooLongResourceNames: Avoid using too long resource names  |
| Low      | Tear Down J Unit                             | OPT.JAVA.JUNIT_JAVA.TearDownJUnit                   | TearDownJUnit: Always overwrite the tearDown() method in a JUnit test case  |
| Low      | Avoid Call Next Double                       | OPT.JAVA.MAT.AvoidCallNextDouble                    | AvoidCallNextDouble: Avoid invoking nextDouble() to generate a random int   |
| Low      | Parent Class Doesnot Reference Child Classes | OPT.JAVA.ParentClassDoesnotReferenceChildClasses    | ParentClassDoesnotReferenceChildClasses: Parent class does not reference any of its child classes   |
| Low      | A D E  | OPT.JAVA.PB.ADE                                     | ADE: Avoid dangling else statements   |
| Low      | Avoid Complex If                             | OPT.JAVA.PB.AvoidComplexIf                          | AvoidComplexIf: Avoid complex condition in the statements   |
| Low      | A C E C                                      | OPT.JAVA.RGD.ACEC                                   | ACEC: Avoid special characters in comments  |

| Severity | Contrast rule  | Engine rule ID  | Description   |
|----------|--|---|---|
| Low      | Leave A White Line Before A Comment Line                                   | OPT.JAVA.RGD.LeaveAWhiteLineBeforeACommentLine                | LeaveAWhiteLineBeforeACommentLine: Leave a white line before a comment line                                     |
| Low      | P J D C F2   | OPT.JAVA.RGD.PJDCF2   | PJDCF2: Provide Javadoc comments for protected fields   |
| Low      | P J D C M  | OPT.JAVA.RGD.PJDCM  | PJDCM: Provide Javadoc comments for public methods in Java classes (non-interface)                              |
| Low      | P J D C M Interface  | OPT.JAVA.RGD.PJDCMInterface                                   | PJDCMInterface: Provide Javadoc comments for public methods in Java interfaces                                  |
| Low      | B L K E L S E  | OPT.JAVA.RGM.BLKELSE  | BLKELSE: Use a branches block for 'else' statements   |
| Low      | B L K I F  | OPT.JAVA.RGM.BLKIF  | BLKIF: Provide a branch block for 'if' statements   |
| Low      | Dont Set In Session  | OPT.JAVA.RGM.DontSetInSession                                 | DontSetInSession: Do not place objects in session scope   |
| Low      | Use Session From Restricted Packages                                       | OPT.JAVA.RGM.UseSessionFromRestrictedPackages                 | UseSessionFromRestrictedPackages: Access session objects only from classes in certain packages                  |
| Low      | U E Q  | OPT.JAVA.RGOR.UEQ   | UEQ: Avoid comparing boolean variables with true  |
| Low      | Transient fields in Serializable classes2                                  | OPT.JAVA.RGS.SER2   | SER2: Do not use interfaces that extends the java.io.Serializable interface                                     |
| Low      | Improper Validation Of Array Index   | OPT.JAVA.SEC_JAVA.ImproperValidationOfArrayIndex              | ImproperValidationOfArrayIndex: Array index coming from a non neutralized vulnerable input                      |
| Low      | Avoid Assign Same Variable   | OPT.JAVA.SENT.AvoidAssignSameVariable                         | AvoidAssignSameVariable: Avoid assigning a variable to itself   |
| Low      | Avoid Return Null  | OPT.JAVA.SENT.AvoidReturnNull                                 | AvoidReturnNull: Avoid returning null in a method declaration   |
| Low      | Avoid Transient Fileds   | OPT.JAVA.SERI.AvoidTransientFiledS                            | AvoidTransientFiledS: Do not declare fields as transient in non-serializable classes                            |
| Low      | Implement Comparable With Serializable                                     | OPT.JAVA.SERI.ImplementComparableWithSerializable             | ImplementComparableWithSerializable: Always implement java.io.Serializable if implementing java.lang.Comparable |
| Low      | Add Comments To Configuration Files  | OPT.JAVA.SPRING.AddCommentsToConfigurationFiles               | AddCommentsToConfigurationFiles: Add comments to the XML configuration files                                    |
| Low      | Use Rest Controller Convenience Annotation                                 | OPT.JAVA.SPRING.UseRestControllerConvenienceAnnotation        | UseRestControllerConvenienceAnnotation: Use @RestController annotation in REST application                      |
| Low      | Use Spring Boot Application Convenience Annotation                         | OPT.JAVA.SPRING.UseSpringBootApplicationConvenienceAnnotation | UseSpringBootApplicationConvenienceAnnotation: Use @SpringBootApplication annotation                            |
| Low      | Avoid New String   | OPT.JAVA.STR.AvoidNewString                                   | AvoidNewString: Avoid using the 'new' operator to create Strings of literals                                    |
| Low      | Do not compare class objects with getName() or getSimpleName() methods C H | OPT.JAVA.STR.CMPCH  | CMPCH: Do not use strings to compare characters   |
| Low      | Avoid Short Switch   | OPT.JAVA.SWITCH.AvoidShortSwitch                              | AvoidShortSwitch: Avoid switch statements with few branches, instead use if-else                                |

| Severity | Contrast rule                                     | Engine rule ID  | Description  |
|----------|---|---|--|
| Low      | Avoid Declare Variable Inside Loop                | OPT.JAVA.VELLOC.AvoidDeclareVariableInsideLoop                | AvoidDeclareVariableInsideLoop: Avoid creating or assigning a variable within a loop                       |
| Low      | Avoid New Object Get Class                        | OPT.JAVA.VELLOC.AvoidNewObjectGetClass                        | AvoidNewObjectGetClass: Avoid creating a new object with the objective of invoking getClass() on it        |
| Low      | Information Exposure Through Debug Log            | OPT.JAVA.SEC_JAVA.InformationExposureThroughDebugLog          | InformationExposureThroughDebugLog: Avoid exposing sensible information through log                        |
| Medium   | Limit Accessibility Of Sensitive Content Provider | OPT.JAVA.ANDROID.LimitAccessibilityOfSensitiveContentProvider | LimitAccessibilityOfSensitiveContentProvider: Limit the accessibility of a app's sensitive ContentProvider |
| Medium   | Secure Resources Properly                         | OPT.JAVA.JAX.SecureResourcesProperly                          | SecureResourcesProperly: Use annotations to secure resources properly                                      |
| Medium   | Use HTTP Method Annotation                        | OPT.JAVA.JAX.UseHTTPMethodAnnotation                          | UseHTTPMethodAnnotation: Use a proper annotation to indicate the HTTP request methods accepted             |
| Medium   | Use Secured Transport Layer                       | OPT.JAVA.JAX.UseSecuredTransportLayer                         | UseSecuredTransportLayer: Avoid using HTTP instead of HTTPS  |
| Medium   | Plaintext Storage In A Cookie Rule                | OPT.JAVA.SEC_JAVA.PlaintextStorageInACookieRule               | PlaintextStorageInACookieRule: Cleartext Storage of Sensitive Information in a Cookie                      |
| Medium   | Unsafe Cookie Rule                                | OPT.JAVA.SEC_JAVA.UnsafeCookieRule                            | UnsafeCookieRule: Generate server-side cookie with adequate security properties                            |
| Medium   | Exported Activity                                 | OPT.JAVA.ANDROID.ExportedActivity                             | ExportedActivity: Exported activity must require permissions   |
| Medium   | Exported Preference Activity                      | OPT.JAVA.ANDROID.ExportedPreferenceActivity                   | ExportedPreferenceActivity: Activities extending PreferenceActivity should not be exported                 |
| Medium   | Exported Provider                                 | OPT.JAVA.ANDROID.ExportedProvider                             | ExportedProvider: Exported providers must require permissions  |
| Medium   | Exported Receiver                                 | OPT.JAVA.ANDROID.ExportedReceiver                             | ExportedReceiver: Exported receivers must require permissions  |
| Medium   | Exported Service                                  | OPT.JAVA.ANDROID.ExportedService                              | ExportedService: Exported services must require permissions  |
| Medium   | Avoid Host Name Checks Rule                       | OPT.JAVA.SEC_JAVA.AvoidHostNameChecksRule                     | AvoidHostNameChecksRule: Avoid checks on client-side hostname, that are not reliable due to DNS poisoning  |
| Medium   | Avoid Cartesian Product                           | OPT.HIBERNATE.AvoidCartesianProduct                           | AvoidCartesianProduct: Avoid unaware cartesian products in HQL and native SQL queries                      |
| Medium   | Avoid Many To Many Associations                   | OPT.HIBERNATE.AvoidManyToManyAssociations                     | AvoidManyToManyAssociations: Avoid many-to-many associations   |
| Medium   | Avoid Non Lazy Collections                        | OPT.HIBERNATE.AvoidNonLazyCollections                         | AvoidNonLazyCollections: Avoid non-lazy persistent collections   |
| Medium   | Avoid Problematic Flush Mode                      | OPT.HIBERNATE.AvoidProblematicFlushMode                       | AvoidProblematicFlushMode: Avoid setting FlushMode that could produce stale data issues                    |
| Medium   | Avoid Using HQL                                   | OPT.HIBERNATE.AvoidUsingHQL                                   | AvoidUsingHQL: Avoid using HQL in mapping descriptors and in code  |
| Medium   | Avoid Using Native SQL                            | OPT.HIBERNATE.AvoidUsingNativeSQL                             | AvoidUsingNativeSQL: Avoid using native SQL in mapping descriptors and in code                             |
| Medium   | Cross Site History Manipulation                   | OPT.JAVA.SEC_JAVA.CrossSiteHistoryManipulation                | CrossSiteHistoryManipulation: Cross-Site History Manipulation (XSHM)                                       |



| Severity | Contrast rule                          | Engine rule ID                                   | Description  |
|----------|--|--|--|
| Medium   | Configure Connection Pool              | OPT.HIBERNATE.ConfigureConnectionPool            | ConfigureConnectionPool: Configure Hibernate with an explicit connection pool  |
| Medium   | Never Use Persistent Arrays            | OPT.HIBERNATE.NeverUsePersistentArrays           | NeverUsePersistentArrays: Never use persistent arrays  |
| Medium   | One Class Per Mapping File             | OPT.HIBERNATE.OneClassPerMappingFile             | OneClassPerMappingFile: Use one mapping file per persistent class  |
| Medium   | Only Use Hibernate For Database Access | OPT.HIBERNATE.OnlyUseHibernateForDatabaseAccess  | OnlyUseHibernateForDatabaseAccess: Only use Hibernate/JPA for database access  |
| Medium   | Override Equals Hashcode In Composites | OPT.HIBERNATE.OverrideEqualsHashcodeInComposites | OverrideEqualsHashcodeInComposites: Every class implementing a composite-* element should override equals() and hashCode() |
| Medium   | Proper Equals Hashcode Policy          | OPT.HIBERNATE.ProperEqualsHashcodePolicy         | ProperEqualsHashcodePolicy: Use the proper policy when implementing equals() and hashCode() in persistent entities         |
| Medium   | Separation Of Concerns                 | OPT.HIBERNATE.SeparationOfConcerns               | SeparationOfConcerns: Avoid domain entities using J2EE APIs  |
| Medium   | Use Interface For Collection Property  | OPT.HIBERNATE.UseInterfaceForCollectionProperty  | UseInterfaceForCollectionProperty: Use interface for collection-valued properties  |
| Medium   | Use Non Final Persistent Classes       | OPT.HIBERNATE.UseNonFinalPersistentClasses       | UseNonFinalPersistentClasses: Avoid 'final' persistent classes   |
| Medium   | Use Nullable Type For Identifier       | OPT.HIBERNATE.UseNullableTypeForIdentifier       | UseNullableTypeForIdentifier: Use a nullable (non-primitive) type for identifier fields in persistent classes              |
| Medium   | Use Version Instead Of Timestamp       | OPT.HIBERNATE.UseVersionInsteadOfTimestamp       | UseVersionInsteadOfTimestamp: Use version instead of timestamp   |
| Medium   | Avoid Absolute Layout                  | OPT.JAVA.ANDROID.AvoidAbsoluteLayout             | AvoidAbsoluteLayout: Avoid using AbsoluteLayout  |
| Medium   | Avoid Calls After Recycle Call         | OPT.JAVA.ANDROID.AvoidCallsAfterRecycleCall      | AvoidCallsAfterRecycleCall: Do not call a recycled resource  |
| Medium   | Check External Storage Permission      | OPT.JAVA.ANDROID.CheckExternalStoragePermission  | CheckExternalStoragePermission: Check permission usage conformance (External Storage Permission)                           |
| Medium   | Check Internet Permission              | OPT.JAVA.ANDROID.CheckInternetPermission         | CheckInternetPermission: Check permission usage conformance (Internet Permission)  |
| Medium   | Check Location Permission              | OPT.JAVA.ANDROID.CheckLocationPermission         | CheckLocationPermission: Check permission usage conformance (Location Permission)  |
| Medium   | Complete Transaction With Commit       | OPT.JAVA.ANDROID.CompleteTransactionWithCommit   | CompleteTransactionWithCommit: Transactions have to be completed calling commit () method                                  |
| Medium   | Format String Injection Rule           | OPT.JAVA.SEC_JAVA.FormatStringInjectionRule      | FormatStringInjectionRule: Exclude unsanitized user input from format strings  |
| Medium   | Do Not Log Sensitive Information       | OPT.JAVA.ANDROID.DoNotLogSensitiveInformation    | DoNotLogSensitiveInformation: Avoid unsafe log access  |
| Medium   | Dont Use Multidimensional List         | OPT.JAVA.ANDROID.DontUseMultidimensionalList     | DontUseMultidimensionalList: Avoid using multidimensional arrays or nested lists   |
| Medium   | Input Path Not Canonicalized Rule      | OPT.JAVA.SEC_JAVA.InputPathNotCanonicalizedRule  | InputPathNotCanonicalizedRule: Incorrect Behavior Order: Validate Before Canonicalize                                      |



| Severity | Contrast rule                                     | Engine rule ID                                     | Description   |
|----------|---|--|---|
| Medium   | Missing Recycle Calls                             | OPT.JAVA.ANDROID.MissingRecycleCalls               | MissingRecycleCalls: Resources must be recycled after using them  |
| Medium   | On Click Method Does Not Exist                    | OPT.JAVA.ANDROID.OnClickMethodDoesNotExist         | OnClickMethodDoesNotExist: onClick method must exists   |
| Medium   | Request Parameters In Session Rule                | OPT.JAVA.SEC_JAVA.RequestParametersInSessionRule   | RequestParametersInSessionRule: Request parameters should not be passed into Session without sanitizing |
| Medium   | View Holder                                       | OPT.JAVA.ANDROID.ViewHolder                        | ViewHolder: Avoid inflate a new layout when implementing a view Adapter                                 |
| Medium   | A Package Does Not Depend On Less Stable Packages | OPT.JAVA.APackageDoesNotDependOnLessStablePackages | APackageDoesNotDependOnLessStablePackages: A package does not depend on less stable packages            |
| Medium   | Do Not Return Store Mutable Members               | OPT.JAVA.DoNotReturnStoreMutableMembers            | DoNotReturnStoreMutableMembers: Do not directly return or store references to mutable members           |
| Medium   | Avoid Peer Interface                              | OPT.JAVA.AWT.AvoidPeerInterface                    | AvoidPeerInterface: Avoid using java.awt.peer interfaces directly                                       |
| Medium   | P P B   | OPT.JAVA.BEANS.PPB                                 | PPB: Avoid passing presentation layer objects to beans  |
| Medium   | Avoid Enums In While                              | OPT.JAVA.BUC.AvoidEnumsInWhile                     | AvoidEnumsInWhile: Avoid using the enumerator for loop control  |
| Medium   | Avoid For Without Ini Incr                        | OPT.JAVA.BUC.AvoidForWithoutIniIncr                | AvoidForWithoutIniIncr: Avoid loops without an initiator and an increase                                |
| Medium   | Avoid Array To String                             | OPT.JAVA.CADCAR.AvoidArrayToString                 | AvoidArrayToString: Avoid calling toString() on an array  |
| Medium   | N C C A   | OPT.JAVA.CDCI.NCCA                                 | NCCA: Old commented code  |
| Medium   | P A R A M   | OPT.JAVA.CDM.PARAM                                 | PARAM: Use the @param tag in Javadoc comments for each parameter of public methods                      |
| Medium   | T H R O W   | OPT.JAVA.CDM.THROW                                 | THROW: Use the @throws or @exception tags in Javadoc comments of public methods                         |
| Medium   | Use Set Rollback Only                             | OPT.JAVA.CFFEJB.UseSetRollbackOnly                 | UseSetRollbackOnly: Call setRollbackOnly() if a method in a bean throws an application exception        |
| Medium   | Classes Are Strongly Internally Coupled           | OPT.JAVA.ClassesAreStronglyInternallyCoupled       | ClassesAreStronglyInternallyCoupled: Classes internally strongly coupled must be avoided                |
| Medium   | Class Hierarchies Are Not Too Deep                | OPT.JAVA.ClassHierarchiesAreNotTooDeep             | ClassHierarchiesAreNotTooDeep: Avoid too deep hierarchy classes   |
| Medium   | Avoid Overload Clone                              | OPT.JAVA.CLON.AvoidOverloadClone                   | AvoidOverloadClone: Avoid overloading the clone method  |
| Medium   | Implement Cloneable Alter Clone                   | OPT.JAVA.CLON.ImplementCloneableAlterClone         | ImplementCloneableAlterClone: Implement java.lang.Cloneable when overwriting clone() method             |
| Medium   | Signature Standard Clone                          | OPT.JAVA.CLON.SignatureStandardClone               | SignatureStandardClone: Always use the standard signature for clone methods                             |
| Medium   | N P R I F   | OPT.JAVA.CMETRICS.NPRIF                            | NPRIF: Maximum allowed number of private fields   |
| Medium   | N P R I M   | OPT.JAVA.CMETRICS.NPRIM                            | NPRIM: Maximum allowed number of private methods  |
| Medium   | N P R O F   | OPT.JAVA.CMETRICS.NPROF                            | NPROF: Maximum allowed number of protected fields   |
| Medium   | N P R O M   | OPT.JAVA.CMETRICS.NPROM                            | NPROM: Maximum allowed number of protected methods  |

| Severity | Contrast rule                                  | Engine rule ID                                   | Description   |
|----------|--|--|---|
| Medium   | N P U B F                                      | OPT.JAVA.CMETRICS.NPUBF                          | NPUBF: Maximum allowed number of public fields  |
| Medium   | N P U B M                                      | OPT.JAVA.CMETRICS.NPUBM                          | NPUBM: Maximum allowed number of public methods   |
| Medium   | S T M T  | OPT.JAVA.CMETRICS.STMT                           | STMT: Follow the limit for number of statements in a method   |
| Medium   | T N L M  | OPT.JAVA.CMETRICS.TNLM                           | TNLM: Follow the limit for number of lines in a method  |
| Medium   | T N M C  | OPT.JAVA.CMETRICS.TNMC                           | TNMC: Counts the number of method calls   |
| Medium   | T N O P  | OPT.JAVA.CMETRICS.TNOP                           | TNOP: Avoid methods with too many parameters  |
| Medium   | G E T A  | OPT.JAVA.CNOM.GETA                               | GETA: Getter methods conventions  |
| Medium   | I R B  | OPT.JAVA.CNOM.IRB                                | IRB: Use is... only for naming methods that return a boolean  |
| Medium   | N A R G S                                      | OPT.JAVA.CNOM.NARGS                              | NARGS: Use a naming convention for arguments  |
| Medium   | N C L  | OPT.JAVA.CNOM.NCL                                | NCL: Naming convention for class names  |
| Medium   | N E  | OPT.JAVA.CNOM.NE                                 | NE: Naming convention for class exceptions  |
| Medium   | N M  | OPT.JAVA.CNOM.NM                                 | NM: Follow a naming standard for methods  |
| Medium   | Inner classes should be protected or private   | OPT.JAVA.CNOM.PKG                                | PKG: Use all lowercase letters for package names  |
| Medium   | R Inner classes should be protected or private | OPT.JAVA.CNOM.RPKG                               | RPKG: Avoid using the package name that is reserved by Sun  |
| Medium   | D I C  | OPT.JAVA.COL.DIC                                 | DIC: Define initial capacities for ArrayList, HashMap, HashSet, Hashtable, Vector and WeakHashMap   |
| Medium   | M C S  | OPT.JAVA.COL.MCS                                 | MCS: Minimize using synchronized collections: detect use of synchronized collections (Vector, Hashtable) and indicate it                                |
| Medium   | M C S C  | OPT.JAVA.COL.MCSC                                | MCSC: Do not make an excessive use of synchronized collections: detect use of Collections.synchronizedCollection() and derivate collections             |
| Medium   | Avoid Bit To Bit Comparisons                   | OPT.JAVA.COMP.AvoidBitToBitComparisons           | AvoidBitToBitComparisons: Avoid using bitwise operators to make comparisons   |
| Medium   | Avoid Comp Byte Max Value Min Value            | OPT.JAVA.COMP.AvoidCompByteMaxValueMinValue      | AvoidCompByteMaxValueMinValue: Avoid the comparisons of byte data with Byte.MIN_VALUE and Byte.MAX_VALUE because they always return the same result     |
| Medium   | Avoid Comp Character Max Value Min Value       | OPT.JAVA.COMP.AvoidCompCharacterMaxValueMinValue | AvoidCompCharacterMaxValueMinValue: Avoid comparisons between Character.MIN_VALUE and Character.MAX_VALUE, because they always return the same result   |
| Medium   | Avoid Comp Double Max Value Min Value          | OPT.JAVA.COMP.AvoidCompDoubleMaxValueMinValue    | AvoidCompDoubleMaxValueMinValue: Avoid comparing double with Double.MAX_VALUE and Double.MIN_VALUE. These comparisons will always return the same value |
| Medium   | Avoid Comp Float Max Value Min Value           | OPT.JAVA.COMP.AvoidCompFloatMaxValueMinValue     | AvoidCompFloatMaxValueMinValue: Avoid comparing Float.MAX_VALUE and Double.MIN_VALUE. These comparisons will always return the same value               |
| Medium   | Avoid Comp Integer Max Value Min Value         | OPT.JAVA.COMP.AvoidCompIntegerMaxValueMinValue   | AvoidCompIntegerMaxValueMinValue: Avoid the comparisons of Integer.MIN_VALUE and Integer.MAX_VALUE because they always return the same result           |

| Severity | Contrast rule  | Engine rule ID   | Description   |
|----------|--|--|---|
| Medium   | Avoid Comp Long Max Value Min Value                  | OPT.JAVA.COMP.AvoidCompLongMaxValueMinValue            | AvoidCompLongMaxValueMinValue: Avoid comparisons with Long.MIN_VALUE and Long.MAX_VALUE, because they always return the same result                 |
| Medium   | Avoid Comp Short Max Value Min Value                 | OPT.JAVA.COMP.AvoidCompShortMaxValueMinValue           | AvoidCompShortMaxValueMinValue: Avoid comparing short with Short.MAX_VALUE and Short.MIN_VALUE. These comparisons will always return the same value |
| Medium   | Dont Compare One Self                                | OPT.JAVA.COMP.DontCompareOneSelf                       | DontCompareOneSelf: Avoid comparing a variable with itself  |
| Medium   | Avoid Excessively Bracketed Loops                    | OPT.JAVA.COMPJ.AvoidExcessivelyBracketedLoops          | AvoidExcessivelyBracketedLoops: Avoid nesting more than three loops   |
| Medium   | Avoidt Nest Try Catch                                | OPT.JAVA.COMPJ.AvoidtNestTryCatch                      | AvoidtNestTryCatch: Avoid nesting more than 1 try / catch   |
| Medium   | Components Are Not Calling Too Many Other Components | OPT.JAVA.ComponentsAreNotCallingTooManyOtherComponents | ComponentsAreNotCallingTooManyOtherComponents: Avoid using components calling too many other components   |
| Medium   | Avoid Assignments Within I F                         | OPT.JAVA.COND.AvoidAssignmentsWithinIF                 | AvoidAssignmentsWithinIF: Avoid assignments inside conditional expressions  |
| Medium   | Private Constructor Utility Program                  | OPT.JAVA.CONST.PrivateConstructorUtilityProgram        | PrivateConstructorUtilityProgram: Only declare 'private' constructors for a class of a utility program  |
| Medium   | Avoid Field Variables Differ Upper Lower Case        | OPT.JAVA.CONV.AvoidFieldVariablesDifferUpperLowerCase  | AvoidFieldVariablesDifferUpperLowerCase: Avoid field names that differ only in case   |
| Medium   | Avoid Import Class Local Package                     | OPT.JAVA.CONV.AvoidImportClassLocalPackage             | AvoidImportClassLocalPackage: Avoid importing classes from the local package  |
| Medium   | Avoid Parameter Differ Upper Lower Case              | OPT.JAVA.CONV.AvoidParameterDifferUpperLowerCase       | AvoidParameterDifferUpperLowerCase: Avoid parameters that only differ in case   |
| Medium   | Avoid Same Method Field Names                        | OPT.JAVA.CONV.AvoidSameMethodFieldNames                | AvoidSameMethodFieldNames: Avoid fields and methods with the same name  |
| Medium   | Collection Type Verification                         | OPT.JAVA.CONV.CollectionTypeVerification               | CollectionTypeVerification: Always test the type of object when it is converted to an abstract collection   |
| Medium   | Object Type Verification                             | OPT.JAVA.CONV.ObjectTypeVerification                   | ObjectTypeVerification: Always check object type before cast  |
| Medium   | Avoid Declare Field Used In Only One Method          | OPT.JAVA.DECL.AvoidDeclareFieldUsedInOnlyOneMethod     | AvoidDeclareFieldUsedInOnlyOneMethod: Do not declare private fields that are used in only one method  |
| Medium   | Avoid Final Static Public Matrix Field               | OPT.JAVA.DECL.AvoidFinalStaticPublicMatrixField        | AvoidFinalStaticPublicMatrixField: Avoid using a public static final field of type Matrix   |
| Medium   | Avoid Local Variable Similar Name                    | OPT.JAVA.DECL.AvoidLocalVariableSimilarName            | AvoidLocalVariableSimilarName: Avoid local variables with similar names   |
| Medium   | Avoid New Boolean                                    | OPT.JAVA.DECL.AvoidNewBoolean                          | AvoidNewBoolean: Avoid creating Boolean objects using Boolean.TRUE or Boolean.FALSE   |
| Medium   | Avoid Num Literals                                   | OPT.JAVA.DECL.AvoidNumLiterals                         | AvoidNumLiterals: Avoid using numeric literals  |
| Medium   | Avoid Use Literal                                    | OPT.JAVA.DECL.AvoidUseLiteral                          | AvoidUseLiteral: Avoid using explicit string literals, but instead, declare constants   |

| Severity | Contrast rule                      | Engine rule ID                               | Description  |
|----------|------------------------------------|--|--|
| Medium   | Private Constructor In Final Class | OPT.JAVA.DECL.PrivateConstructorInFinalClass | PrivateConstructorInFinalClass: Declare classes where all constructors are private as 'final'                              |
| Medium   | A U V T                            | OPT.JAVA.DECLARA.AUVT                        | AUVT: Declare the List and Set variables with their interface type   |
| Medium   | D C I                              | OPT.JAVA.DECLARA.DCI                         | DCI: Define public constants in an interface   |
| Medium   | D C T O R                          | OPT.JAVA.DECLARA.DCTOR                       | DCTOR: Define a default constructor whenever possible  |
| Medium   | I Don't use masterpage files T     | OPT.JAVA.DECLARA.IMPT                        | IMPT: Avoid usage of * in import statements  |
| Medium   | M V O S                            | OPT.JAVA.DECLARA.MVOS                        | MVOS: Avoid declaring multiple variables in one statement  |
| Medium   | N T X                              | OPT.JAVA.DECLARA.NTX                         | NTX: Avoid throwing 'Exception'. Always use a proper Exception subclass  |
| Medium   | Not Define Object Variables        | OPT.JAVA.DECLARA.NotDefineObjectVariables    | NotDefineObjectVariables: Do not define 'Object' variables   |
| Medium   | Avoid Abstract Class Ejb           | OPT.JAVA.EJB.AvoidAbstractClassEjb           | AvoidAbstractClassEjb: Do not declare abstract EJBs  |
| Medium   | Avoid Create Exception             | OPT.JAVA.EJB.AvoidCreateException            | AvoidCreateException: Always launch 'javax.ejb.CreateException' for creation methods of the remote and local interfaces    |
| Medium   | Avoid Final Class Ejb              | OPT.JAVA.EJB.AvoidFinalClassEjb              | AvoidFinalClassEjb: Do not declare EJBs as final   |
| Medium   | Avoid Finder Exception             | OPT.JAVA.EJB.AvoidFinderException            | AvoidFinderException: Always throw a 'javax.ejb.FinderException' for the finder methods of the remote and local interfaces |
| Medium   | Avoid Return This Class Ejb        | OPT.JAVA.EJB.AvoidReturnThisClassEjb         | AvoidReturnThisClassEjb: Avoid returning 'this' from the methods of the Enterprise JavaBean classes                        |
| Medium   | Avoid Using Thread                 | OPT.JAVA.EJB.AvoidUsingThread                | AvoidUsingThread: Do not start, stop or manage objects in a EntityBeans java.lang.Thread                                   |
| Medium   | Declareejb Post Create Public      | OPT.JAVA.EJB.DeclareejbPostCreatePublic      | DeclareejbPostCreatePublic: Always declare ejbPostCreate() public  |
| Medium   | Unnormalized Input String          | OPT.JAVA.SEC_JAVA.UnnormalizedInputString    | UnnormalizedInputString: Always normalize system inputs  |
| Medium   | Dont Pass This As Arg              | OPT.JAVA.EJB.DontPassThisAsArg               | DontPassThisAsArg: Do not pass 'this' as an argument   |
| Medium   | Ejb Create Message Driven Bean     | OPT.JAVA.EJB.EjbCreateMessageDrivenBean      | EjbCreateMessageDrivenBean: Always implement the least one ejbCreate() method in a class of MessageDrivenBean              |
| Medium   | Avoid Text Area                    | OPT.JAVA.ESPUI.AvoidTextArea                 | AvoidTextArea: Avoid using java.awt.TextArea   |
| Medium   | Avoid Empty Finally Blocks         | OPT.JAVA.EXCP.AvoidEmptyFinallyBlocks        | AvoidEmptyFinallyBlocks: Avoid empty final blocks  |
| Medium   | Avoid Empty Try Blocks             | OPT.JAVA.EXCP.AvoidEmptyTryBlocks            | AvoidEmptyTryBlocks: Avoid empty try blocks  |
| Medium   | Avoid Excp Error                   | OPT.JAVA.EXCP.AvoidExcpError                 | AvoidExcpError: Avoid java.lang.Error catch exceptions   |
| Medium   | Avoid Illegal Monitor State Excp   | OPT.JAVA.EXCP.AvoidIllegalMonitorStateExcp   | AvoidIllegalMonitorStateExcp: Avoid capturing java.lang.IllegalMonitorStateException                                       |
| Medium   | Avoid New Exception                | OPT.JAVA.EXCP.AvoidNewException              | AvoidNewException: Avoid creating new instances of java.lang.Exception   |
| Medium   | Avoid Object Throwable             | OPT.JAVA.EXCP.AvoidObjectThrowable           | AvoidObjectThrowable: Avoid capturing Throwable objects  |
| Medium   | Exceptions In Throws               | OPT.JAVA.EXCP.ExceptionsInThrows             | ExceptionsInThrows: Always use specific exceptions in the throws clause  |
| Medium   | A M C                              | OPT.JAVA.FMETODOS.AMC                        | AMC: Avoid multiple comparisons within if  |

| Severity | Contrast rule                       | Engine rule ID                               | Description  |
|----------|-------------------------------------|--|--|
| Medium   | D U N                               | OPT.JAVA.FMETODOS.DUN                        | DUN: Too many uses of the negation operator (!) in a method  |
| Medium   | G N E                               | OPT.JAVA.FMETODOS.GNE                        | GNE: Control number of exceptions in a clause  |
| Medium   | I A D                               | OPT.JAVA.FMETODOS.IAD                        | IAD: Declare arrays with [] braces after the array type and before the variable name(s)  |
| Medium   | Avoid Call Start Constructors       | OPT.JAVA.HEB.AvoidCallStartConstructors      | AvoidCallStartConstructors: Do not call the start() method from within the constructors of the subclass of the thread                  |
| Medium   | Avoid This In Sincronized Sentences | OPT.JAVA.HEB.AvoidThisInSincronizedSentences | AvoidThisInSincronizedSentences: Avoid using this in synchronised blocks   |
| Medium   | Avoid Wait Outside Brackets         | OPT.JAVA.HEB.AvoidWaitOutsideBrackets        | AvoidWaitOutsideBrackets: Avoid using wait() method of the class java.lang.Object outside a while loop                                 |
| Medium   | D V B C                             | OPT.JAVA.INICIA.DVBC                         | DVBC: Define class attributes at the beginning of the class  |
| Medium   | L V                                 | OPT.JAVA.INICIA.LV                           | LV: Initialize all local variables at the declaration statement  |
| Medium   | U S N                               | OPT.JAVA.INICIA.USN                          | USN: Avoid literals in method calls. Named constants (static final class variables) make source code easier to understand and maintain |
| Medium   | Avoid Check Permission              | OPT.JAVA.J2EE.AvoidCheckPermission           | AvoidCheckPermission: Avoid calling java.security.AccessController.checkPermission()   |
| Medium   | Avoid Class Loader Instance         | OPT.JAVA.J2EE.AvoidClassLoaderInstance       | AvoidClassLoaderInstance: Avoid instantiating java.lang.ClassLoader  |
| Medium   | Avoid Do As                         | OPT.JAVA.J2EE.AvoidDoAs                      | AvoidDoAs: Avoid calling javax.security.auth.Subject.doAs()  |
| Medium   | Avoid Do As Privileged              | OPT.JAVA.J2EE.AvoidDoAsPrivileged            | AvoidDoAsPrivileged: Avoid calling javax.security.auth.Subject.doAsPrivileged()  |
| Medium   | Avoid Do Privileged                 | OPT.JAVA.J2EE.AvoidDoPrivileged              | AvoidDoPrivileged: Avoid calling java.security.AccessController.doPrivileged()   |
| Medium   | Avoid Extend Permission             | OPT.JAVA.J2EE.AvoidExtendPermission          | AvoidExtendPermission: Avoid extending java.security.Permission  |
| Medium   | Avoid Get Policy                    | OPT.JAVA.J2EE.AvoidGetPolicy                 | AvoidGetPolicy: Avoid calling Policy.getPolicy()   |
| Medium   | Avoid Get Property                  | OPT.JAVA.J2EE.AvoidGetProperty               | AvoidGetProperty: Avoid calling java.security.Security.getProperty()   |
| Medium   | Avoid Large Blocks                  | OPT.JAVA.J2EE.AvoidLargeBlocks               | AvoidLargeBlocks: Avoiding a privileged block of more than 5 lines   |
| Medium   | Avoid Permission Instance           | OPT.JAVA.J2EE.AvoidPermissionInstance        | AvoidPermissionInstance: Avoid creating an instance of java.security.Permission  |
| Medium   | Avoid Policy Instance               | OPT.JAVA.J2EE.AvoidPolicyInstance            | AvoidPolicyInstance: Avoid creating an instance of java.security.Policy  |
| Medium   | Avoid Set Policy                    | OPT.JAVA.J2EE.AvoidSetPolicy                 | AvoidSetPolicy: Avoid call to Policy.setPolicy()   |
| Medium   | Avoid Alter Check Security Manager  | OPT.JAVA.J2SE.AvoidAlterCheckSecurityManager | AvoidAlterCheckSecurityManager: Avoid overwriting methods check* in SecurityManager  |
| Medium   | Avoid Catch Security Exception      | OPT.JAVA.J2SE.AvoidCatchSecurityException    | AvoidCatchSecurityException: Avoid capturing Java.lang.SecurityException   |
| Medium   | Avoid Static Public No Final Field  | OPT.JAVA.J2SE.AvoidStaticPublicNoFinalField  | AvoidStaticPublicNoFinalField: Avoid non-final public static fields  |
| Medium   | Avoid Using J A X R P C             | OPT.JAVA.JAX.AvoidUsingJAXRPC                | AvoidUsingJAXRPC: Avoid using JAX-RPC  |

| Severity | Contrast rule                              | Engine rule ID                                    | Description  |
|----------|--|---|--|
| Medium   | Include A P I Version Number Into URL      | OPT.JAVA.JAX.IncludeAPIVersionNumberIntoURL       | IncludeAPIVersionNumberIntoURL: Include the API version number into the URL                                  |
| Medium   | Use Default Value Annotation               | OPT.JAVA.JAX.UseDefaultValueAnnotation            | UseDefaultValueAnnotation: Use the @DefaultValue annotation when processing a request                        |
| Medium   | Use Generic Entity                         | OPT.JAVA.JAX.UseGenericEntity                     | UseGenericEntity: Use GenericEntity when returning a list of instances                                       |
| Medium   | Use JSON Responses                         | OPT.JAVA.JAX.UseJSONResponses                     | UseJSONResponses: Use JSON responses in REST applications  |
| Medium   | Use Proper Return Types And Response Codes | OPT.JAVA.JAX.UseProperReturnTypesAndResponseCodes | UseProperReturnTypesAndResponseCodes: Include a proper response code along with an appropriate return type   |
| Medium   | P S T                                      | OPT.JAVA.JDBC.PST                                 | PST: Use PreparedStatement instead of Statement to similar requests  |
| Medium   | R R W D                                    | OPT.JAVA.JDBC.RRWD                                | RRWD: Close JDBC resources when finishing using  |
| Medium   | S E L E C T                                | OPT.JAVA.JDBC.SELECT                              | SELECT: Avoid SQL sentences with SELECT *  |
| Medium   | Javadoc T O D O                            | OPT.JAVA.JDOC.JavadocTODO                         | JavadocTODO: Avoid TODO comments in production code  |
| Medium   | Javadoc Throws Rule                        | OPT.JAVA.JDOC.JavadocThrowsRule                   | JavadocThrowsRule: Provide the @throws tag in Javadoc comments for public and protected methods              |
| Medium   | Call Super Set Up From Set Up              | OPT.JAVA.JUNIT_JAVA.CallSuperSetUpFromSetUp       | CallSuperSetUpFromSetUp: Always call super.setUp() from the method setUp of the JUnit TestCase               |
| Medium   | Call Super Tear Down From Tear Down        | OPT.JAVA.JUNIT_JAVA.CallSuperTearDownFromTearDown | CallSuperTearDownFromTearDown: Always call super.tearDown() from the method tearDown() of the JUnit TestCase |
| Medium   | Invoke Suite As Static Public              | OPT.JAVA.JUNIT_JAVA.InvokeSuiteAsStaticPublic     | InvokeSuiteAsStaticPublic: Always declare Junit.framework.TestCase.suite() as a public static method         |
| Medium   | I A C B                                    | OPT.JAVA.LOOP.IACB                                | IACB: Use System.arraycopy() instead of using a loop to copy arrays  |
| Medium   | L I N T                                    | OPT.JAVA.LOOP.LINT                                | LINT: Use integer index variable in loops  |
| Medium   | Avoid Call Run From Servlet                | OPT.JAVA.MAN.AvoidCallRunFromServlet              | AvoidCallRunFromServlet: Avoid calling java.lang.Runnable.run() from any servlet                             |
| Medium   | Avoid Confused Multiplication              | OPT.JAVA.MAT.AvoidConfusedMultiplication          | AvoidConfusedMultiplication: Avoid Confusing Multiplications   |
| Medium   | Avoid Modulus One                          | OPT.JAVA.MAT.AvoidModulusOne                      | AvoidModulusOne: Avoid modulus value that equal to one   |
| Medium   | Avoid Static Call Math                     | OPT.JAVA.MAT.AvoidStaticCallMath                  | AvoidStaticCallMath: Avoid invoking a static method of java.lang.Math invoke on a constant                   |
| Medium   | Check Variable Odd Value                   | OPT.JAVA.MAT.CheckVariableOddValue                | CheckVariableOddValue: Avoid using var% 2 != 0   |
| Medium   | Avoid Number Instance With New             | OPT.JAVA.MEM.AvoidNumberInstanceWithNew           | AvoidNumberInstanceWithNew: Avoid creating a instance of a number using new                                  |
| Medium   | Avoid Run Finalization                     | OPT.JAVA.MEM.AvoidRunFinalization                 | AvoidRunFinalization: Avoid call to java.lang.Runtime.runFinalization()                                      |
| Medium   | Avoid Return Null Enumeration              | OPT.JAVA.NULL.AvoidReturnNullEnumeration          | AvoidReturnNullEnumeration: Return empty enumerations instead of returning null                              |
| Medium   | Avoid Return Null Iterator                 | OPT.JAVA.NULL.AvoidReturnNullIterator             | AvoidReturnNullIterator: Return an empty iterator instead of null  |

| Severity | Contrast rule                               | Engine rule ID                                 | Description  |
|----------|---|--|--|
| Medium   | Null Dereference                            | OPT.JAVA.NullDereference                       | NullDereference: NULL Pointer Dereference  |
| Medium   | D N C S S                                   | OPT.JAVA.PB.DNCSS                              | DNCSS: Do not call setSize() in ComponentListener.componentResized()                                       |
| Medium   | Empty pages                                 | OPT.JAVA.PB.ISEM                               | ISEM: Avoid calling varString.equals("literal") or varString.equalsIgnoreCase("literal")                   |
| Medium   | J U I N                                     | OPT.JAVA.PB.JUIN                               | JUIN: Avoid incrementers with error  |
| Medium   | M A S P                                     | OPT.JAVA.PB.MASP                               | MASP: Assign protected accessibility to readResolve () and writeReplace () methods in serializable classes |
| Medium   | MVC   | OPT.JAVA.PB.MVC                                | MVC: Avoid local variables with the same name as variables of the enclosing class                          |
| Medium   | Num Max Class By Package                    | OPT.JAVA.PB.NumMaxClassByPackage               | NumMaxClassByPackage: Avoid an excessive number of classes per package/namespace                           |
| Medium   | R F F B                                     | OPT.JAVA.PB.RFFB                               | RFFB: Return from finally blocks   |
| Medium   | U E I                                       | OPT.JAVA.PB.UEI                                | UEI: Use equals() when comparing Objects   |
| Medium   | U O M E                                     | OPT.JAVA.PB.UOME                               | UOME: Do not make useless method overwrites  |
| Medium   | Avoid Dump Stack                            | OPT.JAVA.PERF.AvoidDumpStack                   | AvoidDumpStack: Avoid using Thread.dumpStack() in production code  |
| Medium   | Avoid System                                | OPT.JAVA.PERF.AvoidSystem                      | AvoidSystem: Avoid using System.out or System.err in production code                                       |
| Medium   | Avoid Call Connection From Servlet          | OPT.JAVA.RECBAS.AvoidCallConnectionFromServlet | AvoidCallConnectionFromServlet: Avoid calling java.sql.Connection from the finalize() method of a servlet  |
| Medium   | Avoid Call Net From Servlet                 | OPT.JAVA.RECBAS.AvoidCallNetFromServlet        | AvoidCallNetFromServlet: Avoid calling Java.net .* from finalize() method of a servlet                     |
| Medium   | Avoid Call Omg From Servlet                 | OPT.JAVA.RECBAS.AvoidCallOmgFromServlet        | AvoidCallOmgFromServlet: Avoid calling org.omg .* from finalize() method of a servlet                      |
| Medium   | Avoid Call Result Set From Servlet          | OPT.JAVA.RECBAS.AvoidCallResultSetFromServlet  | AvoidCallResultSetFromServlet: Avoid calling java.sql.ResultSet from the finalize() method of a servlet    |
| Medium   | Avoid Call Statement From Servlet           | OPT.JAVA.RECBAS.AvoidCallStatementFromServlet  | AvoidCallStatementFromServlet: Avoid calling java.sql.Statement from the method finalize() of a servlet    |
| Medium   | Avoid Date Matrix                           | OPT.JAVA.RECBASJ2SE.AvoidDateMatrix            | AvoidDateMatrix: Avoid using a matrix of type Date   |
| Medium   | Avoid Call Jar From Servlet                 | OPT.JAVA.RENDESC.AvoidCallJarFromServlet       | AvoidCallJarFromServlet: Avoid calling Java.util.jar .* from any servlet                                   |
| Medium   | Avoid Call Rmi From Servlet                 | OPT.JAVA.RENDESC.AvoidCallRmiFromServlet       | AvoidCallRmiFromServlet: Avoid calling Java.rmi .* from any servlet  |
| Medium   | A D G C                                     | OPT.JAVA.RGM.ADGC                              | ADGC: Avoid using java.util.Date or java.util.GregorianCalendar  |
| Medium   | A F P                                       | OPT.JAVA.RGM.AFP                               | AFP: Avoid modifications on method or constructor parameters   |
| Medium   | A R N                                       | OPT.JAVA.RGM.ARN                               | ARN: Return zero-length arrays instead of null   |
| Medium   | B L K D O W H L                             | OPT.JAVA.RGM.BLKDOWNHL                         | BLKDOWNHL: Use a braces block for 'do-while' statements  |
| Medium   | B L K F O R                                 | OPT.JAVA.RGM.BLKFOR                            | BLKFOR: Use a braces block for 'for' statements  |
| Medium   | B L K W H L                                 | OPT.JAVA.RGM.BLKWHL                            | BLKWHL: Provide a braces block for 'while' statements  |
| Medium   | C L N C                                     | OPT.JAVA.RGM.CLNC                              | CLNC: Avoid using constructors in the clone() method   |
| Medium   | Make your clone() method final for security | OPT.JAVA.RGM.CLONE                             | CLONE: Call super.clone() in all clone() methods   |
| Medium   | D U I D                                     | OPT.JAVA.RGM.DUID                              | DUID: Create a serialVersionUID for all Serializable classes   |



| Severity | Contrast rule  | Engine rule ID                            | Description   |
|----------|--|---|---|
| Medium   | Dont Use Assert  | OPT.JAVA.RGM.DontUseAssert                | DontUseAssert: Do not use assert and do not launch AssertionError   |
| Medium   | F F  | OPT.JAVA.RGM.FF                           | FF: Declare constant fields private and final   |
| Medium   | F L V  | OPT.JAVA.RGM.FLV                          | FLV: Declare constant local variables as final  |
| Medium   | H M F  | OPT.JAVA.RGM.HMF                          | HMF: Avoid giving method local variables and parameters the same name as class fields                         |
| Medium   | P C I F  | OPT.JAVA.RGM.PCIF                         | PCIF: Declare for loops with a condition and an increment statement   |
| Medium   | P C I F2   | OPT.JAVA.RGM.PCIF2                        | PCIF2: Use only one condition statement in for blocks   |
| Medium   | P C I F3   | OPT.JAVA.RGM.PCIF3                        | PCIF3: Use 'for' loops with explicit condition and increment/decrement statements                             |
| Medium   | P C T O R  | OPT.JAVA.RGM.PCTOR                        | PCTOR: Do not declare public constructors in non-public classes   |
| Medium   | P S F A  | OPT.JAVA.RGM.PSFA                         | PSFA: Avoid using public static final array fields  |
| Medium   | U S T  | OPT.JAVA.RGM.UST                          | UST: Use StringTokenizer instead of indexOf() or substring() for String parsing                               |
| Medium   | C I P A  | OPT.JAVA.RGME.CIPA                        | CIPA: Avoid large array initializations from constant arrays  |
| Medium   | O O M E  | OPT.JAVA.RGME.OOME                        | OOME: Capture OutOfMemoryError for large arrays initializations   |
| Medium   | U N C  | OPT.JAVA.RGOR.UNC                         | UNC: Do not cast a variable to an interface implemented by that variable or to the base class that extends it |
| Medium   | Use Service Locator Pattern  | OPT.JAVA.RGOR.UseServiceLocatorPattern    | UseServiceLocatorPattern: Apply the 'Service Locator' pattern   |
| Medium   | Avoid Packages   | OPT.JAVA.RGP.AvoidPackages                | AvoidPackages: Do not import the specified packages   |
| Medium   | L N S P  | OPT.JAVA.RGP.LNSP                         | LNSP: Do not hard code character for line separator   |
| Medium   | No Absolute Paths  | OPT.JAVA.RGP.NoAbsolutePaths              | NoAbsolutePaths: Do not use absolute paths  |
| Medium   | Make your clone() method final for security                            | OPT.JAVA.RGS.CLONE                        | CLONE: Make your clone() method final for security  |
| Medium   | Do not compare class objects with getName() or getSimpleName() methods | OPT.JAVA.RGS.CMP                          | CMP: Do not compare class objects with getName() or getSimpleName() methods                                   |
| Medium   | Define inner classes as private  | OPT.JAVA.RGS.INNER                        | INNER: Define inner classes as private  |
| Medium   | Inner classes should be protected or private                           | OPT.JAVA.RGS.PKG                          | PKG: Inner classes should be 'protected' or 'private'   |
| Medium   | Avoid EJB AWT Swing  | OPT.JAVA.SEC_JAVA.AvoidEJBAWTSwing        | AvoidEJBAWTSwing: EJB Bad Practices: Use of AWT Swing   |
| Medium   | Avoid EJB JVM Shutdown   | OPT.JAVA.SEC_JAVA.AvoidEJBVMShutdown      | AvoidEJBVMShutdown: J2EE Bad Practices: Use of System.exit()  |
| Medium   | Avoid EJB Java Io  | OPT.JAVA.SEC_JAVA.AvoidEJBJavaIo          | AvoidEJBJavaIo: EJB Bad Practices: Use of Java I/O  |
| Medium   | Avoid EJB Redirect Streams   | OPT.JAVA.SEC_JAVA.AvoidEJBRedirectStreams | AvoidEJBRedirectStreams: Avoid changing the input, output, and error streams in EJB                           |



| Severity | Contrast rule                              | Engine rule ID  | Description  |
|----------|--|---|--|
| Medium   | Avoid EJB Set Class Loader                 | OPT.JAVA.SEC_JAVA.AvoidEJBSetClassLoader                | AvoidEJBSetClassLoader: Avoid setting context ClassLoader in EJB   |
| Medium   | Avoid EJB Set Security Manager             | OPT.JAVA.SEC_JAVA.AvoidEJBSetSecurityManager            | AvoidEJBSetSecurityManager: Avoid setting system SecurityManager in EJB  |
| Medium   | Avoid EJB Synchronization on Primitives    | OPT.JAVA.SEC_JAVA.AvoidEJBsynchronizationPrimitives     | AvoidEJBsynchronizationPrimitives: Avoid use of synchronization primitives in EJB  |
| Medium   | Avoid J2EE Direct Database Connection      | OPT.JAVA.SEC_JAVA.AvoidJ2EEDirectDatabaseConnection     | AvoidJ2EEDirectDatabaseConnection: J2EE Bad Practices: Direct Management of Connections                                  |
| Medium   | Avoid J2EE Explicit Socket                 | OPT.JAVA.SEC_JAVA.AvoidJ2EEExplicitSocket               | AvoidJ2EEExplicitSocket: J2EE Bad Practices: Direct Use of Sockets   |
| Medium   | Avoid J2EE Explicit Thread Management      | OPT.JAVA.SEC_JAVA.AvoidJ2EEExplicitThreadManagement     | AvoidJ2EEExplicitThreadManagement: J2EE Bad Practices: Direct Use of Threads   |
| Medium   | Avoid J2EE Leftover Debug Code             | OPT.JAVA.SEC_JAVA.AvoidJ2EELeftoverDebugCode            | AvoidJ2EELeftoverDebugCode: Leftover Debug Code in J2EE applications   |
| Medium   | Avoid J2EE Non Serializable Objects Stored | OPT.JAVA.SEC_JAVA.AvoidJ2EENonSerializableObjectsStored | AvoidJ2EENonSerializableObjectsStored: Avoid non-serializable objects stored in session in J2EE applications             |
| Medium   | Avoid Native Calls Rule                    | OPT.JAVA.SEC_JAVA.AvoidNativeCallsRule                  | AvoidNativeCallsRule: Avoid calls from Java to native (JNI) code   |
| Medium   | Detail Error Leak Rule                     | OPT.JAVA.SEC_JAVA.DetailErrorLeakRule                   | DetailErrorLeakRule: Do not send detail error information to client  |
| Medium   | Execution After Redirect                   | OPT.JAVA.SEC_JAVA.ExecutionAfterRedirect                | ExecutionAfterRedirect: Execution After Redirect (EAR)   |
| Medium   | Potential Infinite Loop                    | OPT.JAVA.SEC_JAVA.PotentialInfiniteLoop                 | PotentialInfiniteLoop: Loop with Unreachable Exit Condition ('Infinite Loop')  |
| Medium   | Unchecked Input In Loop Condition          | OPT.JAVA.SEC_JAVA.UncheckedInputInLoopCondition         | UncheckedInputInLoopCondition: Unchecked input in loop condition   |
| Medium   | Avoid Assign Repeated Value                | OPT.JAVA.SENT.AvoidAssignRepeatedValue                  | AvoidAssignRepeatedValue: Avoid assigning a value to a variable that has already been assigned                           |
| Medium   | Avoid Call Get Resource Rule               | OPT.JAVA.SENT.AvoidCallGetResourceRule                  | AvoidCallGetResourceRule: Avoid calling this.getClass.getResource  |
| Medium   | Avoid Compare Float Point                  | OPT.JAVA.SENT.AvoidCompareFloatPoint                    | AvoidCompareFloatPoint: Avoid comparing floating point with Code Quality[]{}   |
| Medium   | Implement Externalizable                   | OPT.JAVA.SERI.ImplementExternalizable                   | ImplementExternalizable: Every class that implements Externalizable must have a constructor with no parameters           |
| Medium   | Private Read Write Objects                 | OPT.JAVA.SERI.PrivateReadWriteObjects                   | PrivateReadWriteObjects: Declare optional readObject and writeObject as private in externalizable / serializable classes |
| Medium   | Avoid Implement Single Thread Model        | OPT.JAVA.SERV.AvoidImplementSingleThreadModel           | AvoidImplementSingleThreadModel: Avoid implementing the interface javax.servlet.SingleThreadModel in a servlet           |
| Medium   | Avoid Large Synchronised Blocks            | OPT.JAVA.SERV.AvoidLargeSynchronisedBlocks              | AvoidLargeSynchronisedBlocks: Avoid synchronized blocks with more than 6 statements                                      |
| Medium   | Avoid Constructor Injection By Name        | OPT.JAVA.SPRING.AvoidConstructorInjectionByName         | AvoidConstructorInjectionByName: Avoid constructor injection by name   |

| Severity | Contrast rule  | Engine rule ID  | Description  |
|----------|--|---|--|
| Medium   | Avoid Hardcoding Properties Into XML                   | OPT.JAVA.SPRING.AvoidHardcodingPropertiesIntoXML                | AvoidHardcodingPropertiesIntoXML: Avoid hardcoding properties into XML descriptors, externalize them instead |
| Medium   | Avoid Loading Multiple XML Configuration Files         | OPT.JAVA.SPRING.AvoidLoadingMultipleXMLConfigurationFiles       | AvoidLoadingMultipleXMLConfigurationFiles: Avoid loading multiple XML configuration files                    |
| Medium   | Avoid Too Deep Hierarchy In Jobs                       | OPT.JAVA.SPRING.AvoidTooDeepHierarchyInJobs                     | AvoidTooDeepHierarchyInJobs: Avoid too deep jobs hierarchy   |
| Medium   | Avoid Too Deep Hierarchy In Steps                      | OPT.JAVA.SPRING.AvoidTooDeepHierarchyInSteps                    | AvoidTooDeepHierarchyInSteps: Avoid too deep steps hierarchy   |
| Medium   | Avoid Using Version Numbers Within Spring Schema Names | OPT.JAVA.SPRING.AvoidUsingVersionNumbersWithinSpringSchemaNames | AvoidUsingVersionNumbersWithinSpringSchemaNames: Avoid using version numbers in Spring schema names          |
| Medium   | Disable XML Validation In Production                   | OPT.JAVA.SPRING.DisableXMLValidationInProduction                | DisableXMLValidationInProduction: Disable XML validation in production                                       |
| Medium   | Enforces JSON Responses                                | OPT.JAVA.SPRING.EnforcesJSONResponses                           | EnforcesJSONResponses: Use JSON responses in REST applications   |
| Medium   | Prefer Repository Rest Resource Annotation             | OPT.JAVA.SPRING.PreferRepositoryRestResourceAnnotation          | PreferRepositoryRestResourceAnnotation: Use RepositoryRestResource annotation instead of RestResource        |
| Medium   | Setup Commit Interval For Chunk Processing             | OPT.JAVA.SPRING.SetupCommitIntervalForChunkProcessing           | SetupCommitIntervalForChunkProcessing: Set up a proper commit interval for chunk processing                  |
| Medium   | Use Annotations To Create Controllers                  | OPT.JAVA.SPRING.UseAnnotationsToCreateControllers               | UseAnnotationsToCreateControllers: Create controllers just using annotations                                 |
| Medium   | Use Java Based Configuration Instead XML Config        | OPT.JAVA.SPRING.UseJavaBasedConfigurationInsteadXMLConfig       | UseJavaBasedConfigurationInsteadXMLConfig: Use Java based configuration instead of XML based configuration   |
| Medium   | Use Lazy Initialized Singleton Beans                   | OPT.JAVA.SPRING.UseLazyInitializedSingletonBeans                | UseLazyInitializedSingletonBeans: Use lazy initialized singleton beans                                       |
| Medium   | Use Thread Safe Multi Threading Steps                  | OPT.JAVA.SPRING.UseThreadSafeMultiThreadingSteps                | UseThreadSafeMultiThreadingSteps: Use thread safe multi threading steps                                      |
| Medium   | A D L R  | OPT.JAVA.STR.ADLR   | ADLR: Avoid duplicate literals   |
| Medium   | Avoid String Concat                                    | OPT.JAVA.STR.AvoidStringConcat                                  | AvoidStringConcat: Avoid String concatenation using + or + {}  |
| Medium   | L S T R  | OPT.JAVA.STR.LSTR   | LSTR: Do not concatenate single character strings in a loop  |
| Medium   | N T U L C  | OPT.JAVA.STR.NTULC  | NTULC: Never use either toUpperCase.equals or toLowerCase.equals   |
| Medium   | S B  | OPT.JAVA.STR.SB   | SB: Instantiate StringBuffer/StringBuilder with explicit initial size  |
| Medium   | U C T M  | OPT.JAVA.STR.UCTM   | UCTM: Avoid unnecessary temporal conversion  |

| Severity | Contrast rule                                | Engine rule ID   | Description   |
|----------|--|--|---|
| Medium   | U S B  | OPT.JAVA.STR.USB   | USB: Avoid using the concatenation operator of strings + {}                                 |
| Medium   | F I E L D S                                  | OPT.JAVA.STRUTS.FIELDS                                     | FIELDS: Provide a getter and a setter for each field in a form Bean that extends ActionForm |
| Medium   | F O R M                                      | OPT.JAVA.STRUTS.FORM                                       | FORM: Use only getters and setters in form beans  |
| Medium   | I N S T                                      | OPT.JAVA.STRUTS.INST                                       | INST: Avoid instance variables in an Action class   |
| Medium   | Case With Return                             | OPT.JAVA.SWITCH.CaseWithReturn                             | CaseWithReturn: Every CASE statement should end with a break statement                      |
| Medium   | Avoid Map Set In URL                         | OPT.JAVA.VELOC.AvoidMapSetInURL                            | AvoidMapSetInURL: Avoid Map and Set methods of java.net.URL objects                         |
| Medium   | Avoid String Equals                          | OPT.JAVA.VELOC.AvoidStringEquals                           | AvoidStringEquals: Do not check the length of a series by invoking the String.equals("")    |
| Medium   | Avoid URL Methods                            | OPT.JAVA.VELOC.AvoidURLMethods                             | AvoidURLMethods: Avoid using the equals() and hashCode() in java.net.URL                    |
| Medium   | Transient For System Resources               | OPT.JAVA.J2SE.TransientForSystemResources                  | TransientForSystemResources: Mark as transient the fields with system resources             |
| Medium   | Check HTTP Methods                           | OPT.JAVA.JAX.CheckHTTPMethods                              | CheckHTTPMethods: Check the HTTP method used to send the request                            |
| Medium   | Avoid Total Memory Debug                     | OPT.JAVA.PERF.AvoidTotalMemoryDebug                        | AvoidTotalMemoryDebug: Avoid debugging with Runtime.totalMemory()                           |
| Medium   | Avoid Trace Method Calls Debug               | OPT.JAVA.PERF.AvoidTraceMethodCallsDebug                   | AvoidTraceMethodCallsDebug: Avoid debugging with Runtime.traceMethodCalls ()                |
| Medium   | Hardcoded Username Password                  | OPT.JAVA.SEC_JAVA.HardcodedUsernamePassword                | HardcodedUsernamePassword: Use of Hard-coded Credentials                                    |
| Medium   | Password In Configuration File               | OPT.JAVA.SEC_JAVA.PasswordInConfigurationFile              | PasswordInConfigurationFile: Use of credentials into configuration file                     |
| Medium   | Plaintext Storage Of Password                | OPT.JAVA.SEC_JAVA.PlaintextStorageOfPassword               | PlaintextStorageOfPassword: Plaintext Storage of a Password                                 |
| Medium   | Serializable Class Containing Sensitive Data | OPT.JAVA.SEC_JAVA.SerializableClassContainingSensitiveData | SerializableClassContainingSensitiveData: Serializable Class Containing Sensitive Data      |
| Medium   | Weak Password Hashing                        | OPT.JAVA.SEC_JAVA.WeakPasswordHashing                      | WeakPasswordHashing: Weak Password Hashing  |

## JavaScript Scan rules

Contrast Scan supports these rules for JavaScript.

| Severity | Contrast rule                   | Engine rule ID                                      | Description   |
|----------|---------------------------------|---|---|
| Critical | Improper Certificate Validation | OPT.JAVASCRIPT.ImproperCertificateValidation        | ImproperCertificateValidation: Improper Certificate Validation                    |
| Critical | Too Much Origins Allowed        | OPT.JAVASCRIPT.TooMuchOriginsAllowed                | TooMuchOriginsAllowed: CORS policy (Cross-origin resource sharing) too permissive |
| Critical | Contextual Escaping Disabled    | OPT.JAVASCRIPT.ANGULARJS.ContextualEscapingDisabled | ContextualEscapingDisabled: Strict Contextual Escaping (SCE) disabled             |

| Severity | Contrast rule                         | Engine rule ID                                      | Description   |
|----------|---------------------------------------|---|---|
| Critical | Unsafe Resource Url Whitelist         | OPT.JAVASCRIPT.ANGULARJS.UnsafeResourceUrlWhitelist | UnsafeResourceUrlWhitelist: Loading Angular templates insecurely  |
| Critical | Unsafe Url Whitelist                  | OPT.JAVASCRIPT.ANGULARJS.UnsafeUrlWhitelist         | UnsafeUrlWhitelist: Unsafe URL whitelisting   |
| Critical | Sandbox Allow Scripts And Same Origin | OPT.JAVASCRIPT.JSX.SandboxAllowScriptsAndSameOrigin | SandboxAllowScriptsAndSameOrigin: Unsafe sandbox with allow-scripts and same-origin   |
| Critical | No Use Of Eval                        | OPT.JAVASCRIPT.PERFORMANCE.NoUseOfEval              | NoUseOfEval: Do not use eval() for security and performance reasons   |
| Critical | Client Side Template Injection        | OPT.JAVASCRIPT.ClientSideTemplateInjection          | ClientSideTemplateInjection: Client-side Template Injection   |
| Critical | Code Injection                        | OPT.JAVASCRIPT.CodeInjection                        | CodeInjection: Improper Control of Generation of Code ('Code Injection')  |
| Critical | Code Injection With Deserialization   | OPT.JAVASCRIPT.CodeInjectionWithDeserialization     | CodeInjectionWithDeserialization: Do not use code injection during object deserialization   |
| Critical | Command Injection                     | OPT.JAVASCRIPT.CommandInjection                     | CommandInjection: Avoid non-neutralized user-controlled input to be part of a command   |
| Critical | Connection String Parameter Pollution | OPT.JAVASCRIPT.ConnectionStringParameterPollution   | ConnectionStringParameterPollution: Connection string polluted with untrusted input   |
| Critical | Cookie Poisoning                      | OPT.JAVASCRIPT.CookiePoisoning                      | CookiePoisoning: Cookie Poisoning   |
| Critical | Cross Site Scripting                  | OPT.JAVASCRIPT.CrossSiteScripting                   | CrossSiteScripting: Improper neutralization of input during web content generation (Cross-site Scripting, XSS)                        |
| Critical | DoS Regexp                            | OPT.JAVASCRIPT.DoSRegexp                            | DoSRegexp: Potential denial-of-service attack through malicious regular expressions (ReDoS)   |
| Critical | Http Parameter Pollution              | OPT.JAVASCRIPT.HttpParameterPollution               | HttpParameterPollution: HTTP parameter pollution (HPP)  |
| Critical | Ldap Injection                        | OPT.JAVASCRIPT.LdapInjection                        | LdapInjection: Avoid non-neutralized user-controlled input in LDAP search filters   |
| Critical | Mail Command Injection                | OPT.JAVASCRIPT.MailCommandInjection                 | MailCommandInjection: Mail Command Injection  |
| Critical | No SQL Injection                      | OPT.JAVASCRIPT.NoSQLInjection                       | NoSQLInjection: Improper neutralization of special elements in data query logic (SQL injection)                                       |
| Critical | Resource Injection                    | OPT.JAVASCRIPT.ResourceInjection                    | ResourceInjection: Do not allow external input to control resource identifiers  |
| Critical | Same Origin Method Execution          | OPT.JAVASCRIPT.SameOriginMethodExecution            | SameOriginMethodExecution: Same-Origin Method Execution (SOME)  |
| Critical | Server Side Template Injection        | OPT.JAVASCRIPT.ServerSideTemplateInjection          | ServerSideTemplateInjection: Server-side Template Injection   |
| Critical | SQL Injection                         | OPT.JAVASCRIPT.SqlInjection                         | SqlInjection: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection')                                    |
| Critical | Stored Cross Site Scripting           | OPT.JAVASCRIPT.StoredCrossSiteScripting             | StoredCrossSiteScripting: Web content generation from improperly sanitized data and escaped output (Stored Cross Site Scripting, XSS) |
| Critical | Xml Entity Injection                  | OPT.JAVASCRIPT.XmlEntityInjection                   | XmlEntityInjection: XML entity injection  |
| Critical | Angular Cross Site Scripting          | OPT.JAVASCRIPT.ANGULARJS.AngularCrossSiteScripting  | AngularCrossSiteScripting: Improper neutralization of input during web content generation (Cross-site Scripting, XSS) AngularJS       |

| Severity | Contrast rule                         | Engine rule ID   | Description   |
|----------|---------------------------------------|--|---|
| Critical | Vue Html Escape Disabled              | OPT.JAVASCRIPT.VUE.VueHtmlEscapeDisabled                   | VueHtmlEscapeDisabled: Vue HTML escaping is disabled.                                   |
| Critical | Avoid Assignment In Condition         | OPT.JAVASCRIPT.ERRORCOMUN.AvoidAssignmentInCondition       | AvoidAssignmentInCondition: Avoid assignments into conditional statements               |
| Critical | Avoid Loop With Empty Body            | OPT.JAVASCRIPT.ERRORCOMUN.AvoidLoopWithEmptyBody           | AvoidLoopWithEmptyBody: Avoid loops (while, do/while, for) with empty bodies            |
| Critical | Avoid Unary Ops In Assign             | OPT.JAVASCRIPT.ERRORCOMUN.AvoidUnaryOpsInAssign            | AvoidUnaryOpsInAssign: Avoid unary increment or decrement of a variable                 |
| Critical | No Update Loop Vars In For Body       | OPT.JAVASCRIPT.ERRORCOMUN.NoUpdateLoopVarsInForBody        | NoUpdateLoopVarsInForBody: Do not update control vars in 'for' loop bodies              |
| Critical | Avoid Big Files                       | OPT.JAVASCRIPT.ESTILO.AvoidBigFiles                        | AvoidBigFiles: Avoid too big JavaScript files   |
| Critical | Avoid Large Functions                 | OPT.JAVASCRIPT.ESTILO.AvoidLargeFunctions                  | AvoidLargeFunctions: Avoid functions with excessive number of lines                     |
| Critical | Avoid Popup Windows                   | OPT.JAVASCRIPT.ESTILO.AvoidPopupWindows                    | AvoidPopupWindows: Avoid popup windows  |
| Critical | Avoid Document All                    | OPT.JAVASCRIPT.PORTABILITY.AvoidDocumentAll                | AvoidDocumentAll: Do not use document.all or document.layers                            |
| Critical | Avoid Overwriting Builtin Objects     | OPT.JAVASCRIPT.AvoidOverwritingBuiltinObjects              | AvoidOverwritingBuiltinObjects: Avoid overwriting JavaScript built-in objects           |
| Critical | Path Manipulation                     | OPT.JAVASCRIPT.PathManipulation                            | PathManipulation: External Control Name or Path   |
| Critical | Avoid Cyclic Dependencies             | OPT.JAVASCRIPT.NODEJS.AvoidCyclicDependencies              | AvoidCyclicDependencies: Avoid cyclic dependencies between modules                      |
| Critical | Avoid Using Process Exit              | OPT.JAVASCRIPT.NODEJS.AvoidUsingProcessExit                | AvoidUsingProcessExit: Avoid using process.exit()                                       |
| Critical | Avoid Dom Manipulation In Controllers | OPT.JAVASCRIPT.ANGULARJS.AvoidDomManipulationInControllers | AvoidDomManipulationInControllers: DOM manipulation in controllers                      |
| Critical | Bind Objects In Scope                 | OPT.JAVASCRIPT.ANGULARJS.BindObjectsInScope                | BindObjectsInScope: Bind to object scope, instead of binding to property                |
| Critical | Deprecated Directive Format           | OPT.JAVASCRIPT.ANGULARJS.DeprecatedDirectiveFormat         | DeprecatedDirectiveFormat: Avoid deprecated directive formats                           |
| Critical | Never Store Dom In Scope              | OPT.JAVASCRIPT.ANGULARJS.NeverStoreDomInScope              | NeverStoreDomInScope: Never store elements in scope                                     |
| Critical | Private Property Access               | OPT.JAVASCRIPT.ANGULARJS.PrivatePropertyAccess             | PrivatePropertyAccess: Do not access private properties of AngularJS objects            |
| Critical | Unsafe Minification Annotation        | OPT.JAVASCRIPT.ANGULARJS.UnsafeMinificationAnnotation      | UnsafeMinificationAnnotation: Use minification-safe annotations in dependency injection |
| Critical | Use Controller As Syntax In Views     | OPT.JAVASCRIPT.ANGULARJS.UseControllerAsSyntaxInViews      | UseControllerAsSyntaxInViews: Use "controller as" syntax in views                       |
| Critical | Watch Collection Change               | OPT.JAVASCRIPT.ANGULARJS.WatchCollectionChange             | WatchCollectionChange: Use \$watchCollection instead of \$watch with three parameters   |
| Critical | Too Broad Access Origin               | OPT.JAVASCRIPT.CORDOVA.TooBroadAccessOrigin                | TooBroadAccessOrigin: Access policy too broad   |
| Critical | Vue Component Data Must Be Function   | OPT.JAVASCRIPT.VUE.VueComponentDataMustBeFunction          | VueComponentDataMustBeFunction: Component data must be a function                       |
| Critical | Missing Password Field Masking        | OPT.JAVASCRIPT.JSX.MissingPasswordFieldMasking             | MissingPasswordFieldMasking: Password input field is not masked                         |

| Severity | Contrast rule                             | Engine rule ID                                       | Description   |
|----------|---|--|---|
| High     | Clickjacking Protection                   | OPT.JAVASCRIPT.ClickjackingProtection                | ClickjackingProtection: No clickjack protection configured  |
| High     | Plaintext Storage In A Cookie             | OPT.JAVASCRIPT.PlaintextStorageInACookie             | PlaintextStorageInACookie: Cleartext Storage of Sensitive Information in Cookie   |
| High     | Use Strict Transport Security             | OPT.JAVASCRIPT.UseStrictTransportSecurity            | UseStrictTransportSecurity: Use HTTP Strict Transport Security  |
| High     | Xss Protection Disabled                   | OPT.JAVASCRIPT.XssProtectionDisabled                 | XssProtectionDisabled: Cross-site scripting protection disabled   |
| High     | Avoid Enabled Debug Mode                  | OPT.JAVASCRIPT.CORDOVA.AvoidEnabledDebugMode         | AvoidEnabledDebugMode: Debug mode enabled   |
| High     | Insecure Android Min Sdk Version          | OPT.JAVASCRIPT.CORDOVA.InsecureAndroidMinSdkVersion  | InsecureAndroidMinSdkVersion: Android SDK version too old   |
| High     | Whitelist Plugin Not Installed            | OPT.JAVASCRIPT.CORDOVA.WhitelistPluginNotInstalled   | WhitelistPluginNotInstalled: Whitelist plugin not installed   |
| High     | Cross Site Request Forgery                | OPT.JAVASCRIPT.CrossSiteRequestForgery               | CrossSiteRequestForgery: Execution of action on user behalf in a previously authenticated web site (cross-site request forgery, CSRF) |
| High     | External Control Of Configuration Setting | OPT.JAVASCRIPT.ExternalControlOfConfigurationSetting | ExternalControlOfConfigurationSetting: External Control of System or Configuration Setting  |
| High     | Header Manipulation                       | OPT.JAVASCRIPT.HeaderManipulation                    | HeaderManipulation: Unvalidated data in HTTP response header or in cookie (Response Splitting)  |
| High     | Open Redirect                             | OPT.JAVASCRIPT.OpenRedirect                          | OpenRedirect: URL Redirection to a different Site ('Open Redirect')   |
| High     | Open Redirect Hana XS                     | OPT.JAVASCRIPT.OpenRedirectHanaXS                    | OpenRedirectHanaXS: Open Redirect (HANA XS)   |
| High     | Server Side Request Forgery               | OPT.JAVASCRIPT.ServerSideRequestForgery              | ServerSideRequestForgery: Creation of requests from a vulnerable server using untrusted input (server side request forgery, SSRF)     |
| High     | XPath Injection                           | OPT.JAVASCRIPT.XPathInjection                        | XPathInjection: Improper Neutralization of data within XPath Expressions ('XPath Injection')  |
| High     | Target Blank Vulnerability                | OPT.JAVASCRIPT.JSX.TargetBlankVulnerability          | TargetBlankVulnerability: Improper Neutralization of links to external sites  |
| High     | Avoid Empty Functions                     | OPT.JAVASCRIPT.ERRORCOMUN.AvoidEmptyFunctions        | AvoidEmptyFunctions: Avoid top-level functions with empty body  |
| High     | Many Cases                                | OPT.JAVASCRIPT.ERRORCOMUN.ManyCases                  | ManyCases: Avoid too many choices in switch structures  |
| High     | Potential Infinite Loop                   | OPT.JAVASCRIPT.ERRORCOMUN.PotentialInfiniteLoop      | PotentialInfiniteLoop: Potential infinite loop  |
| High     | Unused Function Parameter                 | OPT.JAVASCRIPT.ERRORCOMUN.UnusedFunctionParameter    | UnusedFunctionParameter: Avoid unused function parameters   |
| High     | Unused Local Var                          | OPT.JAVASCRIPT.ERRORCOMUN.UnusedLocalVar             | UnusedLocalVar: Avoid unused local variable   |
| High     | Avoid Conditional Operator                | OPT.JAVASCRIPT.ESTILO.AvoidConditionalOperator       | AvoidConditionalOperator: Do not use ternary operator to evaluate conditions  |
| High     | Avoid Declaring Vars Without Var          | OPT.JAVASCRIPT.ESTILO.AvoidDeclaringVarsWithoutVar   | AvoidDeclaringVarsWithoutVar: Declare variables with var  |
| High     | Avoid Using With                          | OPT.JAVASCRIPT.ESTILO.AvoidUsingWith                 | AvoidUsingWith: Avoid using 'with' statement  |

| Severity | Contrast rule                                 | Engine rule ID  | Description   |
|----------|---|---|---|
| High     | End Sentences With Semicolon                  | OPT.JAVASCRIPT.ESTILO.EndSentencesWithSemicolon           | EndSentencesWithSemicolon: Avoid statements without semicolon   |
| High     | Avoid Non Portable Methods                    | OPT.JAVASCRIPT.PORTABILITY.AvoidNonPortableMethods        | AvoidNonPortableMethods: Non-portable function check  |
| High     | No Navigator For Browser Detection            | OPT.JAVASCRIPT.PORTABILITY.NoNavigatorForBrowserDetection | NoNavigatorForBrowserDetection: Avoid using navigator.userAgent ('browser detecting') for writing portable code |
| High     | Avoid Accesing Unreliable Variable Properties | OPT.JAVASCRIPT.AvoidAccesingUnreliableVariableProperties  | AvoidAccesingUnreliableVariableProperties: Avoid accessing unreliable variable properties                       |
| High     | Avoid Calling Too Many Other Components       | OPT.JAVASCRIPT.AvoidCallingTooManyOtherComponents         | AvoidCallingTooManyOtherComponents: Avoid using components calling too many other components                    |
| High     | Avoid Misuse Of Delete                        | OPT.JAVASCRIPT.AvoidMisuseOfDelete                        | AvoidMisuseOfDelete: Delete operator should be only properly used with object properties                        |
| High     | Avoid Named Functions                         | OPT.JAVASCRIPT.AvoidNamedFunctions                        | AvoidNamedFunctions: Avoid defining functions in conditional blocks   |
| High     | Avoid Object Instantiation Into Loops         | OPT.JAVASCRIPT.AvoidObjectInstantiationIntoLoops          | AvoidObjectInstantiationIntoLoops: Avoid object instantiation into loops  |
| High     | Avoid Too Complex Functions                   | OPT.JAVASCRIPT.AvoidTooComplexFunctions                   | AvoidTooComplexFunctions: Avoid methods with high cyclomatic complexity values                                  |
| High     | Avoid Too Complex Programs                    | OPT.JAVASCRIPT.AvoidTooComplexPrograms                    | AvoidTooComplexPrograms: Avoid classes with high cyclomatic complexity values                                   |
| High     | Avoid Using Unary Operators With Objects      | OPT.JAVASCRIPT.AvoidUsingUnaryOperatorsWithObjects        | AvoidUsingUnaryOperatorsWithObjects: Avoid using the + and - unary operators on objects                         |
| High     | Duplicated Name For Function And Variable     | OPT.JAVASCRIPT.DuplicatedNameForFunctionAndVariable       | DuplicatedNameForFunctionAndVariable: Avoid declaring a function with the same name as a variable               |
| High     | Function Arguments Uniqueness                 | OPT.JAVASCRIPT.FunctionArgumentsUniqueness                | FunctionArgumentsUniqueness: Avoid duplicated argument names in function declarations                           |
| High     | I E Conditional Comments                      | OPT.JAVASCRIPT.IEConditionalComments                      | IEConditionalComments: Avoid using Internet Explorer conditional comments                                       |
| High     | Nested If Statements                          | OPT.JAVASCRIPT.NestedIfStatements                         | NestedIfStatements: Avoid a high number of nested ifs   |
| High     | Property Names Uniqueness                     | OPT.JAVASCRIPT.PropertyNamesUniqueness                    | PropertyNamesUniqueness: Avoid duplicating property names in objects  |
| High     | Unhandled Promise                             | OPT.JAVASCRIPT.UnhandledPromise                           | UnhandledPromise: Handle function returned promises   |
| High     | Variable Redclaration                         | OPT.JAVASCRIPT.VariableRedeclaration                      | VariableRedeclaration: Avoid declaring variable with a name that is already declared                            |
| High     | Avoid Too Much Nested Callbacks               | OPT.JAVASCRIPT.NODEJS.AvoidTooMuchNestedCallbacks         | AvoidTooMuchNestedCallbacks: Avoid too many nested callbacks  |
| High     | Avoid Using Default Connection Limit          | OPT.JAVASCRIPT.NODEJS.AvoidUsingDefaultConnectionLimit    | AvoidUsingDefaultConnectionLimit: Avoid using the default connections limit                                     |
| High     | Validate Package Json                         | OPT.JAVASCRIPT.NODEJS.ValidatePackageJson                 | ValidatePackageJson: Avoid specifying dependencies versions with the * wildcard                                 |



| Severity | Contrast rule                                   | Engine rule ID   | Description  |
|----------|---|--|--|
| High     | Require Modules At The Begin                    | OPT.JAVASCRIPT.RequireModulesAtTheBegin                            | RequireModulesAtTheBegin: Always require modules at the top of the file                            |
| High     | Avoid Complex Expressions In Html               | OPT.JAVASCRIPT.ANGULARJS.AvoidComplexExpressionsInHtml             | AvoidComplexExpressionsInHtml: Avoid complex AngularJS expressions in HTML                         |
| High     | Avoid Root Scope Event Listeners In Controllers | OPT.JAVASCRIPT.ANGULARJS.AvoidRootScopeEventListenersInControllers | AvoidRootScopeEventListenersInC: Avoid registering event listeners on \$rootScope in controllers   |
| High     | Deprecated Http Functions                       | OPT.JAVASCRIPT.ANGULARJS.DeprecatedHttpFunctions                   | DeprecatedHttpFunctions: Do not use deprecated \$http functions                                    |
| High     | Ng Src When Using Expressions                   | OPT.JAVASCRIPT.ANGULARJS.NgSrcWhenUsingExpressions                 | NgSrcWhenUsingExpressions: Always use ng-src for images when including an AngularJS expression     |
| High     | Prevent Component Name Collision                | OPT.JAVASCRIPT.ANGULARJS.PreventComponentNameCollision             | PreventComponentNameCollision: Prevent name collision in AngularJS component definition            |
| High     | Resolve Controller Dependencies In Route        | OPT.JAVASCRIPT.ANGULARJS.ResolveControllerDependenciesInRoute      | ResolveControllerDependenciesInF: Resolve controller dependencies in route                         |
| High     | Restrict Directives Element Attribute           | OPT.JAVASCRIPT.ANGULARJS.RestrictDirectivesElementAttribute        | RestrictDirectivesElementAttribute: Restrict directives to elements and attributes                 |
| High     | Use Named Functions For Components              | OPT.JAVASCRIPT.ANGULARJS.UseNamedFunctionsForComponents            | UseNamedFunctionsForComponent: Use named functions instead of callbacks for components             |
| High     | Avoid Annotating Inferable Types                | OPT.JAVASCRIPT.TYPESCRIPT.AvoidAnnotatingInferableTypes            | AvoidAnnotatingInferableTypes: Avoid type annotations for inferable primitive types                |
| High     | No Empty Interface                              | OPT.JAVASCRIPT.TYPESCRIPT.NoEmptyInterface                         | NoEmptyInterface: Avoid using empty interfaces   |
| High     | Prefer Read Only                                | OPT.JAVASCRIPT.TYPESCRIPT.PreferReadOnly                           | PreferReadOnly: Use readonly when a property is never reassigned                                   |
| High     | Skip Internal Module Or Namespace               | OPT.JAVASCRIPT.TYPESCRIPT.SkipInternalModuleOrNamespace            | SkipInternalModuleOrNamespace: Skip ES2015 module syntax   |
| High     | Useless Type Cast                               | OPT.JAVASCRIPT.TYPESCRIPT.UselessTypeCast                          | UselessTypeCast: Avoid useless type castings   |
| High     | Useless Type Intersection                       | OPT.JAVASCRIPT.TYPESCRIPT.UselessTypeIntersection                  | UselessTypeIntersection: Avoid useless intersection  |
| High     | Use Type Annotations                            | OPT.JAVASCRIPT.TYPESCRIPT.UseTypeAnnotations                       | UseTypeAnnotations: Use TypeScript type system   |
| High     | Avoid Forward Refs                              | OPT.JAVASCRIPT.TYPESCRIPT.ANGULAR.AvoidForwardRefs                 | AvoidForwardRefs: Avoid using the forwardRef function  |
| High     | Avoid Impure Pipes                              | OPT.JAVASCRIPT.TYPESCRIPT.ANGULAR.AvoidImpurePipes                 | AvoidImpurePipes: Avoid impure Pipes   |
| High     | Avoid Template Async Negation                   | OPT.JAVASCRIPT.TYPESCRIPT.ANGULAR.AvoidTemplateAsyncNegation       | AvoidTemplateAsyncNegation: Inconsistent Async Pipe usage in templates.                            |
| High     | Decorator Incompatibility                       | OPT.JAVASCRIPT.TYPESCRIPT.ANGULAR.DecoratorIncompatibility         | DecoratorIncompatibility: Avoid using decorators with incompatibilities between them               |
| High     | Use Host Decorator                              | OPT.JAVASCRIPT.TYPESCRIPT.ANGULAR.UseHostDecorator                 | UseHostDecorator: Use @Host decorator instead of host metadata property                            |
| High     | Use Injectable Decorator                        | OPT.JAVASCRIPT.TYPESCRIPT.ANGULAR.UseInjectableDecorator           | UseInjectableDecorator: Use @Injectable class decorator instead of the @Inject parameter decorator |



| Severity | Contrast rule                          | Engine rule ID  | Description   |
|----------|--|---|---|
| High     | Use Input Decorator                    | OPT.JAVASCRIPT.TYPESCRIPT.ANGULAR.UseInputDecorator         | UseInputDecorator: Use @Input decorator instead of inputs metadata property   |
| High     | Use Output Decorator                   | OPT.JAVASCRIPT.TYPESCRIPT.ANGULAR.UseOutputDecorator        | UseOutputDecorator: Use @Output decorator instead of inputs metadata property   |
| High     | Use Track By                           | OPT.JAVASCRIPT.TYPESCRIPT.ANGULAR.UseTrackBy                | UseTrackBy: Use trackBy along with  |
| High     | Avoid Click Events                     | OPT.JAVASCRIPT.CORDOVA.AvoidClickEvents                     | AvoidClickEvents: Avoid using click events in Cordova.  |
| High     | Vue For Without Key                    | OPT.JAVASCRIPT.VUE.VueForWithoutKey                         | VueForWithoutKey: Always use key with v-for.  |
| High     | Vue If With For Directive              | OPT.JAVASCRIPT.VUE.VuelfWithForDirective                    | VuelfWithForDirective: Never use v-if with the same element as v-for.   |
| High     | Avoid Web SQL                          | OPT.JAVASCRIPT.AvoidWebSQL                                  | AvoidWebSQL: Avoid Web SQL  |
| High     | Empty Or Hardcoded Password            | OPT.JAVASCRIPT.EmptyOrHardcodedPassword                     | EmptyOrHardcodedPassword: Empty or hardcoded passwords may compromise system security in a way that cannot be easily remedied   |
| High     | Prevent MIME Sniffing                  | OPT.JAVASCRIPT.PreventMIMESniffing                          | PreventMIMESniffing: Prevent MIME sniffing  |
| High     | Angular Local Storage Information Leak | OPT.JAVASCRIPT.ANGULARJS.AngularLocalStorageInformationLeak | AngularLocalStorageInformationLeak: AngularJS local storage information leak  |
| High     | Hardcoded Crypto Key                   | OPT.JAVASCRIPT.HardcodedCryptoKey                           | HardcodedCryptoKey: Hardcoded cryptographic keys  |
| High     | Insecure Transport                     | OPT.JAVASCRIPT.InsecureTransport                            | InsecureTransport: Insecure transport   |
| High     | Insufficient Key Size                  | OPT.JAVASCRIPT.InsufficientKeySize                          | InsufficientKeySize: An otherwise strong encryption algorithm is vulnerable to brute force attack when a small key size is used |
| High     | Server Insecure Transport              | OPT.JAVASCRIPT.ServerInsecureTransport                      | ServerInsecureTransport: Insecure transport in Node.js HTTP servers   |
| High     | Weak Cryptographic Hash                | OPT.JAVASCRIPT.WeakCryptographicHash                        | WeakCryptographicHash: Weak cryptographic hash  |
| High     | Weak Encryption                        | OPT.JAVASCRIPT.WeakEncryption                               | WeakEncryption: Weak symmetric encryption algorithm   |
| Info     | Code Document Percentage               | OPT.JAVASCRIPT.DOCUMENTACION.CodeDocumentPercentage         | CodeDocumentPercentage: Document code percentage  |
| Info     | Document Every Function                | OPT.JAVASCRIPT.DOCUMENTACION.DocumentEveryFunction          | DocumentEveryFunction: Insert header comments before every top-level function   |
| Info     | Function Redecclaration                | OPT.JAVASCRIPT.FunctionRedeclaration                        | FunctionRedeclaration: Avoid duplicate function names in same scope   |
| Info     | Multiline String Literals              | OPT.JAVASCRIPT.MultilineStringLiterals                      | MultilineStringLiterals: Avoid splitting string literal in multiple lines using \n character                                    |
| Info     | Avoid Using Process Env                | OPT.JAVASCRIPT.NODEJS.AvoidUsingProcessEnv                  | AvoidUsingProcessEnv: Avoid using process.env()   |
| Info     | Module Definition And Use              | OPT.JAVASCRIPT.ANGULARJS.ModuleDefinitionAndUse             | ModuleDefinitionAndUse: Declare and access modules using setter/getter without creating a variable                              |
| Low      | Form Without Captcha                   | OPT.JAVASCRIPT.JSX.FormWithoutCaptcha                       | FormWithoutCaptcha: Form without CAPTCHA  |
| Low      | Use Space Between Operators            | OPT.JAVASCRIPT.ESTILO.UseSpaceBetweenOperators              | UseSpaceBetweenOperators: Place whitespaces between logical operators and its operands  |
| Low      | Global Var Pattern                     | OPT.JAVASCRIPT.JSNOM.GlobalVarPattern                       | GlobalVarPattern: Global vars should be avoided or must follow a naming pattern   |

| Severity | Contrast rule                                | Engine rule ID   | Description   |
|----------|--|--|---|
| Low      | Identifier Naming Pattern                    | OPT.JAVASCRIPT.JSNOM.IdentifierNamingPattern           | IdentifierNamingPattern: Follow naming standards for JavaScript identifiers   |
| Low      | Avoid Arguments                              | OPT.JAVASCRIPT.AvoidArguments                          | AvoidArguments: Do not use arguments object   |
| Low      | Avoid Array And Object Constructors          | OPT.JAVASCRIPT.AvoidArrayAndObjectConstructors         | AvoidArrayAndObjectConstructors: Avoid using Array and Object constructors  |
| Low      | Avoid Commented Out Code Blocks              | OPT.JAVASCRIPT.AvoidCommentedOutCodeBlocks             | AvoidCommentedOutCodeBlocks: Avoid commented out code blocks  |
| Low      | Avoid Constructors For Side Effects          | OPT.JAVASCRIPT.AvoidConstructorsForSideEffects         | AvoidConstructorsForSideEffects: Avoid calling constructors without using its return value                          |
| Low      | Avoid Function Definition Inside Loop        | OPT.JAVASCRIPT.AvoidFunctionDefinitionInsideLoop       | AvoidFunctionDefinitionInsideLoop: Avoid declare functions inside loops   |
| Low      | Avoid Octal Number                           | OPT.JAVASCRIPT.AvoidOctalNumber                        | AvoidOctalNumber: Avoid using octal numbers   |
| Low      | Avoid Returning Values From Setters          | OPT.JAVASCRIPT.AvoidReturningValuesFromSetters         | AvoidReturningValuesFromSetters: Avoid returning a value from setters   |
| Low      | Avoid Using Continue                         | OPT.JAVASCRIPT.AvoidUsingContinue                      | AvoidUsingContinue: Avoid using 'continue' statement  |
| Low      | Avoid Using Debugger                         | OPT.JAVASCRIPT.AvoidUsingDebugger                      | AvoidUsingDebugger: Avoid using 'debugger' statement  |
| Low      | Break Non Empty Switch Clauses               | OPT.JAVASCRIPT.BreakNonEmptySwitchClauses              | BreakNonEmptySwitchClauses: Use 'break' statement at the last statement of SwitchCase                               |
| Low      | Default Clause Switch Statements             | OPT.JAVASCRIPT.DefaultClauseSwitchStatements           | DefaultClauseSwitchStatements: Use 'default' clause at the end of the switch statements                             |
| Low      | Else In Else If Statement                    | OPT.JAVASCRIPT.ElseInElseIfStatement                   | ElseInElseIfStatement: Else if statements should finish with an else clause   |
| Low      | Filter For In                                | OPT.JAVASCRIPT.FilterForIn                             | FilterForIn: Filter the body of a for-in statement  |
| Low      | Function Declarations Within Blocks          | OPT.JAVASCRIPT.FunctionDeclarationsWithinBlocks        | FunctionDeclarationsWithinBlocks: Avoid use function declarations within blocks                                     |
| Low      | Labeled Statements                           | OPT.JAVASCRIPT.LabeledStatements                       | LabeledStatements: Use labels only for while and do-while statements  |
| Low      | One Statement Per Line                       | OPT.JAVASCRIPT.OneStatementPerLine                     | OneStatementPerLine: Use only one statement per line  |
| Low      | Parent Class Doesnot Reference Child Classes | OPT.JAVASCRIPT.ParentClassDoesnotReferenceChildClasses | ParentClassDoesnotReferenceChildClasses: Parent class does not reference any child classes                          |
| Low      | Short Circuit If Statements                  | OPT.JAVASCRIPT.ShortCircuitIfStatements                | ShortCircuitIfStatements: Merge nested if statements using a short-circuit operator                                 |
| Low      | Too Many Break Or Continue In Loop           | OPT.JAVASCRIPT.TooManyBreakOrContinueInLoop            | TooManyBreakOrContinueInLoop: Avoid using more than one break or continue statement in each loop                    |
| Low      | Trailing Comma                               | OPT.JAVASCRIPT.TrailingComma                           | TrailingComma: Avoid using a trailing comma at the end of the last element in the declaration of an array or object |
| Low      | Type Casting In Comparisons                  | OPT.JAVASCRIPT.TypeCastingInComparisons                | TypeCastingInComparisons: Avoid using type casting in logical comparators Code Quality [C]                          |

| Severity | Contrast rule                           | Engine rule ID   | Description   |
|----------|---|--|---|
| Low      | Unreachable Code                        | OPT.JAVASCRIPT.UnreachableCode                               | UnreachableCode: Return, break, continue, or throw statements should be followed by a } or case or default statements |
| Low      | Use Single Quote                        | OPT.JAVASCRIPT.UseSingleQuote                                | UseSingleQuote: Avoid using single quotes in literals   |
| Low      | Avoid Mixing Require                    | OPT.JAVASCRIPT.NODEJS.AvoidMixingRequire                     | AvoidMixingRequire: Avoid mixing require calls with variable initializations  |
| Low      | Use Asynchronous Methods                | OPT.JAVASCRIPT.UseAsynchronousMethods                        | UseAsynchronousMethods: Asynchronous methods give Node.js speed and responsiveness                                    |
| Low      | Use J S Doc                             | OPT.JAVASCRIPT.UseJSDoc                                      | UseJSDoc: Describe how the function works using JSDoc   |
| Low      | Use Module Exports                      | OPT.JAVASCRIPT.UseModuleExports                              | UseModuleExports: Use module.exports instead of exports   |
| Low      | Isolate Run Blocks                      | OPT.JAVASCRIPT.ANGULARJS.IsolateRunBlocks                    | IsolateRunBlocks: Isolate run blocks  |
| Low      | Avoid None View Encapsulation           | OPT.JAVASCRIPT.TYPESCRIPT.ANGULAR.AvoidNoneViewEncapsulation | AvoidNoneViewEncapsulation: Avoid applying component styles to the whole application                                  |
| Low      | Avoid Prefixing Output                  | OPT.JAVASCRIPT.TYPESCRIPT.ANGULAR.AvoidPrefixingOutput       | AvoidPrefixingOutput: Avoid prefixing properties with "on"  |
| Low      | Never Use History                       | OPT.JAVASCRIPT.ESTILO.NeverUseHistory                        | NeverUseHistory: Never use JavaScript 'history' object or navigation-based positioning functions                      |
| Low      | Hide Powered By Header                  | OPT.JAVASCRIPT.HidePoweredByHeader                           | HidePoweredByHeader: Deactivate Powered-By header   |
| Low      | Password In Comments                    | OPT.JAVASCRIPT.PasswordInComments                            | PasswordInComments: Avoid hard-coded in-comment passwords in code   |
| Low      | Avoid Using Console For Debugging       | OPT.JAVASCRIPT.NODEJS.AvoidUsingConsoleForDebugging          | AvoidUsingConsoleForDebugging: Avoid using console.log()  |
| Medium   | Unsafe Cookie                           | OPT.JAVASCRIPT.UnsafeCookie                                  | UnsafeCookie: Generate server-side cookies with adequate security properties  |
| Medium   | Avoid Overly Permissive Message Posting | OPT.JAVASCRIPT.AvoidOverlyPermissiveMessagePosting           | AvoidOverlyPermissiveMessagePosting: Avoid post cross-document messages to an overly permissive target origin         |
| Medium   | Trust Boundary Violation                | OPT.JAVASCRIPT.TrustBoundaryViolation                        | TrustBoundaryViolation: Trust boundary violation  |
| Medium   | Specify Integrity Attribute             | OPT.JAVASCRIPT.JSX.SpecifyIntegrityAttribute                 | SpecifyIntegrityAttribute: Specify a integrity attribute on the <script> and <link>                                   |
| Medium   | Javascript Url                          | OPT.JAVASCRIPT.REACT.JavascriptUrl                           | JavascriptUrl: Usage of javascript: URLs in JSX.  |
| Medium   | Avoid For With External Control Vars    | OPT.JAVASCRIPT.ERRORCOMUN.AvoidForWithExternalControlVars    | AvoidForWithExternalControlVars: Avoid for loops where loop control vars are not declared in its initialization block |
| Medium   | If Without Block                        | OPT.JAVASCRIPT.ERRORCOMUN.IfWithoutBlock                     | IfWithoutBlock: Place body of if statement between braces   |
| Medium   | Illegal Identifier                      | OPT.JAVASCRIPT.ERRORCOMUN.IllegalIdentifier                  | IllegalIdentifier: Avoid using identifiers not permitted (like reserved keywords)                                     |
| Medium   | Avoid Alert With Literals               | OPT.JAVASCRIPT.ESTILO.AvoidAlertWithLiterals                 | AvoidAlertWithLiterals: Do not use literals   |
| Medium   | Avoid Multiple Returns                  | OPT.JAVASCRIPT.ESTILO.AvoidMultipleReturns                   | AvoidMultipleReturns: Avoid functions with more than one return statement   |
| Medium   | Check Parameters Number In Function     | OPT.JAVASCRIPT.ESTILO.CheckParametersNumberInFunction        | CheckParametersNumberInFunction: Avoid using functions with too many parameters                                       |
| Medium   | No Style                                | OPT.JAVASCRIPT.ESTILO.NoStyle                                | NoStyle: Do not use style property, use CSS classes instead   |

| Severity | Contrast rule                               | Engine rule ID   | Description   |
|----------|---|--|---|
| Medium   | Avoid Long Calls In Iterations              | OPT.JAVASCRIPT.PERFORMANCE.AvoidLongCallsInIterations        | AvoidLongCallsInIterations: Avoid long reference chains in loops                                      |
| Medium   | No Method Append Child                      | OPT.JAVASCRIPT.PERFORMANCE.NoMethodAppendChild               | NoMethodAppendChild: Use innerHTML instead of DOM modification functions                              |
| Medium   | Old Use Of Document                         | OPT.JAVASCRIPT.PORTABILITY.OldUseOfDocument                  | OldUseOfDocument: Avoid using non-compliant methods/properties of 'document' object                   |
| Medium   | Avoid Assigning Undefined                   | OPT.JAVASCRIPT.AvoidAssigningUndefined                       | AvoidAssigningUndefined: Avoid assigning undefined to a variable                                      |
| Medium   | Avoid Comparing With Na N                   | OPT.JAVASCRIPT.AvoidComparingWithNaN                         | AvoidComparingWithNaN: Avoid comparing with NaN in conditional expressions                            |
| Medium   | Avoid Magic Numbers                         | OPT.JAVASCRIPT.AvoidMagicNumbers                             | AvoidMagicNumbers: Avoid using magic literals   |
| Medium   | Avoid Multiple Statements Per Line          | OPT.JAVASCRIPT.AvoidMultipleStatementsPerLine                | AvoidMultipleStatementsPerLine: Avoid specifying several statements into the same line                |
| Medium   | Avoid Negative Content Length               | OPT.JAVASCRIPT.AvoidNegativeContentLength                    | AvoidNegativeContentLength: The Content Length header should not have a negative value                |
| Medium   | Avoid Rebinding A Const Variable            | OPT.JAVASCRIPT.AvoidRebindingAConstVariable                  | AvoidRebindingAConstVariable: Avoid rebinding a const variable  |
| Medium   | Avoid Too Deep Class Hierarchies            | OPT.JAVASCRIPT.AvoidTooDeepClassHierarchies                  | AvoidTooDeepClassHierarchies: Avoid deep hierarchy classes  |
| Medium   | Avoid Using Parse Int Without Radix         | OPT.JAVASCRIPT.AvoidUsingParseIntWithoutRadix                | AvoidUsingParseIntWithoutRadix: Always specify a radix when using parseInt                            |
| Medium   | Denial Of Service                           | OPT.JAVASCRIPT.DenialOfService                               | DenialOfService: An attacker could exploit the program becomes unavailable to legitimate users        |
| Medium   | Loop Without Block                          | OPT.JAVASCRIPT.LoopWithoutBlock                              | LoopWithoutBlock: Place loop body statements between braces   |
| Medium   | Avoid Concatenating Dirname And Filename    | OPT.JAVASCRIPT.NODEJS.AvoidConcatenatingDirnameAndFilename   | AvoidConcatenatingDirnameAndFilename: Avoid concatenating __dirname and __filename with other strings |
| Medium   | Avoid Using New Require                     | OPT.JAVASCRIPT.NODEJS.AvoidUsingNewRequire                   | AvoidUsingNewRequire: Avoid invoking a module constructor when importing a module                     |
| Medium   | Callbacks Always Pass Error Parameter First | OPT.JAVASCRIPT.NODEJS.CallbacksAlwaysPassErrorParameterFirst | CallbacksAlwaysPassErrorParameterFirst: The first callback parameter must be an error                 |
| Medium   | Ensure Callbacks Are Returned               | OPT.JAVASCRIPT.NODEJS.EnsureCallbacksAreReturned             | EnsureCallbacksAreReturned: Use return statement along with callback                                  |
| Medium   | Use Gzip Compression                        | OPT.JAVASCRIPT.NODEJS.UseGzipCompression                     | UseGzipCompression: Use GZIP compression when using express framework                                 |
| Medium   | Always Use Strict                           | OPT.JAVASCRIPT.AlwaysUseStrict                               | AlwaysUseStrict: "use strict" prevents bad practices  |
| Medium   | Save A Reference To This                    | OPT.JAVASCRIPT.SaveAReferenceToThis                          | SaveAReferenceToThis: The "this" is determined based on context, not encapsulation                    |
| Medium   | Validate Callbacks                          | OPT.JAVASCRIPT.ValidateCallbacks                             | ValidateCallbacks: Only functions are callable  |
| Medium   | Define One Component Per File               | OPT.JAVASCRIPT.ANGULARJS.DefineOneComponentPerFile           | DefineOneComponentPerFile: Define one AngularJS component per file                                    |

| Severity | Contrast rule                               | Engine rule ID  | Description   |
|----------|---|---|---|
| Medium   | Handle Route Errors                         | OPT.JAVASCRIPT.ANGULARJS.HandleRouteErrors                      | HandleRouteErrors: Handle all route errors on a centralised basis   |
| Medium   | Use Angular Wrappers                        | OPT.JAVASCRIPT.ANGULARJS.UseAngularWrappers                     | UseAngularWrappers: Use Angular wrappers for common objects and functions   |
| Medium   | Avoid Casting I Object Literals             | OPT.JAVASCRIPT.TYPESCRIPT.AvoidCastingIObjectLiterals           | AvoidCastingIObjectLiterals: Avoid casting object literals  |
| Medium   | No Return Type Any                          | OPT.JAVASCRIPT.TYPESCRIPT.NoReturnTypeAny                       | NoReturnTypeAny: Don't use "any" for function return type   |
| Medium   | Review Non Null Assertions                  | OPT.JAVASCRIPT.TYPESCRIPT.ReviewNonNullAssertions               | ReviewNonNullAssertions: Review non-null assertions   |
| Medium   | Too Many Classes Per File                   | OPT.JAVASCRIPT.TYPESCRIPT.TooManyClassesPerFile                 | TooManyClassesPerFile: Avoid an excessive number of classes per file  |
| Medium   | Use Primitive Types                         | OPT.JAVASCRIPT.TYPESCRIPT.UsePrimitiveTypes                     | UsePrimitiveTypes: Don't wrap primitive types   |
| Medium   | Use Type Alias                              | OPT.JAVASCRIPT.TYPESCRIPT.UseTypeAlias                          | UseTypeAlias: Use a type alias when the type is complex   |
| Medium   | Avoid Aliasing Input Output                 | OPT.JAVASCRIPT.TYPESCRIPT.ANGULAR.AvoidAliasingInputOutput      | AvoidAliasingInputOutput: Avoid decorating aliases for Input and Output decorators  |
| Medium   | Invalid Pipe Implementation                 | OPT.JAVASCRIPT.TYPESCRIPT.ANGULAR.InvalidPipeImplementation     | InvalidPipeImplementation: Implement Angular Pipes completely   |
| Medium   | Naming Conventions                          | OPT.JAVASCRIPT.TYPESCRIPT.ANGULAR.NamingConventions             | NamingConventions: Follow naming conventions standards for Angular  |
| Medium   | No Parameter Attribute Decorator            | OPT.JAVASCRIPT.TYPESCRIPT.ANGULAR.NoParameterAttributeDecorator | NoParameterAttributeDecorator: Avoid decorating constructor parameters with Attribute   |
| Medium   | Use Life Cycle Interface                    | OPT.JAVASCRIPT.TYPESCRIPT.ANGULAR.UseLifeCycleInterface         | UseLifeCycleInterface: Use the LifeCycle hook interfaces  |
| Medium   | Dangerously Set Inner Html                  | OPT.JAVASCRIPT.REACT.DangerouslySetInnerHTML                    | DangerouslySetInnerHTML: Do not use dangerouslySetInnerHTML property on components.   |
| Medium   | Find Dom Node                               | OPT.JAVASCRIPT.REACT.FindDOMNode                                | FindDOMNode: Do not call ReactDOM.findDOMNode().  |
| Medium   | Avoid Transfer Values Local Session Storage | OPT.JAVASCRIPT.AvoidTransferValuesLocalStorage                  | AvoidTransferValuesLocalStorage: Avoid transferring data between local storage and sessionStorage as it can expose confidential information |
| Medium   | Easy To Guess Database Name                 | OPT.JAVASCRIPT.EasyToGuessDatabaseName                          | EasyToGuessDatabaseName: Do not use easy-to-guess Web SQL database names  |
| Medium   | Hijacking Ad Hoc Ajax                       | OPT.JAVASCRIPT.HijackingAdHocAjax                               | HijackingAdHocAjax: Do not use Ajax to transport sensitive data   |
| Medium   | Information Exposure Through Error Message  | OPT.JAVASCRIPT.InformationExposureThroughErrorMessage           | InformationExposureThroughErrorMessage: Avoid sensitive information exposure through error messages   |
| Medium   | Privacy Violation                           | OPT.JAVASCRIPT.PrivacyViolation                                 | PrivacyViolation: Exposure of Private Information ('Privacy Violation')   |
| Medium   | Sensitive Info In Configuration File        | OPT.JAVASCRIPT.SensitiveInfoInConfigurationFile                 | SensitiveInfoInConfigurationFile: Use sensitive information into configuration files  |
| Medium   | Autocomplete On For Sensitive Fields        | OPT.JAVASCRIPT.JSX.AutocompleteOnForSensitiveFields             | AutocompleteOnForSensitiveFields: Autocomplete enabled for sensitive fields   |
| Medium   | Insecure Randomness                         | OPT.JAVASCRIPT.InsecureRandomness                               | InsecureRandomness: Standard pseudo-random number generators cannot resist cryptographic attacks  |

## JCL Scan rules

Contrast Scan supports these rules for JCL.

| Severity | Contrast Rule                  | Engine rule ID                             | Description  |
|----------|--------------------------------|--|--|
| Critical | Avoid Using Jobs Without Steps | OPT.JCL.AvoidUsingJobsWithoutSteps         | AvoidUsingJobsWithoutSteps: Avoid using JCL programs not defining any step                                 |
| Critical | Job Name Must Match JCL Name   | OPT.JCL.NAM_JCL.JobNameMustMatchJCLName    | JobNameMustMatchJCLName: JOB name must be equal to the JCL filename  |
| Critical | Condition Code In Steps        | OPT.JCL.PB_JCL.ConditionCodeInSteps        | ConditionCodeInSteps: Use COND on each step to avoid wasted CPU in case of abnormal end                    |
| Critical | Allocate File Space In Tracks  | OPT.JCL.PF_JCL.AllocateFileSpaceInTracks   | AllocateFileSpaceInTracks: The allocation of space for files must be on tracks (TRKS)                      |
| Critical | Max Space For File             | OPT.JCL.PF_JCL.MaxSpaceForFile             | MaxSpaceForFile: Maximum allocation of space for files   |
| Critical | Time Per Step And Job          | OPT.JCL.PF_JCL.TimePerStepAndJob           | TimePerStepAndJob: Avoid unlimited time per job or step  |
| High     | Avoid Duplicated Step Names    | OPT.JCL.AvoidDuplicatedStepNames           | AvoidDuplicatedStepNames: Avoid duplicating step names   |
| High     | No Steps Without Steplib       | OPT.JCL.GEN_JCL.NoStepsWithoutSteplib      | NoStepsWithoutSteplib: Every step must have declared a STEPLIB   |
| High     | Steplib Instead Of Joblib      | OPT.JCL.GEN_JCL.SteplibInsteadOfJoblib     | SteplibInsteadOfJoblib: Suggest using local declaration instead of global                                  |
| High     | Allowed Programs               | OPT.JCL.MAN_JCL.AllowedPrograms            | AllowedPrograms: Allowed programs  |
| High     | Deprecated Programs            | OPT.JCL.MAN_JCL.DeprecatedPrograms         | DeprecatedPrograms: Deprecated programs  |
| High     | Job Naming Convention          | OPT.JCL.NAM_JCL.JobNamingConvention        | JobNamingConvention: JOB statement must comply the specifications  |
| High     | Avoid Forbidden Dd Statements  | OPT.JCL.PB_JCL.AvoidForbiddenDdStatements  | AvoidForbiddenDdStatements: SYSDDTERM, SYSDDDUMP, SYSABEND, SORTLIB are DD statements not allowed          |
| High     | Multivolume For Large Files    | OPT.JCL.PF_JCL.MultivolumeForLargeFiles    | MultivolumeForLargeFiles: Large files must be multivolume  |
| Info     | Region Parameter               | OPT.JCL.GEN_JCL.RegionParameter            | RegionParameter: REGION parameter must have a specific value in JOB, and must not be included in the steps |
| Info     | Dd Sysin Columning             | OPT.JCL.MAN_JCL.DdSysinColumning           | DdSysinColumning: Every line of the SYSIN DD and SYSTSIN DD text must begin in the specified column        |
| Info     | First Step Naming Convention   | OPT.JCL.NAM_JCL.FirstStepNamingConvention  | FirstStepNamingConvention: The name of the first step must be the specified one                            |
| Info     | Last Step Naming Convention    | OPT.JCL.NAM_JCL.LastStepNamingConvention   | LastStepNamingConvention: The name of the last step must be the specified one                              |
| Info     | Procedures Naming Convention   | OPT.JCL.NAM_JCL.ProceduresNamingConvention | ProceduresNamingConvention: Procedure names must comply the pattern  |
| Info     | Steps Naming Convention        | OPT.JCL.NAM_JCL.StepsNamingConvention      | StepsNamingConvention: Step names must have a specific format  |

| Severity | Contrast Rule                       | Engine rule ID                            | Description  |
|----------|-------------------------------------|---|--|
| Low      | Avoid Too Long Sysin                | OPT.JCL.AvoidTooLongSysin                 | AvoidTooLongSysin: Avoid a too long SYSIN DD statement   |
| Low      | Unit Assignment                     | OPT.JCL.GEN_JCL.UnitAssignment            | UnitAssignment: The UNIT parameter value must be the specified one                                     |
| Low      | One Parameter Per Line In DD        | OPT.JCL.MAN_JCL.OneParameterPerLineInDD   | OneParameterPerLineInDD: Place every DD parameter in different lines                                   |
| Low      | Files Naming Convention             | OPT.JCL.NAM_JCL.FilesNamingConvention     | FilesNamingConvention: Checks that file names comply with the patterns                                 |
| Low      | Sort Files Naming Convention        | OPT.JCL.NAM_JCL.SortFilesNamingConvention | SortFilesNamingConvention: SORT program files definition format  |
| Low      | Step Numbering Convention           | OPT.JCL.NAM_JCL.StepNumberingConvention   | StepNumberingConvention: Checks if step names comply with specified format                             |
| Medium   | Avoid Formatting Data After Sorting | OPT.JCL.AvoidFormattingDataAfterSorting   | AvoidFormattingDataAfterSorting: Avoid formatting data after sorting, format it before sorting instead |
| Medium   | Number Of Steps                     | OPT.JCL.MAN_JCL.NumberOfSteps             | NumberOfSteps: Limit the number of steps per job   |
| Medium   | Only Allowed Includes               | OPT.JCL.MAN_JCL.OnlyAllowedIncludes       | OnlyAllowedIncludes: Only use the specified include groups   |
| Medium   | No Sys1 Prefixed Libs               | OPT.JCL.PB_JCL.NoSys1PrefixedLibs         | NoSys1PrefixedLibs: Do not use SYS1 prefixed libraries   |

## JSP Scan rules

Contrast Scan supports these rules for JSP.

| Severity | Contrast rule                                | Engine rule ID                                       | Description  |
|----------|--|--|--|
| Critical | Expression Language Injection                | OPT.JSP.SEC_JSP.ExpressionLanguageInjection          | ExpressionLanguageInjection: Expression Language (EL / OGNL) injection                   |
| Critical | Long JavaScript scripts                      | OPT.JSP.CFFJSP.ALJS                                  | ALJS: Avoid long js scripts  |
| Critical | Duplicate pages in multiple locations        | OPT.JSP.CFFJSP.DPNM                                  | DPNM: There are duplicate pages in different locations                                   |
| Critical | JSP Page Name                                | OPT.JSP.CFFJSP.JSPPageName                           | JSPPageName: The name of the jsp page should follow a naming standard                    |
| Critical | JSP Forward found                            | OPT.JSP.CFFJSP.NJFW                                  | NJFW: There are direct invocations to other jsp pages                                    |
| Critical | Long script code                             | OPT.JSP.CFFJSP.NLSC                                  | NLSC: Avoid long scriptlets  |
| Critical | JSP files not in the configured folder       | OPT.JSP.CFFJSP.UECD                                  | UECD: JSP pages located in a folder different from the configured folder                 |
| Critical | Don't Mix Jstl And Jsf Tags                  | OPT.JSP.PB_JSF.DontMixJstlAndJsfTags                 | DontMixJstlAndJsfTags: Nesting JSTL tags within JSF tags, or vice versa                  |
| Critical | Don't Use Conditional Tags In Iterative Tags | OPT.JSP.PB_JSF.DontUseConditionalTagsInIterativeTags | DontUseConditionalTagsInIterativeTags: Do not use conditional tags inside iterative tags |

| Severity | Contrast rule                                | Engine rule ID                                      | Description   |
|----------|--|---|---|
| Critical | Avoid Architecture Classes From JSP Rule     | OPT.JSP.SEC_JSP.AvoidArchitectureClassesFromJSPRule | AvoidArchitectureClassesFromJSPRule: JSP pages should not import architecture classes           |
| Critical | File Inclusion Vulnerability                 | OPT.JSP.SEC_JSP.FileInclusionVulnerability          | FileInclusionVulnerability: JSP File Inclusion vulnerability                                    |
| Critical | Database access from a JSP page              | OPT.JSP.CFFJSP.ABDP                                 | ABDP: Database access from a JSP page   |
| Critical | Missing Password Field Masking               | OPT.JSP.SEC_JSP.MissingPasswordFieldMasking         | MissingPasswordFieldMasking: Password input field is not masked                                 |
| Critical | Unprotected Transport Credential             | OPT.JSP.SEC_JSP.UnprotectedTransportCredential      | UnprotectedTransportCredential: Unprotected transport of credentials                            |
| High     | Path Relative Stylesheet Import              | OPT.JSP.SEC_JSP.PathRelativeStylesheetImport        | PathRelativeStylesheetImport: Path-Relative Stylesheet Import.                                  |
| High     | Target Blank Vulnerability                   | OPT.JSP.SEC_JSP.TargetBlankVulnerability            | TargetBlankVulnerability: Improper Neutralization of links to external sites                    |
| High     | Unnecessary spaces, tab and line terminators | OPT.JSP.CFFJSP.AWLL                                 | AWLL: The page contains many unnecessary spaces, tabs and line terminators overall inside loops |
| High     | Check URL                                    | OPT.JSP.CFFJSP.CheckURL                             | CheckURL: Check the URL in the JSP page   |
| High     | Missing comments in JSP pages                | OPT.JSP.CFFJSP.ICPJ                                 | ICPJ: There are not any comment in the JSP page   |
| High     | Multiple CSS tags                            | OPT.JSP.CFFJSP.NAEE                                 | NAEE: There are many css tags in the elements included in a loop                                |
| High     | JavaScript code in JSP pages                 | OPT.JSP.CFFJSP.NFJS                                 | NFJS: Use of Javascript code in pages   |
| High     | Java source code found                       | OPT.JSP.CFFJSP.NSCR                                 | NSCR: There is JAVA source code in some pages   |
| High     | Use of document.write                        | OPT.JSP.CFFJSP.NUSDW                                | NUSDW: Insertion of HTML code from JSP file including document.write commands                   |
| High     | Commented out JavaScript code                | OPT.JSP.CFFJSP.NUSJSC                               | NUSJSC: There are commented lines of javascript   |
| High     | Allowed Uris                                 | OPT.JSP.GEN_JSF.AllowedUris                         | AllowedUris: Taglib declarations must include standard URI's                                    |
| High     | Information Exposure In Get Request          | OPT.JSP.SEC_JSP.InformationExposureInGetRequest     | InformationExposureInGetRequest: Information exposure through strings sent by GET               |
| Info     | Duplicate imports                            | OPT.JSP.CFFJSP.DJIM                                 | DJIM: Do not put duplicate imports in the JSP files   |
| Low      | Form Without Captcha                         | OPT.JSP.SEC_JSP.FormWithoutCaptcha                  | FormWithoutCaptcha: Form without CAPTCHA  |
| Low      | Managed Beans Naming Convention              | OPT.JSP.NAM_JSF.ManagedBeansNamingConvention        | ManagedBeansNamingConvention: managed-bean names must comply the pattern                        |
| Low      | IFrames missing src attribute                | OPT.JSP.CFFJSP.IMSA                                 | IMSA: Do not use iframes without src attribute  |
| Medium   | Specify Integrity Attribute                  | OPT.JSP.SEC_JSP.SpecifyIntegrityAttribute           | SpecifyIntegrityAttribute: Specify a integrity attribute on the <script> and <link> elements    |
| Medium   | Literals in JSP pages                        | OPT.JSP.CFFJSP.ELED                                 | ELED: There are literals in the JSP page  |



| Severity | Contrast rule                        | Engine rule ID      | Description  |
|----------|--------------------------------------|---------------------|--|
| Medium   | Empty pages                          | OPT.JSP.CFFJSP.ISEM | ISEM: There are empty pages  |
| Medium   | Class attribute found                | OPT.JSP.CFFJSP.NCAT | NCAT: No class attribute   |
| Medium   | HTML commented code                  | OPT.JSP.CFFJSP.NHMC | NHMC: HTML commented code  |
| Medium   | Inline style found                   | OPT.JSP.CFFJSP.NISI | NISI: There is no style information in JSP   |
| Medium   | Use of repeated data in option lists | OPT.JSP.CFFJSP.NUSO | NUSO: Use combo list with static information, so that you will not need option lists |
| Medium   | No header comments                   | OPT.JSP.CFFJSP.UHCP | UHCP: JSP page does not have header comments   |

## Kotlin Scan rules

Contrast Scan supports these rules for Kotlin.

| Severity | Contrast rule                         | Engine rule ID                                    | Description  |
|----------|---------------------------------------|---|--|
| Critical | Insecure SSL                          | OPT.KOTLIN.SEC.InsecureSSL                        | InsecureSSL: Insecure SSL configuration  |
| Critical | Too Much Origins Allowed              | OPT.KOTLIN.SEC.TooMuchOriginsAllowed              | TooMuchOriginsAllowedRule: CORS policy (Cross-origin resource sharing) too broad                                 |
| Critical | Dynamically Loading Code              | OPT.KOTLIN.ANDROID.DynamicallyLoadingCode         | DynamicallyLoadingCode: Discourage dynamically loading code  |
| Critical | Intent Manipulation                   | OPT.KOTLIN.ANDROID.IntentManipulation             | IntentManipulation: Intent Manipulation  |
| Critical | Javascript Enabled                    | OPT.KOTLIN.ANDROID.JavascriptEnabled              | JavascriptEnabled: Enabling JavaScript is not recommended  |
| Critical | Javascript Interface Annotation       | OPT.KOTLIN.ANDROID.JavascriptInterfaceAnnotation  | JavascriptInterfaceAnnotation: Potential code injection via WebView.addJavaScriptInterface()                     |
| Critical | Code Injection                        | OPT.KOTLIN.SEC.CodeInjection                      | CodeInjectionRule: Dynamic code injection in scripting API   |
| Critical | Command Injection                     | OPT.KOTLIN.SEC.CommandInjection                   | CommandInjectionRule: Improper Neutralization of Special Elements used in an OS Command ('OS Command Injection') |
| Critical | Connection String Parameter Pollution | OPT.KOTLIN.SEC.ConnectionStringParameterPollution | ConnectionStringParameterPollution: Connection string polluted with untrusted input                              |
| Critical | Cross Site Scripting                  | OPT.KOTLIN.SEC.CrossSiteScripting                 | CrossSiteScriptingRule: Improper Neutralization of Input During Web Page Generation ('Cross-site Scripting')     |
| Critical | Http Splitting                        | OPT.KOTLIN.SEC.HttpSplitting                      | HttpSplittingRule: Improper Neutralization of CRLF Sequences in HTTP Headers ('HTTP Response Splitting')         |
| Critical | Ldap Injection                        | OPT.KOTLIN.SEC.LdapInjection                      | LdapInjectionRule: Avoid non-neutralized user-controlled input in LDAP search filters                            |
| Critical | Mail Command Injection                | OPT.KOTLIN.SEC.MailCommandInjection               | MailCommandInjection: Mail Command Injection   |
| Critical | No SQL Injection                      | OPT.KOTLIN.SEC.NoSQLInjection                     | NoSQLInjection: Improper neutralization of special elements in data query logic (NoSQL injection)                |
| Critical | Process Control                       | OPT.KOTLIN.SEC.ProcessControl                     | ProcessControlRule: Library loaded from untrusted source   |
| Critical | Regex Injection                       | OPT.KOTLIN.SEC.RegexInjection                     | RegexInjectionRule: Prevent denial of service attack through malicious regular expression ('Regex Injection')    |

| Severity | Contrast rule                             | Engine rule ID                                       | Description  |
|----------|---|--|--|
| Critical | Same Origin Method Execution              | OPT.KOTLIN.SEC.SameOriginMethodExecution             | SameOriginMethodExecution: Same Origin Method Execution (SOME)   |
| Critical | Server Side Request Forgery               | OPT.KOTLIN.SEC.ServerSideRequestForgery              | ServerSideRequestForgeryRule: Server-Side Request Forgery (SSRF)   |
| Critical | SQL Injection                             | OPT.KOTLIN.SEC.SqlInjection                          | SqlInjectionRule: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection')             |
| Critical | Xml Entity Injection                      | OPT.KOTLIN.SEC.XmlEntityInjection                    | XmlEntityInjectionRule: XML entity injection   |
| Critical | Privilege Escalation Attack               | OPT.KOTLIN.ANDROID.PrivilegeEscalationAttack         | PrivilegeEscalationAttack: Don't allow applications to execute code using other applications privileges            |
| Critical | Garbage Collector Call                    | OPT.KOTLIN.GarbageCollectorCall                      | GarbageCollectorCall: Avoid invoking the garbage collector   |
| Critical | Accessibility Subversion                  | OPT.KOTLIN.SEC.AccessibilitySubversion               | AccessibilitySubversionRule: Java access restriction subverted (Reflection)  |
| Critical | Anonymous Ldap Bind                       | OPT.KOTLIN.SEC.AnonymousLdapBind                     | AnonymousLdapBindRule: Access Control - Anonymous LDAP Bind  |
| Critical | Native Code Exposed                       | OPT.KOTLIN.SEC.NativeCodeExposed                     | NativeCodeExposed: Native Code Exposed.  |
| Critical | Path Traversal                            | OPT.KOTLIN.SEC.PathTraversal                         | PathTraversalRule: Avoid non-neutralized user-controlled input composed in a pathname to a resource                |
| Critical | Android Sticky Broadcast                  | OPT.KOTLIN.ANDROID.AndroidStickyBroadcast            | AndroidStickyBroadcast: Avoid Sticky Broadcasts  |
| Critical | SMS Monitoring                            | OPT.KOTLIN.ANDROID.SMSMonitoring                     | SMSMonitoring: Don't use SMS for data input or command   |
| Critical | Password In Redirect                      | OPT.KOTLIN.SEC.PasswordInRedirect                    | PasswordInRedirect: Password Management - Password in Redirect   |
| Critical | Hardcoded Crypto Key                      | OPT.KOTLIN.SEC.HardcodedCryptoKey                    | HardcodedCryptoKey: Hardcoded cryptographic keys   |
| Critical | Non Random IV With CBC Mode               | OPT.KOTLIN.SEC.NonRandomIVWithCBCMode                | NonRandomIVWithCBCMode: Not using a Random IV with CBC Mode  |
| Critical | Weak Cryptographic Hash                   | OPT.KOTLIN.SEC.WeakCryptographicHash                 | WeakCryptographicHashRule: Weak cryptographic hash   |
| Critical | Weak Encryption                           | OPT.KOTLIN.SEC.WeakEncryption                        | WeakEncryptionRule: Weak symmetric encryption algorithm  |
| High     | Prevent Backup Vulnerability              | OPT.KOTLIN.ANDROID.PreventBackupVulnerability        | PreventBackupVulnerability: Inadequate backup configuration  |
| High     | Insufficient Session Expiration           | OPT.KOTLIN.SEC.InsufficientSessionExpiration         | InsufficientSessionExpirationRule: Checks that session expiration interval is positive and does not exceed a limit |
| High     | Web Xml Security Misconfigurations        | OPT.KOTLIN.SEC.WebXmlSecurityMisconfigurations       | WebXmlSecurityMisconfigurationsRule: Avoid misconfiguring security properties in web.xml descriptor                |
| High     | Cross Site Request Forgery                | OPT.KOTLIN.SEC.CrossSiteRequestForgery               | CrossSiteRequestForgeryRule: Cross-site request forgery (CSRF)   |
| High     | External Control Of Configuration Setting | OPT.KOTLIN.SEC.ExternalControlOfConfigurationSetting | ExternalControlOfConfigurationSetting: External Control of System or Configuration Setting                         |
| High     | Http Parameter Pollution                  | OPT.KOTLIN.SEC.HttpParameterPollution                | HttpParameterPollutionRule: HTTP parameter pollution (HPP)   |
| High     | JSON Injection                            | OPT.KOTLIN.SEC.JSONInjection                         | JSONInjection: Avoid using non-neutralized user-controlled input into JSON entities - JSON Injection               |
| High     | Log Forging                               | OPT.KOTLIN.SEC.LogForging                            | LogForging: Improper Output Neutralization for Logs  |
| High     | Open Redirect                             | OPT.KOTLIN.SEC.OpenRedirect                          | OpenRedirectRule: URL Redirection to Untrusted Site ('Open Redirect')  |

| Severity | Contrast rule                        | Engine rule ID                                  | Description  |
|----------|--------------------------------------|---|--|
| High     | Resource Injection                   | OPT.KOTLIN.SEC.ResourceInjection                | ResourceInjection: Improper control of resource identifiers ("Resource Injection")   |
| High     | Trust Boundary Violation             | OPT.KOTLIN.SEC.TrustBoundaryViolation           | TrustBoundaryViolationRule: Trust boundary violation   |
| High     | Unsafe Reflection                    | OPT.KOTLIN.SEC.UnsafeReflection                 | UnsafeReflection: Use of Externally-Controlled Input to Select Classes or Code ('Unsafe Reflection')                                       |
| High     | XPath Injection                      | OPT.KOTLIN.SEC.XPathInjection                   | XPathInjectionRule: Improper Neutralization of Data within XPath Expressions ('XPath Injection')   |
| High     | Xslt Injection                       | OPT.KOTLIN.SEC.XsltInjection                    | XsltInjection: XML Injection (aka Blind XPath Injection)   |
| High     | Iterator Has Next Calls Next         | OPT.KOTLIN.IteratorHasNextCallsNext             | IteratorHasNextCallsNext: Iterator hasNext() calls next().   |
| High     | Cookies In Security Decision         | OPT.KOTLIN.SEC.CookiesInSecurityDecision        | CookiesInSecurityDecision: Reliance on Cookies without Validation and Integrity Checking in a Security Decision                            |
| High     | Security Check In Overridable Method | OPT.KOTLIN.SEC.SecurityCheckInOverridableMethod | SecurityCheckInOverridableMethodRule: Methods that perform a security check must be declared private or final                              |
| High     | Spring No Anti Xss Configuration     | OPT.KOTLIN.SEC.SpringNoAntiXssConfiguration     | SpringNoAntiXssConfiguration: Use defaultHtmlEscape {'OWASP-2021': ['A5'], 'WASC': ['08'], 'PCI-DSS': ['6.5.7'], 'ASVS-v4.0.2': ['3.4.5']} |
| High     | Unhandled SSL Exception              | OPT.KOTLIN.SEC.UnhandledSSLException            | UnhandledSSLExceptionRule: Unhandled SSL exception   |
| High     | User Controlled SQL Primary Key      | OPT.KOTLIN.SEC.UserControlledSQLPrimaryKey      | UserControlledSQLPrimaryKey: Avoid using an user controlled Primary Key into a query   |
| High     | Unpaired Equals Hash Code            | OPT.KOTLIN.UnpairedEqualsHashCode               | UnpairedEqualsHashCode: Object Model Violation: Just one of equals and hashCode defined.   |
| High     | Wrong Equals Signature               | OPT.KOTLIN.WrongEqualsSignature                 | WrongEqualsSignature: Wrong equals() signature.  |
| High     | Hardcoded Ip                         | OPT.KOTLIN.SEC.HardcodedIp                      | HardcodedIp: Do not write IP address in source code  |
| High     | Hardcoded Salt                       | OPT.KOTLIN.SEC.HardcodedSalt                    | HardcodedSaltRule: A hardcoded salt can compromise system security   |
| High     | Inadequate Padding                   | OPT.KOTLIN.SEC.InadequatePadding                | InadequatePaddingRule: Inadequate padding  |
| High     | Insecure Randomness                  | OPT.KOTLIN.SEC.InsecureRandomness               | InsecureRandomnessRule: Standard pseudo-random number generators cannot withstand cryptographic attacks                                    |
| High     | Insecure Transport                   | OPT.KOTLIN.SEC.InsecureTransport                | InsecureTransport: Insecure transport  |
| High     | Insufficient Key Size                | OPT.KOTLIN.SEC.InsufficientKeySize              | InsufficientKeySizeRule: Weak cryptography, insufficient key length  |
| Low      | Bad Exception Handling               | OPT.KOTLIN.BadExceptionHandling                 | BadExceptionHandling: Bad exception handling.  |
| Low      | Complex Condition                    | OPT.KOTLIN.ComplexCondition                     | ComplexCondition: Too complex boolean condition.   |
| Low      | Complex Function                     | OPT.KOTLIN.ComplexFunction                      | ComplexFunction: Too complex function.   |
| Low      | Empty Function                       | OPT.KOTLIN.EmptyFunction                        | EmptyFunction: Empty function.   |
| Low      | Generic Array Of Primitives          | OPT.KOTLIN.GenericArrayOfPrimitives             | GenericArrayOfPrimitives: Generic Array of primitive type.   |
| Low      | Long Function                        | OPT.KOTLIN.LongFunction                         | LongFunction: Long function.   |
| Low      | Spread Operator                      | OPT.KOTLIN.SpreadOperator                       | SpreadOperator: Use of spread (*) operator.  |
| Low      | Too Many Parameters                  | OPT.KOTLIN.TooManyParameters                    | TooManyParameters: Too many parameters in function.  |
| Low      | Unsafe Cast                          | OPT.KOTLIN.UnsafeCast                           | UnsafeCast: Unsafe cast.   |

| Severity | Contrast rule                     | Engine rule ID                                    | Description   |
|----------|-----------------------------------|---|---|
| Low      | Unused Function Parameter         | OPT.KOTLIN.UnusedFunctionParameter                | UnusedFunctionParameter: Unused function parameter.   |
| Medium   | Plaintext Storage In A Cookie     | OPT.KOTLIN.SEC.PlaintextStorageInACookie          | PlaintextStorageInACookieRule: Cleartext Storage of Sensitive Information in a Cookie                     |
| Medium   | Unsafe Cookie                     | OPT.KOTLIN.SEC.UnsafeCookie                       | UnsafeCookie: Generate server-side cookies with adequate security properties                              |
| Medium   | Exported Preference Activity      | OPT.KOTLIN.ANDROID.ExportedPreferenceActivity     | ExportedPreferenceActivity: Activities extending PreferenceActivity should not be exported                |
| Medium   | Avoid Host Name Checks            | OPT.KOTLIN.SEC.AvoidHostNameChecks                | AvoidHostNameChecksRule: Avoid checks on client-side hostname, that are not reliable due to DNS poisoning |
| Medium   | Format String Injection           | OPT.KOTLIN.SEC.FormatStringInjection              | FormatStringInjectionRule: Exclude unsanitized user input from format strings                             |
| Medium   | Serialization Injection           | OPT.KOTLIN.SEC.SerializationInjection             | SerializationInjection: Deserialization of untrusted data   |
| Medium   | Check External Storage Permission | OPT.KOTLIN.ANDROID.CheckExternalStoragePermission | CheckExternalStoragePermission: Check permission usage conformance (External Storage Permission)          |
| Medium   | Check Internet Permission         | OPT.KOTLIN.ANDROID.CheckInternetPermission        | CheckInternetPermission: Check permission usage conformance (Internet Permission)                         |
| Medium   | Check Location Permission         | OPT.KOTLIN.ANDROID.CheckLocationPermission        | CheckLocationPermission: Check permission usage conformance (Location Permission)                         |
| Medium   | Complex Interface                 | OPT.KOTLIN.ComplexInterface                       | ComplexInterface: Too complex interface.  |
| Medium   | Excessive Method Overloading      | OPT.KOTLIN.ExcessiveMethodOverloading             | ExcessiveMethodOverloading: Excessive method overloading.   |
| Medium   | Excessive Nesting Depth           | OPT.KOTLIN.ExcessiveNestingDepth                  | ExcessiveNestingDepth: Excessive nesting depth.   |
| Medium   | For Each On Range                 | OPT.KOTLIN.ForEachOnRange                         | ForEachOnRange: ForEach on range.   |
| Medium   | Missing When Case                 | OPT.KOTLIN.MissingWhenCase                        | MissingWhenCase: Missing when case.   |
| Medium   | Detail Error Leak                 | OPT.KOTLIN.SEC.DetailErrorLeak                    | DetailErrorLeakRule: Do not send detail error information to client                                       |
| Medium   | Execution After Redirect          | OPT.KOTLIN.SEC.ExecutionAfterRedirect             | ExecutionAfterRedirect: Execution After Redirect (EAR)  |
| Medium   | Too Many Functions                | OPT.KOTLIN.TooManyFunctions                       | TooManyFunctions: Too many functions.   |
| Medium   | Unconditional Jump In Loop        | OPT.KOTLIN.UnconditionalJumpInLoop                | UnconditionalJumpInLoop: Unconditional jump in loop.  |
| Medium   | Unreachable Code                  | OPT.KOTLIN.UnreachableCode                        | UnreachableCode: Unreachable ("dead") code.   |
| Medium   | Unused Private Function           | OPT.KOTLIN.UnusedPrivateFunction                  | UnusedPrivateFunction: Unused private function.   |
| Medium   | Hardcoded Username Password       | OPT.KOTLIN.SEC.HardcodedUsernamePassword          | HardcodedUsernamePassword: Use of Hard-coded Credentials  |
| Medium   | JSON P Hijacking                  | OPT.KOTLIN.SEC.JSONPHijacking                     | JSONPHijacking: Sensitive information exposed through JSONP   |
| Medium   | Password In Configuration File    | OPT.KOTLIN.SEC.PasswordInConfigurationFile        | PasswordInConfigurationFile: Use of credentials into configuration file                                   |
| Medium   | Plaintext Storage Of Password     | OPT.KOTLIN.SEC.PlaintextStorageOfPassword         | PlaintextStorageOfPassword: Plaintext Storage of a Password   |
| Medium   | Privacy Violation                 | OPT.KOTLIN.SEC.PrivacyViolation                   | PrivacyViolation: Exposure of Private Information ('Privacy Violation')                                   |

| Severity | Contrast rule                                | Engine rule ID  | Description  |
|----------|--|---|--|
| Medium   | Serializable Class Containing Sensitive Data | OPT.KOTLIN.SEC.SerializableClassContainingSensitiveData | SerializableClassContainingSensitiveData: Serializable Class Containing Sensitive Data |

## NATURAL Scan rules

Contrast Scan supports these rules for NATURAL.

| Severity | Contrast rule                          | Engine rule ID                                      | Description  |
|----------|--|---|--|
| Critical | Avoid Input Using Map Inside Read Find | OPT.NATURAL.NAT_PF.AvoidInputUsingMapInsideReadFind | AvoidInputUsingMapInsideReadFind: Avoid records locking for user input   |
| High     | Avoid Too Complex Routines             | OPT.NATURAL.NAT_MAN.AvoidTooComplexRoutines         | AvoidTooComplexRoutines: Avoid too complex programmes (in cyclomatic complexity, number of different execution ways)             |
| High     | Only Allowed Copy Codes                | OPT.NATURAL.NAT_MAN.OnlyAllowedCopyCodes            | OnlyAllowedCopyCodes: Limit the copy codes to be used  |
| High     | Unused Data Area                       | OPT.NATURAL.NAT_MAN.UnusedDataArea                  | UnusedDataArea: Avoid unused data areas (local, global or parameter) in system   |
| High     | Unused Maps                            | OPT.NATURAL.NAT_MAN.UnusedMaps                      | UnusedMaps: Avoid unused maps / forms declarations in system   |
| High     | Unused Routines                        | OPT.NATURAL.NAT_MAN.UnusedRoutines                  | UnusedRoutines: Avoid unused routines or programs in system  |
| High     | Avoid D M L Out Of Transaction Context | OPT.NATURAL.NAT_PB.AvoidDMLOutOfTransactionContext  | AvoidDMLOutOfTransactionContext: Check that every DML statement has its corresponding END TRANSACTION                            |
| High     | Avoid Empty None Clause                | OPT.NATURAL.NAT_PB.AvoidEmptyNoneClause             | AvoidEmptyNoneClause: Avoid empty NONE clauses in the DECIDE ON/FOR statement in programmes                                      |
| High     | Avoid Empty On Error Clause            | OPT.NATURAL.NAT_PB.AvoidEmptyOnErrorClause          | AvoidEmptyOnErrorClause: It's advisable to not code empty ON ERROR to handle correctly every possible error                      |
| High     | Avoid Stack Usages                     | OPT.NATURAL.NAT_PB.AvoidStackUsages                 | AvoidStackUsages: Avoid using STACK sentence   |
| High     | Avoid Find Sorted By                   | OPT.NATURAL.NAT_PF.AvoidFindSortedBy                | AvoidFindSortedBy: Do not use option SORTED BY in FIND statements  |
| High     | Use With Limit Clause In Read And Find | OPT.NATURAL.NAT_PF.UseWithLimitClauseInReadAndFind  | UseWithLimitClauseInReadAndFind: Limit the amount of records used in READ and FIND   |
| Info     | Avoid Multiple Sentences In One Line   | OPT.NATURAL.NAT_DOC.AvoidMultipleSentencesInOneLine | AvoidMultipleSentencesInOneLine: Avoid writing multiple sentences in one code line   |
| Info     | Avoid Too Large Code Blocks            | OPT.NATURAL.NAT_MAN.AvoidTooLargeCodeBlocks         | AvoidTooLargeCodeBlocks: Certain code structures (LDA, PDA, programs or subroutines) should not exceed a maximum number of lines |
| Info     | Remove Commented Code                  | OPT.NATURAL.NAT_MAN.RemoveCommentedCode             | RemoveCommentedCode: Avoid commented code  |
| Info     | Program Name                           | OPT.NATURAL.NAT_NOM.ProgramName                     | ProgramName: Follow programmes naming standard   |

| Severity | Contrast rule                          | Engine rule ID                                       | Description  |
|----------|--|--|--|
| Info     | Subroutine Name                        | OPT.NATURAL.NAT_NOM.SubroutineName                   | SubroutineName: Follow subroutines naming standard   |
| Info     | Variable Name                          | OPT.NATURAL.NAT_NOM.VariableName                     | VariableName: Follow variables naming standard   |
| Info     | Avoid Escape Top                       | OPT.NATURAL.NAT_PB.AvoidEscapeTop                    | AvoidEscapeTop: Do not use ESCAPE TOP statement  |
| Info     | Avoid Debugging Write In Online Progs  | OPT.NATURAL.NAT_MAN.AvoidDebuggingWriteInOnlineProgs | AvoidDebuggingWriteInOnlineProgs: Avoid debugging WRITE in online-processing programs.                                       |
| Low      | Avoid Excessive Record Nesting         | OPT.NATURAL.NAT_MAN.AvoidExcessiveRecordNesting      | AvoidExcessiveRecordNesting: Avoid variable declarations (records) too deeply nested   |
| Low      | Number Of Options In Decide            | OPT.NATURAL.NAT_MAN.NumberOfOptionsInDecide          | NumberOfOptionsInDecide: Try to limit the number of options in DECIDE statements   |
| Low      | Avoid Find Read With Hold              | OPT.NATURAL.NAT_PF.AvoidFindReadWithHold             | AvoidFindReadWithHold: Detects READ/FIND sentences with UPDATE/STORE/DELETE instructions in its body                         |
| Low      | Avoid Where In Read And Find Statement | OPT.NATURAL.NAT_PF.AvoidWhereInReadAndFindStatement  | AvoidWhereInReadAndFindStatement: Avoid WHERE clause in READ and FIND  |
| Medium   | Avoid Deep Nesting Branches            | OPT.NATURAL.NAT_MAN.AvoidDeepNestingBranches         | AvoidDeepNestingBranches: Avoid deep nesting in flow control sentences (IF, FOR, REPEAT, DECIDE FOR, DECIDE ON)              |
| Medium   | Avoid Accept Reject If                 | OPT.NATURAL.NAT_PB.AvoidAcceptRejectIf               | AvoidAcceptRejectIf: Do not use ACCEPT/REJECT IF statement   |
| Medium   | Avoid Recursive Calls                  | OPT.NATURAL.NAT_PB.AvoidRecursiveCalls               | AvoidRecursiveCalls: Avoid recursive calls (PERFORM to the same subroutine , CALLNAT ... RUN to the same program/subprogram) |
| Medium   | Avoid Stop Statement                   | OPT.NATURAL.NAT_PB.AvoidStopStatement                | AvoidStopStatement: Avoid STOP statement and use TERMINATE with the corresponding error code instead                         |
| Medium   | Avoid Terminate Without Error Code     | OPT.NATURAL.NAT_PB.AvoidTerminateWithoutErrorCode    | AvoidTerminateWithoutErrorCode: It's advisable to code TERMINATE with its corresponding error code                           |
| Medium   | End Transactions In Program Body       | OPT.NATURAL.NAT_PB.EndTransactionsInProgramBody      | EndTransactionsInProgramBody: Avoid placing BACKOUT or END TRANSACTION out of the programme body                             |
| Medium   | Only One Exit Point                    | OPT.NATURAL.NAT_PB.OnlyOneExitPoint                  | OnlyOneExitPoint: Code only one exit point to avoid possible errors  |
| Medium   | Avoid Move By Name                     | OPT.NATURAL.NAT_PF.AvoidMoveByName                   | AvoidMoveByName: It is better to move based on the structure of the group or redefined variable                              |
| Medium   | Avoid Sort                             | OPT.NATURAL.NAT_PF.AvoidSort                         | AvoidSort: Do not use SORT statement   |

## Objective-C Scan rules

Contrast Scan supports these rules for Objective-C.

| Severity | Contrast rule                         | Engine rule ID   | Description   |
|----------|---------------------------------------|--|---|
| Critical | Avoid SQL Injection                   | OPT.OBJECTIVEC.AvoidSqlInjection                           | AvoidSqlInjection: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection')           |
| Critical | Code Injection                        | OPT.OBJECTIVEC.CodeInjection                               | CodeInjection: Improper Control of Generation Code ('Code Injection')   |
| Critical | Cross Site Scripting                  | OPT.OBJECTIVEC.CrossSiteScripting                          | CrossSiteScripting: Improper Neutralization of Input During Web Page Generation ('Cross-site Scripting')          |
| Critical | DoS Regular Expression                | OPT.OBJECTIVEC.DoSRegularExpression                        | DoSRegularExpression: Prevent denial of service attack through malicious regular expression                       |
| Critical | Format String Vulnerability           | OPT.OBJECTIVEC.FormatStringVulnerability                   | FormatStringVulnerability: Exclude unsanitized user input from format strings                                     |
| Critical | JSON Injection                        | OPT.OBJECTIVEC.JSONInjection                               | JSONInjection: Avoid using non-neutralized user controlled input into JSON entities - JSON Injection              |
| Critical | Open Redirect                         | OPT.OBJECTIVEC.OpenRedirect                                | OpenRedirect: URL Redirection to Untrusted Site ('Open Redirect')   |
| Critical | XML Entity Injection                  | OPT.OBJECTIVEC.XMLEntityInjection                          | XMLEntityInjection: XML entity injection  |
| Critical | XPath Injection                       | OPT.OBJECTIVEC.XPathInjection                              | XPathInjection: Improper Neutralization of Data within XPath Expressions ('XPath Injection')                      |
| Critical | Command Injection Rule                | OPT.OBJECTIVEC.SECURITY.CommandInjectionRule               | CommandInjectionRule: Improper Neutralization of Special Elements used in an OS Command ('OS Command Injection')  |
| Critical | Connection String Parameter Pollution | OPT.OBJECTIVEC.SECURITY.ConnectionStringParameterPollution | ConnectionStringParameterPollution: Connection string polluted with untrusted input                               |
| Critical | Http Splitting Rule                   | OPT.OBJECTIVEC.SECURITY.HttpSplittingRule                  | HttpSplittingRule: Improper Neutralization of C Sequences in HTTP Headers ('HTTP Response Splitting')             |
| Critical | Mail Command Injection                | OPT.OBJECTIVEC.SECURITY.MailCommandInjection               | MailCommandInjection: Mail Command Injection  |
| Critical | No SQL Injection                      | OPT.OBJECTIVEC.SECURITY.NoSQLInjection                     | NoSQLInjection: Improper neutralization of special elements in data query logic (NoSQL injection)                 |
| Critical | Avoid Confusing User Id Calls         | OPT.OBJECTIVEC.AvoidConfusingUserIdCalls                   | AvoidConfusingUserIdCalls: Avoid setuid() / setreuid() / setgid() / setregid() to change program privilege levels |
| Critical | Avoid Empty Catch Blocks              | OPT.OBJECTIVEC.AvoidEmptyCatchBlocks                       | AvoidEmptyCatchBlocks: Avoid empty @catch blocks  |
| Critical | Avoid Large Methods                   | OPT.OBJECTIVEC.AvoidLargeMethods                           | AvoidLargeMethods: Avoid methods with excessive number of lines   |
| Critical | Avoid Loop With Empty Body            | OPT.OBJECTIVEC.AvoidLoopWithEmptyBody                      | AvoidLoopWithEmptyBody: Avoid loops (while, while, for) with empty body   |
| Critical | Avoid Sudo                            | OPT.OBJECTIVEC.AvoidSudo                                   | AvoidSudo: Avoid using sudo programmatically  |
| Critical | Avoid Throwing Exceptions             | OPT.OBJECTIVEC.AvoidThrowingExceptions                     | AvoidThrowingExceptions: Avoid throwing exceptions  |
| Critical | Nil In Literals                       | OPT.OBJECTIVEC.NilInLiterals                               | NilInLiterals: Do not use nil in NSArray or NSDictionary literals   |
| Critical | No Update Loop Vars In For Body       | OPT.OBJECTIVEC.NoUpdateLoopVarsInForBody                   | NoUpdateLoopVarsInForBody: Do not update control vars in 'for' loop body  |
| Critical | Override Draw Rect UIView Subclasses  | OPT.OBJECTIVEC.OverrideDrawRectUIViewSubclasses            | OverrideDrawRectUIViewSubclasses: Call super when overriding drawRect: and superclass is a UIView subclass        |
| Critical | Override Is Equal And Hash            | OPT.OBJECTIVEC.OverrideIsEqualAndHash                      | OverrideIsEqualAndHash: Override hash method when overriding isEqual: method                                      |



| Severity | Contrast rule                                 | Engine rule ID                                      | Description  |
|----------|---|---|--|
| Critical | Override U<br>IView<br>Controller<br>Methods  | OPT.OBJECTIVEC.OverrideUIViewControllerMethods      | OverrideUIViewControllerMethods: Call super when overriding some of UIViewController methods   |
| Critical | Override U<br>IView<br>Methods                | OPT.OBJECTIVEC.OverrideUIViewMethods                | OverrideUIViewMethods: Call super when overriding some of UIView methods   |
| Critical | Path<br>Manipulation<br>Vulnerability         | OPT.OBJECTIVEC.PathManipulationVulnerability        | PathManipulationVulnerability: Avoid non-neutralized user-controlled input to be part of a pathname (file or directory) used in I/O operations |
| Critical | Replace With<br>Less Secure<br>Func           | OPT.OBJECTIVEC.ReplaceWithLessSecureFunc            | ReplaceWithLessSecureFunc: Do not replace secure functions with less secure functions  |
| Critical | Reuse<br>Annotation<br>Views                  | OPT.OBJECTIVEC.ReuseAnnotationViews                 | ReuseAnnotationViews: Reuse annotation view maps   |
| Critical | Reuse Table<br>View Cells                     | OPT.OBJECTIVEC.ReuseTableViewCell                   | ReuseTableViewCell: Reuse cells in table view  |
| Critical | Missing<br>Password<br>Field<br>Masking       | OPT.OBJECTIVEC.SECURITY.MissingPasswordFieldMasking | MissingPasswordFieldMasking: Password input field is not masked  |
| Critical | Certificate<br>Verify Failed<br>Bypass        | OPT.OBJECTIVEC.CertificateVerifyFailedBypass        | CertificateVerifyFailedBypass: Do not bypass certificate validation fails  |
| Critical | Hardcoded<br>Crypto Key                       | OPT.OBJECTIVEC.SECURITY.HardcodedCryptoKey          | HardcodedCryptoKey: Hardcoded cryptographic keys   |
| Critical | Weak Key<br>Derivation<br>Iteration           | OPT.OBJECTIVEC.SECURITY.WeakKeyDerivationIteration  | WeakKeyDerivationIteration: Too weak iteration count on key derivation   |
| Critical | Weak Key<br>Derivation<br>Password            | OPT.OBJECTIVEC.SECURITY.WeakKeyDerivationPassword   | WeakKeyDerivationPassword: Empty or nil password used in key derivation  |
| High     | Do Not Use<br>System                          | OPT.OBJECTIVEC.DoNotUseSystem                       | DoNotUseSystem: Do not call system() if you do not need a command processor  |
| High     | Perform<br>Selector With<br>Untrusted<br>Data | OPT.OBJECTIVEC.PerformSelectorWithUntrustedData     | PerformSelectorWithUntrustedData: Avoid external control over performSelector  |
| High     | URL<br>Schemes<br>Handling                    | OPT.OBJECTIVEC.URLSchemesHandling                   | URLSchemesHandling: Verify invoker application identity  |
| High     | Http<br>Parameter<br>Pollution<br>Rule        | OPT.OBJECTIVEC.SECURITY.HttpParameterPollutionRule  | HttpParameterPollutionRule: HTTP parameter pollution (HPP)   |
| High     | Log Forging                                   | OPT.OBJECTIVEC.SECURITY.LogForging                  | LogForging: Improper Output Neutralization for Logs  |
| High     | Resource<br>Injection                         | OPT.OBJECTIVEC.SECURITY.ResourceInjection           | ResourceInjection: Improper control of resource identifiers ("Resource Injection")   |
| High     | URL Scheme<br>Hijacking                       | OPT.OBJECTIVEC.SECURITY.URLSchemeHijacking          | URLSchemeHijacking: URL scheme hijacking through user input  |
| High     | XML<br>Injection                              | OPT.OBJECTIVEC.SECURITY.XMLInjection                | XMLInjection: XML Injection (aka Blind XPath Injection)  |
| High     | Assign Init<br>Result To<br>Self              | OPT.OBJECTIVEC.AssignInitResultToSelf               | AssignInitResultToSelf: Assign the result of [super init] to self in init methods and check for nil  |
| High     | Avoid<br>Conditional<br>Operator              | OPT.OBJECTIVEC.AvoidConditionalOperator             | AvoidConditionalOperator: Do not use ? ternary operator to evaluate conditions   |
| High     | Avoid Empty<br>Draw Rect                      | OPT.OBJECTIVEC.AvoidEmptyDrawRect                   | AvoidEmptyDrawRect: Avoid empty drawRect implementations   |



| Severity | Contrast rule                                    | Engine rule ID   | Description  |
|----------|--|--|--|
| High     | Avoid Insecure C String Functions                | OPT.OBJECTIVEC.AvoidInsecureCStringFunctions               | AvoidInsecureCStringFunctions: Avoid C library functions that do not check for bounds  |
| High     | Avoid Maximum Location Accuracy When Possible    | OPT.OBJECTIVEC.AvoidMaximumLocationAccuracyWhenPossible    | AvoidMaximumLocationAccuracyWhenPossible: Avoid using by default the best location accuracy  |
| High     | Balance Custom Getters And Setters               | OPT.OBJECTIVEC.BalanceCustomGettersAndSetters              | BalanceCustomGettersAndSetters: Always write a custom getter for a property where you have a custom setter, and viceversa  |
| High     | Boolean In Comparisons                           | OPT.OBJECTIVEC.BooleanInComparisons                        | BooleanInComparisons: Avoid using nil/NO or YES in comparisons   |
| High     | Cache N S Date Formatters                        | OPT.OBJECTIVEC.CacheNSDateFormatters                       | CacheNSDateFormatters: Cache a single instance from NSDateFormatter types instead of creating multiple instances   |
| High     | Claim Ownership Core Foundation Objects          | OPT.OBJECTIVEC.ClaimOwnershipCoreFoundationObjects         | ClaimOwnershipCoreFoundationObjects: Claim ownership of Core Foundation objects received from Core Foundation Get functions  |
| High     | Class Cyclomatic Complexity                      | OPT.OBJECTIVEC.ClassCyclomaticComplexity                   | ClassCyclomaticComplexity: Avoid using classes with high cyclomatic complexity values  |
| High     | Clear Frame Buffers Before Drawing               | OPT.OBJECTIVEC.ClearFrameBuffersBeforeDrawing              | ClearFrameBuffersBeforeDrawing: Call glClear function before drawing   |
| High     | Comment Top Level Declarations                   | OPT.OBJECTIVEC.CommentTopLevelDeclarations                 | CommentTopLevelDeclarations: Interfaces, categories and protocols should have an accompanying comment  |
| High     | Create Autorelease Pool In Thread                | OPT.OBJECTIVEC.CreateAutoreleasePoolInThread               | CreateAutoreleasePoolInThread: Create an autorelease pool in each thread   |
| High     | Deallocation Of Objects Removed From Collections | OPT.OBJECTIVEC.DeallocationOfObjectsRemovedFromCollections | DeallocationOfObjectsRemovedFromCollections: Avoid deallocation of objects removed from fundamental collection classes (NSMutableArray, NSMutableDictionary) that you are going to use |
| High     | Dealloc Method                                   | OPT.OBJECTIVEC.DeallocMethod                               | DeallocMethod: Not invoke to the superclass's implementation at the end of the dealloc implementation  |
| High     | Default Clause Switch Statements                 | OPT.OBJECTIVEC.DefaultClauseSwitchStatements               | DefaultClauseSwitchStatements: All switch statements must have a default statement   |
| High     | Designated_INITIALIZER                           | OPT.OBJECTIVEC.DesignatedInitializer                       | DesignatedInitializer: Every public class must have at least one designated initializer  |
| High     | Distance From Main Sequence                      | OPT.OBJECTIVEC.DistanceFromMainSequence                    | DistanceFromMainSequence: Project should not be too far from main sequence   |
| High     | Do Not Instantiate Temporal Objects Loops        | OPT.OBJECTIVEC.DoNotInstantiateTemporalObjectsLoops        | DoNotInstantiateTemporalObjectsLoops: Avoid instantiating temporal objects in loop bodies  |
| High     | Fork Followed By Exec                            | OPT.OBJECTIVEC.ForkFollowedByExec                          | ForkFollowedByExec: A call to fork must be followed by a call to exec or a similar function  |

| Severity | Contrast rule                       | Engine rule ID                                      | Description   |
|----------|-------------------------------------|---|---|
| High     | Handle Memory Warnings              | OPT.OBJECTIVEC.HandleMemoryWarnings                 | HandleMemoryWarnings: Respond to low-memory warnings  |
| High     | Many Cases                          | OPT.OBJECTIVEC.ManyCases                            | ManyCases: Avoid too many choices in switch structures  |
| High     | Method Cyclomatic Complexity        | OPT.OBJECTIVEC.MethodCyclomaticComplexity           | MethodCyclomaticComplexity: Avoid using methods with high cyclomatic complexity values                    |
| High     | Minimize Bluetooth Interaction      | OPT.OBJECTIVEC.MinimizeBluetoothInteraction         | MinimizeBluetoothInteraction: Avoid using CBCentralManagerScanOptionAllowDuplicate as a scan option       |
| High     | Nested If Statements                | OPT.OBJECTIVEC.NestedIfStatements                   | NestedIfStatements: Avoid a high level of if statement nesting  |
| High     | Notify Deallocation Weak References | OPT.OBJECTIVEC.NotifyDeallocationWeakReferences     | NotifyDeallocationWeakReferences: Notify deallocation in weak-referenced objects                          |
| High     | Low Cohesion Within Object          | OPT.OBJECTIVEC.LowCohesionWithinObject              | LowCohesionWithinObject: Avoid classes with low degree of cohesion  |
| High     | Parenthesize Macro Args             | OPT.OBJECTIVEC.ParenthesizeMacroArgs                | ParenthesizeMacroArgs: Macro replacement should be parenthesized  |
| High     | Property Data Member                | OPT.OBJECTIVEC.PropertyDataMember                   | PropertyDataMember: Create a property for each data member and never access instance variables directly   |
| High     | Release Core Foundation Objects     | OPT.OBJECTIVEC.ReleaseCoreFoundationObjects         | ReleaseCoreFoundationObjects: Relinquish ownership of owned Core Foundation objects                       |
| High     | Release Ivars Dealloc               | OPT.OBJECTIVEC.ReleaselvarsDealloc                  | ReleaselvarsDealloc: Release ivars for retained copied properties in dealloc method                       |
| High     | Release Owned Objects               | OPT.OBJECTIVEC.ReleaseOwnedObjects                  | ReleaseOwnedObjects: Release owned objects in MRR   |
| High     | Sizeof Pointer Instead Array        | OPT.OBJECTIVEC.SizeofPointerInsteadArray            | SizeofPointerInsteadArray: Do not apply the sizeof operator to a pointer when taking the size of an array |
| High     | Specify Path For Shadows            | OPT.OBJECTIVEC.SpecifyPathForShadows                | SpecifyPathForShadows: Specify shadowPath property of layer when drawing a shadow                         |
| High     | Subviews In Standard Controls       | OPT.OBJECTIVEC.SubviewsInStandardControls           | SubviewsInStandardControls: Do not add subviews to standard system controls                               |
| High     | Unstructured Branching Statements   | OPT.OBJECTIVEC.UnstructuredBranchingStatements      | UnstructuredBranchingStatements: Avoid using unstructured branching statements                            |
| High     | Unused Local Var                    | OPT.OBJECTIVEC.UnusedLocalVar                       | UnusedLocalVar: Avoid unused local variables  |
| High     | Unused Method Parameter             | OPT.OBJECTIVEC.UnusedMethodParameter                | UnusedMethodParameter: Avoid unused method parameters   |
| High     | Use Automatic Reference Counting    | OPT.OBJECTIVEC.UseAutomaticReferenceCounting        | UseAutomaticReferenceCounting: Code must obey transition to ARC rules                                     |
| High     | Use Block Based Animation           | OPT.OBJECTIVEC.UseBlockBasedAnimation               | UseBlockBasedAnimation: Use block-based animations  |
| High     | Use Setter For Property             | OPT.OBJECTIVEC.UseSetterForProperty                 | UseSetterForProperty: When setting property values, use setter method                                     |
| High     | User Controlled SQL Primary Key     | OPT.OBJECTIVEC.SECURITY.UserControlledSQLPrimaryKey | UserControlledSQLPrimaryKey: Avoid using a user controlled Primary Key into a query                       |

| Severity | Contrast rule                                | Engine rule ID   | Description  |
|----------|--|--|--|
| High     | Insecure Transport Layer                     | OPT.OBJECTIVEC.InsecureTransportLayer                  | InsecureTransportLayer: Avoid using HTTP instead of HTTPS  |
| High     | Hardcoded Ip                                 | OPT.OBJECTIVEC.SECURITY.HardcodedIp                    | HardcodedIp: Do not write IP address in source code  |
| High     | Weak Cryptographic Hash                      | OPT.OBJECTIVEC.WeakCryptographicHash                   | WeakCryptographicHash: Weak cryptographic hashes cannot guarantee data integrity   |
| High     | Weak Encryption                              | OPT.OBJECTIVEC.WeakEncryption                          | WeakEncryption: Weak encryption algorithm  |
| Low      | Avoid CGContext Flush                        | OPT.OBJECTIVEC.AvoidCGContextFlush                     | AvoidCGContextFlush: Avoid calling CGContextFlush  |
| Low      | Avoid Exposing Instance Vars                 | OPT.OBJECTIVEC.AvoidExposingInstanceVars               | AvoidExposingInstanceVars: Instance variables should be properly hidden  |
| Low      | Avoid Function Like Macros                   | OPT.OBJECTIVEC.AvoidFunctionLikeMacros                 | AvoidFunctionLikeMacros: AvoidFunctionLikeMacros: Prefer inline or static functions to function-like macros                |
| Low      | Avoid Locks                                  | OPT.OBJECTIVEC.AvoidLocks                              | AvoidLocks: Avoid using locks  |
| Low      | Avoid Single Word Titles In Alerts           | OPT.OBJECTIVEC.AvoidSingleWordTitlesInAlerts           | AvoidSingleWordTitlesInAlerts: Avoid 'Alert' elements with little explanatory title  |
| Low      | Category In Framework Class Name Conventions | OPT.OBJECTIVEC.CategoryInFrameworkClassNameConventions | CategoryInFrameworkClassNameConventions: Naming convention for category methods in framework classes                       |
| Low      | Dead Code                                    | OPT.OBJECTIVEC.DeadCode                                | DeadCode: Avoid unreachable code   |
| Low      | Declare Subviews As Opaque                   | OPT.OBJECTIVEC.DeclareSubviewsAsOpaque                 | DeclareSubviewsAsOpaque: Declare subviews as opaque  |
| Low      | Reference From Parent To Child Class         | OPT.OBJECTIVEC.ReferenceFromParentToChildClass         | ReferenceFromParentToChildClass: Parent class does not reference any of its child classes                                  |
| Low      | Password In Comment Rule                     | OPT.OBJECTIVEC.SECURITY.PasswordInCommentRule          | PasswordInCommentRule: Storing passwords in plaintext anywhere in the system or system code can compromise system security |
| Medium   | Plaintext Storage In A Cookie Rule           | OPT.OBJECTIVEC.SECURITY.PlaintextStorageInACookieRule  | PlaintextStorageInACookieRule: Cleartext Storage of Sensitive Information in a Cookie                                      |
| Medium   | Unsafe Cookie                                | OPT.OBJECTIVEC.SECURITY.UnsafeCookie                   | UnsafeCookie: Generate server-side cookies with adequate security properties   |
| Medium   | Serialization Injection                      | OPT.OBJECTIVEC.SECURITY.SerializationInjection         | SerializationInjection: Deserialization of untrusted data  |
| Medium   | Avoid Comparing Float Numbers                | OPT.OBJECTIVEC.AvoidComparingFloatNumbers              | AvoidComparingFloatNumbers: Avoid comparing floating point with Code Quality [ ] {}  |
| Medium   | Avoid Magic Numbers                          | OPT.OBJECTIVEC.AvoidMagicNumbers                       | AvoidMagicNumbers: Avoid using numeric constants   |
| Medium   | Avoid NSLog                                  | OPT.OBJECTIVEC.AvoidNSLog                              | AvoidNSLog: Avoid the use of NSLog except in debug mode DEUGB  |
| Medium   | Avoid Querying State Open GL ES              | OPT.OBJECTIVEC.AvoidQueryingStateOpenGL                | AvoidQueryingStateOpenGL: Avoid calls to glGet*() to preserve parallelism  |
| Medium   | Avoid Super In Load View                     | OPT.OBJECTIVEC.AvoidSuperInLoadView                    | AvoidSuperInLoadView: Avoid calling super without overriding loadView  |

| Severity | Contrast rule                         | Engine rule ID                                   | Description  |
|----------|---------------------------------------|--|--|
| Medium   | Avoid Too Deep Class Hierarchies      | OPT.OBJECTIVEC.AvoidTooDeepClassHierarchies      | AvoidTooDeepClassHierarchies: Avoid too deep hierarchy classes   |
| Medium   | Avoid Unsafe File Functions           | OPT.OBJECTIVEC.AvoidUnsafeFileFunctions          | AvoidUnsafeFileFunctions: Use safe file access POSIX functions   |
| Medium   | Background Apps Open G L E S Commands | OPT.OBJECTIVEC.BackgroundAppsOpenGLESCommands    | BackgroundAppsOpenGLESCommands: Avoid submitting OpenGL ES commands when your app is in background                         |
| Medium   | Be Aware Of Location Errors           | OPT.OBJECTIVEC.BeAwareOfLocationErrors           | BeAwareOfLocationErrors: Be aware of location errors   |
| Medium   | Break Non Empty Switch Clauses        | OPT.OBJECTIVEC.BreakNonEmptySwitchClauses        | BreakNonEmptySwitchClauses: Non empty case sentences must end with a break sentence  |
| Medium   | Check Parameter Number In Method      | OPT.OBJECTIVEC.CheckParameterNumberInMethod      | CheckParameterNumberInMethod: Too many parameters in method  |
| Medium   | Class Factory Methods Name Convention | OPT.OBJECTIVEC.ClassFactoryMethodsNameConvention | ClassFactoryMethodsNameConvention: Naming convention for class factory methods   |
| Medium   | Copy Immutable Objects                | OPT.OBJECTIVEC.CopyImmutableObjects              | CopyImmutableObjects: Always use the (copy) storage class for properties that receive objects that have mutable subclasses |
| Medium   | Density Of Comments                   | OPT.OBJECTIVEC.DensityOfComments                 | DensityOfComments: Source code must be properly commented  |
| Medium   | Font Size                             | OPT.OBJECTIVEC.FontSize                          | FontSize: Avoid using fonts smaller than 11 points   |
| Medium   | High Coupling Between Objects         | OPT.OBJECTIVEC.HighCouplingBetweenObjects        | HighCouplingBetweenObjects: Classes internally strongly coupled must be avoided  |
| Medium   | Maximum Number Of Methods             | OPT.OBJECTIVEC.MaximumNumberOfMethods            | MaximumNumberOfMethods: Number of methods in an interface or protocol not should exceed a threshold                        |
| Medium   | Misuse Embedding In Scroll View       | OPT.OBJECTIVEC.MisuseEmbeddingInScrollView       | MisuseEmbeddingInScrollView: Avoid embedding a UIWebView or UITableView in a UIScrollView                                  |
| Medium   | One Statement Per Line                | OPT.OBJECTIVEC.OneStatementPerLine               | OneStatementPerLine: Use only one statement per line   |
| Medium   | Replace Enum By Ns Enum Or Ns Option  | OPT.OBJECTIVEC.ReplaceEnumByNsEnumOrNsOption     | ReplaceEnumByNsEnumOrNsOption: Replace enum declarations by uses of NS_ENUM and NS_OPTIONS macros                          |
| Medium   | Too Many Buttons In Action Sheet      | OPT.OBJECTIVEC.TooManyButtonsInActionSheet       | TooManyButtonsInActionSheet: Avoid defining many buttons in an Action Sheet  |
| Medium   | Too Many Dots In Page Control         | OPT.OBJECTIVEC.TooManyDotsInPageControl          | TooManyDotsInPageControl: Avoid too many opened views in Page Control  |
| Medium   | Touch Controls Size                   | OPT.OBJECTIVEC.TouchControlsSize                 | TouchControlsSize: Touch controls must should have at least a 44 x 44 pixels dimension                                     |
| Medium   | Use Instancetype Instead Of Id        | OPT.OBJECTIVEC.UseInstancetypeInsteadOfId        | UseInstancetypeInsteadOfId: Alloc, init and class factory methods must return instancetype instead of id                   |
| Medium   | Use Modern File A P I                 | OPT.OBJECTIVEC.UseModernFileAPI                  | UseModernFileAPI: Use modern file APIs   |
| Medium   | Use Nonatomic Attribute               | OPT.OBJECTIVEC.UseNonatomicAttribute             | UseNonatomicAttribute: Always use the "nonatomic" attribute on your properties   |

| Severity | Contrast rule                              | Engine rule ID   | Description  |
|----------|--|--|--|
| Medium   | Wrap Macro Statements In Do While          | OPT.OBJECTIVEC.WrapMacroStatementsInDoWhile                    | WrapMacroStatementsInDoWhile: Wrap multistatement macros in a do-while loop  |
| Medium   | Avoid S M S                                | OPT.OBJECTIVEC.SECURITY.AvoidSMS                               | AvoidSMS: Avoid performing SMS-related operations  |
| Medium   | Biometric Without Message                  | OPT.OBJECTIVEC.SECURITY.BiometricWithoutMessage                | BiometricWithoutMessage: User is asked for fingerprints without reason   |
| Medium   | Execution After Redirect                   | OPT.OBJECTIVEC.SECURITY.ExecutionAfterRedirect                 | ExecutionAfterRedirect: Execution After Redirect (EAR)   |
| Medium   | Missing Content Validation                 | OPT.OBJECTIVEC.SECURITY.MissingContentValidation               | MissingContentValidation: Missing Content Validation   |
| Medium   | Potential Infinite Loop                    | OPT.OBJECTIVEC.SECURITY.PotentialInfiniteLoop                  | PotentialInfiniteLoop: Loop with Unreachable Condition ('Infinite Loop')   |
| Medium   | Server Trust Credential Check              | OPT.OBJECTIVEC.SECURITY.ServerTrustCredentialCheck             | ServerTrustCredentialCheck: Evaluate server certificate trust chain  |
| Medium   | Unchecked Input In Loop Condition          | OPT.OBJECTIVEC.SECURITY.UncheckedInputInLoopCondition          | UncheckedInputInLoopCondition: Unchecked in loop condition   |
| Medium   | Cookie Without SSL                         | OPT.OBJECTIVEC.CookieWithoutSSL                                | CookieWithoutSSL: Avoid creating cookies with security attributes  |
| Medium   | Hardcoded Username Password                | OPT.OBJECTIVEC.SECURITY.HardcodedUsernamePassword              | HardcodedUsernamePassword: Use of Hard-coded Credentials   |
| Medium   | Http Response Caching Leak                 | OPT.OBJECTIVEC.SECURITY.HttpResponseCachingLeak                | HttpResponseCachingLeak: HTTP sensitive responses being cached   |
| Medium   | Information Exposure Through Error Message | OPT.OBJECTIVEC.SECURITY.InformationExposureThroughErrorMessage | InformationExposureThroughErrorMessage: A sensitive information exposure through error messages                            |
| Medium   | Insecure Temporary File                    | OPT.OBJECTIVEC.SECURITY.InsecureTemporaryFile                  | InsecureTemporaryFile: Creating and using insecure temporary files can leave application system data vulnerable to attack. |
| Medium   | Keyboard Caching Leak                      | OPT.OBJECTIVEC.SECURITY.KeyboardCachingLeak                    | KeyboardCachingLeak: Sensitive data leaked through keyboard cache  |
| Medium   | Password In Configuration File             | OPT.OBJECTIVEC.SECURITY.PasswordInConfigurationFile            | PasswordInConfigurationFile: Use of credentials into configuration file  |
| Medium   | Pasteboard Caching Leak                    | OPT.OBJECTIVEC.SECURITY.PasteboardCachingLeak                  | PasteboardCachingLeak: Sensitive data leaked through the pasteboard caching mechanism                                      |
| Medium   | Privacy Violation                          | OPT.OBJECTIVEC.SECURITY.PrivacyViolation                       | PrivacyViolation: Exposure of Private Information ('Privacy Violation')  |
| Medium   | Screen Caching Leak                        | OPT.OBJECTIVEC.SECURITY.ScreenCachingLeak                      | ScreenCachingLeak: Sensitive data leaked through the screen caching mechanism when is backgrounded                         |
| Medium   | Sensitive Core Data                        | OPT.OBJECTIVEC.SECURITY.SensitiveCoreData                      | SensitiveCoreData: Sensitive data stored into CoreData('Privacy Violation')  |
| Medium   | Sensitive Data Accessed From Itunes        | OPT.OBJECTIVEC.SECURITY.SensitiveDataAccessedFromItunes        | SensitiveDataAccessedFromItunes: Sensitive data accessed from Itunes ('Privacy Violation')                                 |
| Medium   | Sensitive No SQL                           | OPT.OBJECTIVEC.SECURITY.SensitiveNoSQL                         | SensitiveNoSQL: Sensitive data stored into a NoSQL database('Privacy Violation')   |
| Medium   | Sensitive SQL                              | OPT.OBJECTIVEC.SECURITY.SensitiveSQL                           | SensitiveSQL: Sensitive data stored into a SQL database('Privacy Violation')   |

| Severity | Contrast rule                                | Engine rule ID   | Description  |
|----------|--|--|--|
| Medium   | Sensitive User Defaults                      | OPT.OBJECTIVEC.SECURITY.SensitiveUserDefaults                    | SensitiveUserDefaults: Sensitive data stored in NSUserDefaults('Privacy Violation')    |
| Medium   | Serializable Class Containing Sensitive Data | OPT.OBJECTIVEC.SECURITY.SerializableClassContainingSensitiveData | SerializableClassContainingSensitiveData: Serializable Class Containing Sensitive Data |
| Medium   | Third Party Keyboard Allowed                 | OPT.OBJECTIVEC.SECURITY.ThirdPartyKeyboardAllowed                | ThirdPartyKeyboardAllowed: Avoid exposing sensitive data to third party keyboards.     |

## Oracle Forms Scan rules

Contrast Scan supports these rules for Oracle Forms.

| Severity | Engine rule ID                                    | Contrast rule                         | Description  |
|----------|---|---------------------------------------|--|
| Critical | OPT.ORACLEFORMS.SqlInjection                      | SQL Injection                         | SqlInjection: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection') |
| Critical | OPT.ORACLEFORMS.AvoidGoto                         | Avoid Goto                            | AvoidGoto: Do not use GOTO statement   |
| Critical | OPT.ORACLEFORMS.DeleteWithoutWhere                | Delete Without Where                  | DSW: Find DELETE queries without WHERE   |
| Critical | OPT.ORACLEFORMS.DoNotUseCallOpenForm              | Do Not Use Call Open Form             | DoNotUseCallOpenForm: Do not use CALL_FORM or OPEN_FORM built-in in Oracle Applications            |
| Critical | OPT.ORACLEFORMS.GroupByWithFieldsNotInSelect      | Group By With Fields Not In Select    | TotalGroupAgr: Do not use GROUP BY in fields that are not present in the select                    |
| Critical | OPT.ORACLEFORMS.GroupByWithoutAggregationFunction | Group By Without Aggregation Function | TotalGroup: Do not use GROUP BY in selects without aggregation functions                           |
| Critical | OPT.ORACLEFORMS.QueriesAfterRaise                 | Queries After Raise                   | ESPR: Do not put queries after RAISE and RAISE_APPLICATION_ERROR                                   |
| High     | OPT.ORACLEFORMS.UseBindVariables                  | Use Bind Variables                    | UVB: Use BIND variables  |
| High     | OPT.ORACLEFORMS.AvoidJoinsOnTooManyTables         | Avoid Joins On Too Many Tables        | AvoidJoinsOnTooManyTables: Avoid joins between too many tables                                     |
| High     | OPT.ORACLEFORMS.AvoidMultipleOrInWhere            | Avoid Multiple Or In Where            | TooMuchOr: Do not perform several OR checks over the same field                                    |
| High     | OPT.ORACLEFORMS.AvoidNegatedWhereClauses          | Avoid Negated Where Clauses           | AvoidNeg: Do not use negations in the WHERE clauses  |
| High     | OPT.ORACLEFORMS.AvoidSelectAsterisk               | Avoid Select Asterisk                 | ICT: Put columns of the table to query   |
| High     | OPT.ORACLEFORMS.AvoidSqlInTriggers                | Avoid SQL In Triggers                 | AvoidSqlInTriggers: Avoid having SQL code in certain trigger types                                 |
| High     | OPT.ORACLEFORMS.AvoidStartingPercentInLike        | Avoid Starting Percent In Like        | AvoidPercent: Warns about queries that use LIKE filters and '%' patterns                           |

| Severity | Engine rule ID   | Contrast rule                                 | Description   |
|----------|--|---|---|
| High     | OPT.ORACLEFORMS.AvoidTooLargePlsqlCode                 | Avoid Too Large Plsql Code                    | NLSM: Find PLSQL with more than 1000 lines  |
| High     | OPT.ORACLEFORMS.AvoidTooLargeRoutines                  | Avoid Too Large Routines                      | BigSize: Detects functions and procedures too large                                 |
| High     | OPT.ORACLEFORMS.CheckNoDataFound                       | Check No Data Found                           | NDFException: Check NO_DATA_FOUND exception when SELECT with INTO statement is used |
| High     | OPT.ORACLEFORMS.CloseOpenedCursors                     | Close Opened Cursors                          | CC: Close all opened cursors  |
| High     | OPT.ORACLEFORMS.CloseOpenedRefCursors                  | Close Opened Ref Cursors                      | CRC: Close all opened ref cursors   |
| High     | OPT.ORACLEFORMS.DoNotCallHost                          | Do Not Call Host                              | DoNotCallHost: Do not call HOST built-in  |
| High     | OPT.ORACLEFORMS.DoNotRaiseApplicationError             | Do Not Raise Application Error                | DoNotRaiseApplicationError: Do not use RAISE_APPLICATION_ERROR                      |
| High     | OPT.ORACLEFORMS.DoNotRepeatSqlCode                     | Do Not Repeat SQL Code                        | DoNotRepeatSqlCode: Do not copy and paste SQL code                                  |
| High     | OPT.ORACLEFORMS.DoNotUseGlobalVariables                | Do Not Use Global Variables                   | DoNotUseGlobalVariables: Do not use Forms Global Variables                          |
| High     | OPT.ORACLEFORMS.DoNotUseSqlControlVarsOutsideException | Do Not Use SQL Control Vars Outside Exception | OracleVar: Do not use control variables outside EXCEPTION blocks                    |
| High     | OPT.ORACLEFORMS.ParametersByReferenceInCalls           | Parameters By Reference In Calls              | PPR: Use reference parameters   |
| High     | OPT.ORACLEFORMS.RoutineMustControlExceptions           | Routine Must Control Exceptions               | GER1: Must be at least a block of exceptions by routine                             |
| High     | OPT.ORACLEFORMS.UpdateWithoutWhere                     | Update Without Where                          | USW: Find UPDATE queries without WHERE  |
| High     | OPT.ORACLEFORMS.UseInInsteadOfOr                       | Use In Instead Of Or                          | UILO: Use IN instead of OR  |
| High     | OPT.ORACLEFORMS.UseProperCoordinateSystem              | Use Proper Coordinate System                  | UseProperCoordinateSystem: Use proper coordinate system                             |
| High     | OPT.ORACLEFORMS.UseWhileInsteadOfExitWhen              | Use While Instead Of Exit When                | WL: Use WHILE instead of EXIT WHEN  |
| High     | OPT.ORACLEFORMS.WhenOthersInExceptionControl           | When Others In Exception Control              | GER2: WHEN OTHERS clause must be included in exceptions                             |
| Info     | OPT.ORACLEFORMS.AliasInSelectFields                    | Alias In Select Fields                        | JOIN2: Use the specific alias for JOINS   |
| Info     | OPT.ORACLEFORMS.AvoidDatabaseLinks                     | Avoid Database Links                          | DBL: Find @dblink   |

| Severity | Engine rule ID                                       | Contrast rule                              | Description  |
|----------|--|--|--|
| Info     | OPT.ORACLEFORMS.NamingConvention                     | Naming Convention                          | NamingConvention: Name of Oracle Forms/Reports elements must match naming conventions                        |
| Info     | OPT.ORACLEFORMS.UseConsistentJoinSyntax              | Use Consistent Join Syntax                 | DefSyntax: Defines the syntax in the SELECT statements   |
| Info     | OPT.ORACLEFORMS.UseTableAlias                        | Use Table Alias                            | TableAlias: Define an alias for each table   |
| Low      | OPT.ORACLEFORMS.AvoidSubqueries                      | Avoid Subqueries                           | InSelects: Do not use SELECT with subqueries in the FROM or WHERE clauses                                    |
| Low      | OPT.ORACLEFORMS.Comment                              | Comment                                    | Comment: Avoid objects without comment property  |
| Low      | OPT.ORACLEFORMS.ElementNameMustEqualDatabaseName     | Element Name Must Equal Database Name      | ElementNameMustEqualDatabaseName: Blocks and Items should have the same table and column as the element name |
| Medium   | OPT.ORACLEFORMS.AvoidForInCursors                    | Avoid For In Cursors                       | NDCF: Avoid declaring cursors 'on the fly'   |
| Medium   | OPT.ORACLEFORMS.AvoidNonBlockingInteractionMode      | Avoid Non Blocking Interaction Mode        | AvoidNonBlockingInteractionMode: Avoid Non-Blocking Interaction Mode in forms                                |
| Medium   | OPT.ORACLEFORMS.AvoidUnusedLocalVars                 | Avoid Unused Local Vars                    | UselessVar: Detects local variables declared but not used  |
| Medium   | OPT.ORACLEFORMS.AvoidUsingDataDictionary             | Avoid Using Data Dictionary                | OracleTables: Avoid using tables and views of the Oracle Data Dictionary                                     |
| Medium   | OPT.ORACLEFORMS.CaseWithoutExcludingConditions       | Case Without Excluding Conditions          | UndefCase: Checks WHEN clauses are using the same control variable   |
| Medium   | OPT.ORACLEFORMS.DoNotReferenceFormObjectsInLibraries | Do Not Reference Form Objects In Libraries | DoNotReferenceFormObjectsInLibraries: Do not reference Form objects in libraries                             |
| Medium   | OPT.ORACLEFORMS.FunctionsInWhere                     | Functions In Where                         | EFCW: Avoid use of functions in WHERE clause   |
| Medium   | OPT.ORACLEFORMS.UselessParam                         | Useless Param                              | UselessParam: Detects parameters declared but not used   |

## PHP Scan rules

Contrast Scan supports these rules for PHP.

| Severity | Contrast rule              | Engine rule ID                   | Description   |
|----------|----------------------------|----------------------------------|---|
| Critical | Insecure Php Configuration | OPT.PHP.InsecurePhpConfiguration | InsecurePhpConfiguration: Avoid insecure configuration settings in php.ini / .htaccess descriptors    |
| Critical | Too Broad CORS Policy      | OPT.PHP.TooBroadCORSPolicy       | TooBroadCORSPolicy: CORS policy (Cross-origin resource sharing) too broad                             |
| Critical | Code Injection             | OPT.PHP.CodeInjection            | CodeInjection: Improper Neutralization of Directives in Dynamically Evaluated Code ('Eval Injection') |



| Severity | Contrast rule                           | Engine rule ID                              | Description  |
|----------|---|---|--|
| Critical | Command Injection                       | OPT.PHP.CommandInjection                    | CommandInjection: Improper Neutralization of Special Elements used in an OS Command ('OS Command Injection')         |
| Critical | Connection String Parameter Pollution   | OPT.PHP.ConnectionStringParameterPollution  | ConnectionStringParameterPollution: Connection string polluted with untrusted input                                  |
| Critical | Cross Site Scripting                    | OPT.PHP.CrossSiteScripting                  | CrossSiteScripting: Improper Neutralization of Input During Web Page Generation ('Cross-site Scripting')             |
| Critical | Csv Formula Injection                   | OPT.PHP.CsvFormulaInjection                 | CsvFormulaInjection: CSV Excel macro injection   |
| Critical | DoS Regexp                              | OPT.PHP.DoSRegexp                           | DoSRegexp: Prevent denial of service attack through malicious regular expression ('Regex Injection')]                |
| Critical | External Variable Modification          | OPT.PHP.ExternalVariableModification        | ExternalVariableModification: PHP External Variable Modification   |
| Critical | Http Parameter Pollution                | OPT.PHP.HttpParameterPollution              | HttpParameterPollution: HTTP parameter pollution (HPP)   |
| Critical | Http Splitting                          | OPT.PHP.HttpSplitting                       | HttpSplitting: Improper Neutralization of CRLF Sequences in HTTP Headers ('HTTP Response Splitting')                 |
| Critical | Ldap Injection                          | OPT.PHP.LdapInjection                       | LdapInjection: Avoid non-neutralized user-controlled input in LDAP search filters                                    |
| Critical | Mail Header Manipulation                | OPT.PHP.MailHeaderManipulation              | MailHeaderManipulation: SMTP Header manipulation   |
| Critical | Open Redirect                           | OPT.PHP.OpenRedirect                        | OpenRedirect: URL Redirection to Untrusted Site ('Open Redirect')  |
| Critical | Resource Injection                      | OPT.PHP.ResourceInjection                   | ResourceInjection: Improper Control of Resource Identifiers ('Resource Injection')                                   |
| Critical | Mail Command Injection                  | OPT.PHP.SEC.MailCommandInjection            | MailCommandInjection: Mail Command Injection   |
| Critical | No SQL Injection                        | OPT.PHP.SEC.NoSQLInjection                  | NoSQLInjection: Improper neutralization of special elements in data query logic (NoSQL injection)                    |
| Critical | Server Side Request Forgery             | OPT.PHP.ServerSideRequestForgery            | ServerSideRequestForgery: Server-Side Request Forgery (SSRF)   |
| Critical | SQL Injection                           | OPT.PHP.SqlInjection                        | SqlInjection: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection')                   |
| Critical | Xml Entity Injection                    | OPT.PHP.XmlEntityInjection                  | XmlEntityInjection: XML entity injection   |
| Critical | Avoid Use Default Secret                | OPT.PHP.AvoidUseDefaultSecret               | AvoidUseDefaultSecret: Avoid using secret value default symfony: ThisTokenIsNotSoSecretChangelt                      |
| Critical | Assign Null In Function Call            | OPT.PHP.AssignNullInFunctionCall            | AssignNullInFunctionCall: Assignment of a function call to a variable when the function does not have a return value |
| Critical | Avoid Exitor Die                        | OPT.PHP.AvoidExitorDie                      | AvoidExitorDie: Do not use exit() or die() for error processing  |
| Critical | Avoid Global Variables within Functions | OPT.PHP.AvoidGlobalVariableswithinFunctions | AvoidGlobalVariableswithinFunctions: Avoid global variables within functions   |
| Critical | Avoid Loop With Empty Body              | OPT.PHP.AvoidLoopWithEmptyBody              | AvoidLoopWithEmptyBody: Avoid loops (while, do/while, for) with empty body   |
| Critical | Avoid SQL Queries Within Loop           | OPT.PHP.AvoidSQLQueriesWithinLoop           | AvoidSQLQueriesWithinLoop: Avoid doing SQL queries within a loop   |

| Severity | Contrast rule                        | Engine rule ID                                | Description  |
|----------|--------------------------------------|---|--|
| Critical | Avoid This In Static Methods         | OPT.PHP.AvoidThisInStaticMethods              | AvoidThisInStaticMethods: Avoid \$this in static methods   |
| Critical | Avoid Using Echo HTML                | OPT.PHP.AvoidUsingEchoHTML                    | AvoidUsingEchoHTML: Avoid using echo or print to construct HTML  |
| Critical | Dangerous File Upload                | OPT.PHP.DangerousFileUpload                   | DangerousFileUpload: Unrestricted Upload of File with Dangerous Type   |
| Critical | Do Not Use Error Suppression         | OPT.PHP.DoNotUseErrorSuppression              | DoNotUseErrorSuppression: Do not use error suppression with @  |
| Critical | Fingers Crossed Logger In Production | OPT.PHP.FingersCrossedLoggerInProduction      | FingersCrossedLoggerInProduction: Logging should not use many resources in production.   |
| Critical | Function Arguments Uniqueness        | OPT.PHP.FunctionArgumentsUniqueness           | FunctionArgumentsUniqueness: Avoid duplicated argument names in function declarations  |
| Critical | Include File Injection               | OPT.PHP.IncludeFileInjection                  | IncludeFileInjection: Improper Control of filename for include / require statement   |
| Critical | Nested If Statements                 | OPT.PHP.NestedIfStatements                    | NestedIfStatements: Avoid a high level of if statement nesting   |
| Critical | Optional Parameters At End           | OPT.PHP.OptionalParametersAtEnd               | OptionalParametersAtEnd: Optional parameters in a function or method declaration must be always declared at the end            |
| Critical | Path Traversal                       | OPT.PHP.PathTraversal                         | PathTraversal: Avoid non-neutralized user-controlled input to be part of a pathname (file or directory) used in I/O operations |
| Critical | Persistent Database Connections      | OPT.PHP.PersistentDatabaseConnections         | PersistentDatabaseConnections: Use persistent database connections   |
| Critical | POSIX Extended Regular Expressions   | OPT.PHP.POSIXExtendedRegularExpressions       | POSIXExtendedRegularExpressions: Do not use POSIX Extended regular expression functions  |
| Critical | Return In Constructor                | OPT.PHP.ReturnInConstructor                   | ReturnInConstructor: Constructor returns a value   |
| Critical | Too Many Parameters In Call          | OPT.PHP.TooManyParametersInCall               | TooManyParametersInCall: Avoid calling a function or method with more parameters than declared                                 |
| Critical | Password In Redirect Rule            | OPT.PHP.SEC.PasswordInRedirectRule            | PasswordInRedirectRule: Password Management - Password in Redirect   |
| Critical | Sensitive Data Non Parameter         | OPT.PHP.SensitiveDataNonParameter             | SensitiveDataNonParameter: Sensitive data such as database connection must be in a parameter file                              |
| High     | Cake PHP Configuration               | OPT.PHP.CakePHPConfiguration                  | CakePHPConfiguration: CakePHP framework weak configuration   |
| High     | Cookies Configuration                | OPT.PHP.CookiesConfiguration                  | CookiesConfiguration: Weak cookies configuration   |
| High     | Insufficient Session Expiration Rule | OPT.PHP.SEC.InsufficientSessionExpirationRule | InsufficientSessionExpirationRule: Checks that session expiration interval does not exceed a limit                             |
| High     | Session Cookie Configuration         | OPT.PHP.SessionCookieConfiguration            | SessionCookieConfiguration: Weak session cookies configuration   |
| High     | Zend Configuration                   | OPT.PHP.ZendConfiguration                     | ZendConfiguration: Zend framework session management configuration   |
| High     | Avoid Eval                           | OPT.PHP.AvoidEval                             | AvoidEval: Do not use eval()   |
| High     | Cross Site Request Forgery           | OPT.PHP.CrossSiteRequestForgery               | CrossSiteRequestForgery: Cross-Site Request Forgery (CSRF)   |

| Severity | Contrast rule                             | Engine rule ID                                    | Description  |
|----------|---|---|--|
| High     | Enabled Twig Auto Escaping                | OPT.PHP.EnabledTwigAutoEscaping                   | EnabledTwigAutoEscaping: Twig auto-escaping must be enabled  |
| High     | External Control Of Configuration Setting | OPT.PHP.SEC.ExternalControlOfConfigurationSetting | ExternalControlOfConfigurationSetting: External Control of System or Configuration Setting                                 |
| High     | JSON Injection                            | OPT.PHP.SEC.JSONInjection                         | JSONInjection: Avoid using non-neutralized user-controlled input into JSON entities - JSON Injection                       |
| High     | Trust Boundary Violation Rule             | OPT.PHP.SEC.TrustBoundaryViolationRule            | TrustBoundaryViolationRule: Trust boundary violation   |
| High     | Xslt Injection                            | OPT.PHP.SEC.XsltInjection                         | XsltInjection: XML Injection (aka Blind XPath Injection)   |
| High     | Stored Cross Site Scripting               | OPT.PHP.StoredCrossSiteScripting                  | StoredCrossSiteScripting: Improper neutralization of stored data during web content generation (Cross-site Scripting, XSS) |
| High     | XPath Injection                           | OPT.PHP.XPathInjection                            | XPathInjection: Improper Neutralization of Data within XPath Expressions ('XPath Injection')                               |
| High     | Assign Objects In Instantiation           | OPT.PHP.AssignObjectsInInstantiation              | AssignObjectsInInstantiation: Assign objects to a variable in instantiation  |
| High     | Avoid Business Logic In Twig              | OPT.PHP.AvoidBusinessLogicInTwig                  | AvoidBusinessLogicInTwig: Avoid too much logic in Twig templates   |
| High     | Too Many Statements In Case               | OPT.PHP.TooManyStatementsInCase                   | TooManyStatementsInCase: Avoid using too many statements in each case of a switch statement                                |
| High     | Avoid Auto Reload In Twig                 | OPT.PHP.AvoidAutoReloadInTwig                     | AvoidAutoReloadInTwig: Twig auto_reload must be disabled   |
| High     | Avoid Create From Globals Request         | OPT.PHP.AvoidCreateFromGlobalsRequest             | AvoidCreateFromGlobalsRequest: Avoid use Request::createFromGlobals method   |
| High     | Avoid High Number Of Files In Folder      | OPT.PHP.AvoidHighNumberOfFilesInFolder            | AvoidHighNumberOfFilesInFolder: Avoid handling of folders with many files  |
| High     | Avoid Logical Operators                   | OPT.PHP.AvoidLogicalOperators                     | AvoidLogicalOperators: Avoid using logical operators   |
| High     | Avoid Ref With Multidim Array             | OPT.PHP.AvoidRefWithMultidimArray                 | AvoidRefWithMultidimArray: Avoid &-ref-operator to substitute (or alias) a complex mutidim-array                           |
| High     | Avoid Sleep Function                      | OPT.PHP.AvoidSleepFunction                        | AvoidSleepFunction: Avoid using the sleep function   |
| High     | Avoid Strict Variables In Twig            | OPT.PHP.AvoidStrictVariablesInTwig                | AvoidStrictVariablesInTwig: Twig strict_variables must be disabled   |
| High     | Avoid Action Method Too Long              | OPT.PHP.AvoidActionMethodTooLong                  | AvoidActionMethodTooLong: Avoid using methods controllers "action" too long  |
| High     | Break Non Empty Switch Clauses            | OPT.PHP.BreakNonEmptySwitchClauses                | BreakNonEmptySwitchClauses: Use break statement at the last statement of SwitchCase  |
| High     | Call Time Pass By Reference Forbidden     | OPT.PHP.CallTimePassByReferenceForbidden          | CallTimePassByReferenceForbidden: Do not use call-time pass-by-reference arguments in function calls                       |
| High     | Catching Exception                        | OPT.PHP.CatchingException                         | CatchingException: Avoid catching exception base classes   |

| Severity | Contrast rule                                | Engine rule ID                                 | Description  |
|----------|--|--|--|
| High     | Check Parameters Number In Function          | OPT.PHP.CheckParametersNumberInFunction        | CheckParametersNumberInFunction: Too many parameters in function   |
| High     | Class Includes                               | OPT.PHP.ClassIncludes                          | ClassIncludes: include / require / require_once / include_once is not allowed for loading class files    |
| High     | Delete Acme Demo Bundle                      | OPT.PHP.DeleteAcmeDemoBundle                   | DeleteAcmeDemoBundle: Perform deletion of the AcmeDemoBundle that is included by default in Symfony2     |
| High     | Delete Unused Libraries                      | OPT.PHP.DeleteUnusedLibraries                  | DeleteUnusedLibraries: Remove references to libraries that are not used                                  |
| High     | Default Arguments On The Right Side          | OPT.PHP.DefaultArgumentsOnTheRightSide         | DefaultArgumentsOnTheRightSide: Default arguments must be on the right side of any non-default arguments |
| High     | Default Clause Switch Statements             | OPT.PHP.DefaultClauseSwitchStatements          | DefaultClauseSwitchStatements: Use default clause at the end of the switch statement                     |
| High     | Efficient Php Ini Configuration              | OPT.PHP.EfficientPhpIniConfiguration           | EfficientPhpIniConfiguration: Certain configuration properties should be set for efficiency              |
| High     | Establish New Path Cache                     | OPT.PHP.EstablishNewPathCache                  | EstablishNewPathCache: Set a new path for the cache  |
| High     | Fav Icon In Web Directory                    | OPT.PHP.FaviconInWebDirectory                  | FaviconInWebDirectory: Use favicon in the web application  |
| High     | Few Action Methods In Controller             | OPT.PHP.FewActionMethodsInController           | FewActionMethodsInController: Use a controller by specific concept                                       |
| High     | Get Action Should Not Modify Resources       | OPT.PHP.GetActionShouldNotModifyResources      | GetActionShouldNotModifyResources: Use GET method only to get information                                |
| High     | Include Require Without Parentheses          | OPT.PHP.IncludeRequireWithoutParentheses       | IncludeRequireWithoutParentheses: Do not use include and its variants with parentheses                   |
| High     | Keywords Case                                | OPT.PHP.KeywordsCase                           | KeywordsCase: Write PHP keywords in lower-case   |
| High     | Many Cases                                   | OPT.PHP.ManyCases                              | ManyCases: Avoid too many choices in switch structures   |
| High     | Max Methods                                  | OPT.PHP.MaxMethods                             | MaxMethods: Maximum allowed number of methods  |
| High     | Missing Authorization                        | OPT.PHP.MissingAuthorization                   | MissingAuthorization: Inadequate authorization check to access a resource or perform an action           |
| High     | No Update Loop Vars In For Body              | OPT.PHP.NoUpdateLoopVarsInForBody              | NoUpdateLoopVarsInForBody: Do not update control vars in 'for' loop body                                 |
| High     | No Use Flush In Loop                         | OPT.PHP.NoUseFlushInLoop                       | NoUseFlushInLoop: Avoid calling to the flush() method within a loop                                      |
| High     | No Use Data Base Functions Specific Provider | OPT.PHP.NoUseDataBaseFunctionsSpecificProvider | NoUseDataBaseFunctionsSpecificProvider: Avoid use specific functions of a database provider              |
| High     | No Use PHP Response Functions                | OPT.PHP.NoUsePHPResponseFunctions              | NoUsePHPResponseFunctions: Avoid using php response functions  |
| High     | No Use PHP Session Functions                 | OPT.PHP.NoUsePHPSessionFunctions               | NoUsePHPSessionFunctions: Do not use PHP session functions   |

| Severity | Contrast rule                                 | Engine rule ID                                  | Description   |
|----------|---|---|---|
| High     | No Use PHP Super Global                       | OPT.PHP.NoUsePHPSuperGlobal                     | NoUsePHPSuperGlobal: Use Request Object instead of super-global variables PHP                                   |
| High     | Numerically Indexed Arrays                    | OPT.PHP.NumericallyIndexedArrays                | NumericallyIndexedArrays: Negative numbers are not permitted as indices   |
| High     | Php Tags                                      | OPT.PHP.PhpTags                                 | PhpTags: Do not use the short form for the PHP opening tag  |
| High     | Public Method Only Actions                    | OPT.PHP.PublicMethodOnlyActions                 | PublicMethodOnlyActions: In controllers can only be public the "Action" methods                                 |
| High     | Rethrowing Exceptions                         | OPT.PHP.RethrowingExceptions                    | RethrowingExceptions: When rethrowing, the original exception must be wrapped inside the one being thrown       |
| High     | Return Value Ignored                          | OPT.PHP.ReturnValueIgnored                      | ReturnValueIgnored: Function call return value ignored  |
| High     | Robots Txt In Web Directory                   | OPT.PHP.RobotsTxtInWebDirectory                 | RobotsTxtInWebDirectory: Use robots.txt in the web application  |
| High     | Routes Should Reference Existing Actions      | OPT.PHP.RoutesShouldReferenceExistingActions    | RoutesShouldReferenceExistingActions: Avoid routes that reference a non-existent actions                        |
| High     | Cookies In Security Decision                  | OPT.PHP.SEC.CookiesInSecurityDecision           | CookiesInSecurityDecision: Reliance on Cookies without Validation and Integrity Checking in a Security Decision |
| High     | User Controlled SQL Primary Key               | OPT.PHP.SEC.UserControlledSQLPrimaryKey         | UserControlledSQLPrimaryKey: Avoid using an user controlled Primary Key into a query.                           |
| High     | Should Not Throw Access Denied Http Exception | OPT.PHP.ShouldNotThrowAccessDeniedHttpException | ShouldNotThrowAccessDeniedHttpException: Avoid throwing AccessDeniedHttpException                               |
| High     | Smart Substring Matching                      | OPT.PHP.SmartSubstringMatching                  | SmartSubstringMatching: Smart substring matching  |
| High     | Too Many Break Or Continue In Loop            | OPT.PHP.TooManyBreakOrContinueInLoop            | TooManyBreakOrContinueInLoop: Avoid using more than one break or continue statement in each loop                |
| High     | Throwing Exception                            | OPT.PHP.ThrowingException                       | ThrowingException: Avoid throwing exception base classes  |
| High     | Unused Function Parameter                     | OPT.PHP.UnusedFunctionParameter                 | UnusedFunctionParameter: Avoid unused function parameters   |
| High     | Unused Local Var                              | OPT.PHP.UnusedLocalVar                          | UnusedLocalVar: Avoid unused local variables  |
| High     | Unused Private Field                          | OPT.PHP.UnusedPrivateField                      | UnusedPrivateField: Avoid unused private fields   |
| High     | Unused Private Method                         | OPT.PHP.UnusedPrivateMethod                     | UnusedPrivateMethod: Avoid unused private methods   |
| High     | Use Redirect After Posting Data               | OPT.PHP.UseRedirectAfterPostingData             | UseRedirectAfterPostingData: Is recommended to use redirect after doing a POST                                  |
| High     | Avoid Inject Request Service                  | OPT.PHP.AvoidInjectRequestService               | AvoidInjectRequestService: Avoid injecting the service request  |
| High     | Do Not Debug In Twig Templates                | OPT.PHP.DoNotDebugInTwigTemplates               | DoNotDebugInTwigTemplates: Avoid using debug tag in Twig templates  |
| High     | Http To Send Data                             | OPT.PHP.HttpToSendData                          | HttpToSendData: Avoid using HTTP instead of HTTPS   |

| Severity | Contrast rule                              | Engine rule ID                                 | Description  |
|----------|--|--|--|
| High     | Information Exposure Through Error Message | OPT.PHP.InformationExposureThroughErrorMessage | InformationExposureThroughErrorMessage : Avoid sensitive information exposure through error messages |
| High     | Password Management                        | OPT.PHP.PasswordManagement                     | PasswordManagement: Use of empty or hardcoded password, or storing password in comments              |
| High     | Hardcoded Crypto Key                       | OPT.PHP.HardcodedCryptoKey                     | HardcodedCryptoKey: Use of Hard-coded Cryptographic Key  |
| High     | Hardcoded Salt                             | OPT.PHP.HardcodedSalt                          | HardcodedSalt: Use of hardcoded salt   |
| High     | Insecure Randomness                        | OPT.PHP.InsecureRandomness                     | InsecureRandomness: Standard pseudo-random number generators cannot withstand cryptographic attacks  |
| High     | Missing Encryption Of Sensitive Data       | OPT.PHP.MissingEncryptionOfSensitiveData       | MissingEncryptionOfSensitiveData: Encrypt sensitive data before transmission or storage              |
| High     | Insufficient Key Size Rule                 | OPT.PHP.SEC.InsufficientKeySizeRule            | InsufficientKeySizeRule: Weak cryptography, insufficient key length                                  |
| High     | Weak Cryptographic Hash                    | OPT.PHP.WeakCryptographicHash                  | WeakCryptographicHash: Weak cryptographic hash   |
| High     | Weak Encryption Algorithm                  | OPT.PHP.WeakEncryptionAlgorithm                | WeakEncryptionAlgorithm: Weak symmetric encryption algorithm   |
| Info     | Log Forging                                | OPT.PHP.LogForging                             | LogForging: Improper Output Neutralization for Logs  |
| Info     | Change Default Favicon                     | OPT.PHP.ChangeDefaultFavicon                   | ChangeDefaultFavicon: Replace the default favicon.ico icon   |
| Info     | Line Length                                | OPT.PHP.LineLength                             | LineLength: Lines should not exceed a maximum size   |
| Info     | Methods Name Convention                    | OPT.PHP.MethodsNameConvention                  | MethodsNameConvention: Function / method names should comply with the naming convention              |
| Info     | Php Comments Rule                          | OPT.PHP.PhpCommentsRule                        | PhpCommentsRule: Code must be commented according to comments standard                               |
| Info     | Variable Substitution                      | OPT.PHP.VariableSubstitution                   | VariableSubstitution: Avoid using \${...} style for variable substitutions                           |
| Info     | Avoid Using Request                        | OPT.PHP.AvoidUsingRequest                      | AvoidUsingRequest: Using \$_REQUEST is strongly discouraged  |
| Low      | Do Not Use Default Session Cookies Name    | OPT.PHP.DoNotUseDefaultSessionCookiesName      | DoNotUseDefaultSessionCookiesName: Do not use the default session cookie's name                      |
| Low      | Avoid Complex Methods                      | OPT.PHP.AvoidComplexMethods                    | AvoidComplexMethods: Avoid too long methods  |
| Low      | Avoid Functions In Loops                   | OPT.PHP.AvoidFunctionsInLoops                  | AvoidFunctionsInLoops: Avoid calling functions from evaluation or update part of the loops           |
| Low      | Avoid Many Variables In Twig               | OPT.PHP.AvoidManyVariablesInTwig               | AvoidManyVariablesInTwig: Avoid return too many variables to a Twig template                         |
| Low      | Avoid Special Comment                      | OPT.PHP.AvoidSpecialComment                    | AvoidSpecialComment: Avoid using comments to indicate parts of code that need to be revised          |
| Low      | Avoid Too Long Twig Templates              | OPT.PHP.AvoidTooLongTwigTemplates              | AvoidTooLongTwigTemplates: Too long Twig templates make code harder to understand and maintain       |

| Severity | Contrast rule                              | Engine rule ID                               | Description  |
|----------|--|--|--|
| Low      | Avoid Var Name Prefix Is                   | OPT.PHP.AvoidVarNamePrefixIs                 | AvoidVarNamePrefixIs: PHP variables should not have the prefix "is"  |
| Low      | Class Format PSR-0                         | OPT.PHP.ClassFormatPSR0                      | ClassFormatPSR0: PHP classes must have name and namespace compliant with PSR-0 (autoloading) standard  |
| Low      | Closing Php Tag                            | OPT.PHP.ClosingPhpTag                        | ClosingPhpTag: Omit closing tag in files with only php code  |
| Low      | Constants Name Convention                  | OPT.PHP.ConstantsNameConvention              | ConstantsNameConvention: Constant names should comply with the naming convention   |
| Low      | Customize Error Pages                      | OPT.PHP.CustomizeErrorPages                  | CustomizeErrorPages: Customize Symfony error pages   |
| Low      | Declarations Without Side Effects          | OPT.PHP.DeclarationsWithoutSideEffects       | DeclarationsWithoutSideEffects: PHP files declaring global symbols (functions, classes) should not have side effects                                       |
| Low      | Dependency Injection Container             | OPT.PHP.DependencyInjectionContainer         | DependencyInjectionContainer: Hide dependencies between services   |
| Low      | Else In Else If Statement                  | OPT.PHP.ElseInElseIfStatement                | ElseInElseIfStatement: Else if statements should finish with an else clause  |
| Low      | Empty Boot Method In Bundle                | OPT.PHP.EmptyBootMethodInBundle              | EmptyBootMethodInBundle: The boot() method of all bundles must be empty  |
| Low      | Exception Extension                        | OPT.PHP.ExceptionExtension                   | ExceptionExtension: Properly custom classes that extend from Exception class   |
| Low      | Modifiers Order                            | OPT.PHP.ModifiersOrder                       | ModifiersOrder: Abstract, final and static modifiers declaration order   |
| Low      | Names Suffix Conventions                   | OPT.PHP.NamesSuffixConventions               | NamesSuffixConventions: Comply with the naming conventions for interfaces, traits and exception classes  |
| Low      | Not Mix End Of Lines                       | OPT.PHP.NotMixEndOfLines                     | NotMixEndOfLines: The files must have a only newline format  |
| Low      | No Use Debug Statements                    | OPT.PHP.NoUseDebugStatements                 | NoUseDebugStatements: No use debug statement in production   |
| Low      | Organize Forms In Categories               | OPT.PHP.OrganizeFormsInCategories            | OrganizeFormsInCategories: Forms directory must be structured  |
| Low      | Improper Validation Of Array Index         | OPT.PHP.SEC.ImproperValidationOfArrayIndex   | ImproperValidationOfArrayIndex: Array index coming from a non neutralized vulnerable input   |
| Low      | Specify The Allowed Methods For The Routes | OPT.PHP.SpecifyTheAllowedMethodsForTheRoutes | SpecifyTheAllowedMethodsForTheRoutes: Specify the allowed methods for each route   |
| Low      | String Concatenation                       | OPT.PHP.StringConcatenation                  | StringConcatenation: Add an space before and after '.' operator. In multiple line concatenating statements, pad each line to align '.' operator under ' {} |
| Low      | Text Files End Properly                    | OPT.PHP.TextFilesEndProperly                 | TextFilesEndProperly: The files must end with newline character  |
| Low      | Type Hint Object Arguments                 | OPT.PHP.TypeHintObjectArguments              | TypeHintObjectArguments: Specify argument's type of each method  |
| Low      | Use Strict Comparisons                     | OPT.PHP.UseStrictComparisons                 | UseStrictComparisons: Use strict comparisons   |
| Low      | Variable As String                         | OPT.PHP.VariableAsString                     | VariableAsString: Use of a string created just from a variable   |
| Medium   | Avoid Contain Config File                  | OPT.PHP.AvoidContainConfigFile               | AvoidContainConfigFile: config.php should be removed before the project goes into production   |

| Severity | Contrast rule                           | Engine rule ID                              | Description   |
|----------|---|---|---|
| Medium   | Plaintext Storage In A Cookie Rule      | OPT.PHP.SEC.PlaintextStorageInACookieRule   | PlaintextStorageInACookieRule: Cleartext Storage of Sensitive Information in a Cookie                                 |
| Medium   | Cross Site History Manipulation         | OPT.PHP.SEC.CrossSiteHistoryManipulation    | CrossSiteHistoryManipulation: Cross-Site History Manipulation (XSHM)  |
| Medium   | Format String Injection Rule            | OPT.PHP.SEC.FormatStringInjectionRule       | FormatStringInjectionRule: Exclude unsanitized user input from format strings   |
| Medium   | Serialization Injection                 | OPT.PHP.SerializationInjection              | SerializationInjection: Deserialization of untrusted data   |
| Medium   | Avoid Concat In Echo                    | OPT.PHP.AvoidConcatInEcho                   | AvoidConcatInEcho: Avoid concatenations in echo statement   |
| Medium   | Use Switch Instead Of If Else If        | OPT.PHP.UseSwitchInsteadOfIfElseIf          | UseSwitchInsteadOfIfElseIf: Avoid using if-elseif-else chains   |
| Medium   | Avoid Large Classes                     | OPT.PHP.AvoidLargeClasses                   | AvoidLargeClasses: Avoid classes with too many lines of code  |
| Medium   | Avoid Large Methods                     | OPT.PHP.AvoidLargeMethods                   | AvoidLargeMethods: Avoid functions and methods with too many lines of code  |
| Medium   | Avoid Magic Numbers                     | OPT.PHP.AvoidMagicNumbers                   | AvoidMagicNumbers: Avoid literals in method calls. Named constants make source code easier to understand and maintain |
| Medium   | Avoid Pass Entity Manager As Argument   | OPT.PHP.AvoidPassEntityManagerAsArgument    | AvoidPassEntityManagerAsArgument: Avoid passing as arguments the entity manager                                       |
| Medium   | Avoid Unnecessary Replacements In Loops | OPT.PHP.AvoidUnnecessaryReplacementsInLoops | AvoidUnnecessaryReplacementsInLoops: Avoid unnecessary string replacements in loops                                   |
| Medium   | Avoid Unreachable Code                  | OPT.PHP.AvoidUnreachableCode                | AvoidUnreachableCode: Avoid implementing code will never be executed  |
| Medium   | Check Field Number In Class             | OPT.PHP.CheckFieldNumberInClass             | CheckFieldNumberInClass: Avoid classes with too many fields by class  |
| Medium   | Check Public Methods Number In Class    | OPT.PHP.CheckPublicMethodsNumberInClass     | CheckPublicMethodsNumberInClass: Avoid classes with too many methods  |
| Medium   | Close Opened Database Connections       | OPT.PHP.CloseOpenedDatabaseConnections      | CloseOpenedDatabaseConnections: Close non-persistent connections as soon as they are no longer required               |
| Medium   | Counter Functions In Loops              | OPT.PHP.CounterFunctionsInLoops             | CounterFunctionsInLoops: Do not use counter functions in loop expressions   |
| Medium   | Exceptions Disable In Production        | OPT.PHP.ExceptionsDisableInProduction       | ExceptionsDisableInProduction: Disable exceptions when the application is in production                               |
| Medium   | Foreach To Loop Through Arrays          | OPT.PHP.ForeachToLoopThroughArrays          | ForeachToLoopThroughArrays: Use foreach to loop through arrays  |
| Medium   | If Variable To Check Initialization     | OPT.PHP.IfVariableToCheckInitialization     | IfVariableToCheckInitialization: Do not use if (\$var) to check if a variable is initialized                          |
| Medium   | MIME Type Detection                     | OPT.PHP.MIMETypeDetection                   | MIMETypeDetection: Avoid MIME type detection using 'type' attribute of a file in \$_FILES array                       |
| Medium   | No Use Deprecated Functions             | OPT.PHP.NoUseDeprecatedFunctions            | NoUseDeprecatedFunctions: Do not use deprecated functions   |



| Severity | Contrast rule                              | Engine rule ID                                    | Description   |
|----------|--|---|---|
| Medium   | No Use Magic Constant __DIR__ and __FILE__ | OPT.PHP.NoUseMagicConstant__DIR__and__FILE__<br>— | NoUseMagicConstant__DIR__and__FILE__: Avoid using of the magic constants (__FILE__ and __DIR__)   |
| Medium   | Num Max Class By Namespace                 | OPT.PHP.NumMaxClassByNamespace                    | NumMaxClassByNamespace: Avoid an excessive number of classes per package/namespace  |
| Medium   | Return Value Without Parentheses           | OPT.PHP.ReturnValueWithoutParentheses             | ReturnValueWithoutParentheses: The return value must not be enclosed in parentheses   |
| Medium   | Execution After Redirect                   | OPT.PHP.SEC.ExecutionAfterRedirect                | ExecutionAfterRedirect: Execution After Redirect (EAR)  |
| Medium   | Potential Infinite Loop                    | OPT.PHP.SEC.PotentialInfiniteLoop                 | PotentialInfiniteLoop: Loop with Unreachable Exit Condition ('Infinite Loop')   |
| Medium   | Unchecked Input In Loop Condition          | OPT.PHP.SEC.UncheckedInputInLoopCondition         | UncheckedInputInLoopCondition: Unchecked input in loop condition  |
| Medium   | Set For Attributes With Get                | OPT.PHP.SetForAttributesWithGet                   | SetForAttributesWithGet: Create '__set' method when exists '__get' method   |
| Medium   | Single Line Comments                       | OPT.PHP.SingleLineComments                        | SingleLineComments: Do not use inline comments starting with the sharp character  |
| Medium   | String Literals                            | OPT.PHP.StringLiterals                            | StringLiterals: Use simple quotes to demarcate string literals, except when containing apostrophes, escaped chars or variable substitutions |
| Medium   | Unsafe Function                            | OPT.PHP.UnsafeFunction                            | UnsafeFunction: Use of Potentially Dangerous Function   |
| Medium   | Use Latest Symfony Version                 | OPT.PHP.UseLatestSymfonyVersion                   | UseLatestSymfonyVersion: Use latest stable Symfony version  |
| Medium   | Use Maintained Symfony Version             | OPT.PHP.UseMaintainedSymfonyVersion               | UseMaintainedSymfonyVersion: Use maintained Symfony versions  |
| Medium   | Use Relative Path                          | OPT.PHP.UseRelativePath                           | UseRelativePath: Using relative paths to access resources   |
| Medium   | Variable Initialization                    | OPT.PHP.VariableInitialization                    | VariableInitialization: Variable initialization   |
| Medium   | Privacy Violation                          | OPT.PHP.PrivacyViolation                          | PrivacyViolation: Exposure of Private Information   |
| Medium   | Autocomplete On For Sensitive Fields       | OPT.PHP.SEC.AutocompleteOnForSensitiveFields      | AutocompleteOnForSensitiveFields: Autocomplete enabled for sensitive form fields  |
| Medium   | Plaintext Storage Of Password              | OPT.PHP.SEC.PlaintextStorageOfPassword            | PlaintextStorageOfPassword: Plaintext Storage of a Password   |

## PL/SQL Scan rules

Contrast Scan supports these rules for PL/SQL.

| Severity | Contrast rule     | Engine rule ID                 | Description  |
|----------|-------------------|--------------------------------|--|
| Critical | Command Injection | OPT.PLSQL.SEC.CommandInjection | CommandInjection: Improper Neutralization of Special Elements used in an OS Command ('OS Command Injection') |

| Severity | Contrast rule                  | Engine rule ID                            | Description   |
|----------|--------------------------------|---|---|
| Critical | Cross Site Scripting           | OPT.PLSQL.SEC.CrossSiteScripting          | CrossSiteScripting: Improper Neutralization of Input During Web Page Generation ('Cross-site Scripting')          |
| Critical | Header Manipulation            | OPT.PLSQL.SEC.HeaderManipulation          | HeaderManipulation: Unvalidated data in HTTP response header or in cookies ('HTTP Response Splitting')            |
| Critical | Persisted Cross Site Scripting | OPT.PLSQL.SEC.PersistedCrossSiteScripting | PersistedCrossSiteScripting: Improper Neutralization of Input During Web Page Generation ('Cross-site Scripting') |
| Critical | Second Order SQL Injection     | OPT.PLSQL.SEC.SecondOrderSqlInjection     | SecondOrderSqlInjection: SQL Injection (Second-Order).  |
| Critical | Server Side Request Forgery    | OPT.PLSQL.SEC.ServerSideRequestForgery    | ServerSideRequestForgery: Server-Side Request Forgery (SSRF)  |
| Critical | Sleep Injection                | OPT.PLSQL.SEC.SleepInjection              | SleepInjection: Denial of Service by externally controlled sleep time   |
| Critical | SQL Injection                  | OPT.PLSQL.SEC.SqlInjection                | SqlInjection: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection')                |
| Critical | D V D P                        | OPT.PLSQL.DC_PLSQL.DVDP                   | DVDP: Do not declare variables out of the main Declare  |
| Critical | N L S M                        | OPT.PLSQL.DC_PLSQL.NLSM                   | NLSM: Find PLSQL with more than 1000 lines  |
| Critical | Pkg Comment                    | OPT.PLSQL.DOC_PLSQL.PkgComment            | PkgComment: Packages without comments   |
| Critical | C N L                          | OPT.PLSQL.GEN_PLSQL.CNL                   | CNL: CLOB, NO LONG  |
| Critical | D E W O                        | OPT.PLSQL.GEN_PLSQL.DEWO                  | DEWO: Use 'RAISE_APPLICATION_ERROR' after 'EXCEPTION WHEN OTHERS'   |
| Critical | D S W                          | OPT.PLSQL.GEN_PLSQL.DSW                   | DSW: Find DELETE queries without WHERE  |
| Critical | E S P R                        | OPT.PLSQL.GEN_PLSQL.ESPR                  | ESPR: Do not put queries after RAISE and RAISE_APPLICATION_ERROR  |
| Critical | I N C I                        | OPT.PLSQL.GEN_PLSQL.INCI                  | INCI: Put names to the columns in which data is inserted  |
| Critical | J O I N                        | OPT.PLSQL.GEN_PLSQL.JOIN                  | JOIN: JOINS must have alias   |
| Critical | T G                            | OPT.PLSQL.GEN_PLSQL.TG                    | TG: Identifying the existence of triggers to prevent problems of long-term maintainability                        |
| Critical | Transaction                    | OPT.PLSQL.GEN_PLSQL.Transaction           | Transaction: Use of INSERT, UPDATE and DELETE with COMMIT and ROLLBACK invocations                                |
| Critical | U S W                          | OPT.PLSQL.GEN_PLSQL.USW                   | USW: Find UPDATE queries without WHERE  |
| Critical | V A R 2                        | OPT.PLSQL.GEN_PLSQL.VAR2                  | VAR2: Define variables as VARCHAR2, nor as VARCHAR  |
| Critical | Avoid Goto                     | OPT.PLSQL.MISC_PLSQL.AvoidGoto            | AvoidGoto: Do not use GOTO statement  |
| Critical | Dead Goto                      | OPT.PLSQL.MISC_PLSQL.DeadGoto             | DeadGoto: Detects dead code after GOTO statements   |
| Critical | Avoid calling LN               | OPT.PLSQL.MISC_PLSQL.NLN                  | NLN: Avoid calling LN   |
| Critical | P C D L                        | OPT.PLSQL.MISC_PLSQL.PCDL                 | PCDL: Link parameters supported by DatabaseLink   |
| Critical | P D D                          | OPT.PLSQL.MISC_PLSQL.PDD                  | PDD: Passing parameters not associated to the DD in the Data Access Logic (LD) or Business Logic (LN)             |

| Severity | Contrast rule                       | Engine rule ID                                 | Description  |
|----------|-------------------------------------|--|--|
| Critical | P E P P                             | OPT.PLSQL.MISC_PLSQL.PEPP                      | PEPP: External packages must contain public procedures   |
| Critical | P P A D                             | OPT.PLSQL.MISC_PLSQL.PPAD                      | PPAD: Passing parameters not associated to the DD in the Data Access Logic (LD)  |
| Critical | Big Size                            | OPT.PLSQL.OYR_PLSQL.BigSize                    | BigSize: Detects functions and procedures too large  |
| Critical | Check Data                          | OPT.PLSQL.OYR_PLSQL.CheckData                  | CheckData: It is not allowed to confirm the existence of a record before updating it                                   |
| Critical | Dml Returning                       | OPT.PLSQL.OYR_PLSQL.DmlReturning               | DmlReturning: Do not access to inserted, updated or deleted registers to obtain fields (before or after the operation) |
| Critical | E A D                               | OPT.PLSQL.OYR_PLSQL.EAD                        | EAD: Avoid DUAL access   |
| Critical | Total Group                         | OPT.PLSQL.OYR_PLSQL.TotalGroup                 | TotalGroup: Do not use GROUP BY in selects without aggregation functions   |
| Critical | Total Group Agr                     | OPT.PLSQL.OYR_PLSQL.TotalGroupAgr              | TotalGroupAgr: Do not use GROUP BY in fields that are not present in the select  |
| Critical | U C R                               | OPT.PLSQL.OYR_PLSQL.UCR                        | UCR: One process has a unique commit or rollback associated  |
| Critical | Forbidden Call                      | OPT.PLSQL.SEC.ForbiddenCall                    | ForbiddenCall: Dangerous procedure / function called.  |
| Critical | Path Traversal                      | OPT.PLSQL.SEC.PathTraversal                    | PathTraversal: External Control of File Name or Path   |
| Critical | Too Broad Grant                     | OPT.PLSQL.SEC.TooBroadGrant                    | TooBroadGrant: Too broad privileges granted.   |
| Critical | Weak Cryptographic Hash             | OPT.PLSQL.SEC.WeakCryptographicHash            | WeakCryptographicHash: Weak cryptographic hashes cannot guarantee data integrity                                       |
| Critical | Weak Symmetric Encryption Algorithm | OPT.PLSQL.SEC.WeakSymmetricEncryptionAlgorithm | WeakSymmetricEncryptionAlgorithm: Weak symmetric encryption algorithm.   |
| High     | U V B                               | OPT.PLSQL.GEN_PLSQL.UVB                        | UVB: Use BIND variables  |
| High     | Open Redirect                       | OPT.PLSQL.SEC.OpenRedirect                     | OpenRedirect: Do not allow to control the URL used in a redirect by an unvalidated input                               |
| High     | E C U                               | OPT.PLSQL.CNU_PLSQL.ECU                        | ECU: Avoid non-used constants  |
| High     | E V U                               | OPT.PLSQL.CNU_PLSQL.EVU                        | EVU: Avoid non-used variables  |
| High     | Useless Param                       | OPT.PLSQL.CNU_PLSQL.UselessParam               | UselessParam: Detects parameters declared but not used   |
| High     | N D C F                             | OPT.PLSQL.DC_PLSQL.NDCF                        | NDCF: Avoid declaring cursors 'on the fly'   |
| High     | Proc Comment                        | OPT.PLSQL.DOC_PLSQL.ProcComment                | ProcComment: Functions and procedures without comments   |
| High     | A M                                 | OPT.PLSQL.GEN_PLSQL.AM                         | AM: Put a date mask to TO_DATE and TO_CHAR functions   |
| High     | Avoid Dual                          | OPT.PLSQL.GEN_PLSQL.AvoidDual                  | AvoidDual: Do not use SELECT over DUAL table   |
| High     | Avoid Inner                         | OPT.PLSQL.GEN_PLSQL.AvoidInner                 | AvoidInner: Detects the use of INNER JOIN  |
| High     | C O F                               | OPT.PLSQL.GEN_PLSQL.COF                        | COF: Do not use conditions and filter operators  |
| High     | D H                                 | OPT.PLSQL.GEN_PLSQL.DH                         | DH: Avoid hints  |
| High     | G E R 2                             | OPT.PLSQL.GEN_PLSQL.GER2                       | GER2: WHEN OTHERS clause must be included in exceptions  |
| High     | G E R 3                             | OPT.PLSQL.GEN_PLSQL.GER3                       | GER3: Avoid WHEN OTHERS THEN NULL in exceptions  |

| Severity | Contrast rule   | Engine rule ID                     | Description   |
|----------|---|------------------------------------|---|
| High     | N D F Exception                                       | OPT.PLSQL.GEN_PLSQL.NDFException   | NDFException: Check NO_DATA_FOUND exception when SELECT with INTO statement is used                             |
| High     | W L   | OPT.PLSQL.GEN_PLSQL.WL             | WL: Use WHILE instead of EXIT WHEN  |
| High     | E P P C   | OPT.PLSQL.MISC_PLSQL.EPPC          | EPPC: Avoid passing complex parameters  |
| High     | L E P   | OPT.PLSQL.MISC_PLSQL.LEP           | LEP: No parameters in external logic  |
| High     | Repeated Code   | OPT.PLSQL.MISC_PLSQL.RepeatedCode  | RepeatedCode: Avoid repeating the same query code   |
| High     | Avoid Func  | OPT.PLSQL.OYR_PLSQL.AvoidFunc      | AvoidFunc: Checks that there are no queries that use functions over fields of the tables in the WHERE condition |
| High     | Count Asterisk  | OPT.PLSQL.OYR_PLSQL.CountAsterisk  | CountAsterisk: Do not use COUNT(*) function   |
| High     | Double Select   | OPT.PLSQL.OYR_PLSQL.DoubleSelect   | DoubleSelect: Do not use the same WHERE clause in two consecutive queries                                       |
| High     | Cursor Snarfing                                       | OPT.PLSQL.SEC.CursorSnarfing       | CursorSnarfing: Cursor Snarfing   |
| High     | Insecure Randomness                                   | OPT.PLSQL.SEC.InsecureRandomness   | InsecureRandomness: Standard pseudo-random number generators cannot withstand cryptographic attacks.            |
| Info     | Useless Query   | OPT.PLSQL.CNU_PLSQL.UselessQuery   | UselessQuery: It warns about queries that obtain the field which is used as filter in the WHERE clause          |
| Info     | C A B   | OPT.PLSQL.DOC_PLSQL.CAB            | CAB: Include comments in headers  |
| Info     | E N E C   | OPT.PLSQL.FM_PLSQL.ENEC            | ENEC: Names must not be between inverted commas   |
| Info     | L B   | OPT.PLSQL.FM_PLSQL.LB              | LB: Blank lines in some sentences   |
| Info     | M E I   | OPT.PLSQL.FM_PLSQL.MEI             | MEI: Code lines indentation   |
| Info     | Nomenclator   | OPT.PLSQL.FM_PLSQL.Nomenclator     | Nomenclator: Use a prefix in the name of variables, parameteres, exceptions and cursors                         |
| Info     | DB L  | OPT.PLSQL.GEN_PLSQL.DBL            | DBL: Find @dblink   |
| Info     | Avoid independent procedures called from system logic | OPT.PLSQL.MISC_PLSQL.EPILS         | EPILS: Avoid using independent procedures called from the system logic  |
| Info     | Avoid using procedures/ functions from DD             | OPT.PLSQL.MISC_PLSQL.NPFD          | NPFD: Avoid using procedures/ functions from DD   |
| Info     | N E D V   | OPT.PLSQL.NOM_PLSQL.NEDV           | NEDV: Specific naming convention for variables  |
| Info     | P A Q2  | OPT.PLSQL.NOM_PLSQL.PAQ2           | PAQ2: Specific naming convention for packages   |
| Info     | P R M A   | OPT.PLSQL.NOM_PLSQL.PRMA           | PRMA: Write reserved words in capital letters   |
| Info     | Condition Order                                       | OPT.PLSQL.OYR_PLSQL.ConditionOrder | ConditionOrder: Looks for control contructions with more than one condition                                     |
| Info     | Default Authid  | OPT.PLSQL.SEC.DefaultAuthid        | DefaultAuthid: No explicit AUTHID clause.   |
| Low      | Useless Var   | OPT.PLSQL.CNU_PLSQL.UselessVar     | UselessVar: Detects local variables declared but not used   |

| Severity | Contrast rule                 | Engine rule ID                   | Description   |
|----------|-------------------------------|----------------------------------|---|
| Low      | Func Not Null                 | OPT.PLSQL.DC_PLSQL.FuncNotNull   | FuncNotNull: Do not define parameters as NOT NULL in functions and procedures |
| Low      | L C N I                       | OPT.PLSQL.DC_PLSQL.LCNI          | LCNI: Incorrect literal and numeric constants                                 |
| Low      | Cap Word                      | OPT.PLSQL.FM_PLSQL.CapWord       | CapWord: Use uppercase for PLSQL keywords                                     |
| Low      | C C                           | OPT.PLSQL.GEN_PLSQL.CC           | CC: Close all opened cursors  |
| Low      | C R C                         | OPT.PLSQL.GEN_PLSQL.CRC          | CRC: Close all opened ref cursors   |
| Low      | Do not qualify related tables | OPT.PLSQL.GEN_PLSQL.CTI          | CTI: Do not qualify related tables  |
| Low      | G E R 0                       | OPT.PLSQL.GEN_PLSQL.GER0         | GER0: Make correct errors management  |
| Low      | G E R 1                       | OPT.PLSQL.GEN_PLSQL.GER1         | GER1: Must be at least a block of exceptions by routine                       |
| Low      | J O I N 2                     | OPT.PLSQL.GEN_PLSQL.JOIN2        | JOIN2: Use the specific alias for JOINS                                       |
| Low      | N U L L                       | OPT.PLSQL.GEN_PLSQL.NULL         | NULL: Use NULL instead of   |
| Low      | Oracle Tables                 | OPT.PLSQL.GEN_PLSQL.OracleTables | OracleTables: Avoid using tables and views of the Oracle Data Dictionary      |
| Low      | U I L O                       | OPT.PLSQL.GEN_PLSQL.UILO         | UILO: Use IN instead of OR  |
| Low      | Use Constants                 | OPT.PLSQL.GEN_PLSQL.UseConstants | UseConstants: Do not use literals in the WHERE clauses                        |
| Low      | Var Loop                      | OPT.PLSQL.GEN_PLSQL.VarLoop      | VarLoop: Do not initialize variables in a loop                                |
| Low      | C T E                         | OPT.PLSQL.NOM_PLSQL.CTE          | CTE: Constant names must be written in capital letters                        |
| Low      | Avoid Neg                     | OPT.PLSQL.OYR_PLSQL.AvoidNeg     | AvoidNeg: Do not use negations in the WHERE clauses                           |
| Low      | In Selects                    | OPT.PLSQL.OYR_PLSQL.InSelects    | InSelects: Do not use SELECT with subqueries in the FROM or WHERE clauses     |
| Low      | N V L                         | OPT.PLSQL.OYR_PLSQL.NVL          | NVL: Avoid using NVL function   |
| Low      | Use Between                   | OPT.PLSQL.OYR_PLSQL.UseBetween   | UseBetween: Do not use '< [] {}'  |
| Medium   | C I F A                       | OPT.PLSQL.GEN_PLSQL.CIFA         | CIFA: Use CASE instead nested if elseif                                       |
| Medium   | Def Syntax                    | OPT.PLSQL.GEN_PLSQL.DefSyntax    | DefSyntax: Defines the syntax in the SELECT statements                        |
| Medium   | E F C W                       | OPT.PLSQL.GEN_PLSQL.EFCW         | EFCW: Avoid use of functions in WHERE clause                                  |
| Medium   | N A P E                       | OPT.PLSQL.GEN_PLSQL.NAPE         | NAPE: Do not access to the to the errors stack                                |
| Medium   | N F S 0                       | OPT.PLSQL.GEN_PLSQL.NFS0         | NFS0: Do not format output  |
| Medium   | N F S 1                       | OPT.PLSQL.GEN_PLSQL.NFS1         | NFS1: Do not format the output with RPAD function                             |
| Medium   | N F S 2                       | OPT.PLSQL.GEN_PLSQL.NFS2         | NFS2: Do not format the output with LPAD function                             |
| Medium   | N F S 3                       | OPT.PLSQL.GEN_PLSQL.NFS3         | NFS3: Do not format the output with RTRIM function                            |
| Medium   | N F S 4                       | OPT.PLSQL.GEN_PLSQL.NFS4         | NFS4: Do not format the output with LTRIM function                            |
| Medium   | Oracle Var                    | OPT.PLSQL.GEN_PLSQL.OracleVar    | OracleVar: Do not use control variables outside EXCEPTION blocks              |
| Medium   | P P R                         | OPT.PLSQL.GEN_PLSQL.PPR          | PPR: Use reference parameters   |
| Medium   | U H N                         | OPT.PLSQL.GEN_PLSQL.UHN          | UHN: Use NOCOPY   |

| Severity | Contrast rule                              | Engine rule ID                                      | Description   |
|----------|--|---|---|
| Medium   | Undef Case                                 | OPT.PLSQL.GEN_PLSQL.UndefCase                       | UndefCase: Checks WHEN clauses are using the same control variable                                |
| Medium   | Table Alias                                | OPT.PLSQL.MISC_PLSQL.TableAlias                     | TableAlias: Define an alias for each table  |
| Medium   | E X C                                      | OPT.PLSQL.NOM_PLSQL.EXC                             | EXC: Naming convention for exceptions   |
| Medium   | E X C G                                    | OPT.PLSQL.NOM_PLSQL.EXCG                            | EXCG: Naming convention for global exceptions in packages   |
| Medium   | F U N C                                    | OPT.PLSQL.NOM_PLSQL.FUNC                            | FUNC: Correct format for functions  |
| Medium   | F U N C2                                   | OPT.PLSQL.NOM_PLSQL.FUNC2                           | FUNC2: Naming convention for functions  |
| Medium   | F V C                                      | OPT.PLSQL.NOM_PLSQL.FVC                             | FVC: Correct format for variables   |
| Medium   | I D T                                      | OPT.PLSQL.NOM_PLSQL.IDT                             | IDT: Variable names prefix  |
| Medium   | P A Q                                      | OPT.PLSQL.NOM_PLSQL.PAQ                             | PAQ: Correct format for packages  |
| Medium   | P R M                                      | OPT.PLSQL.NOM_PLSQL.PRM                             | PRM: Specific naming convention for parameters  |
| Medium   | P R O C                                    | OPT.PLSQL.NOM_PLSQL.PROC                            | PROC: Correct format for procedures   |
| Medium   | Avoid Percent                              | OPT.PLSQL.OYR_PLSQL.AvoidPercent                    | AvoidPercent: Warns about queries that use LIKE filters and '%' patterns                          |
| Medium   | I C T                                      | OPT.PLSQL.OYR_PLSQL.ICT                             | ICT: Put columns of the table to query  |
| Medium   | Too Much Or                                | OPT.PLSQL.OYR_PLSQL.TooMuchOr                       | TooMuchOr: Do not perform several OR checks over the same field                                   |
| Medium   | Suspicious Code                            | OPT.PLSQL.SEC.SuspiciousCode                        | SuspiciousCode: Potential malicious code.   |
| Medium   | Unqualified Item At Invoker Rights Routine | OPT.PLSQL.SEC.UnqualifiedItemAtInvokerRightsRoutine | UnqualifiedItemAtInvokerRightsRoutine: Unqualified database items in AUTHID CURRENT_USER routine. |
| Medium   | User Controlled SQL Primary Key            | OPT.PLSQL.SEC.UserControlledSQLPrimaryKey           | UserControlledSQLPrimaryKey: Avoid using an user controlled Primary Key into a query              |
| Medium   | Hardcoded Credential                       | OPT.PLSQL.SEC.HardcodedCredential                   | HardcodedCredential: Use of Hard-coded Credentials  |

## PowerScript Scan rules

Contrast Scan supports these rules for PowerScript.

| Severity | Contrast rule               | Engine rule ID                                       | Description  |
|----------|-----------------------------|--|--|
| Critical | Avoid Undoc Events          | OPT.POWERSCRIPT.DOC_POWSCRT.AvoidUndocEvents         | AvoidUndocEvents: Avoid undocumented events  |
| Critical | Avoid Undoc Functions       | OPT.POWERSCRIPT.DOC_POWSCRT.AvoidUndocFunctions      | AvoidUndocFunctions: Avoid undocumented functions/subroutines                            |
| High     | Comments Ratio In Events    | OPT.POWERSCRIPT.DOC_POWSCRT.CommentsRatioInEvents    | CommentsRatioInEvents: Avoid events with a very low comment/code ratio                   |
| High     | Comments Ratio In Functions | OPT.POWERSCRIPT.DOC_POWSCRT.CommentsRatioInFunctions | CommentsRatioInFunctions: Avoid functions/subroutines with a very low comment/code ratio |
| High     | Art Less5 Param             | OPT.POWERSCRIPT.GEN_POWSCRT.ArtLess5Param            | ArtLess5Param: Avoid artifacts with a lot of parameters                                  |
| High     | Art Without Group By        | OPT.POWERSCRIPT.GEN_POWSCRT.ArtWithoutGroupBy        | ArtWithoutGroupBy: Do not use 'Group By'   |

| Severity | Contrast rule                  | Engine rule ID  | Description  |
|----------|--------------------------------|---|--|
| High     | Art Without Subqueries         | OPT.POWERSCRIPT.GEN_POWSCRT.ArtWithoutSubqueries        | ArtWithoutSubqueries: Avoid subqueries                               |
| High     | Dt Win Access DB               | OPT.POWERSCRIPT.GEN_POWSCRT.DtWinAccessDB               | DtWinAccessDB: Do not use queries directly over database             |
| High     | Dynamic SQL                    | OPT.POWERSCRIPT.GEN_POWSCRT.DynamicSQL                  | DynamicSQL: Avoid using dynamic SQL in scripts                       |
| High     | Dynamic SQL4 Less Tables       | OPT.POWERSCRIPT.GEN_POWSCRT.DynamicSQL4LessTables       | DynamicSQL4LessTables: Avoid dynamic complex SQL queries             |
| High     | Overriding Event               | OPT.POWERSCRIPT.GEN_POWSCRT.OverridingEvent             | OverridingEvent: Avoid overriding Event                              |
| High     | Queries4tables                 | OPT.POWERSCRIPT.GEN_POWSCRT.Queries4tables              | Queries4tables: Avoid SELECT over too many tables                    |
| High     | Queries9select Param           | OPT.POWERSCRIPT.GEN_POWSCRT.Queries9selectParam         | Queries9selectParam: Avoid complex SELECT clause                     |
| High     | Win Too Many Mth               | OPT.POWERSCRIPT.GEN_POWSCRT.WinTooManyMth               | WinTooManyMth: Avoid 'Windows' with too many methods                 |
| High     | Fan In                         | OPT.POWERSCRIPT.OYR_POWSCRT.FanIn                       | FanIn: Avoid calling many times the same artifact                    |
| High     | Fan Out                        | OPT.POWERSCRIPT.OYR_POWSCRT.FanOut                      | FanOut: Avoid calling many artifacts from same one                   |
| High     | Menu High Inheritance          | OPT.POWERSCRIPT.OYR_POWSCRT.MenuHighInheritance         | MenuHighInheritance: Avoid Window with too high level of inheritance |
| High     | No Inheritance                 | OPT.POWERSCRIPT.OYR_POWSCRT.NoInheritance               | NoInheritance: Avoid artifacts without inheritance relations         |
| High     | Win High Inheritance           | OPT.POWERSCRIPT.OYR_POWSCRT.WinHighInheritance          | WinHighInheritance: Avoid Window with too high level of inheritance  |
| Info     | Data Window Naming Convention  | OPT.POWERSCRIPT.NOM_POWSCRT.DataWindowNamingConvention  | DataWindowNamingConvention: DataWindow naming convention             |
| Info     | Global Func Naming Convention  | OPT.POWERSCRIPT.NOM_POWSCRT.GlobalFuncNamingConvention  | GlobalFuncNamingConvention: Global function naming convention        |
| Info     | Global Var Naming Convention   | OPT.POWERSCRIPT.NOM_POWSCRT.GlobalVarNamingConvention   | GlobalVarNamingConvention: Global variables naming convention        |
| Info     | Instance Var Naming Convention | OPT.POWERSCRIPT.NOM_POWSCRT.InstanceVarNamingConvention | InstanceVarNamingConvention: Instance variable naming convention     |
| Info     | Menu Naming Convention         | OPT.POWERSCRIPT.NOM_POWSCRT.MenuNamingConvention        | MenuNamingConvention: Menu naming convention                         |
| Info     | Structure Naming Convention    | OPT.POWERSCRIPT.NOM_POWSCRT.StructureNamingConvention   | StructureNamingConvention: Structure naming convention               |
| Info     | User Event Naming Convention   | OPT.POWERSCRIPT.NOM_POWSCRT.UserEventNamingConvention   | UserEventNamingConvention: User event naming convention              |
| Info     | Window Naming Convention       | OPT.POWERSCRIPT.NOM_POWSCRT.WindowNamingConvention      | WindowNamingConvention: Window naming convention                     |
| Medium   | Avoid Global Functions         | OPT.POWERSCRIPT.GEN_POWSCRT.AvoidGlobalFunctions        | AvoidGlobalFunctions: Avoid using global functions                   |
| Medium   | Avoid Global Vars              | OPT.POWERSCRIPT.GEN_POWSCRT.AvoidGlobalVars             | AvoidGlobalVars: Avoid using global variables                        |
| Medium   | Too Long Lines                 | OPT.POWERSCRIPT.GEN_POWSCRT.TooLongLines                | TooLongLines: Avoid artifacts with lines too long                    |

## Python Scan rules

Contrast Scan supports these rules for Python.

| Severity | Contrast rule                         | Engine rule ID   | Description   |
|----------|---------------------------------------|--|---|
| Critical | Too Much Origins Allowed Rule         | OPT.PYTHON.SECURITY.TooMuchOriginsAllowedRule          | TooMuchOriginsAllowedRule: CORS (Cross-origin resource sharing) too br  |
| Critical | Missing Browser Xss Filter            | OPT.PYTHON.DJANGO.MissingBrowserXssFilter              | MissingBrowserXssFilter: Secure brow filter   |
| Critical | Code Injection                        | OPT.PYTHON.SECURITY.CodeInjection                      | CodeInjection: Avoid non-neutralized controlled input in dynamic code eval  |
| Critical | Command Injection                     | OPT.PYTHON.SECURITY.CommandInjection                   | CommandInjection: Improper Neutrali Special Elements used in an OS Com ('OS Command Injection')                   |
| Critical | Connection String Parameter Pollution | OPT.PYTHON.SECURITY.ConnectionStringParameterPollution | ConnectionStringParameterPollution: Connection string polluted with untrus  |
| Critical | Cross Site Scripting                  | OPT.PYTHON.SECURITY.CrossSiteScripting                 | CrossSiteScripting: Improper Neutraliz Input During Web Page Generation ('Scripting')                             |
| Critical | DoS Regexp                            | OPT.PYTHON.SECURITY.DoSRegexp                          | DoSRegexp: Potential denial-of-service through malicious regular expression                                       |
| Critical | JSON Injection                        | OPT.PYTHON.SECURITY.JSONInjection                      | JSONInjection: Avoid using non-neutr user-controlled input into JSON entitie Injection                            |
| Critical | Ldap Injection                        | OPT.PYTHON.SECURITY.LdapInjection                      | LdapInjection: Avoid non-neutralized controlled input in LDAP search filters                                      |
| Critical | Mail Command Injection                | OPT.PYTHON.SECURITY.MailCommandInjection               | MailCommandInjection: Mail Command Injection  |
| Critical | Memcached Injection                   | OPT.PYTHON.SECURITY.MemcachedInjection                 | MemcachedInjection: Avoid non-neutr user-controlled input to be stored into                                       |
| Critical | No SQL Injection                      | OPT.PYTHON.SECURITY.NoSQLInjection                     | NoSQLInjection: Improper neutralizati special elements in data query logic (l injection)                          |
| Critical | SQL Injection                         | OPT.PYTHON.SECURITY.SqlInjection                       | SqlInjection: Avoid SQL code formed non neutralized user input (vulnerable Injection attacks)                     |
| Critical | Stored Cross Site Scripting           | OPT.PYTHON.SECURITY.StoredCrossSiteScripting           | StoredCrossSiteScripting: Improper Neutralization of Input During Web Pa Generation ('Cross-site Scripting')      |
| Critical | Xpath Injection                       | OPT.PYTHON.SECURITY.XpathInjection                     | XpathInjection: Avoid XPath expressio with non neutralized user input   |
| Critical | Xml Entity Injection                  | OPT.PYTHON.SECURITY.XmlEntityInjection                 | XmlEntityInjection: XML entity injectio   |
| Critical | Path Traversal                        | OPT.PYTHON.SECURITY.PathTraversal                      | PathTraversal: Avoid non-neutralized controlled input to be part of a pathna or directory) used in I/O operations |
| Critical | Password In Redirect Rule             | OPT.PYTHON.SECURITY.PasswordInRedirectRule             | PasswordInRedirectRule: Password Management - Password in Redirect  |
| Critical | Hardcoded Crypto Key                  | OPT.PYTHON.SECURITY.HardcodedCryptoKey                 | HardcodedCryptoKey: Hardcoded cry keys  |
| Critical | Non Random IV With CBC Mode           | OPT.PYTHON.SECURITY.NonRandomIVWithCBCMode             | NonRandomIVWithCBCMode: Not us Random IV with CBC Mode  |



| Severity | Contrast rule                                   | Engine rule ID   | Description  |
|----------|---|--|--|
| Critical | Weak Cryptographic Hash In Settings             | OPT.PYTHON.DJANGO.WeakCryptographicHashInSettings                | WeakCryptographicHashInSettings: Weak cryptographic hashes cannot guarantee integrity  |
| High     | Insufficient Session Expiration Rule            | OPT.PYTHON.SECURITY.InsufficientSessionExpirationRule            | InsufficientSessionExpirationRule: Checks that session expiration interval is positive and does not exceed a limit                 |
| High     | Cookie Based Sessions                           | OPT.PYTHON.DJANGO.CookieBasedSessions                            | CookieBasedSessions: Cookie-based sessions with a unsafe configuration   |
| High     | Insufficient Django Settings Session Expiration | OPT.PYTHON.DJANGO.InsufficientDjangoSettingsSessionExpiration    | InsufficientDjangoSettingsSessionExpiration: Checks that session expiration interval is positive and does not exceed a limit       |
| High     | Cookie Poisoning                                | OPT.PYTHON.SECURITY.CookiePoisoning                              | CookiePoisoning: Cookie Poisoning  |
| High     | Cross Site Request Forgery                      | OPT.PYTHON.SECURITY.CrossSiteRequestForgery                      | CrossSiteRequestForgery: Cross-site request forgery (CSRF)   |
| High     | Dont Use Exec                                   | OPT.PYTHON.SECURITY.DontUseExec                                  | DontUseExec: Avoid using exec() function   |
| High     | Header Manipulation                             | OPT.PYTHON.SECURITY.HeaderManipulation                           | HeaderManipulation: Avoid including unvalidated data in HTTP response headers in Cookies   |
| High     | Http Parameter Pollution Rule                   | OPT.PYTHON.SECURITY.HttpParameterPollutionRule                   | HttpParameterPollutionRule: HTTP parameter pollution (HPP)   |
| High     | Log Forging                                     | OPT.PYTHON.SECURITY.LogForging                                   | LogForging: Unvalidated untrusted input in log   |
| High     | Open Redirect                                   | OPT.PYTHON.SECURITY.OpenRedirect                                 | OpenRedirect: Do not allow to control redirect used in a redirect by an unvalidated input  |
| High     | Resource Injection                              | OPT.PYTHON.SECURITY.ResourceInjection                            | ResourceInjection: Improper control of resource identifiers ("Resource Injection")   |
| High     | Server Side Request Forgery                     | OPT.PYTHON.SECURITY.ServerSideRequestForgery                     | ServerSideRequestForgery: Creation of requests from a vulnerable server using untrusted input (server side request forgery (SSRF)) |
| High     | Trust Boundary                                  | OPT.PYTHON.SECURITY.TrustBoundary                                | TrustBoundary: Trust boundary violation  |
| High     | Unsafe Reflection                               | OPT.PYTHON.SECURITY.UnsafeReflection                             | UnsafeReflection: Use of Externally-Controlled Input to Select Classes or Code ('Unsafe Reflection')                               |
| High     | Xml Injection                                   | OPT.PYTHON.SECURITY.XmlInjection                                 | XmlInjection: Avoid using non-neutralized controlled input when creating XML documents   |
| High     | Mass Assignment Attack                          | OPT.PYTHON.DJANGO.MassAssignmentAttack                           | MassAssignmentAttack: Insufficient form validation   |
| High     | Avoid Calling Magic Methods                     | OPT.PYTHON.MAINTAINABILITY.AvoidCallingMagicMethods              | AvoidCallingMagicMethods: Avoid calling magic methods  |
| High     | Avoid Too Complex Functions                     | OPT.PYTHON.MAINTAINABILITY.AvoidTooComplexFunctions              | AvoidTooComplexFunctions: Avoid too complex functions  |
| High     | Avoid Assignments To True Or False              | OPT.PYTHON.RELIABILITY.AvoidAssignmentsToTrueOrFalse             | AvoidAssignmentsToTrueOrFalse: Avoid assignments to True or False  |
| High     | Avoid Chained Comparisons Containing Equality   | OPT.PYTHON.RELIABILITY.AvoidChainedComparisonsContainingEquality | AvoidChainedComparisonsContainingEquality: Avoid chained comparisons containing equality operator                                  |

| Severity | Contrast rule                         | Engine rule ID                                      | Description   |
|----------|---------------------------------------|---|---|
| High     | Avoid Default Mutable Arguments       | OPT.PYTHON.RELIABILITY.AvoidDefaultMutableArguments | AvoidDefaultMutableArguments: Avoid default mutable parameters  |
| High     | Init Cannot Be A Generator            | OPT.PYTHON.RELIABILITY.InitCannotBeAGenerator       | InitCannotBeAGenerator: __init__ method cannot be a generator   |
| High     | Invalid Open Mode                     | OPT.PYTHON.RELIABILITY.InvalidOpenMode              | InvalidOpenMode: Invalid open() mode  |
| High     | Open Files Using With                 | OPT.PYTHON.RELIABILITY.OpenFilesUsingWith           | OpenFilesUsingWith: Open files using with statement   |
| High     | Same Method And Field Names           | OPT.PYTHON.RELIABILITY.SameMethodAndFieldNames      | SameMethodAndFieldNames: Method and class fields should not to be different or same capitalization                                  |
| High     | Using Deprecated Module               | OPT.PYTHON.RELIABILITY.UsingDeprecatedModule        | UsingDeprecatedModule: Avoid using deprecated modules   |
| High     | Cookies In Security Decision          | OPT.PYTHON.SECURITY.CookiesInSecurityDecision       | CookiesInSecurityDecision: Reliance on Cookies without Validation and Integrity Checking in a Security Decision                     |
| High     | Unhandled SSL Error Rule              | OPT.PYTHON.SECURITY.UnhandledSSLERrorRule           | UnhandledSSLERrorRule: Unhandled SSL exception  |
| High     | User Controlled SQL Primary Key       | OPT.PYTHON.SECURITY.UserControlledSQLPrimaryKey     | UserControlledSQLPrimaryKey: Avoid user controlled Primary Key into a query   |
| High     | Insecure Direct Object References     | OPT.PYTHON.DJANGO.InsecureDirectObjectReferences    | InsecureDirectObjectReferences: Check user authentication and/ or authorization before let him modifying a sensible system resource |
| High     | Missing Function Level Access Control | OPT.PYTHON.DJANGO.MissingFunctionLevelAccessControl | MissingFunctionLevelAccessControl: Add an authorization check when performing an action which requires authorization                |
| High     | Hardcoded Credential                  | OPT.PYTHON.SECURITY.HardcodedCredential             | HardcodedCredential: Empty or hardcoded passwords may compromise system security in a way that cannot be easily remedied            |
| High     | Hardcoded Ip                          | OPT.PYTHON.SECURITY.HardcodedIp                     | HardcodedIp: Do not write IP addresses in code  |
| High     | Hardcoded Salt                        | OPT.PYTHON.SECURITY.HardcodedSalt                   | HardcodedSalt: Use of hardcoded salt  |
| High     | Insecure Transport                    | OPT.PYTHON.SECURITY.InsecureTransport               | InsecureTransport: Insecure transport   |
| High     | Insufficient Key Size Rule            | OPT.PYTHON.SECURITY.InsufficientKeySizeRule         | InsufficientKeySizeRule: Weak cryptography insufficient key length  |
| High     | Server Insecure Transport             | OPT.PYTHON.SECURITY.ServerInsecureTransport         | ServerInsecureTransport: Insecure transport on HTTP servers   |
| High     | Weak Cryptographic Hash               | OPT.PYTHON.SECURITY.WeakCryptographicHash           | WeakCryptographicHash: Weak cryptographic hash  |
| High     | Weak Encryption Algorithm             | OPT.PYTHON.SECURITY.WeakEncryptionAlgorithm         | WeakEncryptionAlgorithm: Weak symmetric encryption algorithm  |
| Info     | Empty Docstring                       | OPT.PYTHON.MAINTAINABILITY.EmptyDocstring           | EmptyDocstring: Empty docstring   |
| Info     | Import Top Of File                    | OPT.PYTHON.MAINTAINABILITY.ImportTopOfFile          | ImportTopOfFile: Module level import of file  |
| Info     | Line Too Long                         | OPT.PYTHON.MAINTAINABILITY.LineTooLong              | LineTooLong: Line too long  |
| Info     | Missing Docstring                     | OPT.PYTHON.MAINTAINABILITY.MissingDocstring         | MissingDocstring: Missing docstring   |

| Severity | Contrast rule                             | Engine rule ID  | Description  |
|----------|---|---|--|
| Info     | Multiple Imports One Line                 | OPT.PYTHON.MAINTAINABILITY.MultipleImportsOneLine               | MultipleImportsOneLine: Multiple imports on one line   |
| Info     | Too Many Local Variables                  | OPT.PYTHON.MAINTAINABILITY.TooManyLocalVariables                | TooManyLocalVariables: Too many local variables  |
| Info     | Unnecessary Semicolon                     | OPT.PYTHON.MAINTAINABILITY.UnnecessarySemicolon                 | UnnecessarySemicolon: Unnecessary semicolon  |
| Low      | Empty Sequences Are False                 | OPT.PYTHON.EFFICIENCY.EmptySequencesAreFalse                    | EmptySequencesAreFalse: Empty sequences are False  |
| Low      | Init Dictionaries With Literals           | OPT.PYTHON.EFFICIENCY.InitDictionariesWithLiterals              | InitDictionariesWithLiterals: Use literals to initialize dictionaries  |
| Low      | Potential Class Or Static Method          | OPT.PYTHON.EFFICIENCY.PotentialClassOrStaticMethod              | PotentialClassOrStaticMethod: Class methods not accessing instance fields must be static                               |
| Low      | Avoid Assigning A Lambda                  | OPT.PYTHON.MAINTAINABILITY.AvoidAssigningALambda                | AvoidAssigningALambda: Avoid assigning a lambda expression   |
| Low      | Avoid Commented Out Code                  | OPT.PYTHON.MAINTAINABILITY.AvoidCommentedOutCode                | AvoidCommentedOutCode: Avoid commenting out code blocks  |
| Low      | Avoid Name Repetition In Comparisons      | OPT.PYTHON.MAINTAINABILITY.AvoidNameRepetitionInComparisons     | AvoidNameRepetitionInComparisons: Avoid unnecessary name repetition in equality comparisons                            |
| Low      | Avoid Nested Empty Blocks                 | OPT.PYTHON.MAINTAINABILITY.AvoidNestedEmptyBlocks               | AvoidNestedEmptyBlocks: Avoid unnecessary nested empty blocks  |
| Low      | Bad Identity Check                        | OPT.PYTHON.MAINTAINABILITY.BadIdentityCheck                     | BadIdentityCheck: Avoid using the [] {} identity check   |
| Low      | Bad Type Comparison                       | OPT.PYTHON.MAINTAINABILITY.BadTypeComparison                    | BadTypeComparison: Use isinstance() for a type comparison  |
| Low      | Blank Line At End Of File                 | OPT.PYTHON.MAINTAINABILITY.BlankLineAtEndOfFile                 | BlankLineAtEndOfFile: It should be a blank line at the end of the file   |
| Low      | Blank Line Contains Whitespace            | OPT.PYTHON.MAINTAINABILITY.BlankLineContainsWhitespace          | BlankLineContainsWhitespace: Blank lines should not contain whitespaces  |
| Low      | Blank Lines Surrounding Function Or Class | OPT.PYTHON.MAINTAINABILITY.BlankLinesSurroundingFunctionOrClass | BlankLinesSurroundingFunctionOrClass: Module level functions and class definitions should be surrounded with two lines |
| Low      | Blank Line Surrounding Methods            | OPT.PYTHON.MAINTAINABILITY.BlankLineSurroundingMethods          | BlankLineSurroundingMethods: Class methods should be surrounded with a single blank line                               |
| Low      | Loops Else Clause Always Executed         | OPT.PYTHON.MAINTAINABILITY.LoopsElseClauseAlwaysExecuted        | LoopsElseClauseAlwaysExecuted: Loop else clause is always executed   |
| Low      | Merge Simple Conditional Branches         | OPT.PYTHON.MAINTAINABILITY.MergeSimpleConditionalBranches       | MergeSimpleConditionalBranches: Simple conditional statements should be merged   |
| Low      | Remove Statements After Jump              | OPT.PYTHON.MAINTAINABILITY.RemoveStatementsAfterJump            | RemoveStatementsAfterJump: Statements after a jump are dead code   |
| Low      | Simplify Repetitive Unequal Checks        | OPT.PYTHON.MAINTAINABILITY.SimplifyRepetitiveUnequalChecks      | SimplifyRepetitiveUnequalChecks: Simplify repetitive unequal checks  |
| Low      | Trailing Whitespace                       | OPT.PYTHON.MAINTAINABILITY.TrailingWhitespace                   | TrailingWhitespace: Avoid trailing whitespaces   |

| Severity | Contrast rule                                   | Engine rule ID   | Description   |
|----------|---|--|---|
| Low      | Use Chained Comparisons                         | OPT.PYTHON.MAINTAINABILITY.UseChainedComparisons                 | UseChainedComparisons: Consider using chained comparisons   |
| Low      | Use Negative Index For Last Element             | OPT.PYTHON.MAINTAINABILITY.UseNegativeIndexForLastElement        | UseNegativeIndexForLastElement: Consider using negative indexes to access the positions of collections                  |
| Low      | Use Proper Inequality Operator                  | OPT.PYTHON.PORTABILITY.UseProperInequalityOperator               | UseProperInequalityOperator: Avoid using <> inequality operator   |
| Low      | Avoid Pre Increment And Pre Decrement Operators | OPT.PYTHON.RELIABILITY.AvoidPreIncrementAndPreDecrementOperators | AvoidPreIncrementAndPreDecrementOperators: Avoid using the pre-increment and pre-decrement operators                    |
| Low      | Avoid Using Return Outside Function             | OPT.PYTHON.RELIABILITY.AvoidUsingReturnOutsideFunction           | AvoidUsingReturnOutsideFunction: Avoid using the return statement outside a function                                    |
| Low      | Avoid Using Yield Outside Function              | OPT.PYTHON.RELIABILITY.AvoidUsingYieldOutsideFunction            | AvoidUsingYieldOutsideFunction: Avoid using the yield statement outside a function                                      |
| Low      | Handle F I X M E Tags                           | OPT.PYTHON.RELIABILITY.HandleFIXMETags                           | HandleFIXMETags: Handle FIXME tags  |
| Low      | No Exception Type Specified                     | OPT.PYTHON.RELIABILITY.NoExceptionTypeSpecified                  | NoExceptionTypeSpecified: No exception type specified   |
| Low      | Information Exposure Through Debug Log          | OPT.PYTHON.SECURITY.InformationExposureThroughDebugLog           | InformationExposureThroughDebugLog: Avoid exposing sensitive information through debug logs                             |
| Low      | Password In Comments                            | OPT.PYTHON.SECURITY.PasswordInComments                           | PasswordInComments: Storing password details in plaintext anywhere in the system or system code can compromise security |
| Medium   | Plaintext Storage In A Cookie Rule              | OPT.PYTHON.SECURITY.PlaintextStorageInACookieRule                | PlaintextStorageInACookieRule: Clear storage of Sensitive Information in a cookie                                       |
| Medium   | Unsafe Cookie                                   | OPT.PYTHON.SECURITY.UnsafeCookie                                 | UnsafeCookie: Generate server-side cookies with adequate security properties  |
| Medium   | Avoid Host Name Checks Rule                     | OPT.PYTHON.SECURITY.AvoidHostNameChecksRule                      | AvoidHostNameChecksRule: Avoid client-side hostname checks, that are not reliable due to DNS poisoning                  |
| Medium   | Format String Injection Rule                    | OPT.PYTHON.SECURITY.FormatStringInjectionRule                    | FormatStringInjectionRule: Exclude user input from format strings   |
| Medium   | Serialization Injection                         | OPT.PYTHON.SECURITY.SerializationInjection                       | SerializationInjection: Deserialization of untrusted data   |
| Medium   | Avoid Unnecessary Materialization               | OPT.PYTHON.EFFICIENCY.AvoidUnnecessaryMaterialization            | AvoidUnnecessaryMaterialization: Use list iterator instead of materializing the list                                    |
| Medium   | Improve List Extension                          | OPT.PYTHON.EFFICIENCY.ImproveListExtension                       | ImproveListExtension: Do not use concatenation to extend lists  |
| Medium   | Not Using Items To Iterate Dictionary           | OPT.PYTHON.EFFICIENCY.NotUsingItemsToIterateDictionary           | NotUsingItemsToIterateDictionary: Do not use items() to iterate over a dictionary                                       |
| Medium   | Not Using Zip To Iterate Pair Of Lists          | OPT.PYTHON.EFFICIENCY.NotUsingZipToIteratePairOfLists            | NotUsingZipToIteratePairOfLists: Do not use zip() to iterate over a pair of lists                                       |
| Medium   | Avoid Too Deeply Nested Statements              | OPT.PYTHON.MAINTAINABILITY.AvoidTooDeeplyNestedStatements        | AvoidTooDeeplyNestedStatements: Avoid using too deeply nested statements  |

| Severity | Contrast rule                                   | Engine rule ID   | Description  |
|----------|---|--|--|
| Medium   | Cls As First Argument                           | OPT.PYTHON.MAINTAINABILITY.ClsAsFirstArgument                    | ClsAsFirstArgument: The first argument methods should be "cls"   |
| Medium   | Dead Code                                       | OPT.PYTHON.MAINTAINABILITY.DeadCode                              | DeadCode: Avoid dead code  |
| Medium   | Maximum Module Lines                            | OPT.PYTHON.MAINTAINABILITY.MaximumModuleLines                    | MaximumModuleLines: Maximum module lines permitted   |
| Medium   | More Than A Statement Single Line               | OPT.PYTHON.MAINTAINABILITY.MoreThanAStatementSingleLine          | MoreThanAStatementSingleLine: Avoid more than one statement per line   |
| Medium   | Naming Conventions                              | OPT.PYTHON.MAINTAINABILITY.NamingConventions                     | NamingConventions: Follow PEP 8 naming conventions for Python elements   |
| Medium   | Self As First Argument                          | OPT.PYTHON.MAINTAINABILITY.SelfAsFirstArgument                   | SelfAsFirstArgument: The first argument instance methods should be "self"  |
| Medium   | Too Many Arguments                              | OPT.PYTHON.MAINTAINABILITY.TooManyArguments                      | TooManyArguments: Too much arguments in function, method or lambda   |
| Medium   | Too Many Statements                             | OPT.PYTHON.MAINTAINABILITY.TooManyStatements                     | TooManyStatements: Too high number of statements in a method   |
| Medium   | Unnecessary Pass Stmt                           | OPT.PYTHON.MAINTAINABILITY.UnnecessaryPassStmt                   | UnnecessaryPassStmt: Avoid using pass statement when is not necessary  |
| Medium   | Wildcard Import                                 | OPT.PYTHON.MAINTAINABILITY.WildcardImport                        | WildcardImport: Avoid using * in import statements   |
| Medium   | Access Dictionary Element                       | OPT.PYTHON.PORTABILITY.AccessDictionaryElement                   | AccessDictionaryElement: Do not use [] to access dictionary elements   |
| Medium   | Avoid Deprecated Raising Exception Form         | OPT.PYTHON.PORTABILITY.AvoidDeprecatedRaisingExceptionForm       | AvoidDeprecatedRaisingExceptionForm: Avoid using the deprecated raising exception form                             |
| Medium   | Avoid Print Statement                           | OPT.PYTHON.PORTABILITY.AvoidPrintStatement                       | AvoidPrintStatement: Avoid using print statement   |
| Medium   | Dont Use Backticks                              | OPT.PYTHON.PORTABILITY.DontUseBackticks                          | DontUseBackticks: Avoid using backticks  |
| Medium   | Hardcoded Absolute Path                         | OPT.PYTHON.PORTABILITY.HardcodedAbsolutePath                     | HardcodedAbsolutePath: Do not hardcode absolute paths  |
| Medium   | Property On An Old Style Class                  | OPT.PYTHON.PORTABILITY.PropertyOnAnOldStyleClass                 | PropertyOnAnOldStyleClass: Avoid using @property decorator on old-style class                                      |
| Medium   | Use New Class Style                             | OPT.PYTHON.PORTABILITY.UseNewClassStyle                          | UseNewClassStyle: Use the new class definition style   |
| Medium   | Avoid Assigning Functions Not Returning A Value | OPT.PYTHON.RELIABILITY.AvoidAssigningFunctionsNotReturningAValue | AvoidAssigningFunctionsNotReturningAValue: Avoid assigning functions not returning a value                         |
| Medium   | Avoid Break And Continue Outside Loop           | OPT.PYTHON.RELIABILITY.AvoidBreakAndContinueOutsideLoop          | AvoidBreakAndContinueOutsideLoop: Avoid using the BREAK and CONTINUE statements outside a LOOP                     |
| Medium   | Avoid Capturing Generic Exception               | OPT.PYTHON.RELIABILITY.AvoidCapturingGenericException            | AvoidCapturingGenericException: Avoid capturing generic exceptions   |
| Medium   | Avoid Characters And Numerals Confusion         | OPT.PYTHON.RELIABILITY.AvoidCharactersAndNumeralsConfusion       | AvoidCharactersAndNumeralsConfusion: Avoid confusion between characters and numerals when used as name identifiers |
| Medium   | Avoid Empty Except                              | OPT.PYTHON.RELIABILITY.AvoidEmptyExcept                          | AvoidEmptyExcept: Avoid using empty except clauses   |
| Medium   | Avoid Explicit Returns Init                     | OPT.PYTHON.RELIABILITY.AvoidExplicitReturnsInit                  | AvoidExplicitReturnsInit: Avoid returning into __init__  |

| Severity | Contrast rule                              | Engine rule ID   | Description  |
|----------|--|--|--|
| Medium   | Avoid Using Return And Yield Together      | OPT.PYTHON.RELIABILITY.AvoidUsingReturnAndYieldTogether    | AvoidUsingReturnAndYieldTogether: Avoid using return inside a generator  |
| Medium   | Check Exit Method Signature                | OPT.PYTHON.RELIABILITY.CheckExitMethodSignature            | CheckExitMethodSignature: Check method signature   |
| Medium   | Duplicate Argument Name                    | OPT.PYTHON.RELIABILITY.DuplicateArgumentName               | DuplicateArgumentName: Avoid using name for more than a function argument  |
| Medium   | Duplicated Field Name With Class           | OPT.PYTHON.RELIABILITY.DuplicatedFieldNameWithClass        | DuplicatedFieldNameWithClass: Avoid same name for attribute than the class   |
| Medium   | Future Import Is Not The First             | OPT.PYTHON.RELIABILITY.FutureImportsNotTheFirst            | FutureImportsNotTheFirst: Avoid to import <code>__future__</code> module in the middle of a module                           |
| Medium   | Redefinition Into List Comprehension       | OPT.PYTHON.RELIABILITY.RedefinitionIntoListComprehension   | RedefinitionIntoListComprehension: Avoid variable redefinitions into a list comprehension                                    |
| Medium   | Static Method First Argument               | OPT.PYTHON.RELIABILITY.StaticMethodFirstArgument           | StaticMethodFirstArgument: The first argument of static methods should not be neither <code>cls</code> nor <code>self</code> |
| Medium   | Unreachable Code                           | OPT.PYTHON.RELIABILITY.UnreachableCode                     | UnreachableCode: Avoid unreachable code  |
| Medium   | Execution After Redirect                   | OPT.PYTHON.SECURITY.ExecutionAfterRedirect                 | ExecutionAfterRedirect: Execution After Redirect (EAR)   |
| Medium   | Potential Infinite Loop                    | OPT.PYTHON.SECURITY.PotentialInfiniteLoop                  | PotentialInfiniteLoop: Loop with Unreachable Exit Condition ('Infinite Loop')  |
| Medium   | Unchecked Input In Loop Condition          | OPT.PYTHON.SECURITY.UncheckedInputInLoopCondition          | UncheckedInputInLoopCondition: Unchecked input in loop condition   |
| Medium   | Hardcoded Auth Data                        | OPT.PYTHON.SECURITY.HardcodedAuthData                      | HardcodedAuthData: Use of Hard-coded Credentials   |
| Medium   | Information Exposure Through Error Message | OPT.PYTHON.SECURITY.InformationExposureThroughErrorMessage | InformationExposureThroughErrorMessage: Avoid sensitive information exposure through error messages                          |
| Medium   | Password In Configuration File             | OPT.PYTHON.SECURITY.PasswordInConfigurationFile            | PasswordInConfigurationFile: Use of Password into configuration file   |
| Medium   | Insecure Randomness                        | OPT.PYTHON.SECURITY.InsecureRandomness                     | InsecureRandomness: Standard pseudo-random number generators cannot withstand cryptographic attacks                          |

## RPG4 Scan rules

Contrast Scan supports these rules for RPG4.

| Severity | Contrast rule                         | Engine rule ID                                  | Description  |
|----------|---------------------------------------|---|--|
| Critical | Connection String Parameter Pollution | OPT.RPG4.SEC.ConnectionStringParameterPollution | ConnectionStringParameterPollution: Connection string polluted with untrusted input                      |
| Critical | Cross Site Scripting                  | OPT.RPG4.SEC.CrossSiteScripting                 | CrossSiteScripting: Improper Neutralization of Input During Web Page Generation ('Cross-site Scripting') |

| Severity | Contrast rule                    | Engine rule ID                            | Description  |
|----------|----------------------------------|---|--|
| Critical | OS Command Injection             | OPT.RPG4.SEC.OSCommandInjection           | OSCommandInjection: Improper Neutralization of Special Elements used in an OS Command ('OS Command Injection')                   |
| Critical | Process Control                  | OPT.RPG4.SEC.ProcessControl               | ProcessControl: Avoid calling subprogram where its name could be controlled by user input  |
| Critical | Regex Injection                  | OPT.RPG4.SEC.RegexInjection               | RegexInjection: Prevent denial of service attack through malicious regular expression ('Regex Injection')                        |
| Critical | Resource Injection               | OPT.RPG4.SEC.ResourceInjection            | ResourceInjection: Improper Control of Resource Identifiers ('Resource Injection')   |
| Critical | SQL Injection                    | OPT.RPG4.SEC.SqlInjection                 | SqlInjection: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection')                               |
| Critical | Alloc Heap Misuse                | OPT.RPG4.REL.AllocHeapMisuse              | AllocHeapMisuse: Check that allocated memory is properly freed   |
| Critical | Path Manipulation                | OPT.RPG4.SEC.PathManipulation             | PathManipulation: External Control of File Name or Path  |
| Critical | Read Record Before Update Delete | OPT.RPG4.SEC.ReadRecordBeforeUpdateDelete | ReadRecordBeforeUpdateDelete: A record UPDATE or DELETE operation must be preceded by a record read operation (CHAIN or READxxx) |
| Critical | Special Authority Granted        | OPT.RPG4.SEC.SpecialAuthorityGranted      | SpecialAuthorityGranted: Least privilege failure due to special authority granted  |
| Critical | Unexpected Key Select            | OPT.RPG4.SEC.UnexpectedKeySelect          | UnexpectedKeySelect: Authorization Bypass Through User-Controlled SQL Primary Key  |
| Critical | Check Crypto Return Code         | OPT.RPG4.SEC.CheckCryptoReturnCode        | CheckCryptoReturnCode: Validate return code for cryptographic operations   |
| Critical | Hardcoded Crypto Key             | OPT.RPG4.SEC.HardcodedCryptoKey           | HardcodedCryptoKey: Use of Hard-coded Cryptographic Key  |
| High     | Ldap Injection                   | OPT.RPG4.SEC.LdapInjection                | LdapInjection: Avoid non-neutralized user-controlled input in LDAP search filters.   |
| High     | Log Forging                      | OPT.RPG4.SEC.LogForging                   | LogForging: Improper Output Neutralization for Logs  |
| High     | Avoid Binary Declarations        | OPT.RPG4.AvoidBinaryDeclarations          | AvoidBinaryDeclarations: Avoid to declare variables of binary type   |
| High     | Const Params When Not Modified   | OPT.RPG4.ConstParamsWhenNotModified       | ConstParamsWhenNotModified: To use 'Const' in parameters of subprocedures that are not modified                                  |
| High     | Initialize Variables             | OPT.RPG4.InitializeVariables              | InitializeVariables: Initialize each variable in its declaration   |
| High     | Call Parameter Mismatch          | OPT.RPG4.REL.CallParameterMismatch        | CallParameterMismatch: Parameter mismatch in CALL  |
| High     | Pointer Arithmetic               | OPT.RPG4.SEC.PointerArithmetic            | PointerArithmetic: Avoid pointer arithmetic in RPG   |
| High     | Hardcoded Ip                     | OPT.RPG4.SEC.HardcodedIp                  | HardcodedIp: Do not write IP address in source code  |
| High     | No Active Debug Rule             | OPT.RPG4.SEC.NoActiveDebugRule            | NoActiveDebugRule: Information Exposure Through Debug Information  |
| High     | Position Before Read File        | OPT.RPG4.SEC.PositionBeforeReadFile       | PositionBeforeReadFile: Every READE command must be preceded by SETLL  |
| High     | Sensitive Security Api Call      | OPT.RPG4.SEC.SensitiveSecurityApiCall     | SensitiveSecurityApiCall: Call to sensitive Security API element.  |

| Severity | Contrast rule                         | Engine rule ID                              | Description   |
|----------|---------------------------------------|---|---|
| High     | Insecure Randomness                   | OPT.RPG4.SEC.InsecureRandomness             | InsecureRandomness: Standard pseudo-random number generators cannot withstand cryptographic attacks |
| High     | Insufficient Key Size                 | OPT.RPG4.SEC.InsufficientKeySize            | InsufficientKeySize: Weak cryptography, insufficient key length                                     |
| High     | Weak Crypto Hash                      | OPT.RPG4.SEC.WeakCryptoHash                 | WeakCryptoHash: Weak cryptographic hashes cannot guarantee data integrity                           |
| High     | Weak Encryption Algorithm             | OPT.RPG4.SEC.WeakEncryptionAlgorithm        | WeakEncryptionAlgorithm: Weak encryption algorithm  |
| Info     | Avoid Capital Specification           | OPT.RPG4.AvoidCapitalSpecification          | AvoidCapitalSpecification: Use small letters for certain sections                                   |
| Info     | Avoid Hard Coding                     | OPT.RPG4.AvoidHardCoding                    | AvoidHardCoding: Declare constants instead of string and integer literals                           |
| Info     | Avoid Old Opcodes                     | OPT.RPG4.AvoidOldOpcodes                    | AvoidOldOpcodes: Avoid old computations in RPG IV   |
| Info     | Capital Logical Operator              | OPT.RPG4.CapitalLogicalOperator             | CapitalLogicalOperator: Logical operators must be coded in upper-case                               |
| Info     | Comments In Program                   | OPT.RPG4.CommentsInProgram                  | CommentsInProgram: Place comments in the header and on each procedure declaration of a RPG program  |
| Info     | Declarations Order                    | OPT.RPG4.DeclarationsOrder                  | DeclarationsOrder: Elements declaration order in RPG programs / procedures                          |
| Info     | Format H Specifications               | OPT.RPG4.FormatHSpecifications              | FormatHSpecifications: Control specifications must begin at column 8                                |
| Info     | Store Copy Prototype                  | OPT.RPG4.StoreCopyPrototype                 | StoreCopyPrototype: To copy prototypes when it is necessary   |
| Info     | Use B I F Instead Op Code             | OPT.RPG4.UseBIFInsteadOpCode                | UseBIFInsteadOpCode: Use built-in functions instead of operations codes                             |
| Info     | Use Eval For String Manipulation      | OPT.RPG4.UseEvalForStringManipulation       | UseEvalForStringManipulation: It is preferable to use the EVAL statement of free-format             |
| Info     | Use Select Instead Cas Or Nested If   | OPT.RPG4.UseSelectInsteadCasOrNestedIf      | UseSelectInsteadCasOrNestedIf: Avoid complex IF ... ELSEIF, or CASxx                                |
| Info     | Password In Comment                   | OPT.RPG4.SEC.PasswordInComment              | PasswordInComment: Avoid placing passwords and other sensitive info in code comments                |
| Low      | Avoid Blocked Records                 | OPT.RPG4.AvoidBlockedRecords                | AvoidBlockedRecords: Use (N) option to read records   |
| Low      | Avoid Dangerous Conditional Sentences | OPT.RPG4.AvoidDangerousConditionalSentences | AvoidDangerousConditionalSentences: Do not use GOTO / TAG, CABXX and COMP statements                |
| Low      | Avoid Display Operation               | OPT.RPG4.AvoidDisplayOperation              | AvoidDisplayOperation: Not to use the operation Display   |
| Low      | Avoid From Column In Data Fields      | OPT.RPG4.AvoidFromColumnInDataFields        | AvoidFromColumnInDataFields: Avoid using columns to indicate the beginning of a field               |
| Low      | Avoid Obsolete Loops                  | OPT.RPG4.AvoidObsoleteLoops                 | AvoidObsoleteLoops: Do not use IFxx, WHENxx, DOUxx and DOWxx operations                             |
| Low      | Avoid Read E In Loops                 | OPT.RPG4.AvoidReadEInLoops                  | AvoidReadEInLoops: Do not use READE operations within loops   |
| Low      | Avoid Read P Read Pe                  | OPT.RPG4.AvoidReadPReadPe                   | AvoidReadPReadPe: Avoid READP and READPE  |
| Low      | Avoid Special Chars                   | OPT.RPG4.AvoidSpecialChars                  | AvoidSpecialChars: Not to use special characters to define variables                                |



| Severity | Contrast rule                        | Engine rule ID                            | Description   |
|----------|--------------------------------------|---|---|
| Low      | Built In Functions With Params       | OPT.RPG4.BuiltInFunctionsWithParams       | BuiltInFunctionsWithParams: Use %EOF(), %FOUND() and %EQUAL() with parameters                       |
| Low      | Check Indicators Near Set            | OPT.RPG4.CheckIndicatorsNearSet           | CheckIndicatorsNearSet: Avoid excessive separation between assignment of an indicator and its usage |
| Low      | Close Opened Files                   | OPT.RPG4.CloseOpenedFiles                 | CloseOpenedFiles: Close all the opened files  |
| Low      | End Block Instructions               | OPT.RPG4.EndBlockInstructions             | EndBlockInstructions: Use 'EndX' instructions instead of the generic 'End'                          |
| Low      | Eval Instead Of Set Move             | OPT.RPG4.EvalInsteadOfSetMove             | EvalInsteadOfSetMove: Use EVAL instead of SETON, SETOFF, MOVE and MOVEA with indicators             |
| Low      | Include Procedure In Large Programs  | OPT.RPG4.IncludeProcedureInLargePrograms  | IncludeProcedureInLargePrograms: Avoid too long programs  |
| Low      | Large Procedures                     | OPT.RPG4.LargeProcedures                  | LargeProcedures: Avoid too large procedures   |
| Low      | Naming Conventions                   | OPT.RPG4.NamingConventions                | NamingConventions: Some of naming conventions must be respected                                     |
| Low      | Overlay Instead Positional Notation  | OPT.RPG4.OverlayInsteadPositionalNotation | OverlayInsteadPositionalNotation: Avoid positional notation   |
| Low      | Record Format In File Operations     | OPT.RPG4.RecordFormatInFileOperations     | RecordFormatInFileOperations: Use record-format in file operations                                  |
| Low      | Use Free Format Syntax               | OPT.RPG4.UseFreeFormatSyntax              | UseFreeFormatSyntax: Use free-format syntax when available  |
| Low      | Use Named Constants To Call Programs | OPT.RPG4.UseNamedConstantsToCallPrograms  | UseNamedConstantsToCallPrograms: Use named constants with CALL and CALLB operations                 |
| Low      | Avoid Debug Control Sentences        | OPT.RPG4.AvoidDebugControlSentences       | AvoidDebugControlSentences: Do not use DEBUG in control-specification statements                    |
| Medium   | Format String Injection              | OPT.RPG4.SEC.FormatStringInjection        | FormatStringInjection: Exclude unsanitized user input from format strings                           |
| Medium   | Avoid Calling Modules                | OPT.RPG4.AvoidCallingModules              | AvoidCallingModules: Avoid call modules   |
| Medium   | Avoid Declare Vbles In Calc Spec     | OPT.RPG4.AvoidDeclareVblesInCalcSpec      | AvoidDeclareVblesInCalcSpec: Avoid variable declarations in calculation specification               |
| Medium   | Constant Instead Array Table         | OPT.RPG4.ConstantInsteadArrayTable        | ConstantInsteadArrayTable: If an array field is assigned just once, declare it as a constant        |
| Medium   | Declare Date Properly                | OPT.RPG4.DeclareDateProperly              | DeclareDateProperly: Declare variables with the suitable type                                       |
| Medium   | Improve Function Keys                | OPT.RPG4.ImproveFunctionKeys              | ImproveFunctionKeys: Avoid indicators *Inkx   |
| Medium   | Include Inz Sr                       | OPT.RPG4.IncludeInzSr                     | IncludeInzSr: Include *InzSr subroutine in the main section of the RPG program                      |
| Medium   | Naming Indicators                    | OPT.RPG4.NamingIndicators                 | NamingIndicators: To name all the declared indicators   |
| Medium   | Use Built In Instead Of Indicator    | OPT.RPG4.UseBuiltInInsteadOfIndicator     | UseBuiltInInsteadOfIndicator: Use built-in functions instead of indicators                          |

| Severity | Contrast rule        | Engine rule ID                   | Description  |
|----------|----------------------|----------------------------------|--|
| Medium   | Use Only Call P      | OPT.RPG4.UseOnlyCallP            | UseOnlyCallP: Not use CALL nor CALLB   |
| Medium   | Hardcoded Credential | OPT.RPG4.SEC.HardcodedCredential | HardcodedCredential: Use of Hard-coded Credentials   |
| Medium   | Poor Error Handling  | OPT.RPG4.SEC.PoorErrorHandling   | PoorErrorHandling: Ignoring error conditions may allow an attacker to induce unexpected behavior unnoticed |
| Medium   | Privacy Violation    | OPT.RPG4.SEC.PrivacyViolation    | PrivacyViolation: Exposure of Private Information  |

## Scala Scan rules

Contrast Scan supports these rules for Scala.

| Severity | Contrast rule                         | Engine rule ID  | Description  |
|----------|---------------------------------------|---|--|
| Critical | Too Broad CORS Policy                 | OPT.SCALA.SECURITY.TooBroadCORSPolicy                 | TooBroadCORSPolicy: Too much allowed origins in HTML5 Access-Control-Allow-Origin header                     |
| Critical | Too Much Origins Allowed              | OPT.SCALA.SECURITY.TooMuchOriginsAllowed              | TooMuchOriginsAllowedRule: CORS policy (Cross-origin resource sharing) too broad                             |
| Critical | Code Injection                        | OPT.SCALA.SECURITY.CodeInjection                      | CodeInjection: Avoid non-neutralized user-controlled input in dynamic code evaluation                        |
| Critical | Command Injection                     | OPT.SCALA.SECURITY.CommandInjection                   | CommandInjection: Improper Neutralization of Special Elements used in an OS Command ('OS Command Injection') |
| Critical | Connection String Parameter Pollution | OPT.SCALA.SECURITY.ConnectionStringParameterPollution | ConnectionStringParameterPollution: Connection string polluted with untrusted input                          |
| Critical | Cross Site Scripting                  | OPT.SCALA.SECURITY.CrossSiteScripting                 | CrossSiteScripting: Improper Neutralization of Input During Web Page Generation ('Cross-site Scripting')     |
| Critical | Http Splitting                        | OPT.SCALA.SECURITY.HttpSplitting                      | HttpSplitting: Improper Neutralization of CRLF Sequences in HTTP Headers ('HTTP Response Splitting')         |
| Critical | JSON Injection                        | OPT.SCALA.SECURITY.JSONInjection                      | JSONInjection: Avoid using non-neutralized user-controlled input into JSON entities - JSON Injection         |
| Critical | Ldap Injection                        | OPT.SCALA.SECURITY.LdapInjection                      | LdapInjection: Avoid non-neutralized user-controlled input in LDAP search filters                            |
| Critical | Mail Command Injection                | OPT.SCALA.SECURITY.MailCommandInjection               | MailCommandInjection: Mail Command Injection   |
| Critical | No SQL Injection                      | OPT.SCALA.SECURITY.NoSQLInjection                     | NoSQLInjection: Improper neutralization of special elements in data query logic (NoSQL injection)            |
| Critical | Process Control                       | OPT.SCALA.SECURITY.ProcessControl                     | ProcessControl: Library loaded from untrusted source   |
| Critical | Regex Injection                       | OPT.SCALA.SECURITY.RegexInjection                     | RegexInjection: Prevent denial of service attack through malicious regular expression ('Regex Injection')    |
| Critical | Same Origin Method Execution          | OPT.SCALA.SECURITY.SameOriginMethodExecution          | SameOriginMethodExecution: Same Origin Method Execution (SOME)   |
| Critical | SQL Injection                         | OPT.SCALA.SECURITY.SqlInjection                       | SqlInjection: Avoid SQL code formed with non neutralized user input (vulnerable to SQL Injection attacks)    |
| Critical | Xml Entity Injection                  | OPT.SCALA.SECURITY.XmlEntityInjection                 | XmlEntityInjection: XML entity injection   |
| Critical | Accessibility Subversion              | OPT.SCALA.SECURITY.AccessibilitySubversion            | AccessibilitySubversionRule: Java access restriction subverted (Reflection)                                  |

| Severity | Contrast rule                              | Engine rule ID  | Description  |
|----------|--|---|--|
| Critical | Anonymous Ldap Bind                        | OPT.SCALA.SECURITY.AnonymousLdapBind                      | AnonymousLdapBind: Access Control - Anonymous LDAP Bind  |
| Critical | Password In Redirect                       | OPT.SCALA.SECURITY.PasswordInRedirect                     | PasswordInRedirect: Password Management - Password in Redirect   |
| Critical | Path Traversal                             | OPT.SCALA.SECURITY.PathTraversal                          | PathTraversal: Avoid non-neutralized user-controlled input composed in a pathname to a resource                                  |
| Critical | Hardcoded Crypto Key                       | OPT.SCALA.SECURITY.HardcodedCryptoKey                     | HardcodedCryptoKey: Hardcoded cryptographic keys   |
| Critical | Non Random IV With CBC Mode                | OPT.SCALA.SECURITY.NonRandomIVWithCBCMode                 | NonRandomIVWithCBCMode: Not using a Random IV with CBC Mode  |
| Critical | Weak Cryptographic Hash                    | OPT.SCALA.SECURITY.WeakCryptographicHash                  | WeakCryptographicHash: Weak cryptographic hash   |
| Critical | Weak Encryption                            | OPT.SCALA.SECURITY.WeakEncryption                         | WeakEncryption: Weak symmetric encryption algorithm  |
| High     | Akka Security Misconfiguration             | OPT.SCALA.SECURITY.AkkaSecurityMisconfiguration           | AkkaSecurityMisconfiguration: Security misconfiguration in Akka framework.   |
| High     | Play Security Misconfiguration             | OPT.SCALA.SECURITY.PlaySecurityMisconfiguration           | PlaySecurityMisconfiguration: Security misconfiguration in Play framework.   |
| High     | Cross Site Request Forgery                 | OPT.SCALA.SECURITY.CrossSiteRequestForgery                | CrossSiteRequestForgery: Cross-site request forgery (CSRF)   |
| High     | External Control Of Configuration Setting  | OPT.SCALA.SECURITY.ExternalControlOfConfigurationSetting  | ExternalControlOfConfigurationSetting: External Control of System or Configuration Setting                                       |
| High     | Http Parameter Pollution                   | OPT.SCALA.SECURITY.HttpParameterPollution                 | HttpParameterPollution: HTTP parameter pollution (HPP)   |
| High     | Open Redirect                              | OPT.SCALA.SECURITY.OpenRedirect                           | OpenRedirect: Do not allow to control the URL used in a redirect by an unvalidated input   |
| High     | Resource Injection                         | OPT.SCALA.SECURITY.ResourceInjection                      | ResourceInjection: Improper control of resource identifiers ("Resource Injection")   |
| High     | Server Side Request Forgery                | OPT.SCALA.SECURITY.ServerSideRequestForgery               | ServerSideRequestForgery: Creation of requests from a vulnerable server using untrusted input (server side request forgery SSRF) |
| High     | Trust Boundary Violation                   | OPT.SCALA.SECURITY.TrustBoundaryViolation                 | TrustBoundaryViolation: Trust boundary violation   |
| High     | Unsafe Reflection                          | OPT.SCALA.SECURITY.UnsafeReflection                       | UnsafeReflection: Use of Externally-Controlled Input to Select Classes or Code ('Unsafe Reflection')                             |
| High     | XPath Injection                            | OPT.SCALA.SECURITY.XPathInjection                         | XPathInjection: Improper Neutralization of Data within XPath Expressions ('XPath Injection')                                     |
| High     | Xslt Injection                             | OPT.SCALA.SECURITY.XsltInjection                          | XsltInjection: XML Injection (aka Blind XPath Injection)   |
| High     | Hardcoded Ip                               | OPT.SCALA.SECURITY.HardcodedIp                            | HardcodedIp: Do not write IP address in source code  |
| High     | Information Exposure Through Error Message | OPT.SCALA.SECURITY.InformationExposureThroughErrorMessage | InformationExposureThroughErrorMessage: Avoid sensitive information exposure through error messages                              |
| High     | Cookies In Security Decision               | OPT.SCALA.SECURITY.CookiesInSecurityDecision              | CookiesInSecurityDecision: Reliance on Cookies without Validation and Integrity Checking in a Security Decision                  |
| High     | User Controlled SQL Primary Key            | OPT.SCALA.SECURITY.UserControlledSQLPrimaryKey            | UserControlledSQLPrimaryKey: Avoid using an user controlled Primary Key into a query   |
| High     | Hardcoded Salt                             | OPT.SCALA.SECURITY.HardcodedSalt                          | HardcodedSalt: A hardcoded salt can compromise system security   |

| Severity | Contrast rule                                | Engine rule ID  | Description   |
|----------|--|---|---|
| High     | Inadequate Padding                           | OPT.SCALA.SECURITY.InadequatePadding                        | InadequatePadding: Inadequate padding   |
| High     | Insecure Transport                           | OPT.SCALA.SECURITY.InsecureTransport                        | InsecureTransport: Insecure transport   |
| High     | Insufficient Key Size                        | OPT.SCALA.SECURITY.InsufficientKeySize                      | InsufficientKeySize: Weak cryptography, insufficient key length                                       |
| Info     | Log Forging                                  | OPT.SCALA.SECURITY.LogForging                               | LogForging: Improper Output Neutralization for Logs   |
| Medium   | Plaintext Storage In A Cookie Rule           | OPT.SCALA.SECURITY.PlaintextStorageInACookieRule            | PlaintextStorageInACookieRule: Cleartext Storage of Sensitive Information in a Cookie                 |
| Medium   | Unsafe Cookie                                | OPT.SCALA.SECURITY.UnsafeCookie                             | UnsafeCookie: Generate server-side cookies with adequate security properties                          |
| Medium   | Avoid Host Name Checks                       | OPT.SCALA.SECURITY.AvoidHostNameChecks                      | AvoidHostNameChecks: Avoid checks on client-side hostname, that are not reliable due to DNS poisoning |
| Medium   | Format String Injection                      | OPT.SCALA.SECURITY.FormatStringInjection                    | FormatStringInjection: Exclude unsanitized user input from format strings                             |
| Medium   | Serialization Injection                      | OPT.SCALA.SECURITY.SerializationInjection                   | SerializationInjection: Deserialization of untrusted data   |
| Medium   | Hardcoded Username Password                  | OPT.SCALA.SECURITY.HardcodedUsernamePassword                | HardcodedUsernamePassword: Use of Hard-coded Credentials  |
| Medium   | JSON P Hijacking                             | OPT.SCALA.SECURITY.JSONPHijacking                           | JSONPHijacking: Sensitive information exposed through JSONP   |
| Medium   | Password In Configuration File               | OPT.SCALA.SECURITY.PasswordInConfigurationFile              | PasswordInConfigurationFile: Use of credentials into configuration file                               |
| Medium   | Avoid Native Calls                           | OPT.SCALA.SECURITY.AvoidNativeCalls                         | AvoidNativeCalls: Avoid calls from Scala to native (JNI) code   |
| Medium   | Plaintext Storage Of Password                | OPT.SCALA.SECURITY.PlaintextStorageOfPassword               | PlaintextStorageOfPassword: Plaintext Storage of a Password   |
| Medium   | Privacy Violation                            | OPT.SCALA.SECURITY.PrivacyViolation                         | PrivacyViolation: Exposure of Private Information ('Privacy Violation')                               |
| Medium   | Serializable Class Containing Sensitive Data | OPT.SCALA.SECURITY.SerializableClassContainingSensitiveData | SerializableClassContainingSensitiveData: Serializable Class Containing Sensitive Data                |
| Medium   | Detail Error Leak                            | OPT.SCALA.SECURITY.DetailErrorLeak                          | DetailErrorLeakRule: Do not send detail error information to client                                   |
| Medium   | Execution After Redirect                     | OPT.SCALA.SECURITY.ExecutionAfterRedirect                   | ExecutionAfterRedirect: Execution After Redirect (EAR)  |
| Medium   | Potential Infinite Loop                      | OPT.SCALA.SECURITY.PotentialInfiniteLoop                    | PotentialInfiniteLoop: Loop with Unreachable Exit Condition ('Infinite Loop')                         |
| Medium   | Unchecked Input In Loop Condition            | OPT.SCALA.SECURITY.UncheckedInputInLoopCondition            | UncheckedInputInLoopCondition: Unchecked input in loop condition                                      |
| Medium   | Insecure Randomness                          | OPT.SCALA.SECURITY.InsecureRandomness                       | InsecureRandomness: Standard pseudo-random number generators cannot withstand cryptographic attacks   |

## SQL Scan rules

Contrast Scan supports these rules for SQL.

| Severity | Contrast rule                          | Engine rule ID  | Description   |
|----------|--|---|---|
| Critical | Detect Unaware Cross Joins             | OPT.SQL.SQL_PB.DetectUnawareCrossJoins                        | DetectUnawareCrossJoins: Do not make "unnoticed" cartesian products in queries  |
| Critical | Fetch And Declare Same Fields          | OPT.SQL.SQL_PB.FetchAndDeclareSameFields                      | FetchAndDeclareSameFields: The number of fields to retrieve specified in the DECLARE CURSOR statement must be the same as the number of fields specified in the FETCH statement |
| Critical | Avoid Correlated Sub Selects           | OPT.SQL.SQL_PERFORMANCE.AvoidCorrelatedSubSelects             | AvoidCorrelatedSubSelects: Avoid nested SELECTs that use columns defined in outer SELECTs   |
| Critical | Cursor For Update Where Current        | OPT.SQL.SQL_PERFORMANCE.CursorForUpdateWhereCurrent           | CursorForUpdateWhereCurrent: If a CURSOR is declared FOR UPDATE, DELETE and UPDATE must be used with the WHERE CURRENT specification  |
| Critical | Dont Select Known Fields               | OPT.SQL.SQL_PERFORMANCE.DontSelectKnownFields                 | DontSelectKnownFields: SELECT queries never should get fields used in the WHERE specification with {}   |
| High     | Avoid Scroll Cursor                    | OPT.SQL.AvoidScrollCursor                                     | AvoidScrollCursor: Do not use SCROLL CURSOR clause  |
| High     | Check Updt Dlt Rowset                  | OPT.SQL.CheckUpdtDltRowset                                    | CheckUpdtDltRowset: Do not use the FOR ROW n OF ROWSET clause in UPDATE or DELETE statements with MULTIROW option.  |
| High     | Check Insert Not Atomic                | OPT.SQL.CheckInsertNotAtomic                                  | CheckInsertNotAtomic: Do not use the NOT ATOMIC CONTINUE ON SQLEXCEPTION in SELECT statements with MULTIROW option  |
| High     | Avoid Dynamic SQL                      | OPT.SQL.AvoidDynamicSql                                       | AvoidDynamicSql: Do not use dynamic SQL   |
| High     | Avoid Lock Table                       | OPT.SQL.AvoidLockTable  | AvoidLockTable: Do not use LOCK TABLE statement   |
| High     | Avoid Numeric References In By Clauses | OPT.SQL.SQL_MAINTAINABILITY.AvoidNumericReferencesInByClauses | AvoidNumericReferencesInByClauses: Do not refer to column names with number indexes in * BY clauses   |
| High     | Use The As Keyword                     | OPT.SQL.SQL_MAINTAINABILITY.UseTheAsKeyword                   | UseTheAsKeyword: Use AS keyword when establishing an alias to tables  |
| High     | Avoid Declared Unopened Cursors        | OPT.SQL.SQL_PERFORMANCE.AvoidDeclaredUnopenedCursors          | AvoidDeclaredUnopenedCursors: If a CURSOR is declared, it must be opened  |
| High     | Avoid For Update Wait Forever          | OPT.SQL.SQL_PERFORMANCE.AvoidForUpdateWaitForever             | AvoidForUpdateWaitForever: No use FOR UPDATE without specifying NOWAIT or WAIT n  |
| High     | Avoid Opened Unclosed Cursors          | OPT.SQL.SQL_PERFORMANCE.AvoidOpenedUnclosedCursors            | AvoidOpenedUnclosedCursors: If a CURSOR is opened, it must be closed  |
| High     | Avoid Opened Unused Cursors            | OPT.SQL.SQL_PERFORMANCE.AvoidOpenedUnusedCursors              | AvoidOpenedUnusedCursors: If a CURSOR is opened, it must be used  |
| High     | Avoid Union                            | OPT.SQL.SQL_PERFORMANCE.AvoidUnion                            | AvoidUnion: Avoid selects with UNION  |
| High     | No Current Clause                      | OPT.SQL.SQL_PERFORMANCE.NoCurrentClause                       | NoCurrentClause: SQL queries with CURRENT clause are heavy-weighted and must be used only when necessary  |

| Severity | Contrast rule                             | Engine rule ID  | Description  |
|----------|---|---|--|
| Info     | Avoid Concat Operator                     | OPT.SQL.AvoidConcatOperator                               | AvoidConcatOperator: Do not use concatenation operator   |
| Info     | Avoid Current Server                      | OPT.SQL.AvoidCurrentServer                                | AvoidCurrentServer: Do not use CURRENT SERVER  |
| Info     | Avoid Numeric Cursor                      | OPT.SQL.AvoidNumericCursor                                | AvoidNumericCursor: Incorrect nomenclature for cursor name   |
| Info     | Avoid Current Time                        | OPT.SQL.AvoidCurrentTime                                  | AvoidCurrentTime: Do not use CURRENT TIME  |
| Info     | Avoid Current Date                        | OPT.SQL.AvoidCurrentDate                                  | AvoidCurrentDate: Do not use CURRENT DATE  |
| Info     | Avoid Non Declared Cursor                 | OPT.SQL.AvoidNonDeclaredCursor                            | AvoidNonDeclaredCursor: Use of cursor not previously declared  |
| Info     | Avoid Current Timestamp                   | OPT.SQL.AvoidCurrentTimestamp                             | AvoidCurrentTimestamp: Do not use CURRENT TIMESTAMP, CURRENT DATE or CURRENT TIME  |
| Info     | Check Nulls In Select Count               | OPT.SQL.CheckNullsInSelectCount                           | CheckNullsInSelectCount: Do not use null indicator in queries with COUNT function  |
| Info     | Use Null Indicator                        | OPT.SQL.UseNullIndicator                                  | UseNullIndicator: Use null indicator in queries with MAX, MIN, AVG and SUM functions   |
| Info     | Avoid Non Qualified Joins                 | OPT.SQL.SQL_PORTABILITY.AvoidNonQualifiedJoins            | AvoidNonQualifiedJoins: Make the type of join explicit   |
| Low      | Do Not Use Negation In Where              | OPT.SQL.DoNotUseNegationInWhere                           | DoNotUseNegationInWhere: Do not use negation operator  |
| Low      | Avoid Whenever                            | OPT.SQL.AvoidWhenever                                     | AvoidWhenever: Do not use WHENEVER clause  |
| Low      | Avoid Host Operations                     | OPT.SQL.AvoidHostOperations                               | AvoidHostOperations: Do not perform arithmetic operations in the WHERE clause  |
| Low      | Avoid Having                              | OPT.SQL.AvoidHaving                                       | AvoidHaving: Do not use HAVING clause  |
| Low      | Check Simple Condition                    | OPT.SQL.CheckSimpleCondition                              | CheckSimpleCondition: Simplify WHERE clause conditions   |
| Low      | Avoid Qualified Tables In Queries         | OPT.SQL.SQL_MAINTAINABILITY.AvoidQualifiedTablesInQueries | AvoidQualifiedTablesInQueries: Table names should not be qualified in queries  |
| Low      | One SQL Statement Per Line                | OPT.SQL.SQL_MAINTAINABILITY.OneSQLStatementPerLine        | OneSQLStatementPerLine: Only write a SQL statement per line  |
| Low      | Qualified Tables In Queries               | OPT.SQL.SQL_MAINTAINABILITY.QualifiedTablesInQueries      | QualifiedTablesInQueries: Every table referenced in the query must be qualified  |
| Low      | Avoid Insert Without Fields Specification | OPT.SQL.SQL_PB.AvoidInsertWithoutFieldsSpecification      | AvoidInsertWithoutFieldsSpecification: Every INSERT statement must include the field specification (i.e : INSERT INTO table(column1,column2) VALUES (value1,value2)) |
| Low      | Avoid Group By                            | OPT.SQL.SQL_PERFORMANCE.AvoidGroupBy                      | AvoidGroupBy: Avoid to use GROUP BY clause   |
| Medium   | Avoid Case In Select                      | OPT.SQL.AvoidCaseInSelect                                 | AvoidCaseInSelect: Do not use CASE clause  |

| Severity | Contrast rule                    | Engine rule ID   | Description  |
|----------|----------------------------------|--|--|
| Medium   | Check Number Tables              | OPT.SQL.CheckNumberTables                                | CheckNumberTables: Do not code queries with more than one table                  |
| Medium   | Fully Qualified Names In Columns | OPT.SQL.SQL_MAINTAINABILITY.FullyQualifiedNamesInColumns | FullyQualifiedNamesInColumns: Use qualified names when referring to column names |
| Medium   | Avoid Natural Joins              | OPT.SQL.SQL_PB.AvoidNaturalJoins                         | AvoidNaturalJoins: NATURAL JOINS are buggy and unmaintenable                     |
| Medium   | Avoid Nested Selects             | OPT.SQL.SQL_PERFORMANCE.AvoidNestedSelects               | AvoidNestedSelects: Avoid nested selects   |
| Medium   | Avoid Queries On Many Tables     | OPT.SQL.SQL_PERFORMANCE.AvoidQueriesOnManyTables         | AvoidQueriesOnManyTables: Avoid JOIN queries referencing too many tables         |
| Medium   | Avoid Select Asterisk            | OPT.SQL.SQL_PERFORMANCE.AvoidSelectAsterisk              | AvoidSelectAsterisk: Do not use SELECT *   |
| Medium   | Avoid Too Many Joins             | OPT.SQL.SQL_PERFORMANCE.AvoidTooManyJoins                | AvoidTooManyJoins: Avoid queries with too many JOINS                             |
| Medium   | Detect Implicit Joins            | OPT.SQL.SQL_PERFORMANCE.DetectImplicitJoins              | DetectImplicitJoins: Never use implicit JOINS                                    |
| Medium   | Prefer On Over Using             | OPT.SQL.SQL_PORTABILITY.PreferOnOverUsing                | PreferOnOverUsing: Replace Using clause for its equivalent On counterpart        |

## SQLScript Scan rules

Contrast Scan supports these rules for SQLScript.

| Severity | Contrast rule                      | Engine rule ID                                     | Description  |
|----------|------------------------------------|--|--|
| Critical | SQL Injection                      | OPT.HANA.SEC.SqlInjection                          | SqlInjection: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection') |
| Critical | Avoid Trace In Production          | OPT.HANA.EFFICIENCY.AvoidTraceInProduction         | AvoidTraceInProduction: Avoid TRACE in production code.  |
| Critical | Deeply Nested Subqueries           | OPT.HANA.EFFICIENCY.DeeplyNestedSubqueries         | DeeplyNestedSubqueries: Deeply nested subqueries.  |
| Critical | Use Of Calculation Engine Operator | OPT.HANA.EFFICIENCY.UseOfCalculationEngineOperator | UseOfCalculationEngineOperator: Use of HANA Calculation Engine Plan Operators (CE Functions).      |
| Critical | Excessive Privileges Granted       | OPT.HANA.SEC.ExcessivePrivilegesGranted            | ExcessivePrivilegesGranted: Excessive privileges granted.  |
| High     | Non Trivial Subquery               | OPT.HANA.EFFICIENCY.NonTrivialSubquery             | NonTrivialSubquery: Non-trivial subqueries.  |
| High     | Select In Scalar Function          | OPT.HANA.EFFICIENCY.SelectInScalarFunction         | SelectInScalarFunction: SELECT ... INTO in scalar function.  |
| High     | Improper Parameter Usage           | OPT.HANA.RELIABILITY.ImproperParameterUsage        | ImproperParameterUsage: Improper parameter usage.  |
| High     | Forbidden Call                     | OPT.HANA.SEC.ForbiddenCall                         | ForbiddenCall: Call to unsafe or dangerous procedure / function.                                   |

| Severity | Contrast rule                  | Engine rule ID                                  | Description   |
|----------|--------------------------------|---|---|
| Low      | Language Not Specified         | OPT.HANA.MAINTAINABILITY.LanguageNotSpecified   | LanguageNotSpecified: LANGUAGE not specified.                                     |
| Low      | Unused Condition               | OPT.HANA.MAINTAINABILITY.UnusedCondition        | UnusedCondition: Unused Error Condition.  |
| Low      | Non Custom Error Code          | OPT.HANA.RELIABILITY.NonCustomErrorCode         | NonCustomErrorCode: Use of non-custom SQL Error Code.                             |
| Medium   | Avoid Using Cursors            | OPT.HANA.EFFICIENCY.AvoidUsingCursors           | AvoidUsingCursors: Avoid Using Cursors.   |
| Medium   | Modification Statement In Loop | OPT.HANA.EFFICIENCY.ModificationStatementInLoop | ModificationStatementInLoop: Data modification statement in a loop.               |
| Medium   | Reads SQL Data Not Specified   | OPT.HANA.EFFICIENCY.ReadsSqlDataNotSpecified    | ReadsSqlDataNotSpecified: Specify READS SQL DATA for side-effect free procedures. |
| Medium   | Unused Variable                | OPT.HANA.EFFICIENCY.UnusedVariable              | UnusedVariable: Unused local variable.  |
| Medium   | Use Of Uninitialized Var       | OPT.HANA.RELIABILITY.UseOfUninitializedVar      | UseOfUninitializedVar: Use of uninitialized variable.                             |

## Swift Scan rules

Contrast Scan supports these rules for Swift.

| Severity | Contrast rule                         | Engine rule ID  | Description  |
|----------|---------------------------------------|---|--|
| Critical | Code Injection                        | OPT.SWIFT.SECURITY.CodeInjection                      | CodeInjection: Avoid non-neutralized user controlled input in dynamic code evaluation                    |
| Critical | Command Injection                     | OPT.SWIFT.SECURITY.CommandInjection                   | CommandInjection: Improper Neutralization of Special Elements used in an OS Command (Command Injection') |
| Critical | Connection String Parameter Pollution | OPT.SWIFT.SECURITY.ConnectionStringParameterPollution | ConnectionStringParameterPollution: Connection string polluted with untrusted input                      |
| Critical | Cross Site Scripting                  | OPT.SWIFT.SECURITY.CrossSiteScripting                 | CrossSiteScripting: Improper Neutralization of Input During Web Page Generation ('Cross Site Scripting') |
| Critical | Header Manipulation                   | OPT.SWIFT.SECURITY.HeaderManipulation                 | HeaderManipulation: Avoid including untrusted data in HTTP response header or in Cookie                  |
| Critical | JSON Injection                        | OPT.SWIFT.SECURITY.JSONInjection                      | JSONInjection: Avoid using non-neutralized user controlled input into JSON entities - JSON Injection     |
| Critical | Mail Command Injection                | OPT.SWIFT.SECURITY.MailCommandInjection               | MailCommandInjection: Mail Command Injection   |
| Critical | No SQL Injection                      | OPT.SWIFT.SECURITY.NoSQLInjection                     | NoSQLInjection: Improper neutralization of user input elements in data query logic (NoSQL injection)     |
| Critical | Regex Injection                       | OPT.SWIFT.SECURITY.RegexInjection                     | RegexInjection: Prevent denial of service through malicious regular expression ('Regex Injection')       |
| Critical | SQL Injection                         | OPT.SWIFT.SECURITY.SqlInjection                       | SqlInjection: Avoid SQL code formed with non-neutralized user input (vulnerable to SQL attacks)          |
| Critical | Xpath Injection                       | OPT.SWIFT.SECURITY.XpathInjection                     | XpathInjection: Avoid XPath expressions with non neutralized user input                                  |



| Severity | Contrast rule                                   | Engine rule ID   | Description  |
|----------|---|--|--|
| Critical | Missing Password Field Masking                  | OPT.SWIFT.SECURITY.MissingPasswordFieldMasking                 | MissingPasswordFieldMasking: Password field is not masked  |
| Critical | Avoid Dangerous Try                             | OPT.SWIFT.RELIABILITY.AvoidDangerousTry                        | AvoidDangerousTry: Avoid using try operator along with ! operator                                    |
| Critical | Path Traversal                                  | OPT.SWIFT.SECURITY.PathTraversal                               | PathTraversal: Avoid non-neutralized user controlled input composed in a pathname resource           |
| Critical | Weak Cryptographic Hash                         | OPT.SWIFT.SECURITY.WeakCryptographicHash                       | WeakCryptographicHash: Weak cryptographic hashes cannot guarantee data integrity                     |
| Critical | Weak Cryptographic Hash Salt                    | OPT.SWIFT.SECURITY.WeakCryptographicHashSalt                   | WeakCryptographicHashSalt: Weak cryptographic salts cannot guarantee data integrity                  |
| Critical | Weak Cryptographic Key                          | OPT.SWIFT.SECURITY.WeakCryptographicKey                        | WeakCryptographicKey: Weak keys used for cryptographic purposes                                      |
| Critical | Weak Encryption                                 | OPT.SWIFT.SECURITY.WeakEncryption                              | WeakEncryption: Weak symmetric encryption algorithm  |
| Critical | Weak Key Derivation Iteration                   | OPT.SWIFT.SECURITY.WeakKeyDerivationIteration                  | WeakKeyDerivationIteration: Too weak iteration count on key derivation                               |
| Critical | Weak Key Derivation Password                    | OPT.SWIFT.SECURITY.WeakKeyDerivationPassword                   | WeakKeyDerivationPassword: Empty or weak password used in key derivation                             |
| Critical | Weak Symmetric Encryption Initialization Vector | OPT.SWIFT.SECURITY.WeakSymmetricEncryptionInitializationVector | WeakSymmetricEncryptionInitializationVector: Weak encryption initialization data vector              |
| Critical | Weak Symmetric Encryption Mode Of Operation     | OPT.SWIFT.SECURITY.WeakSymmetricEncryptionModeOfOperation      | WeakSymmetricEncryptionModeOfOperation: Do not use weak modes of operation with symmetric encryption |
| High     | Http Parameter Pollution Rule                   | OPT.SWIFT.SECURITY.HttpParameterPollutionRule                  | HttpParameterPollutionRule: HTTP parameter pollution (HPP)   |
| High     | Log Forging                                     | OPT.SWIFT.SECURITY.LogForging                                  | LogForging: Improper Output Neutralization in Logs   |
| High     | Open Redirect                                   | OPT.SWIFT.SECURITY.OpenRedirect                                | OpenRedirect: Do not allow to control the redirect used in a redirect by an unvalidated input        |
| High     | Resource Injection                              | OPT.SWIFT.SECURITY.ResourceInjection                           | ResourceInjection: Improper control of resource identifiers ("Resource Injection")                   |
| High     | Unsafe Reflection                               | OPT.SWIFT.SECURITY.UnsafeReflection                            | UnsafeReflection: Use of Externally-Controlled Input to Select Classes or Code ('Unsafe Reflection') |
| High     | URL Scheme Hijacking                            | OPT.SWIFT.SECURITY.URLSchemeHijacking                          | URLSchemeHijacking: URL scheme hijacking through user input  |
| High     | XML Entity Injection                            | OPT.SWIFT.SECURITY.XMLEntityInjection                          | XMLEntityInjection: XML entity injection   |
| High     | XML Injection                                   | OPT.SWIFT.SECURITY.XMLInjection                                | XMLInjection: XML Injection (aka Blind XML Injection)  |
| High     | Hardcoded Ip                                    | OPT.SWIFT.SECURITY.HardcodedIp                                 | HardcodedIp: Do not write IP address in source code  |
| High     | Avoid Maximum Location Accuracy When Possible   | OPT.SWIFT.EFFICIENCY.AvoidMaximumLocationAccuracyWhenPossible  | AvoidMaximumLocationAccuracyWhenPossible: Avoid using by default the best location accuracy          |

| Severity | Contrast rule                             | Engine rule ID  | Description   |
|----------|---|---|---|
| High     | Cache Date Formatters                     | OPT.SWIFT.EFFICIENCY.CacheDateFormatters                    | CacheDateFormatters: Cache a single instance of NSDateFormatter from NSDateFormatter types instead of creating multiple instances |
| High     | Do Not Instantiate Temporal Objects Loops | OPT.SWIFT.EFFICIENCY.DoNotInstantiateTemporalObjectsLoops   | DoNotInstantiateTemporalObjectsLoops: Avoid allocating temporal objects in loop bodies  |
| High     | Minimize Bluetooth Interaction            | OPT.SWIFT.EFFICIENCY.MinimizeBluetoothInteraction           | MinimizeBluetoothInteraction: Avoid using CBCentralManagerScanOptionAllowDuplicates as a scan option constant                     |
| High     | Class Cyclomatic Complexity               | OPT.SWIFT.MAINTAINABILITY.ClassCyclomaticComplexity         | ClassCyclomaticComplexity: Avoid using classes with high cyclomatic complexity values   |
| High     | Dead Stores                               | OPT.SWIFT.MAINTAINABILITY.DeadStores                        | DeadStores: Bound local variable value is not used  |
| High     | Method Cyclomatic Complexity              | OPT.SWIFT.MAINTAINABILITY.MethodCyclomaticComplexity        | MethodCyclomaticComplexity: Avoid using methods with high cyclomatic complexity values  |
| High     | Unused Local Var                          | OPT.SWIFT.MAINTAINABILITY.UnusedLocalVar                    | UnusedLocalVar: Unused local variable   |
| High     | Hardcoded Absolute Path                   | OPT.SWIFT.PORTABILITY.HardcodedAbsolutePath                 | HardcodedAbsolutePath: Do not hardcode absolute paths   |
| High     | Avoid Empty Catch Blocks                  | OPT.SWIFT.RELIABILITY.AvoidEmptyCatchBlocks                 | AvoidEmptyCatchBlocks: Avoid use empty catch blocks   |
| High     | User Controlled SQL Primary Key           | OPT.SWIFT.SECURITY.UserControlledSQLPrimaryKey              | UserControlledSQLPrimaryKey: Avoid using user controlled Primary Key into a query   |
| High     | Insecure Transport                        | OPT.SWIFT.SECURITY.InsecureTransport                        | InsecureTransport: Insecure transport   |
| Low      | Password In Comment Rule                  | OPT.SWIFT.SECURITY.PasswordInCommentRule                    | PasswordInCommentRule: Storing password details in plaintext anywhere in system or system code can compromise security            |
| Low      | Avoid Locks                               | OPT.SWIFT.EFFICIENCY.AvoidLocks                             | AvoidLocks: Avoid using locks   |
| Low      | Avoid Commented Out Code                  | OPT.SWIFT.MAINTAINABILITY.AvoidCommentedOutCode             | AvoidCommentedOutCode: Avoid commenting out code blocks   |
| Low      | Functions Should Not Return Constants     | OPT.SWIFT.MAINTAINABILITY.FunctionsShouldNotReturnConstants | FunctionsShouldNotReturnConstants: Functions shouldn't return the same constant value   |
| Low      | Review Useless Empty Blocks               | OPT.SWIFT.MAINTAINABILITY.ReviewUselessEmptyBlocks          | ReviewUselessEmptyBlocks: Avoid using if and conditional statements with empty blocks   |
| Low      | Unused Parameter                          | OPT.SWIFT.MAINTAINABILITY.UnusedParameter                   | UnusedParameter: Unused function parameter  |
| Low      | Only One Return                           | OPT.SWIFT.RELIABILITY.OnlyOneReturn                         | OnlyOneReturn: Too many return statements in function or method   |
| Low      | Unconditional Jump Statements             | OPT.SWIFT.RELIABILITY.UnconditionalJumpStatements           | UnconditionalJumpStatements: Wrong use of unconditional jump statements   |
| Medium   | Plaintext Storage In A Cookie Rule        | OPT.SWIFT.SECURITY.PlaintextStorageInACookieRule            | PlaintextStorageInACookieRule: Clear text storage of Sensitive Information in a Cookie  |
| Medium   | Unsafe Cookie                             | OPT.SWIFT.SECURITY.UnsafeCookie                             | UnsafeCookie: Generate server-side cookies with adequate security properties  |
| Medium   | Serialization Injection                   | OPT.SWIFT.SECURITY.SerializationInjection                   | SerializationInjection: Deserialization of untrusted data   |

| Severity | Contrast rule                                | Engine rule ID  | Description  |
|----------|--|---|--|
| Medium   | String Format Injection                      | OPT.SWIFT.SECURITY.StringFormatInjection                    | StringFormatInjection: Exclude unsanitiz input from format strings   |
| Medium   | Hardcoded Username Password                  | OPT.SWIFT.SECURITY.HardcodedUsernamePassword                | HardcodedUsernamePassword: Use of h coded Credentials  |
| Medium   | HTTP Response Caching Leak                   | OPT.SWIFT.SECURITY.HTTPResponseCachingLeak                  | HTTPResponseCachingLeak: HTTP sen responses being cached   |
| Medium   | Insecure Temporary File                      | OPT.SWIFT.SECURITY.InsecureTemporaryFile                    | InsecureTemporaryFile: Creating and us insecure temporary files can leave applic system data vulnerable to attack. |
| Medium   | Keyboard Caching Leak                        | OPT.SWIFT.SECURITY.KeyboardCachingLeak                      | KeyboardCachingLeak: Sensitive data le through keyboard cache  |
| Medium   | Password In Configuration File               | OPT.SWIFT.SECURITY.PasswordInConfigurationFile              | PasswordInConfigurationFile: Use of cre into configuration file  |
| Medium   | Pasteboard Caching Leak                      | OPT.SWIFT.SECURITY.PasteboardCachingLeak                    | PasteboardCachingLeak: Sensitive data through the pasteboard caching mechan  |
| Medium   | Privacy Violation                            | OPT.SWIFT.SECURITY.PrivacyViolation                         | PrivacyViolation: Exposure of Private Inf ('Privacy Violation')  |
| Medium   | Sensitive Core Data                          | OPT.SWIFT.SECURITY.SensitiveCoreData                        | SensitiveCoreData: Sensitive data store CoreData('Privacy Violation')  |
| Medium   | Sensitive Data Accessed From Itunes          | OPT.SWIFT.SECURITY.SensitiveDataAccessedFromItunes          | SensitiveDataAccessedFromItunes: Exp Private Information ('Privacy Violation')                                     |
| Medium   | Sensitive SQL                                | OPT.SWIFT.SECURITY.SensitiveSQL                             | SensitiveSQL: Sensitive data stored into database('Privacy Violation')   |
| Medium   | Sensitive No SQL                             | OPT.SWIFT.SECURITY.SensitiveNoSQL                           | SensitiveNoSQL: Sensitive data stored in NoSQL database('Privacy Violation')                                       |
| Medium   | Sensitive User Defaults                      | OPT.SWIFT.SECURITY.SensitiveUserDefaults                    | SensitiveUserDefaults: Sensitive data st UserDefaults('Privacy Violation')   |
| Medium   | Serializable Class Containing Sensitive Data | OPT.SWIFT.SECURITY.SerializableClassContainingSensitiveData | SerializableClassContainingSensitiveDa Serializable Class Containing Sensitive L                                   |
| Medium   | Screen Caching Leak                          | OPT.SWIFT.SECURITY.ScreenCachingLeak                        | ScreenCachingLeak: Sensitive data leak through the screen caching mechanism is backgrounded                        |
| Medium   | Third Party Keyboard Allowed                 | OPT.SWIFT.SECURITY.ThirdPartyKeyboardAllowed                | ThirdPartyKeyboardAllowed: Avoid expo sensitive data to third party keyboards.                                     |
| Medium   | Avoid Comparing Count To Zero                | OPT.SWIFT.EFFICIENCY.AvoidComparingCountToZero              | AvoidComparingCountToZero: Use isEmpty check is a collection is empty  |
| Medium   | Stop Scanning On Device Found                | OPT.SWIFT.EFFICIENCY.StopScanningOnDeviceFound              | StopScanningOnDeviceFound: Stop sca device has been already found  |
| Medium   | Vars Should Be Constants                     | OPT.SWIFT.EFFICIENCY.VarsShouldBeConstants                  | VarsShouldBeConstants: Vars that never should be constants   |
| Medium   | Avoid Excessive Nested Statements            | OPT.SWIFT.MAINTAINABILITY.AvoidExcessiveNestedStatements    | AvoidExcessiveNestedStatements: Avoid deeply nested statements   |

| Severity | Contrast rule                               | Engine rule ID   | Description  |
|----------|---|--|--|
| Medium   | Avoid Same Class Field Names                | OPT.SWIFT.MAINTAINABILITY.AvoidSameClassFieldNames           | AvoidSameClassFieldNames: Avoid using same name for attribute than the class name                    |
| Medium   | Avoid Same Method Field Names               | OPT.SWIFT.MAINTAINABILITY.AvoidSameMethodFieldNames          | AvoidSameMethodFieldNames: Method names and class fields should not be different only capitalization |
| Medium   | Avoid Many Parameters Function              | OPT.SWIFT.MAINTAINABILITY.AvoidManyParametersFunction        | AvoidManyParametersFunction: Too many arguments in function or method                                |
| Medium   | Density Of Comments                         | OPT.SWIFT.MAINTAINABILITY.DensityOfComments                  | DensityOfComments: Source code must be properly commented  |
| Medium   | Nested Switch Statement                     | OPT.SWIFT.MAINTAINABILITY.NestedSwitchStatement              | NestedSwitchStatement: Avoid to nest switch statements   |
| Medium   | One Statement Per Line                      | OPT.SWIFT.MAINTAINABILITY.OneStatementPerLine                | OneStatementPerLine: Use only one statement per line   |
| Medium   | Unused Private Function                     | OPT.SWIFT.MAINTAINABILITY.UnusedPrivateFunction              | UnusedPrivateFunction: Avoid unused private methods and constructors                                 |
| Medium   | Avoid Forced Type Conversion                | OPT.SWIFT.RELIABILITY.AvoidForcedTypeConversion              | AvoidForcedTypeConversion: Avoid using type conversion   |
| Medium   | Buffer Overflow                             | OPT.SWIFT.RELIABILITY.BufferOverflow                         | BufferOverflow: Potential memory corruption  |
| Medium   | Local Vars With Global Name                 | OPT.SWIFT.RELIABILITY.LocalVarsWithGlobalName                | LocalVarsWithGlobalName: Same name for local and global variable                                     |
| Medium   | Potential Encoding Buffer Overflow          | OPT.SWIFT.RELIABILITY.PotentialEncodingBufferOverflow        | PotentialEncodingBufferOverflow: Potential memory corruption   |
| Medium   | Unreachable Code                            | OPT.SWIFT.RELIABILITY.UnreachableCode                        | UnreachableCode: Avoid unreachable code  |
| Medium   | Use Weak References With Delegate Protocols | OPT.SWIFT.RELIABILITY.UseWeakReferencesWithDelegateProtocols | UseWeakReferencesWithDelegateProtocols: Delegate protocols must be class-only                        |
| Medium   | Avoid S M S                                 | OPT.SWIFT.SECURITY.AvoidSMS                                  | AvoidSMS: Avoid performing SMS-related operations  |
| Medium   | Biometric Without Message                   | OPT.SWIFT.SECURITY.BiometricWithoutMessage                   | BiometricWithoutMessage: User is asked for fingerprints without reason                               |
| Medium   | Execution After Redirect                    | OPT.SWIFT.SECURITY.ExecutionAfterRedirect                    | ExecutionAfterRedirect: Execution After Redirect (EAR)   |
| Medium   | Missing Content Validation                  | OPT.SWIFT.SECURITY.MissingContentValidation                  | MissingContentValidation: Missing Content Validation   |
| Medium   | Potential Infinite Loop                     | OPT.SWIFT.SECURITY.PotentialInfiniteLoop                     | PotentialInfiniteLoop: Loop with Unreachable Condition ('Infinite Loop')                             |
| Medium   | Server Trust Credential Check               | OPT.SWIFT.SECURITY.ServerTrustCredentialCheck                | ServerTrustCredentialCheck: Evaluate server certificate trust chain                                  |
| Medium   | Unchecked Input In Loop Condition           | OPT.SWIFT.SECURITY.UncheckedInputInLoopCondition             | UncheckedInputInLoopCondition: Unchecked input in loop condition                                     |

## Transact-SQL Scan rules

Contrast Scan supports these rules for Transact-SQL.

| Severity | Contrast rule                                | Engine rule ID  | Description  |
|----------|--|---|--|
| Critical | Command Injection                            | OPT.TRANSACTSQL.SEC.CommandInjection                    | CommandInjection: Improper Neutralization of Special Elements used in an OS Command ('OS Command Injection')                     |
| Critical | Sleep Injection                              | OPT.TRANSACTSQL.SEC.SleepInjection                      | SleepInjection: Denial of Service by externally controlled sleep time  |
| Critical | SQL Injection                                | OPT.TRANSACTSQL.SEC.SqlInjection                        | SqlInjection: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection')                               |
| Critical | Avoid No Lock                                | OPT.TRANSACTSQL.AvoidNoLock                             | AvoidNoLock: Avoid NOLOCK table hint   |
| Critical | Use Proper Transaction Isolation Level       | OPT.TRANSACTSQL.UseProperTransactionIsolationLevel      | UseProperTransactionIsolationLevel: Use proper Transaction Isolation Level   |
| Critical | Too Broad Grant                              | OPT.TRANSACTSQL.SEC.TooBroadGrant                       | TooBroadGrant: Too broad privileges granted.   |
| Critical | Weak Cryptographic Hash                      | OPT.TRANSACTSQL.SEC.WeakCryptographicHash               | WeakCryptographicHash: Weak cryptographic hashes cannot guarantee data integrity   |
| Critical | Weak Symmetric Encryption Algorithm          | OPT.TRANSACTSQL.SEC.WeakSymmetricEncryptionAlgorithm    | WeakSymmetricEncryptionAlgorithm: Weak symmetric encryption algorithm.   |
| High     | Avoid Email Hardcoded                        | OPT.TRANSACTSQL.AvoidEmailHardcoded                     | AvoidEmailHardcoded: Avoid hardcoded or in-comment emails in source code   |
| High     | Avoid IP Hardcoded                           | OPT.TRANSACTSQL.AvoidIPHardcoded                        | AvoidIPHardcoded: Do not write IP address in source code   |
| High     | Avoid Cross Joins                            | OPT.TRANSACTSQL.AvoidCrossJoins                         | AvoidCrossJoins: Avoid explicit or unwanted CROSS JOINS (cartesian products)   |
| High     | Avoid Delete Update Without Search Condition | OPT.TRANSACTSQL.AvoidDeleteUpdateWithoutSearchCondition | AvoidDeleteUpdateWithoutSearchCondition: Do not Use UPDATE / DELETE without search condition                                     |
| High     | Close Deallocate Cursors                     | OPT.TRANSACTSQL.CloseDeallocateCursors                  | CloseDeallocateCursors: Close/deallocate cursors and deallocate cursor variables in the same T-SQL scope where they are declared |
| High     | Dead Variable Or Parameter                   | OPT.TRANSACTSQL.DeadVariableOrParameter                 | DeadVariableOrParameter: Looks for unused local variables and procedure/ function parameter.s                                    |
| High     | Use Exists Instead Of In                     | OPT.TRANSACTSQL.UseExistsInsteadOfIn                    | UseExistsInsteadOfIn: Avoid IN(subquery) if not necessary  |
| High     | Use Order By With Top                        | OPT.TRANSACTSQL.UseOrderByWithTop                       | UseOrderByWithTop: Use ORDER BY or GROUP BY clause in queries with TOP clause  |
| High     | Encrypt Information                          | OPT.TRANSACTSQL.EncryptInformation                      | EncryptInformation: Avoid including sensitive information in column names  |
| High     | Insecure Randomness                          | OPT.TRANSACTSQL.SEC.InsecureRandomness                  | InsecureRandomness: Standard pseudo-random number generators cannot withstand cryptographic attacks.                             |
| Info     | Avoid Comparing With Null Constant           | OPT.TRANSACTSQL.AvoidComparingWithNullConstant          | AvoidComparingWithNullConstant: Use IS/IS NOT NULL instead of comparing against NULL constant                                    |
| Info     | Avoid Distinct                               | OPT.TRANSACTSQL.AvoidDistinct                           | AvoidDistinct: Avoid DISTINCT  |
| Info     | Avoid Large Composite Primary Keys           | OPT.TRANSACTSQL.AvoidLargeCompositePrimaryKeys          | AvoidLargeCompositePrimaryKeys: Limit columns in composite PRIMARY KEY   |
| Info     | Avoid Large Text Binary Objects              | OPT.TRANSACTSQL.AvoidLargeTextBinaryObjects             | AvoidLargeTextBinaryObjects: Do not store binary or image files (Binary Large Objects or BLOBs) inside the database              |

| Severity | Contrast rule                                | Engine rule ID  | Description   |
|----------|--|---|---|
| Info     | Avoid Non Ansi Outer Join Syntax             | OPT.TRANSACTSQL.AvoidNonAnsiOuterJoinSyntax             | AvoidNonAnsiOuterJoinSyntax: Avoid non-ANSI outer join syntax * [] {}   |
| Info     | Avoid Nullable Char                          | OPT.TRANSACTSQL.AvoidNullableChar                       | AvoidNullableChar: Use the CHAR/NCHAR data type for a column only when the column is non-nullable                       |
| Info     | Avoid Text Datatypes                         | OPT.TRANSACTSQL.AvoidTextDatatypes                      | AvoidTextDatatypes: Avoid TEXT, NTEXT or IMAGE datatypes for storing large textual/binary data                          |
| Info     | Comment Tsql Code                            | OPT.TRANSACTSQL.CommentTsqlCode                         | CommentTsqlCode: Comment specific T-SQL elements  |
| Info     | Prefix Column Names With Table Name          | OPT.TRANSACTSQL.PrefixColumnNamesWithTableName          | PrefixColumnNamesWithTableName: Prefix column names with table name/alias in SQL statements referencing multiple tables |
| Info     | Single Exit Point In Procedures              | OPT.TRANSACTSQL.SingleExitPointInProcedures             | SingleExitPointInProcedures: Code stored procedures, functions and triggers with a single exit point (RETURN)           |
| Info     | Use Ansi Join                                | OPT.TRANSACTSQL.UseAnsiJoin                             | UseAnsiJoin: Use ANSI-Standard Join clauses instead of the old style joins  |
| Info     | Use Set No Count On In Procedures            | OPT.TRANSACTSQL.UseSetNoCountOnInProcedures             | UseSetNoCountOnInProcedures: Use SET NOCOUNT ON at the beginning of SQL batches, stored procedures and triggers         |
| Info     | Use Standard Names                           | OPT.TRANSACTSQL.UseStandardNames                        | UseStandardNames: Follow naming conventions for names of database objects and T-SQL entities                            |
| Low      | Avoid Cursors                                | OPT.TRANSACTSQL.AvoidCursors                            | AvoidCursors: Try to avoid server side cursors as much as possible  |
| Low      | Avoid Expressions That Prevent Index         | OPT.TRANSACTSQL.AvoidExpressionsThatPreventIndex        | AvoidExpressionsThatPreventIndex: Avoid expressions with columns in a query predicate that disable index search         |
| Low      | Avoid Goto                                   | OPT.TRANSACTSQL.AvoidGoto                               | AvoidGoto: Do not use GOTO  |
| Low      | Avoid Group By Without Aggregation Functions | OPT.TRANSACTSQL.AvoidGroupByWithoutAggregationFunctions | AvoidGroupByWithoutAggregationFunctions: Do not use the GROUP BY clause without an aggregate function                   |
| Low      | Avoid Recompile                              | OPT.TRANSACTSQL.AvoidRecompile                          | AvoidRecompile: Avoid operations that force a recompilation of an SQL batch or stored procedure / trigger               |
| Low      | Avoid Reserved Words In Identifiers          | OPT.TRANSACTSQL.AvoidReservedWordsInIdentifiers         | AvoidReservedWordsInIdentifiers: Do not use reserved words in identifiers   |
| Low      | Avoid Select Count From Table                | OPT.TRANSACTSQL.AvoidSelectCountFromTable               | AvoidSelectCountFromTable: Avoid SELECT COUNT to fetch number of rows in table  |
| Low      | Avoid System Prefixes                        | OPT.TRANSACTSQL.AvoidSystemPrefixes                     | AvoidSystemPrefixes: Do not use sp_ or fn_ as prefix for stored procedures and functions                                |
| Low      | Explicit Column Names In Insert              | OPT.TRANSACTSQL.ExplicitColumnNamesInInsert             | ExplicitColumnNamesInInsert: Identify Column Names in INSERT statements   |
| Low      | Length With Varchar Types                    | OPT.TRANSACTSQL.LengthWithVarcharTypes                  | LengthWithVarcharTypes: Specify explicit length with character and binary data types                                    |
| Low      | Precision Scale With Decimal Numeric         | OPT.TRANSACTSQL.PrecisionScaleWithDecimalNumeric        | PrecisionScaleWithDecimalNumeric: Specify explicit precision and scale with DECIMAL and NUMERIC data types              |
| Medium   | Avoid Dynamic SQL                            | OPT.TRANSACTSQL.AvoidDynamicSql                         | AvoidDynamicSql: Avoid dynamic SQL statements as much as possible   |

| Severity | Contrast rule                       | Engine rule ID                                  | Description   |
|----------|-------------------------------------|---|---|
| Medium   | Avoid Deprecated Features           | OPT.TRANSACTSQL.AvoidDeprecatedFeatures         | AvoidDeprecatedFeatures: Avoid deprecated features  |
| Medium   | Avoid Exact Or Overlapping Indexes  | OPT.TRANSACTSQL.AvoidExactOrOverlappingIndexes  | AvoidExactOrOverlappingIndexes: Avoid indexes with same or overlapping columns  |
| Medium   | Avoid Like Patterns Table Scan      | OPT.TRANSACTSQL.AvoidLikePatternsTableScan      | AvoidLikePatternsTableScan: Avoid patterns in LIKE that disable index usage and forces a table/index scan                   |
| Medium   | Avoid Negative Operator             | OPT.TRANSACTSQL.AvoidNegativeOperator           | AvoidNegativeOperator: Avoid using <> or ! {}   |
| Medium   | Avoid Select Asterisk               | OPT.TRANSACTSQL.AvoidSelectAsterisk             | AvoidSelectAsterisk: Avoid * in SELECT  |
| Medium   | Avoid Too Many Joins                | OPT.TRANSACTSQL.AvoidTooManyJoins               | AvoidTooManyJoins: Avoid queries with too many joined tables  |
| Medium   | Avoid Trigger Return Data           | OPT.TRANSACTSQL.AvoidTriggerReturnData          | AvoidTriggerReturnData: Avoid returning results in triggers   |
| Medium   | Check Error After Data Manipulation | OPT.TRANSACTSQL.CheckErrorAfterDataManipulation | CheckErrorAfterDataManipulation: Check result from INSERT / UPDATE / DELETE using @@ERROR or @@ROWCOUNT or in TRY ... CATCH |
| Medium   | Prefer Union All Over Union         | OPT.TRANSACTSQL.PreferUnionAllOverUnion         | PreferUnionAllOverUnion: Prefer UNION ALL over UNION  |
| Medium   | Forbidden Call                      | OPT.TRANSACTSQL.SEC.ForbiddenCall               | ForbiddenCall: Dangerous procedure / function called.   |
| Medium   | User Controlled SQL Primary Key     | OPT.TRANSACTSQL.SEC.UserControlledSQLPrimaryKey | UserControlledSQLPrimaryKey: Avoid using an user controlled Primary Key into a query  |

## VB.NET Scan rules

Contrast Scan supports these rules for VB.NET.

| Severity | Contrast rule                         | Engine rule ID                                   | Description   |
|----------|---------------------------------------|--|---|
| Critical | Too Much Origins Allowed              | OPT.VBNET.TooMuchOriginsAllowed                  | TooMuchOriginsAllowed: CORS policy (Cross origin resource sharing) too broad                              |
| Critical | Code Injection                        | OPT.VBNET.CodeInjection                          | CodeInjection: Improper Control of Generated Code ('Code Injection')                                      |
| Critical | Code Injection With Deserialization   | OPT.VBNET.CodeInjectionWithDeserialization       | CodeInjectionWithDeserialization: Dynamic injection during object deserialization                         |
| Critical | Command Injection                     | OPT.VBNET.CommandInjection                       | CommandInjection: Improper Neutralization of Special Elements used in an OS Command ('Command Injection') |
| Critical | Cross Site Scripting                  | OPT.VBNET.CrossSiteScripting                     | CrossSiteScripting: Improper Neutralization of Input During Web Page Generation ('Cross-Site Scripting')  |
| Critical | DoS Regexp                            | OPT.VBNET.DoSRegexp                              | DoSRegexp: Prevent denial of service attack through malicious regular expression                          |
| Critical | Ldap Injection                        | OPT.VBNET.LdapInjection                          | LdapInjection: Avoid non-neutralized user-controlled input in LDAP search filters                         |
| Critical | Connection String Parameter Pollution | OPT.VBNET.SEC.ConnectionStringParameterPollution | ConnectionStringParameterPollution: Connection string polluted with untrusted input                       |

| Severity | Contrast rule                                   | Engine rule ID   | Description  |
|----------|---|--|--|
| Critical | Http Parameter Pollution                        | OPT.VBNET.SEC.HttpParameterPollution                     | HttpParameterPollution: HTTP parameter pollution (HPP)   |
| Critical | Http Splitting Rule                             | OPT.VBNET.SEC.HttpSplittingRule                          | HttpSplittingRule: Improper neutralization of CR/LF Sequences in HTTP headers  |
| Critical | Mail Command Injection                          | OPT.VBNET.SEC.MailCommandInjection                       | MailCommandInjection: Mail Command Injection   |
| Critical | No SQL Injection                                | OPT.VBNET.SEC.NoSQLInjection                             | NoSQLInjection: Improper neutralization of elements in data query logic (NoSQL injection)  |
| Critical | Process Control                                 | OPT.VBNET.SEC.ProcessControl                             | ProcessControl: Do not load executables or libraries from untrusted sources  |
| Critical | Registry Manipulation                           | OPT.VBNET.SEC.RegistryManipulation                       | RegistryManipulation: Registry manipulation  |
| Critical | Server Side Request Forgery                     | OPT.VBNET.ServerSideRequestForgery                       | ServerSideRequestForgery: Server-Side Request Forgery (SSRF)   |
| Critical | SQL Injection                                   | OPT.VBNET.SqlInjection                                   | SqlInjection: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection')                                     |
| Critical | Stored Cross Site Scripting                     | OPT.VBNET.StoredCrossSiteScripting                       | StoredCrossSiteScripting: Web content generated from improper sanitized database data and escaped output (Stored Cross-site Scripting) |
| Critical | MVC Non Action Public Methods                   | OPT.VBNET.MVCNonActionPublicMethods                      | MVCNonActionPublicMethods: Protect public methods that are not action methods in controllers   |
| Critical | Path Traversal                                  | OPT.VBNET.PathTraversal                                  | PathTraversal: Avoid non-neutralized user-controlled input composed in a pathname to access a resource                                 |
| Critical | Accessibility Subversion Rule                   | OPT.VBNET.SEC.AccessibilitySubversionRule                | AccessibilitySubversionRule: .Net access restriction subverted (Reflection)  |
| Critical | Anonymous Ldap Bind                             | OPT.VBNET.SEC.AnonymousLdapBind                          | AnonymousLdapBind: Access Control - Anonymous LDAP Bind  |
| Critical | Dangerous File Upload                           | OPT.VBNET.SEC.DangerousFileUpload                        | DangerousFileUpload: Unrestricted Upload with Dangerous Type   |
| Critical | Static Database Connection                      | OPT.VBNET.SEC.StaticDatabaseConnection                   | StaticDatabaseConnection: Static database connection / session   |
| Critical | Temporary Files Left                            | OPT.VBNET.SEC.TemporaryFilesLeft                         | TemporaryFilesLeft: Temporary files not deleted  |
| Critical | COM With Param Constructors                     | OPT.VBNET.VBnet.COMWithParamConstructors                 | COMWithParamConstructors: Avoid COM vtbl attribute in parameterized constructors   |
| Critical | Dispose Finalize Throws Ex                      | OPT.VBNET.VBnet.DisposeFinalizeThrowsEx                  | DisposeFinalizeThrowsEx: Avoid throwing exception in constructors, Dispose or Finalize   |
| Critical | Dispose Objects Before Losing Scope             | OPT.VBNET.VBnet.DisposeObjectsBeforeLosingScope          | DisposeObjectsBeforeLosingScope: Dispose objects before losing scope   |
| Critical | Do Not Dispose Objects Multiple Times           | OPT.VBNET.VBnet.DoNotDisposeObjectsMultipleTimes         | DoNotDisposeObjectsMultipleTimes: Possible multiple calls to 'Dispose' over an object  |
| Critical | Do Not Use Idle Process Priority                | OPT.VBNET.VBnet.DoNotUseIdleProcessPriority              | DoNotUseIdleProcessPriority: Do not use idle process priority  |
| Critical | Mark I Serializable Types With Serializable     | OPT.VBNET.VBnet.MarkISerializableTypesWithSerializable   | MarkISerializableTypesWithSerializable: Specify the Serializable attribute in ISerializable class                                      |
| Critical | Mark Windows Forms Entry Points With Sta Thread | OPT.VBNET.VBnet.MarkWindowsFormsEntryPointsWithStaThread | MarkWindowsFormsEntryPointsWithStaThread: Mark Windows Forms entry points with STA Thread  |



| Severity | Contrast rule                               | Engine rule ID                                       | Description  |
|----------|---|--|--|
| Critical | Weak Cryptographic Hash                     | OPT.VBNET.WeakCryptographicHash                      | WeakCryptographicHash: Weak cryptographic hash   |
| Critical | Weak Key Size                               | OPT.VBNET.WeakKeySize                                | WeakKeySize: Weak cryptography, insufficient key length  |
| Critical | Weak Symmetric Encryption Algorithm         | OPT.VBNET.WeakSymmetricEncryptionAlgorithm           | WeakSymmetricEncryptionAlgorithm: Weak symmetric encryption algorithm                                |
| Critical | Weak Symmetric Encryption Mode Of Operation | OPT.VBNET.WeakSymmetricEncryptionModeOfOperation     | WeakSymmetricEncryptionModeOfOperation: not use weak modes of operation with symmetric encryption    |
| High     | Cross Site Request Forgery                  | OPT.VBNET.CrossSiteRequestForgery                    | CrossSiteRequestForgery: Cross-Site Request Forgery (CSRF)   |
| High     | JSON Injection                              | OPT.VBNET.JSONInjection                              | JSONInjection: Avoid using non-neutralized controlled input in JSON entities                         |
| High     | MVC Prevent Overposting Model Definition    | OPT.VBNET.MVCPreventOverpostingModelDefinition       | MVCPreventOverpostingModelDefinition: Prevent over-posting attacks in model definition               |
| High     | MVC Prevent Underposting Model Composition  | OPT.VBNET.MVCPreventUnderpostingModelComposition     | MVCPreventUnderpostingModelComposition: Prevent under-posting attacks in model composition           |
| High     | MVC Prevent Underposting Model Definition   | OPT.VBNET.MVCPreventUnderpostingModelDefinition      | MVCPreventUnderpostingModelDefinition: Prevent under-posting attacks in model definition             |
| High     | Open Redirect                               | OPT.VBNET.OpenRedirect                               | OpenRedirect: URL Redirection to Untrusted ('Open Redirect')   |
| High     | Cross Site History Manipulation             | OPT.VBNET.SEC.CrossSiteHistoryManipulation           | CrossSiteHistoryManipulation: Cross-Site History Manipulation (XSHM)                                 |
| High     | Log Forging                                 | OPT.VBNET.SEC.LogForging                             | LogForging: Improper Output Neutralization in Logs   |
| High     | Resource Injection                          | OPT.VBNET.SEC.ResourceInjection                      | ResourceInjection: Improper control of resource identifiers ("Resource Injection")                   |
| High     | Trust Boundary Violation                    | OPT.VBNET.SEC.TrustBoundaryViolation                 | TrustBoundaryViolation: Trust boundary violation   |
| High     | Unsafe Reflection                           | OPT.VBNET.SEC.UnsafeReflection                       | UnsafeReflection: Use of Externally-Controlled Input to Select Classes or Code ('Unsafe Reflection') |
| High     | XML Entity Injection                        | OPT.VBNET.SEC.XMLEntityInjection                     | XMLEntityInjection: XML entity injection   |
| High     | XML Injection                               | OPT.VBNET.XMLInjection                               | XMLInjection: XML Injection (aka Blind XPath Injection)  |
| High     | XPath Injection                             | OPT.VBNET.XPathInjection                             | XPathInjection: Improper Neutralization of DTD within XPath Expressions ('XPath Injection')          |
| High     | XQuery Injection                            | OPT.VBNET.XQueryInjection                            | XQueryInjection: Improper Neutralization of DTD within XQuery Expressions ('XQuery Injection')       |
| High     | XSLT Injection                              | OPT.VBNET.XSLTInjection                              | XSLTInjection: Avoid using non-neutralized controlled input when creating XSL stylesheets            |
| High     | Information Exposure Through Error Message  | OPT.VBNET.SEC.InformationExposureThroughErrorMessage | InformationExposureThroughErrorMessage: sensitive information exposure through error messages        |
| High     | Insecure Email Transport                    | OPT.VBNET.SEC.InsecureEmailTransport                 | InsecureEmailTransport: Insecure Mail Transport  |

| Severity | Contrast rule                               | Engine rule ID   | Description   |
|----------|---|--|---|
| High     | Review Visible Event Handlers               | OPT.VBNET.VBnet.ReviewVisibleEventHandlers             | ReviewVisibleEventHandlers: A public or protected event-handling method was detected                          |
| High     | Resource Leak Database                      | OPT.VBNET.ResourceLeakDatabase                         | ResourceLeakDatabase: Unreleased database resource  |
| High     | Resource Leak Ldap                          | OPT.VBNET.ResourceLeakLdap                             | ResourceLeakLdap: Unreleased LDAP resource  |
| High     | Resource Leak Stream                        | OPT.VBNET.ResourceLeakStream                           | ResourceLeakStream: Unreleased stream resource  |
| High     | Resource Leak Unmanaged                     | OPT.VBNET.ResourceLeakUnmanaged                        | ResourceLeakUnmanaged: Unreleased unmanaged resource  |
| High     | Avoid Certificate Equals                    | OPT.VBNET.SEC.AvoidCertificateEquals                   | AvoidCertificateEquals: Never use X509Certificate.Equals() in a security context                              |
| High     | Cookies In Security Decision                | OPT.VBNET.SEC.CookiesInSecurityDecision                | CookiesInSecurityDecision: Reliance on Cookies without Validation and Integrity Checking in Security Decision |
| High     | Improper Authentication                     | OPT.VBNET.SEC.ImproperAuthentication                   | ImproperAuthentication: Avoid that a user can perform actions to which he does not have access                |
| High     | Missing Standard Error Handling             | OPT.VBNET.SEC.MissingStandardErrorHandling             | MissingStandardErrorHandling: Missing Standardized Error Handling Mechanism in ASP.Net                        |
| High     | Setting Manipulation                        | OPT.VBNET.SEC.SettingManipulation                      | SettingManipulation: Setting Manipulation   |
| High     | Unvalidated Asp Net Model                   | OPT.VBNET.SEC.UnvalidatedAspNetModel                   | UnvalidatedAspNetModel: Unvalidated model MVC controller  |
| High     | User Controlled SQL Primary Key             | OPT.VBNET.SEC.UserControlledSQLPrimaryKey              | UserControlledSQLPrimaryKey: Avoid using user controlled Primary Key into a query                             |
| High     | Abstract Types Should Not Have Constructors | OPT.VBNET.VBnet.AbstractTypesShouldNotHaveConstructors | AbstractTypesShouldNotHaveConstructors: abstract class with public constructor                                |
| High     | Attribute Usage                             | OPT.VBNET.VBnet.AttributeUsage                         | AttributeUsage: Specify AttributeUsage  |
| High     | Avoid Excessive Complexity                  | OPT.VBNET.VBnet.AvoidExcessiveComplexity               | AvoidExcessiveComplexity: A method has excessive cyclomatic complexity  |
| High     | Avoid Excessive Locals                      | OPT.VBNET.VBnet.AvoidExcessiveLocals                   | AvoidExcessiveLocals: Avoid excessive local variables   |
| High     | Avoid Floating Point Equality               | OPT.VBNET.VBnet.AvoidFloatingPointEquality             | AvoidFloatingPointEquality: Do not perform (in)equality operations over floating point values                 |
| High     | Avoid Inconditional Recursive Invocation    | OPT.VBNET.VBnet.AvoidInconditionalRecursiveInvocation  | AvoidInconditionalRecursiveInvocation: Avoid recursive calls without a precondition                           |
| High     | Avoid Out Parameters                        | OPT.VBNET.VBnet.AvoidOutParameters                     | AvoidOutParameters: Public or protected method has ByRef parameters   |
| High     | Avoid Overloads In Com Visible Interfaces   | OPT.VBNET.VBnet.AvoidOverloadsInComVisibleInterfaces   | AvoidOverloadsInComVisibleInterfaces: COM visible interface declares overloaded methods                       |
| High     | Avoid Uncalled Private Code                 | OPT.VBNET.VBnet.AvoidUncalledPrivateCode               | AvoidUncalledPrivateCode: Avoid uncalled private code   |
| High     | Avoid Unused Private Fields                 | OPT.VBNET.VBnet.AvoidUnusedPrivateFields               | AvoidUnusedPrivateFields: Avoid unused private fields   |
| High     | Declare Event Handlers Correctly            | OPT.VBNET.VBnet.DeclareEventHandlersCorrectly          | DeclareEventHandlersCorrectly: Declare Event Handlers Correctly   |

| Severity | Contrast rule                                   | Engine rule ID  | Description  |
|----------|---|---|--|
| High     | Do Not Assume Int Ptr Size Rule                 | OPT.VBNET.VBnet.DoNotAssumeIntPtrSizeRule                 | DoNotAssumeIntPtrSizeRule: Do not downcast IntPtr or UIntPtr into a 32-bit or smaller value              |
| High     | Do Not Call Overridable Methods In Constructors | OPT.VBNET.VBnet.DoNotCallOverridableMethodsInConstructors | DoNotCallOverridableMethodsInConstructors: Do not call virtual method call from constructor              |
| High     | Do Not Declare Static Members On Generic Types  | OPT.VBNET.VBnet.DoNotDeclareStaticMembersOnGenericTypes   | DoNotDeclareStaticMembersOnGenericTypes: Do not declare shared members on generic types                  |
| High     | Do Not Lock On This Or Types                    | OPT.VBNET.VBnet.DoNotLockOnThisOrTypes                    | DoNotLockOnThisOrTypes: Do not lock on object or over its 'Type'   |
| High     | Do Not Pass Types By Reference                  | OPT.VBNET.VBnet.DoNotPassTypesByReference                 | DoNotPassTypesByReference: Do not pass types by reference  |
| High     | Empty Catch                                     | OPT.VBNET.VBnet.EmptyCatch                                | EmptyCatch: Do not leave empty catch block   |
| High     | Exceptions Should Be Public                     | OPT.VBNET.VBnet.ExceptionsShouldBePublic                  | ExceptionsShouldBePublic: Exceptions should be public  |
| High     | Get Hash Code Equals                            | OPT.VBNET.VBnet.GetHashCodeEquals                         | GetHashCodeEquals: Overload GetHashCode and Equals as a whole  |
| High     | Identifiers Should Not Match Keywords           | OPT.VBNET.VBnet.IdentifiersShouldNotMatchKeywords         | IdentifiersShouldNotMatchKeywords: The identifiers must not be reserved words                            |
| High     | Initialize Reference Type Static Fields Inline  | OPT.VBNET.VBnet.InitializeReferenceTypeStaticFieldsInline | InitializeReferenceTypeStaticFieldsInline: Initialize reference type static fields inline                |
| High     | Mark Boolean P Invoke Arguments With Marshal As | OPT.VBNET.VBnet.MarkBooleanPInvokeArgumentsWithMarshalAs  | MarkBooleanPInvokeArgumentsWithMarshalAs: Mark boolean P/Invoke arguments with MarshalAs attribute       |
| High     | Max Methods                                     | OPT.VBNET.VBnet.MaxMethods                                | MaxMethods: Maximum allowed number of methods  |
| High     | Non Constant Fields Should Not Be Visible       | OPT.VBNET.VBnet.NonConstantFieldsShouldNotBeVisible       | NonConstantFieldsShouldNotBeVisible: A public or protected static field is not constant nor is read-only |
| High     | Normalize Strings To Uppercase                  | OPT.VBNET.VBnet.NormalizeStringsToUppercase               | NormalizeStringsToUppercase: Not to convert string chains to lower case letters                          |
| High     | Obsolete Usages                                 | OPT.VBNET.VBnet.ObsoleteUsages                            | ObsoleteUsages: Avoid use of deprecated methods or obsolete classes depending on chosen .NET SDK         |
| High     | Parameter Names Should Not Match Member Names   | OPT.VBNET.VBnet.ParameterNamesShouldNotMatchMemberNames   | ParameterNamesShouldNotMatchMemberNames: Parameter names should not match member names                   |
| High     | Properties Should Not Return Arrays             | OPT.VBNET.VBnet.PropertiesShouldNotReturnArrays           | PropertiesShouldNotReturnArrays: Properties should not return arrays                                     |
| High     | Property Names Should Not Match Get Methods     | OPT.VBNET.VBnet.PropertyNamesShouldNotMatchGetMethods     | PropertyNamesShouldNotMatchGetMethods: Property names should not match get methods                       |
| High     | Remove Unused Locals                            | OPT.VBNET.VBnet.RemoveUnusedLocals                        | RemoveUnusedLocals: Unused local variables   |

| Severity | Contrast rule                                   | Engine rule ID  | Description   |
|----------|---|---|---|
| High     | Insecure Randomness                             | OPT.VBNET.InsecureRandomness                              | InsecureRandomness: Standard pseudo-random number generators cannot withstand cryptographic attacks     |
| High     | Review Unused Parameters                        | OPT.VBNET.VBnet.ReviewUnusedParameters                    | ReviewUnusedParameters: Method parameters not used  |
| High     | Hardcoded Crypto Key                            | OPT.VBNET.SEC.HardcodedCryptoKey                          | HardcodedCryptoKey: Use of Hard-coded Cryptographic Key   |
| High     | Suppress Finalize Correctly                     | OPT.VBNET.VBnet.SuppressFinalizeCorrectly                 | SuppressFinalizeCorrectly: Call GC.SuppressFinalize correctly   |
| High     | Use Safe Handle To Encapsulate Native Resources | OPT.VBNET.VBnet.UseSafeHandleToEncapsulateNativeResources | UseSafeHandleToEncapsulateNativeResources: Use of System.IntPtr   |
| High     | Variable Names Should Not Match Field Names     | OPT.VBNET.VBnet.VariableNamesShouldNotMatchFieldNames     | VariableNamesShouldNotMatchFieldNames: Variable names should not match field names                      |
| High     | Hardcoded Salt                                  | OPT.VBNET.SEC.HardcodedSalt                               | HardcodedSalt: A hardcoded salt can compromise system security  |
| High     | Insecure Transport                              | OPT.VBNET.SEC.InsecureTransport                           | InsecureTransport: Insecure transport   |
| High     | Proper Padding With Public Key Crypto           | OPT.VBNET.SEC.ProperPaddingWithPublicKeyCrypto            | ProperPaddingWithPublicKeyCrypto: Use of Algorithm without Optimal Asymmetric Encryption Padding (OAEP) |
| High     | Server Insecure Transport                       | OPT.VBNET.SEC.ServerInsecureTransport                     | ServerInsecureTransport: Insecure transport [HTTP servers]  |
| High     | Weak Encryption                                 | OPT.VBNET.WeakEncryption                                  | WeakEncryption: Insufficient RSA key length   |
| Info     | Do Not Initialize Unnecessarily                 | OPT.VBNET.DoNotInitializeUnnecessarily                    | DoNotInitializeUnnecessarily: Do not initialize variables unnecessarily                                 |
| Info     | Do Not Prefix Enum Values With Type Name        | OPT.VBNET.DoNotPrefixEnumValuesWithTypeName               | DoNotPrefixEnumValuesWithTypeName: Names of enumeration members should not start with enumeration name  |
| Info     | Avoid Unneeded Calls On String                  | OPT.VBNET.VBnet.AvoidUnneededCallsOnString                | AvoidUnneededCallsOnString: Avoid unnecessary calls on string objects                                   |
| Info     | Do Not Hardcode Locale Specific Strings         | OPT.VBNET.VBnet.DoNotHardcodeLocaleSpecificStrings        | DoNotHardcodeLocaleSpecificStrings: Do not hardcode locale specific strings                             |
| Info     | Identifiers Should Have Correct Suffix          | OPT.VBNET.VBnet.IdentifiersShouldHaveCorrectSuffix        | IdentifiersShouldHaveCorrectSuffix: An identifier does not have the correct suffix                      |
| Info     | Identifiers Should Not Contain Underscores      | OPT.VBNET.VBnet.IdentifiersShouldNotContainUnderscores    | IdentifiersShouldNotContainUnderscores: An identifier contains the underscore character                 |
| Info     | Identifiers Should Not Have Incorrect Suffix    | OPT.VBNET.VBnet.IdentifiersShouldNotHaveIncorrectSuffix   | IdentifiersShouldNotHaveIncorrectSuffix: An identifier has an incorrect suffix                          |
| Info     | Interface Naming Conventions                    | OPT.VBNET.VBnet.InterfaceNamingConventions                | InterfaceNamingConventions: Follow naming conventions in interfaces                                     |
| Info     | Naming Conventions                              | OPT.VBNET.VBnet.NamingConventions                         | NamingConventions: Follow naming conventions for classes  |

| Severity | Contrast rule                                    | Engine rule ID                                       | Description   |
|----------|--|--|---|
| Low      | Constants Should Be Transparent                  | OPT.VBNET.ConstantsShouldBeTransparent               | ConstantsShouldBeTransparent: A field constant or an enumeration member should be transparent   |
| Low      | Information Exposure Through Debug Log           | OPT.VBNET.SEC.InformationExposureThroughDebugLog     | InformationExposureThroughDebugLog: Avoid exposing sensible information through log   |
| Low      | Avoid Language Specific Type Names In Parameters | OPT.VBNET.AvoidLanguageSpecificTypeNamesInParameters | AvoidLanguageSpecificTypeNamesInParameters: Avoid names of parameters that contains language-specific type name, in public methods            |
| Low      | Avoid Unnecessary String Creation                | OPT.VBNET.AvoidUnnecessaryStringCreation             | AvoidUnnecessaryStringCreation: Avoid creating unnecessary strings through a call to System.String.ToLower or System.String.ToUpper           |
| Low      | Collection Properties Should Be Read Only        | OPT.VBNET.CollectionPropertiesShouldBeReadOnly       | CollectionPropertiesShouldBeReadOnly: Public properties that are of a type that implements System.Collections.ICollection should be read-only |
| Low      | Consider Converting Method To Property           | OPT.VBNET.ConsiderConvertingMethodToProperty         | ConsiderConvertingMethodToProperty: Consider converting the method into a property  |
| Low      | Disposable Types Should Declare Finalizer        | OPT.VBNET.DisposableTypesShouldDeclareFinalizer      | DisposableTypesShouldDeclareFinalizer: A type that implements System.IDisposable and has fields of unmanaged types, should have a finalizer   |
| Low      | Do Not Concatenate Strings Inside Loops          | OPT.VBNET.DoNotConcatenateStringsInsideLoops         | DoNotConcatenateStringsInsideLoops: Do not concatenate string values inside loops   |
| Low      | Do Not Mark Enums With Flags                     | OPT.VBNET.DoNotMarkEnumsWithFlags                    | DoNotMarkEnumsWithFlags: The values of an enumeration that has System.FlagsAttribute attribute, should be powers of two                       |
| Low      | Identifiers Should Be Cased Correctly            | OPT.VBNET.IdentifiersShouldBeCasedCorrectly          | IdentifiersShouldBeCasedCorrectly: Use consistent "pascal-case" and "camel-case" according to the agreement established                       |
| Low      | Implement Serialization Constructors             | OPT.VBNET.ImplementSerializationConstructors         | ImplementSerializationConstructors: A type that implements ISerializable, should implement a serialization constructor                        |
| Low      | Implement Serialization Methods Correctly        | OPT.VBNET.ImplementSerializationMethodsCorrectly     | ImplementSerializationMethodsCorrectly: Implement a correct signature for methods that handle serialization events                            |
| Low      | Initialize Value Type Static Fields Inline       | OPT.VBNET.InitializeValueTypeStaticFieldsInline      | InitializeValueTypeStaticFieldsInline: Avoid explicitly declare a static constructor  |
| Low      | Instantiate Argument Exceptions Correctly        | OPT.VBNET.InstantiateArgumentExceptionsCorrectly     | InstantiateArgumentExceptionsCorrectly: Avoid calling default constructor of ArgumentException  |
| Low      | Operator Overloads Have Named Alternates         | OPT.VBNET.OperatorOverloadsHaveNamedAlternates       | OperatorOverloadsHaveNamedAlternates: When a type overrides an operator, it is recommended to also override the alternative method            |
| Low      | Overload Operator Equals On Overriding Equals    | OPT.VBNET.OverloadOperatorEqualsOnOverridingEquals   | OverloadOperatorEqualsOnOverridingEquals: When a type overrides System.Object.Equals method, it also should override the operator             |

| Severity | Contrast rule  | Engine rule ID  | Description  |
|----------|--|---|--|
| Low      | Prefer Jagged Arrays Over Multidimensional                           | OPT.VBNET.PreferJaggedArraysOverMultidimensional                            | PreferJaggedArraysOverMultidimensional: declare multidimensional array   |
| Low      | Use Literals Where Appropriate                                       | OPT.VBNET.UseLiteralsWhereAppropriate                                       | UseLiteralsWhereAppropriate: Do not declare shared and readonly fields, that are initialized with a value  |
| Low      | Use Managed Equivalents Of Win32 Api                                 | OPT.VBNET.UseManagedEquivalentsOfWin32Api                                   | UseManagedEquivalentsOfWin32Api: Use alternatives to existing methods for managing win32 api   |
| Low      | Attribute String Literals Should Parse Correctly                     | OPT.VBNET.VBnet.AttributeStringLiteralsShouldParseCorrectly                 | AttributeStringLiteralsShouldParseCorrectly: Attribute's literal value should be correctly parsed  |
| Low      | Avoid Long Parameter Lists   | OPT.VBNET.VBnet.AvoidLongParameterLists                                     | AvoidLongParameterLists: Do not encode methods with too many parameters  |
| Low      | Avoid Namespaces With Few Types                                      | OPT.VBNET.VBnet.AvoidNamespacesWithFewTypes                                 | AvoidNamespacesWithFewTypes: Avoid namespaces with few types   |
| Low      | Avoid Non Stored Procedure Commands                                  | OPT.VBNET.VBnet.AvoidNonStoredProcedureCommands                             | AvoidNonStoredProcedureCommands: Avoid using non stored-procedure database operations  |
| Low      | Avoid Type Get Type For Constant Strings                             | OPT.VBNET.VBnet.AvoidTypeGetTypeForConstantStrings                          | AvoidTypeGetTypeForConstantStrings: Do not use Type.GetType() with constant string values  |
| Low      | Avoid Uninstantiated Internal Classes                                | OPT.VBNET.VBnet.AvoidUninstantiatedInternalClasses                          | AvoidUninstantiatedInternalClasses: An instance of an assembly-level type is not created by the assembly   |
| Low      | Call Base Class Methods On I Serializable Types                      | OPT.VBNET.VBnet.CallBaseClassMethodsOnISerializableTypes                    | CallBaseClassMethodsOnISerializableTypes: Call base class methods on ISerializable types   |
| Low      | Check New Exception Without Throwing                                 | OPT.VBNET.VBnet.CheckNewExceptionWithoutThrowing                            | CheckNewExceptionWithoutThrowing: Exception instantiation not used   |
| Low      | Consider Custom Accessors For Non Visible Events Rule                | OPT.VBNET.Vbnet.ConsiderCustomAccessorsForNonVisibleEventsRule              | ConsiderCustomAccessorsForNonVisibleEventsRule: For non visible events, evaluate using custom accessors instead of default ones                    |
| Low      | Delegates Passed To Native Code Must Include Exception Handling Rule | OPT.VBNET.VBnet.DelegatesPassedToNativeCodeMustIncludeExceptionHandlingRule | DelegatesPassedToNativeCodeMustIncludeExceptionHandlingRule: Enclose with a catch all handler the entire block for delegates passed to native code |
| Low      | Do Not Cast Unnecessarily  | OPT.VBNET.VBnet.DoNotCastUnnecessarily                                      | DoNotCastUnnecessarily: A method performs unnecessary duplicate casts on one of its arguments or local variables                                   |
| Low      | Do Not Destroy Stack Trace Rule                                      | OPT.VBNET.VBnet.DoNotDestroyStackTraceRule                                  | DoNotDestroyStackTraceRule: Catch handlers should rethrow original exception instead of throwing the same exception                                |
| Low      | Do Not Indirectly Expose Methods With Link Demands                   | OPT.VBNET.VBnet.DoNotIndirectlyExposeMethodsWithLinkDemands                 | DoNotIndirectlyExposeMethodsWithLinkDemands: Do not indirectly expose methods with link demands  |

| Severity | Contrast rule  | Engine rule ID  | Description  |
|----------|--|---|--|
| Low      | Do Not Raise Exceptions In Unexpected Locations      | OPT.VBNET.Vbnet.DoNotRaiseExceptionsInUnexpectedLocations     | DoNotRaiseExceptionsInUnexpectedLocations: Do not raise exceptions in unexpected locations   |
| Low      | Do Not Use Thread Static With Instance Fields        | OPT.VBNET.VBnet.DoNotUseThreadStaticWithInstanceFields        | DoNotUseThreadStaticWithInstanceFields: use 'ThreadStatic' with instance fields  |
| Low      | Num Max Class By Namespaces                          | OPT.VBNET.VBnet.NumMaxClassByNamespaces                       | NumMaxClassByNamespaces: Avoid an excessive number of classes per package/namespace  |
| Low      | Only Flags Enums Should Have Plural Names            | OPT.VBNET.VBnet.OnlyFlagsEnumsShouldHavePluralNames           | OnlyFlagsEnumsShouldHavePluralNames: Externally visible enumeration ends in a plural word and is not marked with the Flags attribute |
| Low      | Operations Should Not Overflow                       | OPT.VBNET.VBnet.OperationsShouldNotOverflow                   | OperationsShouldNotOverflow: Operations should not overflow  |
| Low      | Override Equals On Value Types                       | OPT.VBNET.VBnet.OverrideEqualsOnValueTypes                    | OverrideEqualsOnValueTypes: A public value type does not override Equals   |
| Low      | Remove Empty Finalizers                              | OPT.VBNET.VBnet.RemoveEmptyFinalizers                         | RemoveEmptyFinalizers: Remove empty finalizers   |
| Low      | Test For Empty Strings Using Length                  | OPT.VBNET.VBnet.TestForEmptyStringsUsingLength                | TestForEmptyStringsUsingLength: Compare strings with empty string using 'Equals'   |
| Low      | Types That Own Native Resources Should Be Disposable | OPT.VBNET.VBnet.TypesThatOwnNativeResourcesShouldBeDisposable | TypesThatOwnNativeResourcesShouldBeDisposable: Types that own native resources should be disposable                                  |
| Low      | Write Static Field From Instance Method              | OPT.VBNET.VBnet.WriteStaticFieldFromInstanceMethod            | WriteStaticFieldFromInstanceMethod: Do not write in static fields from instance methods  |
| Medium   | Unsafe Cookie Rule                                   | OPT.VBNET.SEC.UnsafeCookieRule                                | UnsafeCookieRule: Generate server-side cookies with adequate security properties   |
| Medium   | Avoid Host Name Checks                               | OPT.VBNET.SEC.AvoidHostNameChecks                             | AvoidHostNameChecks: Avoid checks on client-side hostname, that are not reliable due to DNS poisoning                                |
| Medium   | MVC Remove Version Header                            | OPT.VBNET.MVCRemoveVersionHeader                              | MVCRemoveVersionHeader: Remove ASP.NET MVC version from HTTP headers   |
| Medium   | P Invokes Should Not Be Safe Critical                | OPT.VBNET.PInvokesShouldNotBeSafeCritical                     | PInvokesShouldNotBeSafeCritical: A P/Invoke declaration should not have the SecuritySafeCriticalAttribute attribute                  |
| Medium   | Hardcoded Credential                                 | OPT.VBNET.SEC.HardcodedCredential                             | HardcodedCredential: Use of Hard-coded Credentials   |
| Medium   | Hardcoded Network Address                            | OPT.VBNET.SEC.HardcodedNetworkAddress                         | HardcodedNetworkAddress: Network addresses should not be hardcoded   |
| Medium   | Plaintext Storage Of Password                        | OPT.VBNET.SEC.PlaintextStorageOfPassword                      | PlaintextStorageOfPassword: Plaintext Storage of a Password  |
| Medium   | Serializable Class Containing Sensitive Data         | OPT.VBNET.SEC.SerializableClassContainingSensitiveData        | SerializableClassContainingSensitiveData: Serializable Class Containing Sensitive Data   |
| Medium   | Secure Serialization Constructors                    | OPT.VBNET.SecureSerializationConstructors                     | SecureSerializationConstructors: Serialization constructors should be protected with security demands                                |
| Medium   | Secured Types Should Not Expose Fields               | OPT.VBNET.SecuredTypesShouldNotExposeFields                   | SecuredTypesShouldNotExposeFields: Types secured with Link Demands should not expose fields  |



| Severity | Contrast rule   | Engine rule ID   | Description   |
|----------|---|--|---|
| Medium   | Transparency Annotations Should Not Conflict            | OPT.VBNET.TransparencyAnnotationsShouldNotConflict         | TransparencyAnnotationsShouldNotConflict: The security attribute of a type should have the same transparency that the security attributes of its members that it contains |
| Medium   | Do Not Expose Fields In Secured Type                    | OPT.VBNET.VBnet.DoNotExposeFieldsInSecuredType             | DoNotExposeFieldsInSecuredType: Do not declare public types that are secured but also expose its fields   |
| Medium   | Review Suppress Unmanaged Code Security Usage           | OPT.VBNET.VBnet.ReviewSuppressUnmanagedCodeSecurityUsage   | ReviewSuppressUnmanagedCodeSecurityUsage: Do not use the 'SuppressUnmanagedCodeSecurity' attribute  |
| Medium   | Avoid Readonly Mutable Types                            | OPT.VBNET.AvoidReadonlyMutableTypes                        | AvoidReadonlyMutableTypes: Do not declare externally visible read-only fields with mutable types  |
| Medium   | Call GC Keep Alive When Using a Native Resource         | OPT.VBNET.CallGCKeepAliveWhenUsingaNativeResource          | CallGCKeepAliveWhenUsingaNativeResource: GC.KeepAlive should be called in methods that use unmanaged resources  |
| Medium   | Critical Types Must Not Participate In Type Equivalence | OPT.VBNET.CriticalTypesMustNotParticipateInTypeEquivalence | CriticalTypesMustNotParticipateInTypeEquivalence: SecurityCriticalAttribute should not be used on members, or types that participate in type equivalence                  |
| Medium   | Dispose Methods Should Call Suppress Finalize           | OPT.VBNET.DisposeMethodsShouldCallSuppressFinalize         | DisposeMethodsShouldCallSuppressFinalize: Dispose method of a class that implements System.IDisposable, should call GC.SuppressFinalize                                   |
| Medium   | Method Security Should Be Superset Of Type              | OPT.VBNET.MethodSecurityShouldBeSupersetOfType             | MethodSecurityShouldBeSupersetOfType: Security of methods should be a subset of the security of types   |
| Medium   | MVC Post In Controllers                                 | OPT.VBNET.MVCPostInControllers                             | MVCPostInControllers: Restrict allowed HTTP verbs for state-change operations in MVC controllers  |
| Medium   | Potential Infinite Loop                                 | OPT.VBNET.PotentialInfiniteLoop                            | PotentialInfiniteLoop: Loop with Unreachable Condition ('Infinite Loop')  |
| Medium   | Provide Correct Arguments To Formatting Methods         | OPT.VBNET.ProvideCorrectArgumentsToFormattingMethods       | ProvideCorrectArgumentsToFormattingMethods: The format argument passed to System.String.Format does not match with the objects passed as parameters                       |
| Medium   | Provide Deserialization Methods For Optional Fields     | OPT.VBNET.ProvideDeserializationMethodsForOptionalFields   | ProvideDeserializationMethodsForOptionalFields: Provide methods for the de-serialization of fields marked with OptionalFieldAttribute                                     |
| Medium   | Review Declarative Security On Value Types              | OPT.VBNET.ReviewDeclarativeSecurityOnValueTypes            | ReviewDeclarativeSecurityOnValueTypes: Avoid using declarative security in value types  |
| Medium   | Review Imperative Security                              | OPT.VBNET.ReviewImperativeSecurity                         | ReviewImperativeSecurity: Avoid using the imperative security whenever possible   |
| Medium   | Http Request Value Shadowing                            | OPT.VBNET.SEC.HttpRequestValueShadowing                    | HttpRequestValueShadowing: Request data accessed in an ambiguous way, which can be open to attack   |
| Medium   | Main Method In Web Application                          | OPT.VBNET.SEC.MainMethodInWebApplication                   | MainMethodInWebApplication: Main() method not allowed in web application  |
| Medium   | System Information Leak                                 | OPT.VBNET.SystemInformationLeak                            | SystemInformationLeak: Exposure of System Data to an Unauthorized Control Sphere  |



| Severity | Contrast rule   | Engine rule ID  | Description   |
|----------|---|---|---|
| Medium   | Test For NaN Correctly  | OPT.VBNET.TestForNaNCorrectly   | TestForNaNCorrectly: Not use NaN in the expressions for developing equality test  |
| Medium   | Transparent Methods Must Not Call Native Code                     | OPT.VBNET.TransparentMethodsMustNotCallNativeCode                     | TransparentMethodsMustNotCallNativeCode: A transparent method should not make calls to native code  |
| Medium   | Transparent Methods Must Not Handle Process Corrupting Exceptions | OPT.VBNET.TransparentMethodsMustNotHandleProcessCorruptingExceptions  | TransparentMethodsMustNotHandleProcessCorruptingExceptions: A transparent method must not have the attribute HandleProcessCorruptedStateExceptionsAttribute |
| Medium   | Transparent Methods Should Not Be Protected With Link Demands     | OPT.VBNET.TransparentMethodsShouldNotBeProtectedWithLinkDemands       | TransparentMethodsShouldNotBeProtectedWithLinkDemands: A transparent method should not require LinkDemand   |
| Medium   | Transparent Methods Should Not Demand                             | OPT.VBNET.TransparentMethodsShouldNotDemand                           | TransparentMethodsShouldNotDemand: A transparent method should not require SecurityAction.Demand, and should not call CodeAccessPermission.Demand method    |
| Medium   | Transparent Methods Should Not Load Assemblies From Byte Arrays   | OPT.VBNET.TransparentMethodsShouldNotLoadAssembliesFromByteArrays     | TransparentMethodsShouldNotLoadAssembliesFromByteArrays: A transparent method should not load an assembly from a byte array using the Assembly.Load method  |
| Medium   | Transparent Methods Should Not Use SuppressUnmanagedCodeSecurity  | OPT.VBNET.TransparentMethodsShouldNotUseSuppressUnmanagedCodeSecurity | TransparentMethodsShouldNotUseSuppressUnmanagedCodeSecurity: A transparent method should not have the attribute SuppressUnmanagedCodeSecurityAttribute      |
| Medium   | Type Link Demands Require Inheritance Demands                     | OPT.VBNET.TypeLinkDemandsRequireInheritanceDemands                    | TypeLinkDemandsRequireInheritanceDemands: A public type protected with link demand requires inheritance demand  |
| Medium   | Unchecked Input In Loop Condition                                 | OPT.VBNET.UncheckedInputInLoopCondition                               | UncheckedInputInLoopCondition: Unchecked input in loop condition  |
| Medium   | Unchecked Return Value  | OPT.VBNET.UncheckedReturnValue  | UncheckedReturnValue: Unchecked return value  |
| Medium   | Array Fields Should Not Be Read Only                              | OPT.VBNET.VBnet.ArrayFieldsShouldNotBeReadOnly                        | ArrayFieldsShouldNotBeReadOnly: Array fields should not be read only  |
| Medium   | Attribute Suffix  | OPT.VBNET.VBnet.AttributeSuffix                                       | AttributeSuffix: Name of an attribute class should be postfixed with 'Attribute'  |
| Medium   | Avoid Calling Problematic Methods                                 | OPT.VBNET.VBnet.AvoidCallingProblematicMethods                        | AvoidCallingProblematicMethods: Potential dangerous call  |
| Medium   | Avoid Large Methods   | OPT.VBNET.VBnet.AvoidLargeMethods                                     | AvoidLargeMethods: Avoid functions and methods with too many lines of code  |
| Medium   | Avoid Large Structure   | OPT.VBNET.VBnet.AvoidLargeStructure                                   | AvoidLargeStructure: Avoid creating structures that are too large   |
| Medium   | Avoid Protected Instance Fields                                   | OPT.VBNET.VBnet.AvoidProtectedInstanceFields                          | AvoidProtectedInstanceFields: Avoid Protected public fields   |
| Medium   | Avoid Static Members In Com Visible Types                         | OPT.VBNET.VBnet.AvoidStaticMembersInComVisibleTypes                   | AvoidStaticMembersInComVisibleTypes: Avoid static members in COM visible types  |

| Severity | Contrast rule   | Engine rule ID  | Description   |
|----------|---|---|---|
| Medium   | Avoid Unsealed Concrete Attributes Rule                     | OPT.VBNET.VBnet.AvoidUnsealedConcreteAttributesRule                 | AvoidUnsealedConcreteAttributesRule: Avoid attributes defined as NotInheritable but not abstract                                  |
| Medium   | Bad Exception Parent  | OPT.VBNET.VBnet.BadExceptionParent                                  | BadExceptionParent: Custom Exception should not derive from certain 'not allowed' base exception classes                          |
| Medium   | Bad Exception Thrown  | OPT.VBNET.VBnet.BadExceptionThrown                                  | BadExceptionThrown: Illegal Exception Thrown. Exceptions must be defined in separated class                                       |
| Medium   | Call Get Last Error Immediately After P Invoke              | OPT.VBNET.VBnet.CallGetLastErrorImmediatelyAfterPInvoke             | CallGetLastErrorImmediatelyAfterPInvoke: GetLastError immediately after P/Invoke  |
| Medium   | Check New Thread Without Start                              | OPT.VBNET.VBnet.CheckNewThreadWithoutStart                          | CheckNewThreadWithoutStart: Avoid creating unstarted threads  |
| Medium   | Clone Method Should Not Return Null                         | OPT.VBNET.VBnet.CloneMethodShouldNotReturnNull                      | CloneMethodShouldNotReturnNull: An override of Clone() method should never return null  |
| Medium   | Collection Suffix   | OPT.VBNET.VBnet.CollectionSuffix                                    | CollectionSuffix: Classes that implement Collection interfaces should have the 'Collection' suffix                                |
| Medium   | Collections Should Implement Generic Interface              | OPT.VBNET.VBnet.CollectionsShouldImplementGenericInterface          | CollectionsShouldImplementGenericInterface: Collections should implement the generic interface                                    |
| Medium   | Com Visible Type Base Types Should Be Com Visible           | OPT.VBNET.VBnet.ComVisibleTypeBaseTypesShouldBeComVisible           | ComVisibleTypeBaseTypesShouldBeComVisible: COM visible type derive from a non COM visible type                                    |
| Medium   | Common Exception Bases                                      | OPT.VBNET.VBnet.CommonExceptionBases                                | CommonExceptionBases: Derive Custom Exceptions from allowed classes defined in rule's properties                                  |
| Medium   | Consider Passing Base Types As Parameters                   | OPT.VBNET.VBnet.ConsiderPassingBaseTypesAsParameters                | ConsiderPassingBaseTypesAsParameters: Consider passing base types as parameters   |
| Medium   | Declare Types In Namespaces                                 | OPT.VBNET.VBnet.DeclareTypesInNamespaces                            | DeclareTypesInNamespaces: Declare types in namespaces   |
| Medium   | Default Parameters Should Not Be Used                       | OPT.VBNET.VBnet.DefaultParametersShouldNotBeUsed                    | DefaultParametersShouldNotBeUsed: Do not use default parameters   |
| Medium   | Disable Debugging Code Rule                                 | OPT.VBNET.VBnet.DisableDebuggingCodeRule                            | DisableDebuggingCodeRule: Avoid using Console.WriteLine   |
| Medium   | Disposable Fields Should Be Disposed                        | OPT.VBNET.VBnet.DisposableFieldsShouldBeDisposed                    | DisposableFieldsShouldBeDisposed: Call Dispose method of fields that implements IDisposable                                       |
| Medium   | Dispose Finalize  | OPT.VBNET.VBnet.DisposeFinalize                                     | DisposeFinalize: Implement both Finalize and Dispose  |
| Medium   | Do Not Catch General Exception Types                        | OPT.VBNET.VBnet.DoNotCatchGeneralExceptionTypes                     | DoNotCatchGeneralExceptionTypes: Do not catch general exception types   |
| Medium   | Do Not Declare Overridable Members In Not Inheritable Types | OPT.VBNET.VBnet.DoNotDeclareOverridableMembersInNotInheritableTypes | DoNotDeclareOverridableMembersInNotInheritableTypes: Do not declare Overridable and not virtual members in NotInheritable classes |

| Severity | Contrast rule                                      | Engine rule ID  | Description  |
|----------|--|---|--|
| Medium   | Do Not Decrease Inherited Member Visibility        | OPT.VBNET.VBnet.DoNotDecreaseInheritedMemberVisibility      | DoNotDecreaseInheritedMemberVisibility: Do not decrease inherited member visibility  |
| Medium   | Do Not Ignore Method Results                       | OPT.VBNET.VBnet.DoNotIgnoreMethodResults                    | DoNotIgnoreMethodResults: Do not ignore returning value of methods   |
| Medium   | Do Not Pass Literals As Localized Parameters       | OPT.VBNET.VBnet.DoNotPassLiteralsAsLocalizedParameters      | DoNotPassLiteralsAsLocalizedParameters: literal passes as parameter should be localized  |
| Medium   | Do Not Raise Exceptions In Exception Clauses       | OPT.VBNET.VBnet.DoNotRaiseExceptionsInExceptionClauses      | DoNotRaiseExceptionsInExceptionClauses: exception is thrown from a finally, filter, or finally clause  |
| Medium   | Do Not Raise Reserved Exception Types              | OPT.VBNET.VBnet.DoNotRaiseReservedExceptionTypes            | DoNotRaiseReservedExceptionTypes: Do not raise reserved exception types  |
| Medium   | Do Not Use Timers That Prevent Power State Changes | OPT.VBNET.VBnet.DoNotUseTimersThatPreventPowerStateChanges  | DoNotUseTimersThatPreventPowerStateChanges: Avoid timers that prevent power state changes  |
| Medium   | Double Check Locking Rule                          | OPT.VBNET.VBnet.DoubleCheckLockingRule                      | DoubleCheckLockingRule: Incorrect usage of double checking when implementing SingleCheck pattern   |
| Medium   | Equal Op With Add Sub                              | OPT.VBNET.VBnet.EqualOpWithAddSub                           | EqualOpWithAddSub: Implement +, -, and {}  |
| Medium   | Equals Throws Ex                                   | OPT.VBNET.VBnet.EqualsThrowsEx                              | EqualsThrowsEx: Avoid throwing exception in Equals method  |
| Medium   | Exception Constructors                             | OPT.VBNET.VBnet.ExceptionConstructors                       | ExceptionConstructors: Custom Exception classes should implement the common Constructors   |
| Medium   | Exception Suffix                                   | OPT.VBNET.VBnet.ExceptionSuffix                             | ExceptionSuffix: Classes that inherits Exception classes should have the 'Exception' suffix  |
| Medium   | Get Hash Code Throws Ex                            | OPT.VBNET.VBnet.GetHashCodeThrowsEx                         | GetHashCodeThrowsEx: Avoid throwing exceptions when overriding GetHashCode   |
| Medium   | I Comparable With Comp Ops                         | OPT.VBNET.VBnet.IComparableWithCompOps                      | IComparableWithCompOps: Implement comparison operators when implementing IComparable   |
| Medium   | Implement I Serializable Correctly                 | OPT.VBNET.VBnet.ImplementISerializableCorrectly             | ImplementISerializableCorrectly: Implement ISerializable correctly   |
| Medium   | Implement Standard Exception Constructors          | OPT.VBNET.VBnet.ImplementStandardExceptionConstructors      | ImplementStandardExceptionConstructors: Implement standard exception constructors  |
| Medium   | Index With ICollection                             | OPT.VBNET.VBnet.IndexWithICollection                        | IndexWithICollection: Avoid indexed properties on classes not extending from System.Collections.Interfaces                                   |
| Medium   | Level2 Assemblies Should Not Contain Linkdemands   | OPT.VBNET.VBnet.Level2AssembliesShouldNotContainLinkdemands | Level2AssembliesShouldNotContainLinkdemands: A class or class member is using a LinkDemands in an application that is using Level 2 security |
| Medium   | Mark Members As Static                             | OPT.VBNET.VBnet.MarkMembersAsStatic                         | MarkMembersAsStatic: A method that only accesses class members should be marked 'Shared'   |

| Severity | Contrast rule                                    | Engine rule ID   | Description   |
|----------|--|--|---|
| Medium   | Members Should Not Expose Certain Concrete Types | OPT.VBNET.VBnet.MembersShouldNotExposeCertainConcreteTypes | MembersShouldNotExposeCertainConcreteTypes: Members should not expose certain concrete types              |
| Medium   | Move P Invokes To Native Methods Class           | OPT.VBNET.VBnet.MovePInvokesToNativeMethodsClass           | MovePInvokesToNativeMethodsClass: MovePInvokes to NativeMethods class                                     |
| Medium   | Nested Types Should Not Be Visible               | OPT.VBNET.VBnet.NestedTypesShouldNotBeVisible              | NestedTypesShouldNotBeVisible: An externally visible type contains an externally visible type declaration |
| Medium   | Operator Throws Ex                               | OPT.VBNET.VBnet.OperatorThrowsEx                           | OperatorThrowsEx: Overloading a binary operator should not throw exceptions                               |
| Medium   | Pass System Obj Instead Of String                | OPT.VBNET.VBnet.PassSystemObjInsteadOfString               | PassSystemObjInsteadOfString: Method invocation can be improved   |
| Medium   | Pointers Should Not Be Visible                   | OPT.VBNET.VBnet.PointersShouldNotBeVisible                 | PointersShouldNotBeVisible: Pointers should not be visible  |
| Medium   | Properties Matched By Constructor Args           | OPT.VBNET.VBnet.PropertiesMatchedByConstructorArgs         | PropertiesMatchedByConstructorArgs: Constructor parameters set to Properties                              |
| Medium   | Properties Should Not Be Write Only              | OPT.VBNET.VBnet.PropertiesShouldNotBeWriteOnly             | PropertiesShouldNotBeWriteOnly: Avoid write-only properties   |
| Medium   | Rethrow To Preserve Stack Details                | OPT.VBNET.VBnet.RethrowToPreserveStackDetails              | RethrowToPreserveStackDetails: Do not rethrow exceptions explicitly                                       |
| Medium   | Same Namespace Type                              | OPT.VBNET.VBnet.SameNamespaceType                          | SameNamespaceType: Conflict between namespace and class names   |
| Medium   | Set Locale For Data Types                        | OPT.VBNET.VBnet.SetLocaleForDataTypes                      | SetLocaleForDataTypes: Set locale property for data types   |
| Medium   | Specify Culture Info                             | OPT.VBNET.VBnet.SpecifyCultureInfo                         | SpecifyCultureInfo: Specify CultureInfo   |
| Medium   | Specify Message Box Options                      | OPT.VBNET.VBnet.SpecifyMessageBoxOptions                   | SpecifyMessageBoxOptions: Specify MessageBoxOptions   |
| Medium   | Specify String Comparison                        | OPT.VBNET.VBnet.SpecifyStringComparison                    | SpecifyStringComparison: Specify StringComparison   |
| Medium   | Static Holder Types Should Be Sealed             | OPT.VBNET.VBnet.StaticHolderTypesShouldBeSealed            | StaticHolderTypesShouldBeSealed: Class containing only static members should be declared NotInheritable   |
| Medium   | Static Holder Types Should Not Have Constructors | OPT.VBNET.VBnet.StaticHolderTypesShouldNotHaveConstructors | StaticHolderTypesShouldNotHaveConstructors: Static holder types should not have constructors              |
| Medium   | Struct Empty Constructor                         | OPT.VBNET.VBnet.StructEmptyConstructor                     | StructEmptyConstructor: Avoid Structures with empty constructors  |
| Medium   | Type Names Should Not Match Namespaces           | OPT.VBNET.VBnet.TypeNamesShouldNotMatchNamespaces          | TypeNamesShouldNotMatchNamespaces: Type names should not match namespaces                                 |
| Medium   | Types Should Not Extend Certain Base Types       | OPT.VBNET.VBnet.TypesShouldNotExtendCertainBaseTypes       | TypesShouldNotExtendCertainBaseTypes: Types should not extend certain base types                          |
| Medium   | Uri Parameters Should Not Be Strings             | OPT.VBNET.VBnet.UriParametersShouldNotBeStrings            | UriParametersShouldNotBeStrings: URI parameters should not be strings                                     |

| Severity | Contrast rule                           | Engine rule ID                                    | Description   |
|----------|---|---|---|
| Medium   | Uri Return Values Should Not Be Strings | OPT.VBNET.VBnet.UriReturnValuesShouldNotBeStrings | UriReturnValuesShouldNotBeStrings: The name of a method contains 'uri', 'Uri', 'urn', 'Urn', 'url' or 'Url', and returns a string |
| Medium   | Use Generic Event Handler Instances     | OPT.VBNET.VBnet.UseGenericEventHandlerInstances   | UseGenericEventHandlerInstances: Use generic event handler instances  |
| Medium   | Validate Arguments Of Public Methods    | OPT.VBNET.VBnet.ValidateArgumentsOfPublicMethods  | ValidateArgumentsOfPublicMethods: Check parameters of externally visible methods  |

## Visual Basic 6 Scan rules

Contrast supports these rules for Visual Basic 6.

| Severity | Contrast rule | Engine rule ID    | Description   |
|----------|---------------|-------------------|---|
| Critical | B I T N       | OPT.VB6.VBCC.BITN | BITN: Nested if...then sentences are not allowed                          |
| Critical | R A D L       | OPT.VB6.VBDS.RADL | RADL: Avoid absolute paths in Lib definition                              |
| Critical | O E R N       | OPT.VB6.VBEH.OERN | OERN: Use of 'On Error Resume Next'                                       |
| Critical | K C R A       | OPT.VB6.VBFA.KCRA | KCRA: 'Kill' command must not contain absolute paths                      |
| Critical | O C R A       | OPT.VB6.VBFA.OCRA | OCRA: 'Open' command must not contain absolute paths                      |
| Critical | S C R A       | OPT.VB6.VBFA.SCRA | SCRA: 'Shell' command must not contain absolute paths                     |
| Critical | N C P F       | OPT.VB6.VBFD.NCPF | NCPF: Maximum number of controls per form                                 |
| Critical | F A O E       | OPT.VB6.VBSF.FAOE | FAOE: In every source code file must appear 'Option Explicit' declaration |
| Critical | F R D P       | OPT.VB6.VBSF.FRDP | FRDP: Source files must be in the same directory than project (.vpb file) |
| Critical | E U F P       | OPT.VB6.VBUK.EUFP | EUFP: Avoid using pointer functions                                       |
| Critical | V N U C       | OPT.VB6.VBVD.VNUC | VNUC: Public variables must not be used in class modules                  |
| High     | A N E M       | OPT.VB6.VBCC.ANEM | ANEM: Check number of arguments in the methods                            |
| High     | C P C L       | OPT.VB6.VBCC.CPCL | CPCL: Cyclomatic complexity for VB6 procedures should be low              |
| High     | D E V L       | OPT.VB6.VBCC.DEVL | DEVL: Avoid excessive local variables                                     |
| High     | E U V G       | OPT.VB6.VBCC.EUVG | EUVG: Avoid using global variables (except with 'WithEvents')             |
| High     | S S D O       | OPT.VB6.VBCC.SSDO | SSDO: Do not use nested case statements                                   |
| High     | A C G E       | OPT.VB6.VBCD.ACGE | ACGE: Global constants should be Private.                                 |
| High     | E C M N       | OPT.VB6.VBCD.ECMN | ECMN: Avoid constants with the same name                                  |
| High     | N C C F       | OPT.VB6.VBCD.NCCF | NCCF: Constants must follow a naming standard                             |
| High     | D C A V       | OPT.VB6.VBCL.DCAV | DCAV: Constants declaration should be placed before variables declaration |
| High     | D V C P       | OPT.VB6.VBCL.DVCP | DVCP: Variables declaration should be in the headers of the procedures    |
| High     | E D L C       | OPT.VB6.VBCL.EDLC | EDLC: Avoid Functions and Procedures with more than 200 code lines        |
| High     | F P V D       | OPT.VB6.VBCL.FPVD | FPVD: Empty function or Procedure detected                                |
| High     | N E C F       | OPT.VB6.VBCL.NECF | NECF: Line label names must be properly formed                            |
| High     | P E M L       | OPT.VB6.VBCL.PEML | PEML: PROPERTY procedures must not exceed certain number of code lines    |
| High     | U L I T       | OPT.VB6.VBCL.ULIT | ULIT: Do not use inline If...Then statements                              |
| High     | C G N U       | OPT.VB6.VBDC.CGNU | CGNU: Avoid unused Global Constants                                       |
| High     | V G N U       | OPT.VB6.VBDC.VGNU | VGNU: Avoid unused Global variables                                       |

| Severity | Contrast rule                               | Engine rule ID    | Description  |
|----------|---|-------------------|--|
| High     | V L S U                                     | OPT.VB6.VBDC.VLSU | VLSU: Avoid unused Local variables   |
| High     | S D A P                                     | OPT.VB6.VBDS.SDAP | SDAP: Declare sentences must have 'Private' scope  |
| High     | D E D E                                     | OPT.VB6.VBED.DEDE | DEDE: 'Enum' declaration scope must be 'Public' or 'Private'   |
| High     | U E C T                                     | OPT.VB6.VBEH.UECT | UECT: Use 'On Error Resume Next' with 'Class_Terminate' event  |
| High     | U O E H                                     | OPT.VB6.VBEH.UOEH | UOEH: Use error-handling routines  |
| High     | Number used to describe files (Close)       | OPT.VB6.VBFA.CUNF | CUNF: With 'Close' command, numbers must not be used to describe files                                   |
| High     | Number used to describe files (EOF)         | OPT.VB6.VBFA.EUNF | EUNF: With 'EOF' command, number must not be used to describe files                                      |
| High     | Number used to describe files (LOF)         | OPT.VB6.VBFA.LUNF | LUNF: With 'LOF' command, number must not be used to describe files                                      |
| High     | Number used to describe files (File Access) | OPT.VB6.VBFA.NCAF | NCAF: With file access commands, number must not be used to describe files                               |
| High     | Close command used, without file number     | OPT.VB6.VBFA.NCSF | NCSF: Do not use 'Close' command without file number   |
| High     | Number used to describe files (Open)        | OPT.VB6.VBFA.OUNF | OUNF: With 'Open' command, number must not be used to describe files                                     |
| High     | B B I T                                     | OPT.VB6.VBFD.BBIT | BBIT: 'Browser' buttons (...) or buttons with only an image should have activated 'ToolTipText' property |
| High     | F C C B                                     | OPT.VB6.VBFD.FCCB | FCCB: Forms must have 'ControlBox'   |
| High     | F I E U                                     | OPT.VB6.VBFD.FIEU | FIEU: Forms must implement 'Unload' event  |
| High     | F T F P                                     | OPT.VB6.VBFD.FTFP | FTFP: Forms must have the same font type   |
| High     | T B M L                                     | OPT.VB6.VBFD.TBML | TBML: MaxLenght property must be specificated  |
| High     | I E O M                                     | OPT.VB6.VBOU.IEOM | IEOM: Avoid using 'InStr()' command embedded in 'Mid()' command  |
| High     | U O C C                                     | OPT.VB6.VBP.UOCC  | UOCC: Avoid using '+' operator to concatenate strings  |
| High     | A D P E                                     | OPT.VB6.VBPD.ADPE | ADPE: Procedure declaration scope must be always specified   |
| High     | A D T A                                     | OPT.VB6.VBPD.ADTA | ADTA: Formal parameter types must be specified   |
| High     | A E V R                                     | OPT.VB6.VBPD.AEVR | AEVR: Formal parameters must be specified as 'ByVal' or 'ByRef'  |
| High     | M U P S                                     | OPT.VB6.VBPD.MUPS | MUPS: Methods must have an only exit point   |
| High     | N A C F                                     | OPT.VB6.VBPD.NACF | NACF: Formal parameter names must be properly formed   |
| High     | O A D V                                     | OPT.VB6.VBPD.OADV | OADV: Optional formal parameters must have a default value   |
| High     | N M C P                                     | OPT.VB6.VBSF.NMCP | NMCP: Module names (.bas files) must have a prefix   |
| High     | P C N M                                     | OPT.VB6.VBSF.PCNM | PCNM: Class modules names (.cls file) must have a prefix   |
| High     | P F M D                                     | OPT.VB6.VBSF.PFMD | PFMD: MDI Forms must have a prefix   |
| High     | P F N M                                     | OPT.VB6.VBSF.PFNM | PFNM: No MDI forms must have a prefix  |
| High     | P N D F                                     | OPT.VB6.VBSF.PNDF | PNDF: Designer file names (.dsr files) must have a prefix  |
| High     | P N P P                                     | OPT.VB6.VBSF.PNPP | PNPP: Property Page file names (.pag files) must have a prefix   |
| High     | P N U C                                     | OPT.VB6.VBSF.PNUC | PNUC: User Control file names (.ctl files) must have a prefix  |
| High     | P N U D                                     | OPT.VB6.VBSF.PNUD | PNUD: User Document file names (.dob files) must have a prefix   |
| High     | E T C N                                     | OPT.VB6.VBTU.ETCN | ETCN: The names of the Type's elements must be properly formed   |
| High     | N T C D                                     | OPT.VB6.VBTU.NTCD | NTCD: Type names must follow a naming standard   |
| High     | E S O B                                     | OPT.VB6.VBUK.ESOB | ESOB: Do not use 'Option Base' sentence  |
| High     | E U F I                                     | OPT.VB6.VBUK.EUFI | EUFI: Avoid using 'IsMissing()' function   |
| High     | E V M N                                     | OPT.VB6.VBVD.EVMN | EVMN: Avoid variables with the same name   |

| Severity | Contrast rule | Engine rule ID    | Description  |
|----------|---------------|-------------------|--|
| High     | N V C F       | OPT.VB6.VBVD.NVCF | NVCF: Public vars must follow a naming standard  |
| High     | N V L F       | OPT.VB6.VBVD.NVLF | NVLF: Name of a local variable must follow a naming standard   |
| High     | N V S F       | OPT.VB6.VBVD.NVSF | NVSF: Static (shared) vars must follow a naming standard   |
| High     | N V W F       | OPT.VB6.VBVD.NVWF | NVWF: Names of 'WithEvents' variables must be properly formed  |
| High     | V O L D       | OPT.VB6.VBVD.VOLD | VOLD: Local Object variables must be destroyed   |
| Info     | O E G 0       | OPT.VB6.VBEH.OEG0 | OEG0: Use of 'On Error GoTo 0'   |
| Info     | U P A A       | OPT.VB6.VBPD.UPAA | UPAA: Avoid using 'ParamArray' in formal parameters  |
| Low      | M C P L       | OPT.VB6.VBCL.MCPL | MCPL: Maximum number of characters per line  |
| Low      | A O L E       | OPT.VB6.VBEH.AOLE | AOLE: Avoid using 'On Local Error'   |
| Low      | C T F P       | OPT.VB6.VBFD.CTFP | CTFP: Controls must have the same font type  |
| Low      | N C C P       | OPT.VB6.VBFD.NCCP | NCCP: Form control names must be properly formed   |
| Low      | A I V N       | OPT.VB6.VBPP.AIVN | AIVN: Auto-increment version number must be disabled   |
| Low      | V I C N       | OPT.VB6.VBPP.VICN | VICN: 'VersionCompanyName' must be defined   |
| Low      | V I F D       | OPT.VB6.VBPP.VIFD | VIFD: 'VersionFileDescription' must be defined   |
| Low      | V I L C       | OPT.VB6.VBPP.VILC | VILC: 'VersionLegalCopyright' must be defined  |
| Low      | V I P N       | OPT.VB6.VBPP.VIPN | VIPN: 'VersionProductName' must be defined   |
| Low      | U D M L       | OPT.VB6.VBVD.UDML | UDML: Avoid using 'Dim' in global variable declarations  |
| Medium   | T C D A       | OPT.VB6.VBCD.TCDA | TCDA: Constants must have a defined type   |
| Medium   | A G L S       | OPT.VB6.VBCL.AGLS | AGLS: Place property Let/Get/Set accessors together  |
| Medium   | E S D F       | OPT.VB6.VBCL.ESDF | ESDF: Avoid modules that contain only declarations   |
| Medium   | C S U         | OPT.VB6.VBDC.CSU  | CSU: Local constants not used  |
| Medium   | P S U         | OPT.VB6.VBDC.PSU  | PSU: Parameters not used   |
| Medium   | E E N P       | OPT.VB6.VBED.EENP | EENP: Elements names of a statement Enum must follow a naming standard                                   |
| Medium   | V N E E       | OPT.VB6.VBED.VNEE | VNEE: Assign numeric values to 'Enum' elements   |
| Medium   | T B N E       | OPT.VB6.VBFD.TBNE | TBNE: CommandButton size must be standar   |
| Medium   | A N S C       | OPT.VB6.VBP.ANSC  | ANSC: Avoid String comparisons with empty strings or null string   |
| Medium   | A V D V       | OPT.VB6.VBP.AVDV  | AVDV: Avoid Variant variables  |
| Medium   | E T R E       | OPT.VB6.VBP.ETRE  | ETRE: Specify return type in functions   |
| Medium   | U I S C       | OPT.VB6.VBP.UISC  | UISC: Use String Constants instead of 'Chr\$()' and 'Chr()' functions                                    |
| Medium   | U S C F       | OPT.VB6.VBP.USCF  | USCF: Use Chr\$() instead of Chr() for Variant variables   |
| Medium   | U S D F       | OPT.VB6.VBP.USDF  | USDF: Use 'CurDir\$()' and 'Dir\$()' functions instead of 'CurDir()' and 'Dir()'                         |
| Medium   | U S E F       | OPT.VB6.VBP.USEF  | USEF: Use 'Left\$()', 'Right\$()' and 'Mid\$()' functions instead of 'Left()', 'Right()' and 'Mid()'     |
| Medium   | U S H F       | OPT.VB6.VBP.USHF  | USHF: Use 'Hex\$()' function instead of 'Hex()'  |
| Medium   | U S S F       | OPT.VB6.VBP.USSF  | USSF: Use 'Space\$()' function instead of 'Space()'  |
| Medium   | U S T F       | OPT.VB6.VBP.USTF  | USTF: Use 'LTrim\$()', 'RTrim\$()' and 'Trim\$()' functions instead of 'LTrim()', 'RTrim()' and 'Trim()' |
| Medium   | M I V D       | OPT.VB6.VBVD.MIVD | MIVD: Avoid multiple variable declaration in the same declaration statement                              |

## XML Scan rules

Contrast Scan supports these rules for XML.



| Severity | Contrast rule                          | Engine rule ID                                     | Description  |
|----------|--|--|--|
| Critical | Check Action Mappings Type             | OPT.XML.STRUTSCONFIG.CheckActionMappingsType       | CheckActionMappingsType: Class for action-mappings property does not match with the ones defined in this rule's property |
| Critical | Check Action With Path Attribute       | OPT.XML.STRUTSCONFIG.CheckActionWithPathAttribute  | CheckActionWithPathAttribute: Every action must contain a path attribute   |
| Critical | Check Html Redirect Links              | OPT.XML.STRUTSCONFIG.CheckHtmlRedirectLinks        | CheckHtmlRedirectLinks: A forward to a web document must use the redirect attribute                                      |
| Critical | Check Maximum Session Scopes           | OPT.XML.STRUTSCONFIG.CheckMaximumSessionScopes     | CheckMaximumSessionScopes: Level of ActionForm in session overpassed   |
| Critical | Check Name Attribute In Form Beans     | OPT.XML.STRUTSCONFIG.CheckNameAttributeInFormBeans | CheckNameAttributeInFormBeans: Every <form-bean> must specify a "name" attribute   |
| Critical | Specify Filter Action                  | OPT.XML.WEB.SpecifyFilterAction                    | SpecifyFilterAction: Action filter is not properly defined   |
| Critical | Use the proper slash character in URLs | OPT.XML.XMLPT.USEOFCORRECTBARS                     | USEOFCORRECTBARS: Use the proper slash character in URLs ('/')   |
| Critical | Document your code                     | OPT.XML.XSLT_MAN.DOCUMENTEDCODE                    | DOCUMENTEDCODE: Checks if the code is documented   |
| Critical | Use xsl:choose correctly               | OPT.XML.XSLT_MAN.EFFICIENTUSEOFCHOOSE              | EFFICIENTUSEOFCHOOSE: Checks if the xsl:choose tag is being used correctly   |
| Critical | Remove unused parameters               | OPT.XML.XSLT_MAN.NOUSEDPARAM                       | NOUSEDPARAM: Detects declared parameters are not being used  |
| Critical | Remove unused variables                | OPT.XML.XSLT_MAN.NOUSEDVARIABLES                   | NOUSEDVARIABLES: Detects declared variables are not being used   |
| Critical | Avoid using axis                       | OPT.XML.XSLT_OYR.INEFFICIENTAXES                   | INEFFICIENTAXES: Avoid using axis  |
| Critical | Avoid using XPath comparisons          | OPT.XML.XSLT_OYR.NOUSEXPATHEXPRESSIONS             | NOUSEXPATHEXPRESSIONS: Advises avoid the direct comparisons between nodes  |
| Critical | Advised the use keys                   | OPT.XML.XSLT_OYR.USEKEYS                           | USEKEYS: Advised the use of keys   |
| Critical | Check XPath expressions                | OPT.XML.XSLT_PB.CHECKXPATHEXPRESSIONS              | CHECKXPATHEXPRESSIONS: Checks the XPath expressions  |
| Critical | Checks tag names xsl:template          | OPT.XML.XSLT_PB.DUPLICATENAMEOFTEMPLATE            | DUPLICATENAMEOFTEMPLATE: Checks tag names xsl:template   |
| Critical | Checks if the stylesheet is portable   | OPT.XML.XSLT_PT.PORTABILITY                        | PORTABILITY: Checks if the stylesheet is portable  |
| High     | Check Unused Action Forms              | OPT.XML.STRUTSCONFIG.CheckUnusedActionForms        | CheckUnusedActionForms: There are ActionForms that are not being used in actions   |
| Info     | Check Form Properties                  | OPT.XML.STRUTSCONFIG.CheckFormProperties           | CheckFormProperties: There are Forms without properties  |
| Info     | Compulsory Resources Import            | OPT.XML.STRUTSCONFIG.CompulsoryResourcesImport     | CompulsoryResourcesImport: Parameter attribute in message-resources is not valid   |
| Medium   | Check Action With Forward              | OPT.XML.STRUTSCONFIG.CheckActionWithForward        | CheckActionWithForward: Every action must be followed by a forward child node  |



| Severity | Contrast rule                  | Engine rule ID                                 | Description   |
|----------|--------------------------------|--|---|
| Medium   | Non Matching Type In Form Bean | OPT.XML.STRUTSCONFIG.NonMatchingTypeInFormBean | NonMatchingTypeInFormBean: ActionForm different from DynaValidatorForm or ValidatorForm |

## Contrast Scan local engine supported versions

Use this topic to understand the supported versions for the Contrast Scan local engine. This information can help you to determine:

- Which versions of the Scan local engine to use.
- How often you need to update.
- Whether you're using versions in your pipelines that Contrast no longer supports.

### Local engine versioning

The version number for the Scan local engine comprises three numbers, X.Y.Z (for example 1.1.2), which follows industry standard versioning:

- **X:** A major version of the Scan local engine.  
Typically, this version number changes only when the Scan local engine has significant changes. For example, releasing a new engine that fundamentally changes the core architecture represents a major version change.
- **Y:** A minor version of the Scan local engine.  
This version number changes for improvements of core components within the Scan local engine. For example, upgrading an existing engine or updating a supported version of Java that the engine uses represents a minor version change.
- **Z:** A maintenance release of the Scan local engine.  
Usually, updates for the Scan local engine occur on a monthly basis, therefore, this version number changes with each monthly release.

### Scan local engine release notes

To find the latest version of the Scan local engine, visit the [release notes](#). (page 674) The release notes also provide an overview of recent updates.

### Support status based on versions

The following table provides guidelines for determining the supported versions of the Scan local engine.

| Version number                    | Supported status  |
|-----------------------------------|---|
| Major (for example, 1.Y.Z)        | Current major version only. Where possible, Contrast provides a three-month notice before a Major release is due. |
| Minor (for example, X.2.Z)        | Current — one version (where applicable)  |
| Maintenance (for example: (X.Y.2) | All maintenance versions within the current minor version unless otherwise stated                                 |

For example, if the current Scan local engine is version 1.5.8, then unless stated otherwise in the release notes, all versions from 1.4.X onward are considered supported versions.

However if the next release is 2.1.1 then all previous versions of the Scan local engine are considered unsupported. Contrast notifies customers to update their software as soon as possible. Contrast also notifies customers about the new major version three months before the release.

## Download the Scan local engine application

Contrast provides a reusable script that lets you download the the latest version of Scan local engine application. The downloaded application is a Java JAR file.

## Before you begin

- The script provided in this topic is designed to run in a terminal window as a bash script.
- The script uses these [environment variables \(page 919\)](#):

- CONTRAST\_\_API\_\_ORGANIZATION
- CONTRAST\_\_API\_\_URL
- CONTRAST\_\_API\_\_USER\_NAME
- CONTRAST\_\_API\_\_API\_KEY
- CONTRAST\_\_API\_\_SERVICE\_KEY

To find these keys in the Contrast web interface, select **usermenu > User settings > Profile** and locate the keys under **Your keys**.

## Steps

1. Create a script named `download-release.sh` that includes the following code:

```
#!/bin/bash

RELEASE=latest

if [ -n "$1" ]
then
    RELEASE=$1
fi

OUTPUT_FILE=sast-local-scanner-$RELEASE.zip
AUTH_TOKEN=$(echo -n
$CONTRAST__API__USER_NAME:$CONTRAST__API__SERVICE_KEY | base64)

curl \
  -H "api-key: $CONTRAST__API__API_KEY" \
  -H "authorization: $AUTH_TOKEN" \
  -L \
  -o $OUTPUT_FILE \
  $CONTRAST__API__URL/organizations/$CONTRAST__API__ORGANIZATION/release-
artifacts/local-scanner/$RELEASE?download=true
```

2. In a terminal window, set the environment variables with commands similar to the following:

```
export CONTRAST__API__ORGANIZATION=<Contrast_organization_ID>
export CONTRAST__API__URL=https://<your_teamserver_environment>/
Contrast/api/sast
export CONTRAST__API__USER_NAME=<Contrast_user_name>
export CONTRAST__API__API_KEY=<Contrast_API_key>
export CONTRAST__API__SERVICE_KEY=<Contrast_service_key>
```

- Replace `<Contrast_organization_ID>` with your organization ID.
  - Replace `<your_teamserver_environment>` with the address of the Contrast installation where you want to report scan results. For example: `https://teamserver-mycompany/Contrast/api/sast`.
  - Replace `<Contrast_user_name>` with the user name for your Contrast account (usually, your login ID).
  - Replace `<Contrast_API_key>` with your Contrast API key.
  - Replace `<Contrast_service_key>` with your Contrast service key.
3. Run the script using `bash` (for example, `bash download-release.sh`)

You'll see output results similar to the following:

```
janedoe@JDOE-LOCAL Webapps % bash ./download-release.sh
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           %             %             Dload  Upload  Total  Spent    Left     Speed
  0     0     0     0     0     0     0     0  --:--:--  0:00:03  --:--:--    0
82  138M  82  114M   0     0  4389k   0  0:00:32  0:00:26  0:00:06 5011k
```

The script downloads `sast-local-scanner-latest.zip` which includes the latest version of the Scan local engine. The ZIP file is approximately 145 MB in size.

|   |                      |           |               |
|---|----------------------|-----------|---------------|
|  release-notes.md                    | 21 Mar 2024 at 10:22 | 222 bytes | Document      |
|  sast-local-scan-runner-1.0.9.jar    | 21 Mar 2024 at 10:22 | 154.5 MB  | Java JAR file |
|  sast-local-scan-runner-1.0.9.md5    | 21 Mar 2024 at 10:22 | 32 bytes  | Document      |
|  sast-local-scan-runner-1.0.9.sha1   | 21 Mar 2024 at 10:22 | 40 bytes  | Document      |
|  sast-local-scan-runner-1.0.9.sha256 | 21 Mar 2024 at 10:22 | 64 bytes  | Document      |

4. Extract the Scan local engine files to a convenient location.
5. Update any custom scripts with the correct version of the Scan local engine

## See also

[Run local scan \(page 919\)](#)

## Local scan engine environment variables

Use these environment variables with the local Scan engine:

| Variable                       | Required?                          | Description  |
|--------------------------------|------------------------------------|--|
| CONTRAST__API__URL             | Yes                                | The address of the Contrast installation where you want to report scan results. The URL should include <code>/api/sast</code> at the end of the URL. |
| CONTRAST__API__USER_NAME       | Yes                                | User name for the Contrast user account (in most cases, your login ID)   |
| CONTRAST__API__API_KEY         | Yes                                | Contrast API key   |
| CONTRAST__API__SERVICE_KEY     | Yes                                | Contrast service key   |
| CONTRAST__API__ORGANIZATION    | Yes                                | Contrast organization ID   |
| CONTRAST__API__PROXY__ENABLE   | No                                 | Enables proxy settings   |
| CONTRAST__API__PROXY__URL      | Yes, if proxy settings are enabled | The URL for the proxy server (for example, <code>http://host:port</code> )   |
| CONTRAST__API__PROXY__TYPE     | Yes, if proxy settings are enabled | The proxy server type (for example, BASIC)   |
| CONTRAST__API__PROXY__USERNAME | No                                 | Username for the proxy server  |
| CONTRAST__API__PROXY__PASSWORD | No                                 | Password for the proxy server  |

## Run local scan

The Contrast Scan local engine is available as a Java JAR file. It requires the location of a build artifact so it can process the scan.

### Before you begin

- Identify where the build artifacts that you want to scan are located.
- Determine where you want to store scan results on your local system.  
If you don't specify a path for output results, the Scan local engine writes results to the current working directory in a file named `results.sarif`.
- Ensure that this software is installed on your system:
  - **Multi-language source code scans:** Java 17

- **Java binary scans:** Up to Java 17
- **Scans for JavaScript project files:** Semgrep App version 0.114.0
- Internet access exists to let the Scan local engine upload scan results and scanner output to Contrast.
- Verify that you have 1 CPU available (the Contrast Scan local engine is single threaded) and have 12 GB of RAM free.
- Ensure the Scan local engine has read and write permissions for the directory where it runs or for the specified output directory.

**IMPORTANT**

Make sure that the path for the files you want to scan does not include spaces.

**Steps**

1. Log in to the Contrast web interface.
2. Under the user menu, select **User settings**.
3. In Profile, under Your keys, get the following information:
  - Organization ID
  - Your API key
  - Service key
  - Contrast URL

**User Settings**

**Profile**

Change Password  
Notifications  
Permissions  
Two-Step Verification

**GENERAL INFORMATION**

First Name: my.username@contrastsecuri  
Last Name: my.username@contrastsecurity.com  
Date Format: yyyy/dd/MM  
Time Format: hh:mm a  
Language: English  
Time Zone: (GMT-05:00) Eastern Time (US & Canada)

**YOUR KEYS**

Use your API Keys when you write scripts that interact with Contrast.  
Read our [API documentation](#) to learn how to use the Contrast REST API.

**Your API Keys**

Organization ID: 12 [redacted] d5

Your API Key: demo  
This is not your agent API Key. Go to [Organization Settings](#) to access your agent API Key.

Service Key: demo [Rotate](#)  
Connect to services with your credentials.

Authorization Header: [Copy](#)

Looking for your Agent keys? Go to [Organization Settings](#).

[Generate Sample API Request](#)

4. Configure the environment variables that let the local scanner communicate with Contrast:



### NOTE

If you want to use a proxy server for communication between the local scan engine and the Contrast platform, include the [proxy server environment variables](#). (page 714)

```
export CONTRAST__API__URL=<URL>
export CONTRAST__API__USER_NAME=<Username>
export CONTRAST__API__API_KEY=<APIKey>
export CONTRAST__API__SERVICE_KEY=<ServiceKey>
export CONTRAST__API__ORGANIZATION=<OrgId>
export LOCAL_ARTIFACT_LOCATION=<LocalArtifactLocation>
export LOCAL_OUTPUT_LOCATION=<LocalOutputLocation>
```

- Replace <URL> with the address of the Contrast installation where you want to report scan results. The URL should include `Contrast/api/sast` at the end of the URL. For example:

```
export CONTRAST__API__URL=https://app.contrastsecurity.com/
Contrast/api/sast
```

- Replace `<Username>` with your Contrast user account (in most cases your login ID).
- Replace `<APIKey>` with the Contrast API key.
- Replace `<ServiceKey>` with the Contrast service key.
- Replace `<OrgID>` with the Contrast organization ID.
- Replace `<LocalArtifactLocation>` with the path for the JAR or WAR files for Java scans. For JavaScript scans, specify the folder containing the source code.  
**Optional:** You can specify the path in the command instead of using a variable.
- Replace `<LocalOutputLocation>` with the path on the local system where you want to store results files.  
**Optional:** You can specify the path in the command instead of using a variable.

5. Start the scan with a command similar to this one:

```
java -jar sast-local-scan-runner.jar <ScanArtifact> --project- \
name <ProjectName> --label <LabelName>
```

- Replace `<ScanArtifact>` with the path of the JAR, WAR, or ZIP file (which contains only JAR or WAR files) that you want to scan.  
For source code scanning, specify the path of the folder that contains the source code you want to scan (not a ZIP file).  
For Unix systems, a file name without a path requires `./` in front of the filename.
- Replace `<ProjectName>` with a name for a project. For example: "my project name".
- Replace `<LabelName>` with a label for the scan. For example, you could specify a build number as: "build:1.0.1".

6. Wait several minutes after the scan completes to view results in the Contrast web application. Results are not immediately viewable due to upload and processing times.

## Scan branches in repositories

To scan branches in a repository (for example, for a pull request (PR), use the `--branch` option when you run the scan. For example:

```
java -jar sast-local-scan-runner-1.0.10.jar --project-name <ProjectName> --
label <LabelName> --branch <BranchName> <ScanArtifact>
```

Scans of branches return a pass or fail status in the GitHub action. [View details of scanned branches \(page 1173\)](#) describes how to view the results in the Contrast web interface.

To configure the scans to fail for new vulnerabilities only, use both the `--fail` and `--branch` options. The scan continues if it finds open vulnerabilities.

If you want to scan to fail when it finds open vulnerabilities use the `--new` option with a value of `false`.

## Command options

Use any of these command options:

| Option                            | Description   |
|-----------------------------------|---|
| <code>-o, --output-results</code> | Specifies the location for output results.<br><br>If you don't specify a location, the local scanner writes the results to the current working directory.                               |
| <code>-V, --version</code>        | Prints version information  |
| <code>-b, --branch</code>         | Specifies a branch in a repository to be scanned.<br><br>When specified, scan results are aggregated against results for the current branch, without affecting scans for a main branch. |

| Option   | Description  |
|--|--|
| <code>-f, --fail</code>                                      | <p>Fails when the Scan finds open vulnerabilities on a main branch.</p> <p><b>Branch scanning:</b> If you also specify the <code>--branch</code> option, the scan fails only if it finds new vulnerabilities.</p>  |
| <code>--label &lt;label&gt;</code>                           | A label for the current scan.  |
| <code>--level &lt;level&gt;</code>                           | <p>Turns on logging for the specified log level. Values for this option are:</p> <ul style="list-style-type: none"> <li>• ERROR</li> <li>• WARN</li> <li>• INFO</li> <li>• DEBUG</li> <li>• TRACE</li> </ul> <p>Use this option only if Contrast Support instructs you to do so. Don't use it for all scans.</p>   |
| <code>--memory &lt;value&gt;</code>                          | <p>Lets you override the default memory usage of 2 GB.</p> <p>This option is only available for the multi-language source code scan engine.</p>  |
| <code>--metadata &lt;Metatadata&gt; : &lt;Value&gt;</code>   | <p>Lets you specify metadata as a key-value pair when you create a scan project.</p> <p>If metadata is required, project creation fails if you don't specify the metadata.</p>   |
| <code>-n &lt;true false&gt;, --new &lt;true false&gt;</code> | <p>Explicitly specifies whether the scan should fail if it finds new vulnerabilities. The default value is <code>true</code>.</p> <p><b>Branch scanning:</b> If set to <code>false</code>, the scan fails when it finds open vulnerabilities.</p>  |
| <code>--project-name &lt;ProjectName&gt;</code>              | <p>The name of a scan project.</p> <p>If you specify a project name that already exists, the Scan local engine adds the scan to that project. Otherwise, it creates a new project with the specified name.</p> <p>If the project name includes spaces, enclose the name in double quotes ("). For example: "My Scan Project".</p> <p>This option is required if you don't use a project ID.</p>  |
| <code>--project-ID</code>                                    | <p>The ID for an existing project.</p> <p>This option is required if you don't use a project name.</p>   |
| <code>-s, --severity &lt;SeverityLevel&gt;</code>            | <p>A Contrast vulnerability severity level that returns a build failure status code that you can use to gate builds in pipelines.</p> <p>Valid values are: <code>critical</code>, <code>high</code>, <code>medium</code>, <code>low</code>, and <code>note</code>.</p> <p>The specified value is the minimum level of severity that returns a build failure status code. For example, if you specify <code>--severity high</code>, a finding of that severity or higher returns a build failure status code.</p> <p>This option applies to new and open vulnerabilities.</p> |
| <code>-q, --code-quality</code>                              | <p>Includes code quality rules when scanning source code.</p> <p>This option is not applicable for Java binary scans.</p>  |
| <code>-r &lt;ResourceGroupName&gt;</code>                    | <p>The name of the resource group where you want to add the project.</p> <p>If you are a hosted customer and <a href="#">role-based access control (page 1565)</a> is turned on, this option is required.</p>  |
| <code>--timeout &lt;minutes&gt;</code>                       | <p>Lets you control the maximum time the source code scan engine scans the provided code. Specify a value in minutes.</p> <p>This option is only available for the Scan local engine.</p> <p>This option applies to each language found in the code to be scanned. For example if you set this to 120 minutes and your repo contains four languages, there is a potential for the scan to run for hours (4 languages x 120 minutes each).</p>  |

## Exit codes

The Scan local engine returns these exit codes when a scan completes:

| Exit code | Description  |
|-----------|--|
| 0         | Scan completed successfully and uploaded results to Contrast |

| Exit code | Description   |
|-----------|---|
| 1         | Input validation error  |
| 2         | Error connecting to Contrast API server                           |
| 3         | Contrast API error returned                                       |
| 4         | Scan local engine returned an error, details are in the log files |
| 5         | Unexpected error occurred, details are in the log files           |

## Exclude files and folders for Contrast Scan

You have the option to exclude specified files or folders from scans. This feature is useful when you want to exclude artifacts that generate a lot of noise or are irrelevant to the scan.

Contrast [excludes some files and folders by default \(page 925\)](#).

### Before you begin

- This feature is available only for multi-language source code scans with the Scan local engine.
- If you exclude files from a previously scanned project, Contrast changes the status of vulnerabilities affected by the exclusions to **Remediated**. For example, after you exclude files, the number of vulnerabilities in the scan results could be reduced from the original findings and the number of remediated vulnerabilities could increase.
- Specified file and folder names are case-sensitive.

### Steps

1. In the root folder of the source code you are scanning, create a file named `.contrast-scan.json`.
2. In the JSON file, specify the files and folders you want to exclude using this format:

```
{
  "excludes": [
    "**/MavenWrapperDownloader.java",
    "**/*.js"
  ]
}
```

Replace the examples of `MavenWrapperDownloader.java` and `*.js` with the names of your files and folders.

### Pattern examples

These examples show how you can specify excluded files and folders.

Patterns are considered relative paths.

| This pattern example:  | Excludes...  |
|------------------------|--|
| <code>*.java</code>    | Files with zero or more than one character before the <code>.java</code> extension. For example: <code>.java</code> , <code>x.java</code> , and <code>FooBar.java</code> .<br><br><b>Not excluded:</b> Files that are not in the root directory being scanned, even if the filename has an extension of <code>.java</code> . |
| <code>? .java</code>   | Files with one character before the <code>.java</code> extension For example: <code>x.java</code> or <code>A.java</code> .<br><br><b>Not excluded:</b> Files such as <code>.java</code> or <code>xyz.java</code> because they have zero or more than one character before the <code>.java</code> extension.                  |
| <code>**/*.java</code> | All folders and files with the extension of <code>.java</code> .   |
| <code>**/CVS/*</code>  | All files in <code>CVS</code> directories that exist anywhere in the directory tree.   |



| This pattern example:       | Excludes...   |
|-----------------------------|---|
| org/apache/<br>jakarta/**   | All files in the org/apache/jakarta directory tree.<br><br><b>Not excluded:</b> The file org/apache/xyz.java because jakarta is not included in the path  |
| org/<br>apache/**/CVS/<br>* | All files in CVS directories that are located anywhere in the directory tree under org/apache.<br><br><b>Not excluded:</b> A file named org/apache/CVS/foo/bar/Entries because foo/bar/ does not match the pattern. |
| **/test/**                  | All files that have test in their path, including test as part of a filename.   |
| **/*test**/**               | Excludes the string test wherever it is found in the path.  |

## Default exclusions

By default, Contrast Scan excludes these files, folders, patterns, and extensions:

| Excluded file and folder patterns  | Excluded extensions   | Excluded files   |
|--|---|--|
| <ul style="list-style-type: none"> <li>• /src/test/</li> <li>• /__MACOSX/</li> <li>• /*.min.js,</li> <li>• /.Designer.vb</li> <li>• **/.designer.vb</li> <li>• /*Reference.vb</li> <li>• /Service.vb</li> <li>• /*Silverlight.vb</li> <li>• /.Designer.cs</li> <li>• /*.designer.cs</li> <li>• /Reference.cs</li> <li>• /*Service.cs</li> <li>• /Silverlight.cs</li> <li>• **/.</li> <li>• /Pods/BuildHeaders/**/*.h</li> <li>• /Pods/Headers/**/*.h</li> <li>• /node_modules/</li> <li>• /bower_components/</li> <li>• /target/</li> <li>• /bin/</li> <li>• /obj/</li> <li>• /dist/</li> <li>• /lib/</li> </ul> | <ul style="list-style-type: none"> <li>• exe</li> <li>• dll</li> <li>• so</li> <li>• bin</li> <li>• arc</li> <li>• arj</li> <li>• zip</li> <li>• rar</li> <li>• ear</li> <li>• tar</li> <li>• tgz</li> <li>• gz</li> <li>• gzip</li> <li>• z</li> </ul> | <ul style="list-style-type: none"> <li>• readme</li> <li>• changelog</li> <li>• changes</li> <li>• todo</li> <li>• license</li> <li>• copying</li> <li>• maintainers</li> <li>• thumbs.db</li> </ul> |

## See also

[Directory-based tasks](#) provides additional information on patterns for specifying files and folders.

## Create custom Scan rule exclusions

Create custom Scan rule exclusions when you are confident that a specific rule is generating multiple false positives and you are frequently setting the status for these findings to **Not a Problem**.

### Before you begin

- Before you exclude rules, run a baseline scan to determine which rules are creating false positives
- Excluding rules affects the findings for the scan project.

### Location of Scan rules

The [Contrast Scan rules \(page 926\)](#) section links to tables where you can find the rules for each language. Alternatively, during a scan, you can find the rules in target/engines/sast-engine4/rulesets under the source directory that you're scanning with the Scan local engine.



## IMPORTANT

The `sast-engines4` folder and its subfolders are available temporarily when a scan is in progress.

For easy access, make a copy of the `rulesets` folder. This folder contains security rules files for each language (`qaking_{lang}_security.xml`) that the Scan local engine supports. To find the name of a rule in a file, search for `<rule name " "`.

## Steps

1. Create a text file called `contrastsec.checks.config` and place it at the root of the project you are going to scan.

The format of the file is:

```
[rule-Engine-rule-ID]
active=false
```

2. To exclude multiple rules, repeat the block of lines with an empty row between each block. For example, to exclude the **Detect and handle input/output errors** and **Don't use cast** rules for CPP, the file looks like this:

```
[OPT.CPP.CERTC.FIO33]
active=false

[OPT.CPP.DontUseCast]
active=false
```

## Effects of Scan rule exclusions

When you disable rules using the `contrastsec.checks.config` file, the status for the findings corresponding to the excluded rule change to **Remediated**.

If you reenable the rule using the `contrastsec.checks.config` file or remove the file, the status for the findings corresponding to the newly enabled rule changes to **Reopened**.

## Contrast Scan rules

These tables include the supported Contrast Scan rules: test

|   |                                       |   |   |
|---|---------------------------------------|---|---|
| <a href="#">ABAP (page 717)</a>         | <a href="#">Go (page 787)</a>         | <a href="#">NATURAL (page 849)</a>      | <a href="#">Scala (page 886)</a>          |
| <a href="#">ActionScript (page 729)</a> | <a href="#">HTML (page 790)</a>       | <a href="#">Objective-C (page 850)</a>  | <a href="#">SQL (page 888)</a>            |
| <a href="#">ASP (page 733)</a>          | <a href="#">Informix (page 793)</a>   | <a href="#">Oracle Forms (page 858)</a> | <a href="#">SQLScript (page 891)</a>      |
| <a href="#">ASP.NET (page 731)</a>      | <a href="#">Java (page 795)</a>       | <a href="#">PHP (page 860)</a>          | <a href="#">Swift (page 892)</a>          |
| <a href="#">C (page 776)</a>            | <a href="#">JavaScript (page 831)</a> | <a href="#">PL/SQL (page 869)</a>       | <a href="#">Transact-SQL (page 896)</a>   |
| <a href="#">C# (page 734)</a>           | <a href="#">JCL (page 842)</a>        | <a href="#">PowerScript (page 874)</a>  | <a href="#">VB.NET (page 899)</a>         |
| <a href="#">COBOL (page 749)</a>        | <a href="#">JSP (page 843)</a>        | <a href="#">Python (page 876)</a>       | <a href="#">Visual Basic 6 (page 913)</a> |
| <a href="#">CPP (page 763)</a>          | <a href="#">Kotlin (page 845)</a>     | <a href="#">RPG4 (page 882)</a>         | <a href="#">XML (page 915)</a>            |

## Create OWASP top 10 only rules policy

Create an OWASP top 10 policy to focus the analysis of your source code on OWASP top 10 based findings only. When you save the policy to the root of a repo or directory you wish to scan, it disables all rules except for rules specifically linked to the OWASP top 10 list.

**Best practice:** Use this policy on new Scan projects only. If you use the policy on an existing project, Contrast Scan might mark some existing findings as **Remediated** and therefore, may show significant changes to open vulnerabilities.

[View scan details \(page 1171\)](#) describes how to see which files and rules are excluded for a specific scan.

## Steps

1. Create a text file named `contrastsec.checks.config` and place it at the root of the project you are going to scan.
2. Copy the code in [OWASP 10 rules only \(page 927\)](#) and add it to the file.
3. Run the scan.

## See also

[Create custom Scan rule exclusions \(page 716\)](#) shows an example of how to significantly change the rules a scan uses. Doing so lowers the noise and potential for false positives that can occur with the larger rules base.

## OWASP 10 rules only

Copy this code and place it in the `contrastsec.checks.config` file.

```
[OPT.ABAP.ADR.AvoidNoStandardPageHeading]
active=false

[OPT.ABAP.ADR.AvoidVbleMessage]
active=false

[OPT.ABAP.ADR.CommentsBeforeProgramsOrReports]
active=false

[OPT.ABAP.ADR.CommentsBeforeSubroutines]
active=false

[OPT.ABAP.ADR.CorrectNamingMeth]
active=false

[OPT.ABAP.ADR.MessageLanguage]
active=false

[OPT.ABAP.ADR.NamingConventions]
active=false

[OPT.ABAP.ADR.NoFieldAsOperator]
active=false

[OPT.ABAP.ADR.NoIdsOtherType]
active=false

[OPT.ABAP.ADR.NoLongIds]
active=false

[OPT.ABAP.ADR.PercentageOfCommentLinesPerFile]
active=false
```

```
[OPT.ABAP.ADR.StandCommentForm]
active=false

[OPT.ABAP.ADR.UnicodePrograms]
active=false

[OPT.ABAP.ADR.WarnWithoutAdobePrintForm]
active=false

[OPT.ABAP.AGR.AvoidDeclareVarsInMod]
active=false

[OPT.ABAP.AGR.AvoidDuplicateEvents]
active=false

[OPT.ABAP.AGR.AvoidFormParamWithoutType]
active=false

[OPT.ABAP.AGR.AvoidFreeMemory]
active=false

[OPT.ABAP.AGR.AvoidLiteralWitAdd]
active=false

[OPT.ABAP.AGR.AvoidMacro]
active=false

[OPT.ABAP.AGR.AvoidNoUseFields]
active=false

[OPT.ABAP.AGR.AvoidNonTranspTable]
active=false

[OPT.ABAP.AGR.AvoidSapScript]
active=false

[OPT.ABAP.AGR.AvoidWriteTo]
active=false

[OPT.ABAP.AGR.CallEditorCall]
active=false

[OPT.ABAP.AGR.CallFMInGroup]
active=false

[OPT.ABAP.AGR.CallTx]
active=false

[OPT.ABAP.AGR.CaseNoRepeatWhen]
active=false

[OPT.ABAP.AGR.CheckStatusPF]
active=false

[OPT.ABAP.AGR.CheckTitlebar]
```

```
active=false

[OPT.ABAP.AGR.ExistsForm]
active=false

[OPT.ABAP.AGR.FieldsCurrQuan]
active=false

[OPT.ABAP.AGR.FormCorrespondsPerform]
active=false

[OPT.ABAP.AGR.ImportExportNametab]
active=false

[OPT.ABAP.AGR.KeySelectOption]
active=false

[OPT.ABAP.AGR.MoveInsteadOfMoveCorresponding]
active=false

[OPT.ABAP.AGR.NestedOnlyDataDef]
active=false

[OPT.ABAP.AGR.NoDataDefinitionsWithinEvents]
active=false

[OPT.ABAP.AGR.NoHyphenInName]
active=false

[OPT.ABAP.AGR.NoOverWriteSysVar]
active=false

[OPT.ABAP.AGR.NoSentenceAfterExit]
active=false

[OPT.ABAP.AGR.NoUseSYUname]
active=false

[OPT.ABAP.AGR.OutputFileExtension]
active=false

[OPT.ABAP.AGR.OutputFilesWithHeader]
active=false

[OPT.ABAP.AGR.RecommendALVwithReport]
active=false

[OPT.ABAP.AGR.RecommendCaseWhenOthers]
active=false

[OPT.ABAP.AGR.RecommendStartOfSelection]
active=false

[OPT.ABAP.AGR.SubmitReport]
active=false
```

```
[OPT.ABAP.AGR.SubroutineDefinitionsAfterEvents]
active=false

[OPT.ABAP.AGR.SuggestTypedParameters]
active=false

[OPT.ABAP.AGR.UseLocalInsteadOfTablesInSubroutines]
active=false

[OPT.ABAP.AGR.WorkingWithReport]
active=false

[OPT.ABAP.AGR.WorkingWithTextPool]
active=false

[OPT.ABAP.AMR.AccessBDinLoop]
active=false

[OPT.ABAP.AMR.AvoidBatchInput]
active=false

[OPT.ABAP.AMR.AvoidNonUsedDeclaredModule]
active=false

[OPT.ABAP.AMR.AvoidPercentage_Var]
active=false

[OPT.ABAP.AMR.DataDefinitionAtTheBeginning]
active=false

[OPT.ABAP.AMR.ExtractCodeIntoSubroutines]
active=false

[OPT.ABAP.AMR.ImportExportDynpro]
active=false

[OPT.ABAP.AMR.NestedCaseStatement]
active=false

[OPT.ABAP.AMR.NestedIfStatement]
active=false

[OPT.ABAP.AMR.NestedLoops]
active=false

[OPT.ABAP.AMR.NoDeadDataDefinitions]
active=false

[OPT.ABAP.AMR.NoLiterals]
active=false

[OPT.ABAP.AMR.OneStatementPerLine]
active=false
```

```
[OPT.ABAP.AMR.PathOutputFile]
active=false

[OPT.ABAP.AMTR.CyclomaticComplexity]
active=false

[OPT.ABAP.AMTR.ExcessOfParameters]
active=false

[OPT.ABAP.AMTR.ExcessOfResponsibility]
active=false

[OPT.ABAP.AMTR.ExcessOfReturn]
active=false

[OPT.ABAP.AMTR.FanIn]
active=false

[OPT.ABAP.AMTR.FanOut]
active=false

[OPT.ABAP.APBR.AvoidCallNoDefModule]
active=false

[OPT.ABAP.APBR.AvoidEmptyCatchBlocks]
active=false

[OPT.ABAP.APBR.AvoidEmptyWhenOthers]
active=false

[OPT.ABAP.APBR.AvoidModuleMessedUp]
active=false

[OPT.ABAP.APBR.AvoidStopMessedUp]
active=false

[OPT.ABAP.APBR.CallSYSUBRC]
active=false

[OPT.ABAP.APBR.CheckAtrNoExistDynpro]
active=false

[OPT.ABAP.APBR.CheckAuthority]
active=false

[OPT.ABAP.APBR.CheckDlgModules]
active=false

[OPT.ABAP.APBR.CheckFMParam]
active=false

[OPT.ABAP.APBR.CheckFnModule]
active=false

[OPT.ABAP.APBR.CheckIncludes]
```

```
active=false

[OPT.ABAP.APBR.CheckLoadTable]
active=false

[OPT.ABAP.APBR.CheckMessages]
active=false

[OPT.ABAP.APBR.CheckSubmitWithParam]
active=false

[OPT.ABAP.APBR.CheckTx]
active=false

[OPT.ABAP.APBR.CompatibleFormParams]
active=false

[OPT.ABAP.APBR.CorrespondRaiseExcep]
active=false

[OPT.ABAP.APBR.DynproNonExistAtr]
active=false

[OPT.ABAP.APBR.EqualNumberParam]
active=false

[OPT.ABAP.APBR.ExistProgFormDecl]
active=false

[OPT.ABAP.APBR.MessageParam]
active=false

[OPT.ABAP.APBR.NoBreakPointStatements]
active=false

[OPT.ABAP.APBR.NoControlBreakWithinLoopAtWhere]
active=false

[OPT.ABAP.APBR.NoExistContext]
active=false

[OPT.ABAP.APBR.NoRaiseOutOfFunctionGroup]
active=false

[OPT.ABAP.APBR.SetGetSysParam]
active=false

[OPT.ABAP.APBR.SubmitReportType1]
active=false

[OPT.ABAP.APBR.SuggestOthersExceptions]
active=false

[OPT.ABAP.APFR.AvoidDuplicateIncludesInPrograms]
active=false
```



```
[OPT.ABAP.APFR.AvoidSubSelectQueries]
active=false

[OPT.ABAP.APFR.AvoidTraceOn]
active=false

[OPT.ABAP.APFR.CloseAllOpenResources]
active=false

[OPT.ABAP.APFR.LimitedNumberOfIncludes]
active=false

[OPT.ABAP.APFR.LoopAtWhereInsideLoop]
active=false

[OPT.ABAP.APFR.LoopWhereInsteadOfLoopCheck]
active=false

[OPT.ABAP.APFR.MaxNumberDBOp]
active=false

[OPT.ABAP.APFR.MaximumJoinsPerQuery]
active=false

[OPT.ABAP.APFR.NoAppendSortedBy]
active=false

[OPT.ABAP.APFR.NoCheckOrContinueWithinSelectLoops]
active=false

[OPT.ABAP.APFR.NoCorrespondingFields]
active=false

[OPT.ABAP.APFR.NoDataOrObjectCreationInsideLoops]
active=false

[OPT.ABAP.APFR.NoSelectInsideLoop]
active=false

[OPT.ABAP.APFR.NoWildcardsAtTheBeginningOfLikeLiterals]
active=false

[OPT.ABAP.APFR.OnlyOneCommitAndRollback]
active=false

[OPT.ABAP.APFR.OpenCloseResourcesOnlyOnce]
active=false

[OPT.ABAP.APFR.ReplaceIfWithCase]
active=false

[OPT.ABAP.APFR.SelectIntoInsteadOfSelectAppending]
active=false
```

```
[OPT.ABAP.APFR.SelectIntoTableInsteadOfSelectEndSelect]
active=false

[OPT.ABAP.APFR.SuggestAppendLinesInsteadOfAppend]
active=false

[OPT.ABAP.APFR.SuggestWhileInsteadOfDo]
active=false

[OPT.ABAP.APFR.UseForAllEntries]
active=false

[OPT.ABAP.APFR.UseReadWithBinarySearchIfWithKey]
active=false

[OPT.ABAP.APTR.MaxLongLineSize]
active=false

[OPT.ABAP.APTR.NoAbsolutePaths]
active=false

[OPT.ABAP.APTR.NoExecSqlStatements]
active=false

[OPT.ABAP.ASR.AvoidClientSpecified]
active=false

[OPT.ABAP.ASR.AvoidFromDynamic]
active=false

[OPT.ABAP.ASR.AvoidLogicDB]
active=false

[OPT.ABAP.ASR.AvoidReadSAPTables]
active=false

[OPT.ABAP.ASR.AvoidSAPQueries]
active=false

[OPT.ABAP.ASR.AvoidWhereDynamic]
active=false

[OPT.ABAP.ASR.CmdTableOutLoop]
active=false

[OPT.ABAP.ASR.ControlFieldsClientTables]
active=false

[OPT.ABAP.ASR.EnqueueInsteadOfSelectSingleForUpdate]
active=false

[OPT.ABAP.ASR.LimitIndexes]
active=false

[OPT.ABAP.ASR.LimitedNumberOfTablesInQueries]
```

```
active=false

[OPT.ABAP.ASR.MarkBufferingIfNecessary]
active=false

[OPT.ABAP.ASR.MaxOneAppendStruct]
active=false

[OPT.ABAP.ASR.NoDeclaredField]
active=false

[OPT.ABAP.ASR.NoLostCursor]
active=false

[OPT.ABAP.ASR.NoSelectAll]
active=false

[OPT.ABAP.ASR.NoUpdateConfigTables]
active=false

[OPT.ABAP.ASR.OnlyClientFieldsInAppendStr]
active=false

[OPT.ABAP.ASR.RecommendWhereWithIndexes]
active=false

[OPT.ABAP.ASR.SecuritySelectTables]
active=false

[OPT.ABAP.ASR.SortInsteadOfOrderBy]
active=false

[OPT.ABAP.ASR.SuggestSelectWhere]
active=false

[OPT.ABAP.ASR.WhereClausesWithoutNotOr]
active=false

[OPT.ABAP.AWD.AlterLayoutDinamically]
active=false

[OPT.ABAP.AWD.AssignIDElement]
active=false

[OPT.ABAP.AWD.AvoidComplexContext]
active=false

[OPT.ABAP.AWD.AvoidControllerWithCode]
active=false

[OPT.ABAP.AWD.AvoidElementiIUTree]
active=false

[OPT.ABAP.AWD.AvoidModifyContext]
active=false
```

```
[OPT.ABAP.AWD.AvoidModifyElementsDirectly]
active=false

[OPT.ABAP.AWD.AvoidMultipleDynamicAttributes]
active=false

[OPT.ABAP.AWD.AvoidNestedLayout]
active=false

[OPT.ABAP.AWD.AvoidPoolAndInclude]
active=false

[OPT.ABAP.AWD.AvoidStretchedVertically]
active=false

[OPT.ABAP.AWD.ComplexLayoutUseMatrixLayout]
active=false

[OPT.ABAP.AWD.ImplementLayout]
active=false

[OPT.ABAP.AWD.MatchLayoutWithViewController]
active=false

[OPT.ABAP.AWD.NamingComponents]
active=false

[OPT.ABAP.AWD.NoAccessModelFromMths]
active=false

[OPT.ABAP.AWD.NumberViewInWD]
active=false

[OPT.ABAP.AWD.RecommendableDynproSize]
active=false

[OPT.ABAP.AWD.UseAttributesControllerClass]
active=false

[OPT.ABAP.AWD.WarnScroll]
active=false

[OPT.ABAP.DuplicatedCodeBig]
active=false

[OPT.ABAP.DuplicatedCodeMedium]
active=false

[OPT.ABAP.DuplicatedCodeSmall]
active=false

[OPT.ABAP.EFFICIENCY.AvoidSqlExistSubqueries]
active=false
```

```
[OPT.ABAP.EFFICIENCY.AvoidUpToRowsWithForAllEntries]
active=false

[OPT.ABAP.EFFICIENCY.EmptySelectEndselect]
active=false

[OPT.ABAP.EFFICIENCY.FirstStmtReturnSelectEndselect]
active=false

[OPT.ABAP.EFFICIENCY.JoinInsteadOfSelectInLoop]
active=false

[OPT.ABAP.EFFICIENCY.LoopAtInto]
active=false

[OPT.ABAP.EFFICIENCY.NestedSelectStatement]
active=false

[OPT.ABAP.EFFICIENCY.NotInSubquery]
active=false

[OPT.ABAP.EFFICIENCY.SortStmtInALoop]
active=false

[OPT.ABAP.EFFICIENCY.SubmitStmtInALoop]
active=false

[OPT.ABAP.EFFICIENCY.UpdateDeleteWithoutWhere]
active=false

[OPT.ABAP.MAINT.AvoidCommentedOutCode]
active=false

[OPT.ABAP.MAINT.AvoidEmptyBlocksInLoopOrIf]
active=false

[OPT.ABAP.MAINT.AvoidEmptySubroutineOrFunction]
active=false

[OPT.ABAP.MAINT.CaseShouldHaveAtLeast3When]
active=false

[OPT.ABAP.MAINT.CommentsBeforeClasses]
active=false

[OPT.ABAP.MAINT.DeeplyNestedStatements]
active=false

[OPT.ABAP.MAINT.HardcodedTextInMessage]
active=false

[OPT.ABAP.MAINT.HardcodedHostCheck]
active=false

[OPT.ABAP.MAINT.HardcodedOSCheck]
```

```
active=false

[OPT.ABAP.MAINT.KeywordsForUserIdentifiers]
active=false

[OPT.ABAP.MAINT.PercentageOfCommentLinesPerMethod]
active=false

[OPT.ABAP.MAINT.TooManyAttributesInAClass]
active=false

[OPT.ABAP.MAINT.TooManyDatabaseOperationsInBlock]
active=false

[OPT.ABAP.MAINT.TooManyLinesByFile]
active=false

[OPT.ABAP.MAINT.TooNestedMacroCalls]
active=false

[OPT.ABAP.MAINT.UseClassBasedExceptions]
active=false

[OPT.ABAP.PORTABILITY.AvoidDatabaseHints]
active=false

[OPT.ABAP.PORTABILITY.DeprecatedAsynchronousRFC]
active=false

[OPT.ABAP.PORTABILITY.ObsoleteCode]
active=false

[OPT.ABAP.RELIABILITY.CxRootCaught]
active=false

[OPT.ABAP.RELIABILITY.DeleteFromTableWithoutWhere]
active=false

[OPT.ABAP.RELIABILITY.DirectRecursiveCall]
active=false

[OPT.ABAP.RELIABILITY.ElseifWithElse]
active=false

[OPT.ABAP.RELIABILITY.HardcodedRfcDestination]
active=false

[OPT.ABAP.RELIABILITY.LogicDependingOnTextSymbols]
active=false

[OPT.ABAP.RELIABILITY.ModifiedInputParameter]
active=false

[OPT.ABAP.RELIABILITY.NoAssertWithSideEffectsCondition]
active=false
```

```
[OPT.ABAP.RELIABILITY.SortBeforeRemovingDuplicates]
active=false

[OPT.ABAP.RELIABILITY.UncaughtExceptionInRfcCall]
active=false

[OPT.ABAP.RELIABILITY.UpdateDbtableWithoutWhere]
active=false

[OPT.ABAP.SEC.AuthorityChecks]
active=false

[OPT.ABAP.SEC.Backdoors]
active=false

[OPT.ABAP.SEC.Calls2CriticalFunctions]
active=false

[OPT.ABAP.SEC.CheckAuthInAllPrograms]
active=false

[OPT.ABAP.SEC.CrossClientDatabaseAccess]
active=false

[OPT.ABAP.SEC.DangerousFileDownload]
active=false

[OPT.ABAP.SEC.DangerousFileUpload]
active=false

[OPT.ABAP.SEC.DirectUpdate]
active=false

[OPT.ABAP.SEC.HardcodedClientCheck]
active=false

[OPT.ABAP.SEC.HardcodedDateCheck]
active=false

[OPT.ABAP.SEC.HardcodedSensitiveData]
active=false

[OPT.ABAP.SEC.HardcodedSystemIdCheck]
active=false

[OPT.ABAP.SEC.HardcodedUsernameCheck]
active=false

[OPT.ABAP.SEC.InsecureRandomness]
active=false

[OPT.ABAP.SEC.NoAuthorizationCheckSQL]
active=false
```

```
[OPT.ABAP.SEC.NoAuthorizationGroup4Table]
active=false

[OPT.ABAP.SEC.OpenRedirect]
active=false

[OPT.ABAP.SEC.OverwriteSystemFields]
active=false

[OPT.ABAP.SEC.PasswordManagement]
active=false

[OPT.ABAP.SEC.RegexInjection]
active=false

[OPT.ABAP.SEC.RfcCallbackAttack]
active=false

[OPT.ABAP.SEC.UsagesOfSySysid]
active=false

[OPT.ABAP.SEC.UsagesOfSyUname]
active=false

[OPT.ACTIONSCRIPT.DOC_ACTIONSCRIPT.CodeDocumentPercentage]
active=false

[OPT.ACTIONSCRIPT.DOC_ACTIONSCRIPT.DocumentEveryFunction]
active=false

[OPT.ACTIONSCRIPT.DuplicatedCodeBig]
active=false

[OPT.ACTIONSCRIPT.DuplicatedCodeMedium]
active=false

[OPT.ACTIONSCRIPT.DuplicatedCodeSmall]
active=false

[OPT.ACTIONSCRIPT.EST_ACTIONSCRIPT.AvoidAlertWithLiterals]
active=false

[OPT.ACTIONSCRIPT.EST_ACTIONSCRIPT.AvoidDeclaringVarsWithoutVar]
active=false

[OPT.ACTIONSCRIPT.EST_ACTIONSCRIPT.EndSentencesWithSemicolon]
active=false

[OPT.ACTIONSCRIPT.EST_ACTIONSCRIPT.UseSpaceBetwenOperators]
active=false

[OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidAssignamentinCondition]
active=false

[OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidEmptyFunctions]
```



```
active=false

[OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidForWithExternalControlVars]
active=false

[OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidLoopWithEmptyBody]
active=false

[OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidSwitchManyCases]
active=false

[OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidUnaryOpsInAssign]
active=false

[OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidUnusedFunction]
active=false

[OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidUnusedFunctionParameter]
active=false

[OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.AvoidUnusedLocalVar]
active=false

[OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.CompLifeCycle]
active=false

[OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.IfWithOutBlock]
active=false

[OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.NoUpdateLoopInForBody]
active=false

[OPT.ACTIONSCRIPT.GEN_ACTIONSCRIPT.UnusedConstant]
active=false

[OPT.ACTIONSCRIPT.NOM_ACTIONSCRIPT.ClassNamingPattern]
active=false

[OPT.ACTIONSCRIPT.NOM_ACTIONSCRIPT.ConstantNamingPattern]
active=false

[OPT.ACTIONSCRIPT.NOM_ACTIONSCRIPT.FunctionNamingPattern]
active=false

[OPT.ACTIONSCRIPT.NOM_ACTIONSCRIPT.InterfaceNamingPattern]
active=false

[OPT.ACTIONSCRIPT.NOM_ACTIONSCRIPT.NoKeywordsAsIdentifiers]
active=false

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[OPT.CPP.OneStatementPerLine]
active=false
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[OPT.CPP.OnlyOneReturn]
active=false

[OPT.CPP.PORT.ObsoleteFunction]
active=false

[OPT.CPP.ParentClassDoesnotReferenceChildClasses]
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[OPT.CPP.ParenthesizedFunctions]
active=false

[OPT.CPP.PotentialInfiniteLoop]
active=false

[OPT.CPP.PrivateDataMembers]
active=false

[OPT.CPP.PrivateMethods]
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[OPT.CPP.ProtectedDataMembers]
active=false

[OPT.CPP.ProtectedMethods]
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[OPT.CPP.RemoveUnusedMembers]
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[OPT.CPP.RemoveUnusedMethods]
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[OPT.CPP.RemoveUnusedParam]
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[OPT.CPP.SEC.DoSRegexp]
active=false

[OPT.CPP.SEC.StaticDatabaseConnection]
active=false

[OPT.CPP.SEC.UnsafeChroot]
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[OPT.CPP.SpecifySectionOrder]
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[OPT.CPP.TooManyDataMembers]
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[OPT.CPP.TypedefNamingConvention]
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[OPT.CPP.UnspecifiedParameters]
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[OPT.CPP.UseSetters]
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[OPT.CPP.VirtualDestructorIfVirtualMethod]
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[OPT.CPP.WriteOperatorDeleteWithOperatorNew]
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[OPT.CSHARP.AvoidLanguageSpecificTypeNamesInParameters]
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[OPT.CSHARP.AvoidNullReferenceException]
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[OPT.CSHARP.AvoidReadOnlyMutableTypes]
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[OPT.CSHARP.AvoidSystemOutputStream]
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[OPT.CSHARP.AvoidTypeNamesInParameters]
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[OPT.CSHARP.AvoidUnnecessaryStringCreation]
active=false

[OPT.CSHARP.CallGCKeepAliveWhenUsingNativeResources]
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[OPT.CSHARP.ClassesAreStronglyInternallyCoupled]
active=false

[OPT.CSHARP.CollectionPropertiesShouldBeReadOnly]
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[OPT.CSHARP.ConsiderConvertingMethodToProperty]
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[OPT.CSHARP.ConstantsShouldBeTransparent]
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[OPT.CSHARP.CriticalTypesMustNotParticipateInTypeEquivalence]
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[OPT.CSHARP.CrossSiteRequestForgery]
active=false

[OPT.CSHARP.Csharp.AbstractTypesShouldNotHaveConstructors]
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[OPT.CSHARP.Csharp.ArrayFieldsShouldNotBeReadOnly]
active=false

[OPT.CSHARP.Csharp.AttributeClassSuffix]
active=false

[OPT.CSHARP.Csharp.AttributeStringLiteralsShouldParseCorrectly]
active=false

[OPT.CSHARP.Csharp.AvoidCallingProblematicMethods]
active=false

[OPT.CSHARP.Csharp.AvoidComParameterizedConstructors]
active=false

[OPT.CSHARP.Csharp.AvoidComStaticMethods]
active=false

[OPT.CSHARP.Csharp.AvoidCustomApplicationExceptions]
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[OPT.CSHARP.Csharp.AvoidEmptyCatchBlock]
active=false

[OPT.CSHARP.Csharp.AvoidEmptyConstructorsInStructs]
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[OPT.CSHARP.Csharp.AvoidExceptionThrowingInBinaryOperators]
active=false

[OPT.CSHARP.Csharp.AvoidExceptionThrowingInDisposeMethod]
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[OPT.CSHARP.Csharp.AvoidExceptionThrowingInEqualsClause]
active=false

[OPT.CSHARP.Csharp.AvoidExceptionThrowingInGetHashCode]
active=false
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[OPT.CSHARP.Csharp.AvoidExcessiveLocals]
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[OPT.CSHARP.Csharp.AvoidFloatingPointEquality]
active=false

[OPT.CSHARP.Csharp.AvoidInconditionalRecursiveInvocation]
active=false

[OPT.CSHARP.Csharp.AvoidIndexersInNonCollectionClasses]
active=false

[OPT.CSHARP.Csharp.AvoidLargeMethods]
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[OPT.CSHARP.Csharp.AvoidLargeStructure]
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[OPT.CSHARP.Csharp.AvoidLongMethods]
active=false

[OPT.CSHARP.Csharp.AvoidLongParameterLists]
active=false

[OPT.CSHARP.Csharp.AvoidNamespacesWithFewTypes]
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[OPT.CSHARP.Csharp.AvoidNonStoredProcedureCommands]
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[OPT.CSHARP.Csharp.AvoidOutParameters]
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[OPT.CSHARP.Csharp.AvoidOverloadsInComVisibleInterfaces]
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[OPT.CSHARP.Csharp.AvoidTypeGetTypeForConstantStrings]
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[OPT.CSHARP.Csharp.AvoidUncalledPrivateCode]
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[OPT.CSHARP.Csharp.AvoidUninstantiatedInternalClasses]
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[OPT.CSHARP.Csharp.AvoidUnneededCallsOnString]
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[OPT.CSHARP.Csharp.AvoidUnsealedConcreteAttributesRule]
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[OPT.CSHARP.Csharp.AvoidUnusedPrivateFields]
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[OPT.CSHARP.Csharp.CallBaseClassMethodsOnISerializableTypes]
active=false

[OPT.CSHARP.Csharp.CallGetLastErrorImmediatelyAfterPInvoke]
active=false

[OPT.CSHARP.Csharp.CheckNewExceptionWithoutThrowing]
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[OPT.CSHARP.Csharp.CheckNewThreadWithoutStart]
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[OPT.CSHARP.Csharp.CloneMethodShouldNotReturnNull]
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[OPT.CSHARP.Csharp.CollectionClassSuffix]
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[OPT.CSHARP.Csharp.CollectionsShouldImplementGenericInterface]
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[OPT.CSHARP.Csharp.ComVisibleTypeBaseTypesShouldBeComVisible]
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[OPT.CSHARP.Csharp.ConsiderCustomAccessorsForNonVisibleEventsRule]
active=false

[OPT.CSHARP.Csharp.ConsiderPassingBaseTypesAsParameters]
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[OPT.CSHARP.Csharp.DeclareEventHandlersCorrectly]
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[OPT.CSHARP.Csharp.DeclareTypesInNamespaces]
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[OPT.CSHARP.Csharp.DefaultParametersShouldNotBeUsed]
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[OPT.CSHARP.Csharp.DelegatesPassedToNativeCodeMustIncludeExceptionHandlingRule]
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[OPT.CSHARP.Csharp.DisableDebuggingCodeRule]
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[OPT.CSHARP.Csharp.DisposableFieldsShouldBeDisposed]
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[OPT.CSHARP.Csharp.DisposeObjectsBeforeLosingScope]
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[OPT.CSHARP.Csharp.DoNotAssumeIntPtrSizeRule]
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[OPT.CSHARP.Csharp.DoNotCallOverridableMethodsInConstructors]
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[OPT.CSHARP.Csharp.DoNotCastUnnecessarily]
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[OPT.CSHARP.Csharp.DoNotCatchGeneralExceptionTypes]
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[OPT.CSHARP.Csharp.DoNotDeclareStaticMembersOnGenericTypes]
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[OPT.CSHARP.Csharp.DoNotDeclareVirtualMembersInSealedTypes]
active=false

[OPT.CSHARP.Csharp.DoNotDeclareVisibleInstanceFields]
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[OPT.CSHARP.Csharp.DoNotDecreaseInheritedMemberVisibility]
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[OPT.CSHARP.Csharp.DoNotDestroyStackTraceRule]
active=false

[OPT.CSHARP.Csharp.DoNotDisposeObjectsMultipleTimes]
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[OPT.CSHARP.Csharp.DoNotExposeFieldsInSecuredType]
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[OPT.CSHARP.Csharp.DoNotHardcodeLocaleSpecificStrings]
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[OPT.CSHARP.Csharp.DoNotIgnoreMethodResults]
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[OPT.CSHARP.Csharp.DoNotIndirectlyExposeMethodsWithLinkDemands]
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[OPT.CSHARP.Csharp.DoNotNestGenericTypesInMemberSignatures]
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[OPT.CSHARP.Csharp.DoNotPassLiteralsAsLocalizedParameters]
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[OPT.CSHARP.Csharp.DoNotPassTypesByReference]
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[OPT.CSHARP.Csharp.DoNotRaiseExceptionsInExceptionClauses]
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[OPT.CSHARP.Csharp.DoNotRaiseExceptionsInUnexpectedLocations]
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[OPT.CSHARP.Csharp.DoNotRaiseReservedExceptionTypes]
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[OPT.CSHARP.Csharp.DoNotUseIdleProcessPriority]
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[OPT.CSHARP.Csharp.DoNotUseThreadStaticWithInstanceFields]
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[OPT.CSHARP.Csharp.DoNotUseTimersThatPreventPowerStateChanges]
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[OPT.CSHARP.Csharp.DoubleCheckLockingRule]
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[OPT.CSHARP.Csharp.ExceptionConstructors]
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[OPT.CSHARP.Csharp.ExceptionsShouldBePublic]
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[OPT.CSHARP.Csharp.IdentifiersShouldHaveCorrectSuffix]
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[OPT.CSHARP.Csharp.IdentifiersShouldNotContainUnderscores]
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[OPT.CSHARP.Csharp.IdentifiersShouldNotHaveIncorrectSuffix]
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[OPT.CSHARP.Csharp.IdentifiersShouldNotMatchKeywords]
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[OPT.CSHARP.Csharp.ImplementIDisposableCorrectly]
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[OPT.CSHARP.Csharp.ImplementIDisposableWithFinalize]
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[OPT.CSHARP.Csharp.ImplementISerializableCorrectly]
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[OPT.CSHARP.Csharp.ImplementStandardExceptionConstructors]
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[OPT.CSHARP.Csharp.InitializeReferenceTypeStaticFieldsInline]
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[OPT.CSHARP.Csharp.InterfaceName]
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[OPT.CSHARP.Csharp.Level2AssembliesShouldNotContainLinkdemands]
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[OPT.CSHARP.Csharp.MarkISerializableTypesWithSerializable]
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[OPT.CSHARP.Csharp.MarkMembersAsStatic]
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[OPT.CSHARP.Csharp.MarkWindowsFormsEntryPointsWithStaThread]
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[OPT.CSHARP.Csharp.MaxMethods]
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[OPT.CSHARP.Csharp.MembersShouldNotExposeCertainConcreteTypes]
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[OPT.CSHARP.Csharp.MethodCase]
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[OPT.CSHARP.Csharp.MovePInvokesToNativeMethodsClass]
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[OPT.CSHARP.Csharp.NamespaceCase]
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[OPT.CSHARP.Csharp.NamingClassNamespace]
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[OPT.CSHARP.Csharp.NestedNamespaceDependency]
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[OPT.CSHARP.Csharp.NestedTypesShouldNotBeVisible]
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[OPT.CSHARP.Csharp.NonConstantFieldsShouldNotBeVisible]
active=false
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[OPT.CSHARP.Csharp.OperationsShouldNotOverflow]
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[OPT.CSHARP.Csharp.OverloadingEqualsReferenceTypes]
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[OPT.CSHARP.Csharp.OverloadingEqualsValueTypes]
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[OPT.CSHARP.Csharp.OverrideEqualsOnValueTypes]
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[OPT.CSHARP.Csharp.OverridingEqualAndDistinctOperators]
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[OPT.CSHARP.Csharp.OverridingEqualsAndGetHashCode]
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[OPT.CSHARP.Csharp.ParameterCase]
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[OPT.CSHARP.Csharp.ParameterNamesShouldNotMatchMemberNames]
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[OPT.CSHARP.Csharp.PassSystemObjInsteadOfString]
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[OPT.CSHARP.Csharp.PointersShouldNotBeVisible]
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[OPT.CSHARP.Csharp.PropertiesShouldNotBeWriteOnly]
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[OPT.CSHARP.Csharp.PropertiesShouldNotReturnArrays]
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[OPT.CSHARP.Csharp.PropertyCase]
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[OPT.CSHARP.Csharp.PropertyNamesShouldNotMatchGetMethods]
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[OPT.CSHARP.Csharp.PropertyType]
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[OPT.CSHARP.Csharp.RemoveUnusedLocals]
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[OPT.CSHARP.Csharp.ReviewUselessControlFlowRule]
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[OPT.CSHARP.Csharp.ReviewVisibleEventHandlers]
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[OPT.CSHARP.Csharp.SetLocaleForDataTypes]
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[OPT.CSHARP.Csharp.SpecifyAttributeUsage]
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[OPT.CSHARP.Csharp.SpecifyCultureInfo]
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[OPT.CSHARP.Csharp.SpecifyMessageBoxOptions]
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[OPT.CSHARP.Csharp.SpecifyStringComparison]
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[OPT.CSHARP.Csharp.StaticHolderTypesShouldBeSealed]
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[OPT.CSHARP.Csharp.StaticHolderTypesShouldNotHaveConstructors]
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[OPT.CSHARP.Csharp.SuppressFinalizeCorrectly]
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[OPT.CSHARP.Csharp.TestForEmptyStringsUsingLength]
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[OPT.CSHARP.Csharp.TypeCase]
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[OPT.CSHARP.Csharp.TypeNamesShouldNotMatchNamespaces]
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[OPT.CSHARP.Csharp.TypesShouldNotExtendCertainBaseTypes]
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[OPT.CSHARP.Csharp.TypesThatOwnNativeResourcesShouldBeDisposable]
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[OPT.CSHARP.Csharp.UseConstructorsToSetProperties]
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[OPT.CSHARP.Csharp.UseExceptionConstructor]
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[OPT.CSHARP.Csharp.UseGenericEventHandlerInstances]
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[OPT.CSHARP.Csharp.UseSafeHandleToEncapsulateNativeResources]
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[OPT.CSHARP.Csharp.ValidateArgumentsOfPublicMethods]
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[OPT.CSHARP.DisposeMethodsShouldCallSuppressFinalize]
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[OPT.CSHARP.SEC.MissingStandardErrorHandling]
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[OPT.CSHARP.SEC.RegistryManipulation]
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[OPT.CSHARP.SEC.SerializableClassContainingSensitiveData]
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[OPT.CSHARP.SEC.SettingManipulation]
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[OPT.CSHARP.SEC.StaticDatabaseConnection]
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[OPT.CSHARP.SEC.TemporaryFilesLeft]
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[OPT.CSHARP.SEC.TrustBoundaryViolation]
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[OPT.CSHARP.SEC.UnsafeCookieRule]
active=false

[OPT.CSHARP.SEC.UnvalidatedAspNetModel]
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[OPT.CSHARP.SEC.UserControlledSQLPrimaryKey]
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[OPT.CSHARP.SameConditionalInIfElseIf]
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[OPT.CSHARP.SameImplementationInConditional]
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[OPT.CSHARP.SameSubexpressionInLogicalExpression]
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[OPT.GO.DuplicatedCodeSmall]
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[OPT.GO.SECURITY.CrossSiteRequestForgery]
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[OPT.GO.SECURITY.ExecutionAfterRedirect]
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[OPT.GO.SECURITY.ForbiddenCall]
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[OPT.GO.SECURITY.FormatStringInjection]
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[OPT.GO.SECURITY.HardcodedIp]
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[OPT.GO.SECURITY.LogForging]
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[OPT.GO.SECURITY.OpenRedirect]
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[OPT.GO.SECURITY.PasswordInComments]
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[OPT.GO.SECURITY.PlaintextStorageInACookie]
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[OPT.GO.SECURITY.PotentialBlockerStmt]
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[OPT.GO.SECURITY.PotentialInfiniteLoop]
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[OPT.GO.SECURITY.PrivacyViolation]
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[OPT.GO.SECURITY.ProfilingEndpointExposed]
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[OPT.GO.SECURITY.RegexInjection]
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[OPT.GO.SECURITY.SerializableTypeContainingSensitiveData]
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[OPT.GO.SECURITY.TrustBoundaryViolation]
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[OPT.HANA.EFFICIENCY.NonTrivialSubquery]
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[OPT.HANA.EFFICIENCY.UnusedVariable]
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[OPT.HANA.EFFICIENCY.UseOfCalculationEngineOperator]
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[OPT.HANA.MAINTAINABILITY.LanguageNotSpecified]
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[OPT.HANA.MAINTAINABILITY.UnusedCondition]
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[OPT.HANA.RELIABILITY.ImproperParameterUsage]
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[OPT.HANA.RELIABILITY.NonCustomErrorCode]
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[OPT.HANA.RELIABILITY.UseOfUninitializedVar]
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[OPT.HIBERNATE.AvoidProblematicFlushMode]
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[OPT.HIBERNATE.AvoidUsingNativeSQL]
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[OPT.HIBERNATE.CollectionGetterAndSetterMustReturnSameObject]
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[OPT.HIBERNATE.ConfigureConnectionPool]
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[OPT.HIBERNATE.DeclareIdentifierProperty]
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[OPT.HIBERNATE.DeclarePrivateIdentifierSetter]
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[OPT.HIBERNATE.DeclareTypeForDateProperty]
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[OPT.HIBERNATE.ExternalizeQueries]
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[OPT.HIBERNATE.ImplementEqualsHashCodeInComponents]
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[OPT.HIBERNATE.NeverUseIdentifierInEqualsHashCode]
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[OPT.HIBERNATE.ProperEqualsHashCodePolicy]
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[OPT.HIBERNATE.RollbackTransactionOnException]
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[OPT.HIBERNATE.SelectBeforeUpdateWithUpdateTrigger]
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[OPT.HIBERNATE.SeparationOfConcerns]
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[OPT.HIBERNATE.StaticInnerPersistentClasses]
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[OPT.HIBERNATE.UseInterfaceForCollectionProperty]
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[OPT.HIBERNATE.UseNamedIdentifier]
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[OPT.HIBERNATE.UseNonFinalPersistentClasses]
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[OPT.HIBERNATE.UseNullableTypeForIdentifier]
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[OPT.HIBERNATE.UseProperSubclassStrategy]
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[OPT.HIBERNATE.UseVersionInsteadOfTimestamp]
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[OPT.HTML.AvoidInlineStyles]
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[OPT.HTML.DuplicatedCodeSmall]
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[OPT.SWIFT.SECURITY.LogForging]
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[OPT.SWIFT.SECURITY.MailCommandInjection]
active=true

[OPT.SWIFT.SECURITY.NoSQLInjection]
active=true

[OPT.SWIFT.SECURITY.PasswordInCommentRule]
active=true

[OPT.SWIFT.SECURITY.PasswordInConfigurationFile]
active=true

[OPT.SWIFT.SECURITY.PasteboardCachingLeak]
active=true

[OPT.SWIFT.SECURITY.PathTraversal]
active=true

[OPT.SWIFT.SECURITY.PrivacyViolation]
active=true

[OPT.SWIFT.SECURITY.ResourceInjection]
active=true

[OPT.SWIFT.SECURITY.ScreenCachingLeak]
active=true

[OPT.SWIFT.SECURITY.SensitiveCoreData]
active=true

[OPT.SWIFT.SECURITY.SensitiveDataAccessedFromItunes]
active=true

[OPT.SWIFT.SECURITY.SensitiveNoSQL]
active=true

[OPT.SWIFT.SECURITY.SensitiveSQL]
active=true

[OPT.SWIFT.SECURITY.SensitiveUserDefaults]
active=true

[OPT.SWIFT.SECURITY.SerializationInjection]
active=true

[OPT.SWIFT.SECURITY.ServerTrustCredentialCheck]
active=true

[OPT.SWIFT.SECURITY.SqlInjection]
```

```
active=true

[OPT.SWIFT.SECURITY.ThirdPartyKeyboardAllowed]
active=true

[OPT.SWIFT.SECURITY.UnsafeReflection]
active=true

[OPT.SWIFT.SECURITY.WeakCryptographicHash]
active=true

[OPT.SWIFT.SECURITY.WeakCryptographicHashSalt]
active=true

[OPT.SWIFT.SECURITY.WeakCryptographicKey]
active=true

[OPT.SWIFT.SECURITY.WeakEncryption]
active=true

[OPT.SWIFT.SECURITY.WeakKeyDerivationIteration]
active=true

[OPT.SWIFT.SECURITY.WeakKeyDerivationPassword]
active=true

[OPT.SWIFT.SECURITY.WeakSymmetricEncryptionInitializationVector]
active=true

[OPT.SWIFT.SECURITY.WeakSymmetricEncryptionModeOfOperation]
active=true

[OPT.SWIFT.SECURITY.XMLEntityInjection]
active=true

[OPT.SWIFT.SECURITY.XMLInjection]
active=true

[OPT.SWIFT.SECURITY.XpathInjection]
active=true

[OPT.TRANSACTIONSQL.AvoidDynamicSql]
active=true

[OPT.TRANSACTIONSQL.SEC.CommandInjection]
active=true

[OPT.TRANSACTIONSQL.SEC.InsecureRandomness]
active=true

[OPT.TRANSACTIONSQL.SEC.SleepInjection]
active=true

[OPT.TRANSACTIONSQL.SEC.SqlInjection]
active=true
```

```
[OPT.TRANSACTIONS.SQL.SEC.TooBroadGrant]
active=true

[OPT.TRANSACTIONS.SQL.SEC.WeakCryptographicHash]
active=true

[OPT.TRANSACTIONS.SQL.SEC.WeakSymmetricEncryptionAlgorithm]
active=true

[OPT.VBNET.CodeInjection]
active=true

[OPT.VBNET.CodeInjectionWithDeserialization]
active=true

[OPT.VBNET.CommandInjection]
active=true

[OPT.VBNET.CrossSiteScripting]
active=true

[OPT.VBNET.DoSRegexp]
active=true

[OPT.VBNET.InsecureRandomness]
active=true

[OPT.VBNET.JSONInjection]
active=true

[OPT.VBNET.LdapInjection]
active=true

[OPT.VBNET.MVCNonActionPublicMethods]
active=true

[OPT.VBNET.MVCPreventOverpostingModelDefinition]
active=true

[OPT.VBNET.MVCPreventUnderpostingModelComposition]
active=true

[OPT.VBNET.MVCPreventUnderpostingModelDefinition]
active=true

[OPT.VBNET.PathTraversal]
active=true

[OPT.VBNET.SEC.AccessibilitySubversionRule]
active=true

[OPT.VBNET.SEC.AnonymousLdapBind]
active=true
```

```
[OPT.VBNET.SEC.AvoidHostNameChecks]
active=true

[OPT.VBNET.SEC.ConnectionStringParameterPollution]
active=true

[OPT.VBNET.SEC.CookiesInSecurityDecision]
active=true

[OPT.VBNET.SEC.HardcodedCredential]
active=true

[OPT.VBNET.SEC.HardcodedCryptoKey]
active=true

[OPT.VBNET.SEC.HardcodedSalt]
active=true

[OPT.VBNET.SEC.HttpParameterPollution]
active=true

[OPT.VBNET.SEC.HttpSplittingRule]
active=true

[OPT.VBNET.SEC.InformationExposureThroughErrorMessage]
active=true

[OPT.VBNET.SEC.InsecureEmailTransport]
active=true

[OPT.VBNET.SEC.InsecureTransport]
active=true

[OPT.VBNET.SEC.LogForging]
active=true

[OPT.VBNET.SEC.MailCommandInjection]
active=true

[OPT.VBNET.SEC.NoSQLInjection]
active=true

[OPT.VBNET.SEC.PlaintextStorageOfPassword]
active=true

[OPT.VBNET.SEC.ProcessControl]
active=true

[OPT.VBNET.SEC.ProperPaddingWithPublicKeyCrypto]
active=true

[OPT.VBNET.SEC.ResourceInjection]
active=true

[OPT.VBNET.SEC.ServerInsecureTransport]
```



```
active=true

[OPT.VBNET.SEC.UnsafeReflection]
active=true

[OPT.VBNET.SEC.XMLEntityInjection]
active=true

[OPT.VBNET.ServerSideRequestForgery]
active=true

[OPT.VBNET.SqlInjection]
active=true

[OPT.VBNET.SystemInformationLeak]
active=true

[OPT.VBNET.TooMuchOriginsAllowed]
active=true

[OPT.VBNET.WeakCryptographicHash]
active=true

[OPT.VBNET.WeakEncryption]
active=true

[OPT.VBNET.WeakKeySize]
active=true

[OPT.VBNET.WeakSymmetricEncryptionAlgorithm]
active=true

[OPT.VBNET.WeakSymmetricEncryptionModeOfOperation]
active=true

[OPT.VBNET.XMLInjection]
active=true

[OPT.VBNET.XPathInjection]
active=true

[OPT.VBNET.XQueryInjection]
active=true

[OPT.VBNET.XSLTInjection]
active=true
```

## Use Contrast Scan for GitHub repositories

Use the [Contrast Local Scan](#) to scan GitHub repositories for vulnerabilities without uploading your files to Contrast.

### Before you begin

- Get your Contrast authentication details by selecting the **user menu > User settings** in the Contrast web interface. You need these details:

- Organization ID
- API key
- Service key
- You also need a valid Contrast username and the URL of your Contrast instance.

## Steps

1. Configure these GitHub secrets:
  - `CONTRAST__API__API_KEY`
  - `CONTRAST__API__ORGANIZATION`
  - `CONTRAST__API__SERVICE_KEY`
  - `CONTRAST__API__USER_NAME`
  - `CONTRAST__API__URL`
2. Create a workflow or update an existing one to run this action against your code. This example shows how to run the action on push.

```
name: Scan with local scanner

on:
  push:
    branches:
      - 'main'

permissions:
  contents: read

jobs:
  scan:
    runs-on: ubuntu-latest
    steps:
      - uses: actions/checkout@v3
      - uses: Contrast-Security-OSS/contrast-local-scan-action@v1.0.0
        with:
          apiUrl: ${ secrets.CONTRAST__API__URL }
          apiUserName: ${ secrets.CONTRAST__API__USER_NAME }
          apiKey: ${ secrets.CONTRAST__API__API_KEY }
          apiServiceKey: ${ secrets.CONTRAST__API__SERVICE_KEY }
          apiOrgId: ${ secrets.CONTRAST__API__ORGANIZATION }
```

The [README](#) contains additional examples of other inputs that you can add to your workflow.

## Required inputs

- `apiUserName`: A valid Contrast username.
- `apiKey`: Your Contrast API key.
- `apiServiceKey`: The Contrast service key.
- `apiOrgId`: The Contrast organization ID,

## Optional inputs

- `apiUrl`: The URL of your Contrast instance.  
The default value is: `https://app-agents.contrastsecurity.com/Contrast`.
- `checks`: If set, adds GitHub checks to the current commit based on any vulnerabilities found.
- `codeQuality`: Passes the `-q` option to the Contrast local scan engine to include code quality rules in the scan.

- **label**: A label to associate with the current scan.  
The default value is the current ref , for example: `refs/heads/main`.
- **memory**: Memory setting passed to the underlying scan engine. The default value is 2G.
- **path**: The path the Contrast local scan engine uses for the scan.  
The default value is the current repository path.
- **projectName**: The name of a project to associate with the scan.  
The default value is the current GitHub repository name, for example, `mycompany/myrepo`
- **resourceGroup**: Passes the `-r` option to the Contrast local scan engine to associate newly created projects with the specified resource group.
- **severity**: Set this to cause a build to fail if the scan finds vulnerabilities at this severity or higher.  
Valid values are critical, high, medium, low, note.

### See also

Contrast [Contrast Local Scan](#) for latest details.

[Contrast Scan local engine \(page 714\)](#)

## Scan languages with the Semgrep engine

Contrast provides, as a courtesy to those customers with Terraform, Rust, and Ruby 3.X source code elements, an optional way to scan their source code using the Semgrep open source SAST scanner and have results presented in the Contrast web interface along with other supported languages.

### Steps

1. Download the Semgrep engine from [Semgrep](#).
2. Place the Semgrep engine file in the same location as the Scan local engine JAR file.
3. Run a scan with the Contrast Scan local engine.  
When the Contrast Scan local engine detects the presence of Terraform (TF) files, Rust (RS) files, or Ruby (RB) files, it passes the relevant files to the Semgrep engine. The Scan local engine uses the Semgrep rules for those languages ([Terraform rules](#), [Rust rules](#), or [Ruby rules](#)) and creates a SARIF file for the scanned languages.  
When scanning of the complete repo completes:
  1. The scan process combines the SARIF files that the Semgrep engine and the Contrast Scan local engine create.
  2. The scan process uploads the SARIF file to the Contrast web interface.
4. View results as described in the [Analyze scan results \(page 1168\)](#) section.

### Contrast support

Contrast provides support for Rust, Terraform, and Ruby on an as is basis. You are free to use the Semgrep engine to scan Rust, Terraform, and Ruby files (and any other language) without integration with the Contrast SAST platform. Contrast supports this functionality for convenience purposes only, where Rust, Terraform, or Ruby files are part of a larger repo.

## View local scan results

View details and results of a local scan in the Contrast web interface.

If you specified a location for output results, you can view the SARIF file that the scan created on your local system.

### Steps

1. Log in to the Contrast web application.

2. Select the **Scans** tab.
3. In the scans list, select the scan project for the local scan.
4. To view results from the local scan, explore the Overview, Vulnerabilities, and Policy tabs.  
The Contrast Documentation contains additional information on [analyzing scan results](#).

## Analyze scan results

A scan observes the data flow in an application and reports vulnerabilities that it discovers.

After you analyze the results, update your code and run the scan again to verify the vulnerability is fixed.

## Scoring

Contrast provides a score for each scan that represents the potential security risk for an application:

- Scoring is not dynamic except for vulnerabilities that have a status of **Not a Problem**.  
[Configure dynamic scoring \(page 704\)](#) describes how to use dynamic scoring. For all other vulnerabilities, run the scan again to see updated scores after updating code.
- Scoring uses the standard scoring methodology described in the [Contrast application scoring guide \(page 1557\)](#).


## Before you begin


[Contrast Scan vulnerability workflow \(page 1174\)](#) provides guidelines for managing vulnerabilities that Contrast Scan reports.

## Steps

After a scan completes, you can view information on vulnerabilities, the name of the project creator, and the name of the person who ran each scan.

1. Select **Scans** in the header.  
The Scans page shows a list of scan projects..
2. Select a scan project.
3. On the Overview tab, view a summary of the scan results as well as a list of scans in the project.

 **MyTest45**  
Language: Java | Last Scan: 6 Minutes Ago | Created By: Jane Danielson



OverviewVulnerabilitiesPolicy

+ New Scan

F

0/100

34  
Vulnerabilities

0  
New Vulnerabilities





0  
Remediated

4  
Scans Completed

0  
Days Since Last Scan

SCAN HISTORY

All (4)

| VULNERABILITIES   | LABEL               | SCAN DATE      | NAME           | LANGUAGE | COVERAGE             |  |
|---|---------------------|----------------|----------------|----------|----------------------|--|
| <div><div></div><div></div><div></div><div>(37)</div><div>7</div></div> | 2023-10-31 14:56:22 | 2 minutes ago  | Jane Danielson | Java     | <a href="#">View</a> |   |
| <div><div></div><div></div><div></div><div>(37)</div><div>7</div></div> | 2023-10-31 14:51:50 | 7 minutes ago  | Jane Danielson | Java     | <a href="#">View</a> |   |
| <div><div></div><div></div><div></div><div>(37)</div><div>7</div></div> | 2023-10-31 14:48:50 | 10 minutes ago | Jane Danielson | Java     | <a href="#">View</a> |   |
| <div><div></div><div></div><div></div><div>(37)</div><div>7</div></div> | 2023-10-31 14:43:04 | 16 minutes ago | Jane Danielson | Java     | <a href="#">View</a> |  |

<Page 1 of 1>

Results per page 10 25 50

The summary section shows these details:

- **Score:** A letter grade that represents the potential security risk for application based on the most recent scan in the project.
- **Vulnerabilities:** The number of vulnerabilities discovered in the most recent scan. To see details about discovered vulnerabilities, select the number.
- **New Vulnerabilities:** The number of new vulnerabilities discovered in the most recent scan. This value excludes vulnerabilities that previous scans discovered and are not fixed.

For example:

If Scan 1 discovered three vulnerabilities:

- The number of vulnerabilities is three.
- The number of new vulnerabilities is also three.

If code modifications introduce a new vulnerability but do not fix existing vulnerabilities, when you run Scan 2:

- The vulnerabilities number changes to four (all discovered vulnerabilities).
- The new vulnerabilities number becomes one (the new one discovered in Scan 2).

To see details about new vulnerabilities, select the number.

- **Remediated:** The number of vulnerabilities that are fixed by changing source code or configuration files within the application.  
To see details about remediated vulnerabilities, select the number.
- **Scans completed:** The number of scans completed in the project.  
To see details about completed scans, select the number.
- **Days since last scan:** The number of days since the last scan completed.

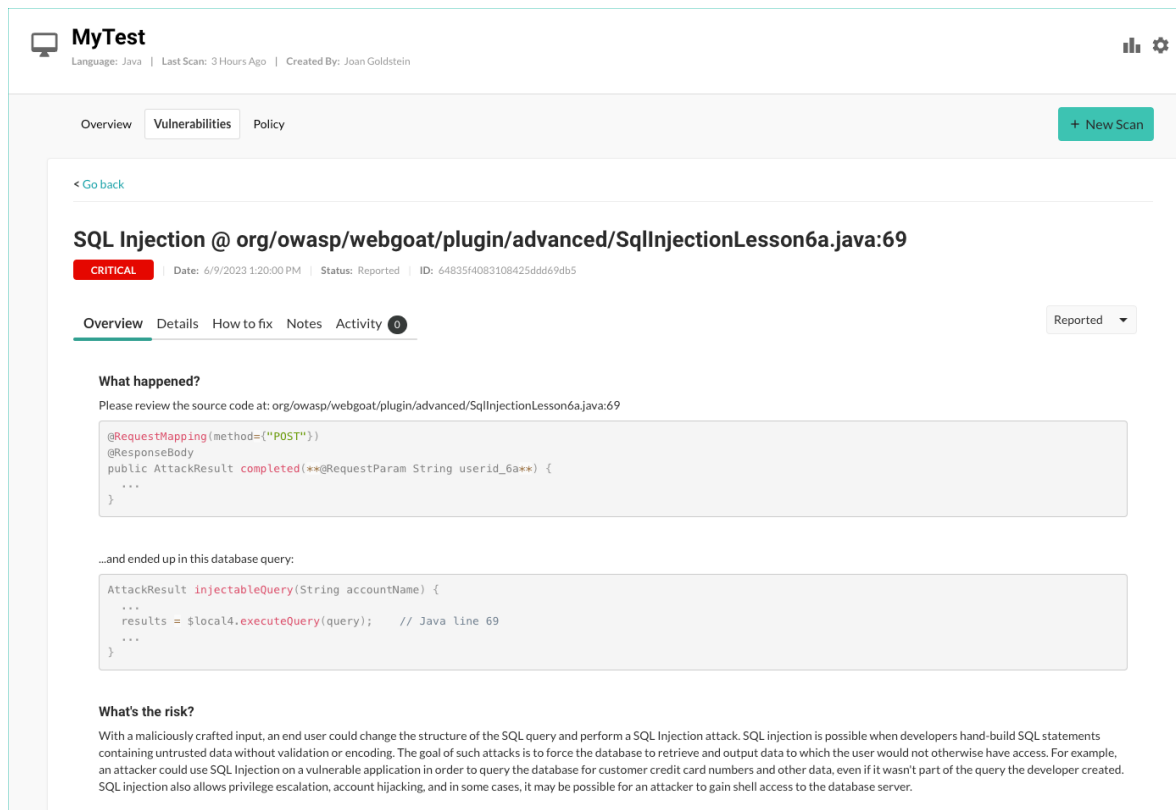
The Scan history shows these details:

- **Vulnerabilities:** A bar that shows the different types of detected vulnerabilities for a scan.  
To view a filtered list of a specific type of vulnerability, select a section of the bar.

- **Label:** The label associated with the scan.  
To view additional [scan details \(page 1171\)](#), select the label.
- **Scan date** The date the scan completed.
- **Name:** The name of the person who ran the scan.
- **Language:** The languages detected in the scanned code.
- **Coverage:** A link to additional [scan details \(page 1171\)](#).

To export the results to a SARIF file, select the **Download** icon (  ) at the end of a scan's row.

- To view more information about a specific vulnerability, select the **Vulnerabilities** tab and select the vulnerability.



The screenshot shows the Contrast web interface for a scan named "MyTest". The interface has tabs for Overview, Vulnerabilities, and Policy. The "Vulnerabilities" tab is selected, showing a list of vulnerabilities. One vulnerability is highlighted: "SQL Injection @ org/owasp/webgoat/plugin/advanced/SqlInjectionLesson6a.java:69". The vulnerability is marked as "CRITICAL" and has a date of 6/9/2023 1:20:00 PM. The status is "Reported" and the ID is 64835f4083108425dd69db5. Below the vulnerability list, there are tabs for Overview, Details, How to fix, Notes, and Activity. The "Overview" tab is selected, showing a description of the vulnerability, the source code snippet where it was found, and the risk associated with it.

**SQL Injection @ org/owasp/webgoat/plugin/advanced/SqlInjectionLesson6a.java:69**

**CRITICAL** | Date: 6/9/2023 1:20:00 PM | Status: Reported | ID: 64835f4083108425dd69db5

Overview Details How to fix Notes Activity 0

**What happened?**

Please review the source code at: [org/owasp/webgoat/plugin/advanced/SqlInjectionLesson6a.java:69](#)

```
@RequestMapping(method={"POST"})
@ResponseBody
public AttackResult completed(**@RequestParam String userid_6a**) {
    ...
}
```

...and ended up in this database query:

```
AttackResult injectableQuery(String accountName) {
    ...
    results = $local4.executeQuery(query); // Java line 69
    ...
}
```

**What's the risk?**

With a maliciously crafted input, an end user could change the structure of the SQL query and perform a SQL Injection attack. SQL injection is possible when developers hand-build SQL statements containing untrusted data without validation or encoding. The goal of such attacks is to force the database to retrieve and output data to which the user would not otherwise have access. For example, an attacker could use SQL Injection on a vulnerable application in order to query the database for customer credit card numbers and other data, even if it wasn't part of the query the developer created. SQL injection also allows privilege escalation, account hijacking, and in some cases, it may be possible for an attacker to gain shell access to the database server.

- The Overview tab for the selected vulnerability shows a description of the vulnerability, including what happened in your code and the risk associated with the vulnerability.
- To view the details about the vulnerability and its location in your code, select the **Details** tab:
    - The method where a vulnerability exists.
    - The file where the scan discovered the vulnerability.
    - The first line in the code where the scan discovered the vulnerability.
  - To view suggestions for fixing the code, select the **How to fix** tab.
  - To view suggestions for fixing the code from Secure Code Warrior, select the **SCW How to fix** tab.  
This tab includes suggestions from Secure Code Warrior as well as videos, links to additional information, and guidelines. If no relevant Secure Code Warrior information is available, this tab is not displayed.
  - To view additional details about the vulnerability, select the **Notes** tab for these details:
    - When the vulnerability is detected
    - The code module where Contrast found the vulnerability
    - The type of vulnerability (for example, injection)
    - Severity
    - Risk confidence

- Security standards that apply to the vulnerability
- e. To view vulnerability activity, select the **Activity** tab for these details:
  - The user who made changes
  - Vulnerability status changes
  - Comments

## See also

[View scan details \(page 1171\)](#)

## View scan details

Scan details include:

- A summary of the scan results.
- Scan coverage details.

## Before you begin

- Identify the scan project that contains the scan you want to view.

## Steps

1. In the header, select **Scans**.
2. Select a scan project.
3. At the top of the page, view these details:
  - The language of the scanned artifact.  
Composite indicates that the scan discovered multiple languages in the artifact.
  - The last time a scan occurred for this project.
  - The name of the person who ran the scan.
  - Metadata associated with the project, if configured.
  - If role-based access control is turned in, the name of the resource group with which the project is associated, based on the role of the logged-in user.  
Different users could see different resource groups, depending on their role. For example, a standard user could see different resource groups than a user with administrator permissions.
4. View the summary details:
  - **Score**: A letter grade that represents an aggregate of both the number and seriousness of the vulnerabilities discovered based on the amount of the application that was exercised.
  - **Vulnerabilities**: The current number of vulnerabilities.
  - **New Vulnerabilities**: The number of new vulnerabilities discovered with the most recent scan.
  - **Remediated**: The number of vulnerabilities that were remediated:
  - **Scans completed**: The number of scans in the project.
  - **Days since last scan**: The number of days since the last scan completed.
5. To view additional details about vulnerabilities, select the **Vulnerabilities** tab at the top of the page.

|                          | SEVERITY | VULNERABILITY  | LANGUAGE | CWE | LAST DETECTED | STATUS   |
|--------------------------|----------|--|----------|-----|---------------|----------|
| <input type="checkbox"/> | CRITICAL | SQL Injection @ org/owasp/webgoat/plugin/advanced/SqlInjectionLesson6a.java:69     | Java     | 89  | 1 minute ago  | Reported |
| <input type="checkbox"/> | CRITICAL | SQL Injection @ org/owasp/webgoat/plugin/mitigation/Servers.java:46                | Java     | 89  | 1 minute ago  | Reported |
| <input type="checkbox"/> | CRITICAL | SQL Injection @ org/owasp/webgoat/plugin/challenge5/challenge6/Assignment5.java:49 | Java     | 89  | 1 minute ago  | Reported |

- To filter the view by severity, vulnerability, language, CWE, or status, select the **Filter** icon (▼) next to the column heading and select available options.
  - In addition to filtering by severity, you can also [edit the severity \(page 1177\)](#).
  - The Vulnerability column shows the name of the vulnerability and where in the code it was found.
  - The Language column shows the language of the code where the scan found the vulnerability.
  - The CWE column shows the number of the CWE that maps to the rule for the vulnerability. For example, if CWE-89 maps to a rule for a specific vulnerability, the CWE column displays 89. If no CWE exists for a specific vulnerability, the column is blank.
  - The Status column shows the status of the vulnerability.  
[Scan statuses \(page 1174\)](#) provides descriptions of each vulnerability status.
  - To [download the vulnerability data to a CSV file \(page 1178\)](#), select the **Download** icon (📄) at the top of the vulnerability list.
6. To view the rules that the scan used, select the **Policy** tab at the top of the page.
  7. To view coverage details, under Scan history, select the link in the Label column for a specific scan or select **View** in the Coverage column under Scan history.

The screenshot shows the Contrast Scan interface for a scan named "MyTest". At the top, it indicates "Language: Java" and "Created By: Jane Doe". The interface has tabs for "Overview", "Vulnerabilities", and "Policy". A "+ New Scan" button is in the top right. Below the tabs, there's a "Go back" link. The main section displays the scan name "webgoat-server-8.0.0.M21.jar" and its details: "Scan Date: 6/9/2023 1:19:09 PM", "Created By: Jane Doe", and "ID: 45be7ecd-44d1-4ff5-a04a-aa4b7a76022a".

The "Analysis" section shows a summary of findings:

| Category        | Count |
|-----------------|-------|
| Entry Points    | 111   |
| Dangerous Calls | 296   |
| Custom Classes  | 512   |
| Library Classes | 3829  |

A donut chart shows the "Breakdown" of findings: Vulnerabilities (red), Warnings (teal), and Other findings (grey). The "Scan Status" is "Completed in 1 minute". The "Policy" is "Default". The "Custom Code" is "Automatically Detected".

Below the analysis, there are tabs for "Vulnerabilities" and "Other Findings". A table lists the vulnerabilities:

| Severity | Vulnerability  | Status   |
|----------|--|----------|
| CRITICAL | SQL Injection @ org/owasp/webgoat/plugin/introduction/SqlInjectionLesson5b.java:69 | Reported |
| CRITICAL | SQL Injection @ org/owasp/webgoat/plugin/advanced/SqlInjectionChallenge.java:51    | Reported |

- At the top of the list, view a summary of scan details.  
The name of the person who ran the scan is displayed at the top of the summary.



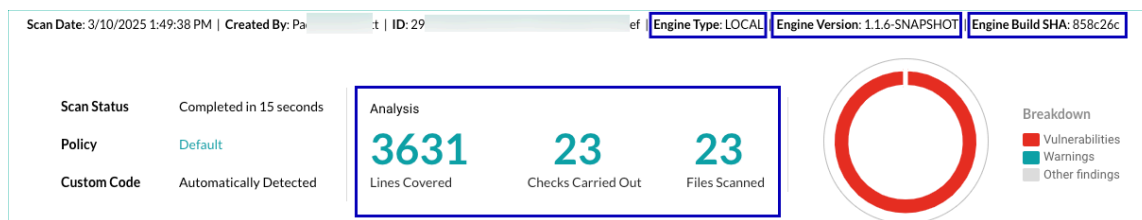
### NOTE

The ability to view the name of the person who ran the scan is available for scan projects created after June 12, 2023.

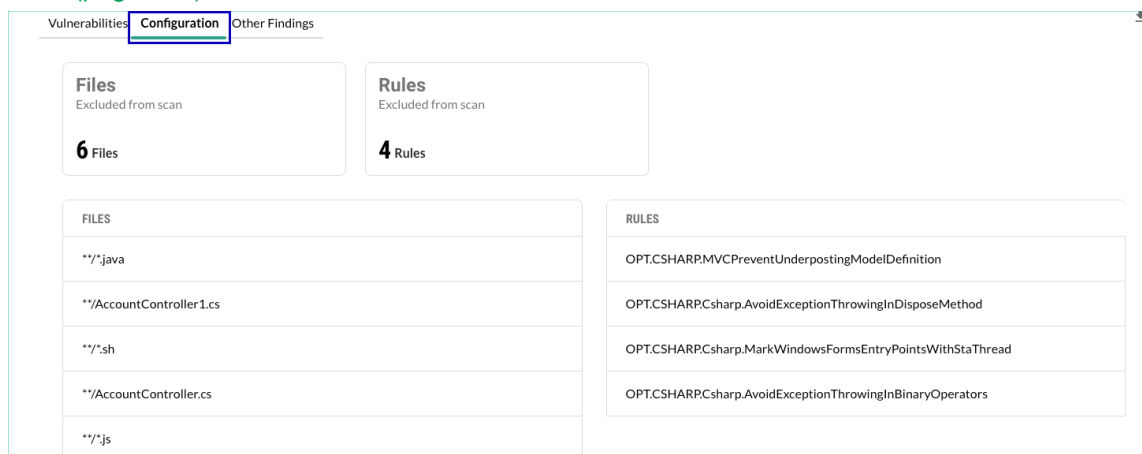
**Scans with the Contrast Scan local engine:** If you used the Contrast Scan local engine, the summary shows the type of scan engine (for example LOCAL), the version of the scan engine used, and the engine SHA checksum.

The charts in the Analysis section show the number of lines of code scanned, the number of rules that the scan checked, and the number of files scanned.





- Under **Vulnerabilities**, view the severity, vulnerability name, and status of the vulnerability. Contrast has high confidence that the vulnerabilities in this list require remediation.
- Under **Configuration**, view the files and rules excluded from the scan. To see this tab, use the Contrast Scan local engine and [exclude files \(page 924\)](#) or [rules \(page 716\)](#).



- Under **Other Findings**, view additional vulnerabilities that the scan found. Due to the assumptions the scan made when reporting these vulnerabilities, Contrast has lower confidence that the vulnerabilities in this list require remediation

## View details for scanned branches

The Scan local engine lets you scan personal branches in repos. You can view the results of these scans in the Contrast web interface.

### Before you begin

- Scan results for branches have no affect on the score or aggregated results for the parent scan project.

### Steps

1. With the [Scan local engine \(page 919\)](#), scan a branch.
2. In the Contrast web interface, select **Scans**.
3. Select the scan project associated with your branch.
4. Select the **Branches** tab.  
This tab is available only if the scan project has scanned branches associated with it. Use the Scan local engine to [scan branches \(page 922\)](#).
5. View the details of the scan:
  - **Overview:** Shows a summary of the scan results and the scan history.
  - **Vulnerabilities:** Shows the list of vulnerabilities for the scanned branch. Select a vulnerability to view additional details.
  - **Policy:** Shows the list of rules applied to the scanned branch.

- To return to the parent scan project, select **Go to parent project** at the top of the page.

## Contrast Scan vulnerability statuses

This table lists the different statuses that you or Contrast sets for vulnerabilities that Contrast Scan discovers.

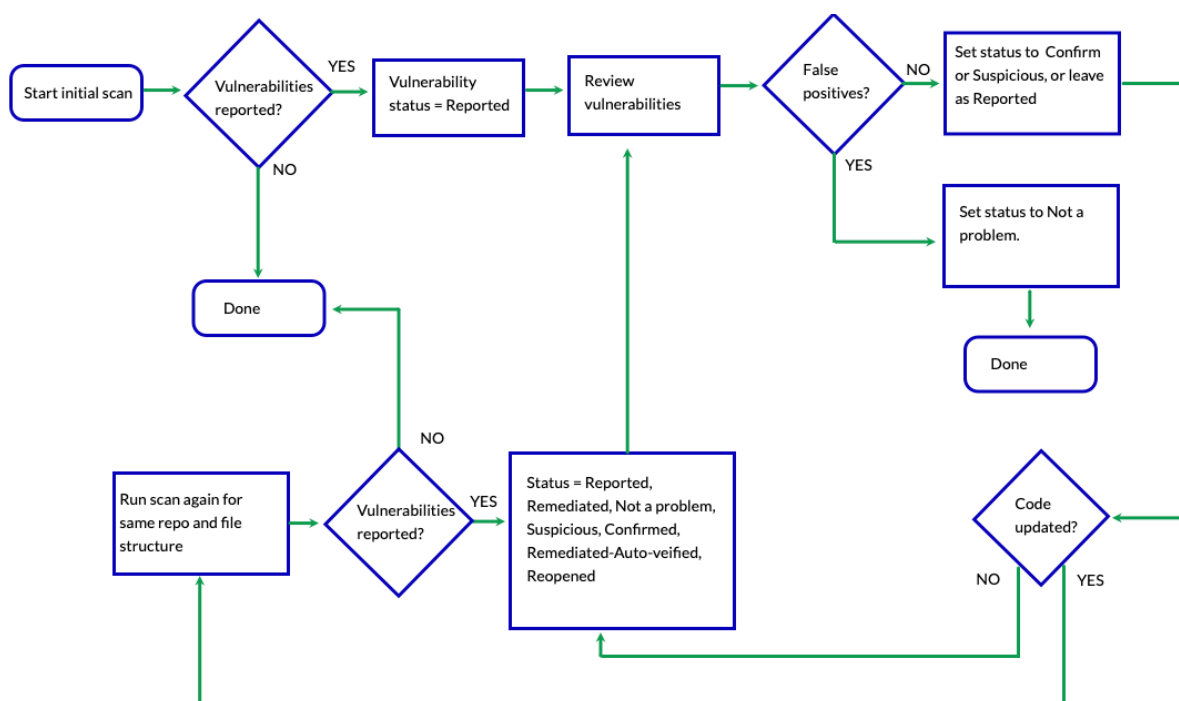
| Status                          | Automated or manually set? | Description  |
|---------------------------------|----------------------------|--|
| <b>Reported</b>                 | Automated                  | Contrast sets this status automatically the first time it discovers vulnerabilities during a scan.   |
| <b>Confirmed</b>                | Manual                     | You've reviewed the code and confirmed that the vulnerability is a true finding.   |
| <b>Suspicious</b>               | Manual                     | The vulnerability seems to be a true finding, but it needs more investigation to determine its validity.   |
| <b>Not a problem</b>            | Manual                     | The vulnerability doesn't require code changes.<br><br>Optionally, you can provide a reason for this status change.<br><br>If you change the status to <b>Not a Problem</b> , it never changes to <b>Remediated</b> or any other status, even if subsequent scans don't discover the vulnerability. To have the vulnerability assessed again, change the status to <b>Confirmed</b> or <b>Suspicious</b> . |
| <b>Remediated</b>               | Automated                  | A change to the source code or application configuration files fixed the vulnerability.  |
| <b>Fixed</b>                    | Automated                  | Not currently used.  |
| <b>Remediated Auto-verified</b> | Automated                  | The vulnerability had a status of <b>Remediated</b> . After the fifth scan, Contrast updates the <b>Remediated</b> status to <b>Remediated Auto-Verified</b> .   |
| <b>Reopened</b>                 | Automated                  | The vulnerability had a status of <b>Remediated</b> , but a new scan detects the vulnerability again. Contrast changes the status to <b>Reopened</b> .   |

## Contrast Scan vulnerability workflow

This topic provides workflow guidelines for managing the vulnerabilities that Contrast Scan reports.

### Diagram: Scan vulnerability workflow

This diagram shows a suggested workflow for managing vulnerabilities that Contrast Scan reports.



## Workflow for managing scan vulnerabilities

1. Create a scan project and run the scan.  
Each time you run a scan for a specific project, ensure you are using the same repo and file structure.  
Contrast sets the status for new vulnerabilities to **Reported**.
2. Review the findings.
  - If the reported vulnerabilities are false positives or do not require code changes, change the status to **Not a Problem** and add a comment.
  - If the finding is a true positive, change the vulnerability status to **Confirmed** to indicate that the development team should fix the code.
  - If the finding is true based on the details of the vulnerability, but the vulnerability requires additional investigation to determine its validity, changing the status to **Suspicious** might be appropriate.
3. Fix the code or exclude irrelevant files and folders.
4. Run the scan again.
  - If the vulnerability is not found in a subsequent scan, Contrast changes its status to **Remediated**.
  - If Contrast detects a vulnerability with a status of **Not a Problem**, **Confirmed**, or **Suspicious** in a subsequent scan, Contrast keeps the current status.
  - If you exclude files or folder file related to a previously reported vulnerability and the vulnerability had a status of **Confirmed** or **Suspicious**, Contrast changes the status to **Remediated** if the scan no longer detects the vulnerability.
  - If a vulnerability had a status of **Remediated** and the vulnerability is detected in a subsequent scan, Contrast changes the status to **Reopened**.
  - If the vulnerability has a status of **Remediated** for five scans, Contrast changes the status to **Remediated Auto-Verified**.
5. Repeat steps 2 through 4 until you address all the vulnerabilities.

## Edit scan vulnerability status

When Contrast discovers a vulnerability during a scan, it assigns a status of **Reported** to the vulnerability. This status indicates that the vulnerability could possibly be exploited.

You can change this status, based on how you are managing the vulnerability, to one of these values:

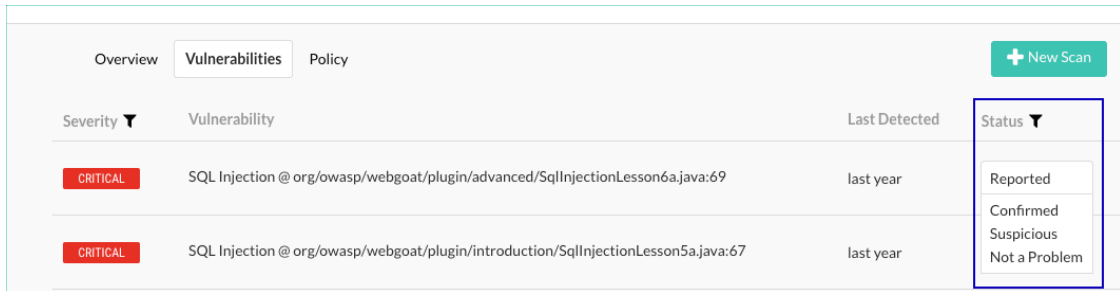
- **Confirmed:** You've confirmed that the vulnerability is a true finding by reviewing the source code or exploiting it.
- **Suspicious:** You've confirmed that the vulnerability appears to be a true finding based on the details provided, but it requires more investigation to determine its validity.
- **Not a problem:** You've determined that the vulnerability doesn't require code changes.  
If you change the status to **Not a Problem**, it never changes to **Remediated** or any other status, even if subsequent scans don't discover the vulnerability. To have the vulnerability assessed again, change the status to **Confirmed** or **Suspicious**.

[Batch edit Scan vulnerability status \(page 1176\)](#) describes how to edit multiple statuses at the same time

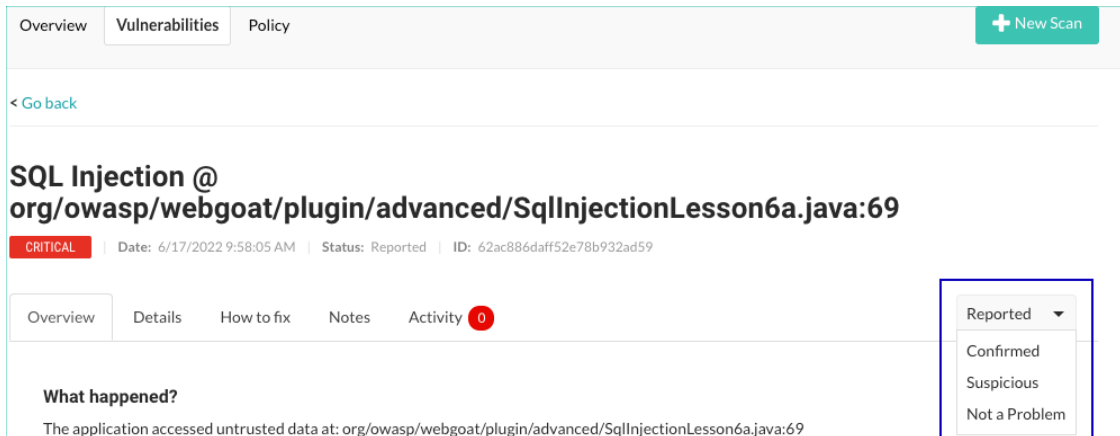
## Steps

1. Select **Scans** in the header.
2. Select a Scan project.
3. Select the **Vulnerabilities** tab.
4. Change the status:

- a. On the Vulnerabilities page, select a status in the Status column.



Alternatively, select a vulnerability from the Vulnerabilities list and select a status on the right side of the view.



- b. Optionally, enter a comment explaining why you are making the change and select **Override**.
5. Add comments for a vulnerability without changing its status:



- From the Vulnerabilities tab, select a vulnerability.
- Select the **Activity** tab.
- Enter a comment and select **Add comment**.

## Batch edit Scan vulnerability status

When Contrast discovers a vulnerability during a scan, it assigns a status of **Reported** to the vulnerability. This status indicates that the vulnerability could possibly be exploited.

You can change this status for multiple vulnerabilities, based on how you are managing them, to one of these values:

- **Confirmed:** You've confirmed that the vulnerability is a true finding by reviewing the source code or exploiting it.
- **Suspicious:** You've confirmed that the vulnerability appears to be a true finding based on the details provided, but it requires more investigation to determine its validity.
- **Not a problem:** You've determined that the vulnerability doesn't require code changes.

If you change the status to **Not a Problem**, it never changes to **Remediated** or any other status, even if subsequent scans don't discover the vulnerability. To have the vulnerability assessed again, change the status to **Confirmed** or **Suspicious**.

## Steps

1. Select **Scans** in the header.
2. Select a Scan project.
3. Select the **Vulnerabilities** tab.
4. Use the checkbox on the left to select multiple vulnerabilities with the same status. You can select vulnerabilities with different types.
5. In the batch action menu at the bottom of the page, select **Status** and select a status from the dropdown.
6. If you selected one or more vulnerabilities of the same type, optionally select the checkbox to change the status of all vulnerabilities that match that type.

### Mark as Confirmed

8 Selected    Include all 8 Command Injection types? ☒ Select all

Development confirmed that these are real issues

Cancel Change status

7. Optionally, enter a comment in the Mark window.
8. Select **Change status**.



### NOTE

Changing the status for large numbers of vulnerabilities at the same time can take several minutes to complete. You can continue to make changes without waiting. Contrast displays a message when the change operations finish.

## Edit scan vulnerability severity

Contrast classifies scan vulnerabilities based on the likelihood and impact of a vulnerability in the code, from most to least severe:

- Critical
- High
- Medium
- Low
- Notes

You have the option to change the severity that Contrast applies automatically to a vulnerability. Future scans do not override a severity change.

### Before you begin

- If you are using role-based access control, a role with the View, edit, and delete project action is required.
- If you are using organization users and groups, the Organization Admin role is required.

### Steps

1. In the header, select **Scans**.
2. Select a scan project.
3. Select the **Vulnerabilities** tab.
4. Select the colored badge in the Severity column and choose a new level from the menu.
  - a. If more than one vulnerability of the same type exists, you have the option of changing the severity for the selected vulnerability only or the severity of all matching vulnerabilities.
  - b. Optionally, add a reason for the change in the Comment box.
  - c. Select **Change severity**.

### Download scan results

You can download scan results to these file types:


- **SARIF file:** After a scan completes, you can download the results to a Static Analysis Results Interchange Format (SARIF) file. This type of file is a standard, JSON-based format for the output of static analysis data.

To optimize storage usage, SARIF files are available for up to five days after the scan completes. No download option is available for older scans.
- **CSV file:** You can download vulnerability data for a scan project to a Comma-separated Values (CSV) file. The CSV file:
  - Excludes vulnerabilities with a status of **Remediated** and **Not a problem**.
  - Includes or excludes data based on selected filters.

### Before you begin

Identify the scan whose results you want to download.

### Steps for SARIF download

1. Select **Scans** in the header.
2. Select a scan project.
3. In the Overview tab, under Scan history, select the **Download** icon (  ) at the end of a scan row.
4. When prompted, select a location for the SARIF file.

### Steps for CSV download

1. Select **Scans** in the header.
2. Select a scan project.

3. Select the **Vulnerabilities** tab.
4. To filter the data in the CSV file, select any of the filters for **Severity**, **Vulnerability**, **Language**, or **Status**.
5. Select the **Download** icon (⬇) at the top of the page.
6. If the number of vulnerabilities exceeds 2,000, you are prompted to select a page of results to download.  
You can download one page at a time.
7. When prompted, select a location for the CSV file.

## SARIF file data

When you download results, Scan writes the data to a SARIF file.

SARIF is a standard data model and serialization format for static analysis results. Understanding the data in the SARIF file can help when you need a deeper understanding of scan results.

The SARIF file includes this type of information:

- Information about the scanner that Contrast uses
- Data on what was scanned and the scan composition
- Data on vulnerability findings
- Errors or notifications that are handled gracefully during the scan
- Scan coverage data

## Scanner data

This example shows data about the scanner that Contrast uses:

```
5  "tool" : {  
6    "driver" : {  
7      "name" : "Contrast Scan",  
8      "organization" : "Contrast Security, Inc.",  
9      "version" : "pkg: 2.0.0-SNAPSHOT, engine: 2.0.0-SNAPSHOT, policy: 2.0.0-SNAPSHOT",  
10     "informationUri" : "https://www.contrastsecurity.com"  
11   }  
}
```

## Vulnerability data

The examples in this section show some of the data for a single vulnerability. The scan shows this data in the `results` section.

### • Single object

This example shows the scan results for a SQL injection vulnerability. The data in the `threadFlows` section show the scanned data from the source to the data sink.

```

13  "artifacts" : [ ],
14  "results" : [ {
15    "ruleId" : "sql-injection",
16    "level" : "error",
17    "message" : {
18      "text" : "sql-injection in User.fetch() reachable from LoginController.login()"
19    },
20    "locations" : [ {
21      "physicalLocation" : {
22        "artifactLocation" : {
23          "uri" : "file:///github/workspace/src/main/java/com/scalesec/vulnado/User.java"
24        },
25        "region" : {
26          "startLine" : 49,
27          "startColumn" : 1,
28          "snippet" : {
29            "text" : "public static User fetch(String un) {\n  ...\n  rs = stmt.executeQuery(query);    // Java line
30            49\n  ...\n}"
31          }
32        },
33        "contextRegion" : {
34          "snippet" : { }
35        }
36      } ],
37      "partialFingerprints" : {
38        "GITHUB_SOURCECODE_LSH/v1" :
39        "e86a7a0c38715f4a:1-158823731d54d12e:1-6b692237789f9a2a:1-64ed8e6526b79cf4:1-13db8c734146ff90:1"
40      },
41      "codeFlows" : [ {
42        "message" : {
43          "text" : "Untrusted data flow from LoginController.java:19 to User.java:49 via variable `query`"
44        },
45        "threadFlows" : [ {
46          "locations" : [ {
47            "location" : {
48              "physicalLocation" : {
49                "artifactLocation" : {
50                  "uri" : "com/scalesec/vulnado/LoginController.java"
51                },
52                "region" : {
53                  "startLine" : 19,
54                  "snippet" : {
55                    "rendered" : {
56                      "text" : "@CrossOrigin(origins={\"*\"})\n@RequestMapping(value=\"/login\"), method={\"POST\"},
57                        produces={\"application/json\"}, consumes={\"application/json\"})\nLoginResponse login(**@RequestBody
58                        LoginRequest input**) {\n  ...\n}"
59                    }
60                  },
61                  "properties" : {
62                    "ir" : [ "@CrossOrigin(origins={\"*\"})\n@RequestMapping(value=\"/login\"), method={\"POST\"},
63                        produces={\"application/json\"}, consumes={\"application/json\"})\nLoginResponse login(**@RequestBody
64                        LoginRequest input**) {\", \" ...\", \"}\" ]
65                  }
66                }
67              } ],
68              "contextRegion" : {
69                "snippet" : { }
70              }
71            }
72          }
73        }
74      ]
75    }
76  ]
77 }

```

- **Sink location**

This example shows the sink or problem location for the vulnerability.

```

"locations" : [ {
  "physicalLocation" : {
    "artifactLocation" : {
      "uri" : "file:///github/workspace/src/main/java/com/scalesec/vulnado/User.java"
    },
    "region" : {
      "startLine" : 49,
      "startColumn" : 1,
      "snippet" : {
        "text" : "public static User fetch(String un) {\n  ...\n  rs = stmt.executeQuery(query);    // Java line
        49\n  ...\n}"
      }
    },
    "contextRegion" : {
      "snippet" : { }
    }
  }
]
}

```

- **Thread flow steps**

This example shows some of the data for one execution step in the data flow:



```

44     "threadFlows" : [ {
45         "locations" : [ {
46             "location" : {
47                 "physicalLocation" : {
48                     "artifactLocation" : {
49                         "uri" : "com/scalesec/vulnado/LoginController.java"
50                     },
51                     "region" : {
52                         "startLine" : 19,
53                         "snippet" : {
54                             "rendered" : {
55                                 "text" : "@CrossOrigin(origins={\"*\"})\n@RequestMapping(value=\"/login\"), method={\"POST\"},
produces={\"application/json\"}, consumes={\"application/json\"})\nLoginResponse login(**@RequestBody
LoginRequest input**) {\n    ...\n}"
56                             }
57                         },
58                         "properties" : {
59                             "ir" : [ "@CrossOrigin(origins={\"*\"})\n@RequestMapping(value=\"/login\"), method={\"POST\"},
produces={\"application/json\"}, consumes={\"application/json\"})\nLoginResponse login(**@RequestBody
LoginRequest input**) {\", \"    ...\", \"}\" ]
60                         }
61                     },
62                 },
63                 "logicalLocations" : [ {
64                     "name" : "LoginController.login()",
65                     "fullyQualifiedName" : "com.scalesec.vulnado.LoginController.login(com.scalesec.vulnado.LoginRequest)"
66                 } ]
67             }, {
68                 "location" : {
69                     "physicalLocation" : {
70                         "artifactLocation" : {
71                             "uri" : "com/scalesec/vulnado/LoginController.java"
72                         },
73                         "region" : {
74                             "startLine" : 20,
75                             "snippet" : {
76                                 "rendered" : {
77                                     "text" : "@CrossOrigin(origins={\"*\"})\n@RequestMapping(value=\"/login\"), method={\"POST\"},
produces={\"application/json\"}, consumes={\"application/json\"})\nLoginResponse login(@RequestBody
LoginRequest input) {\n    ...\n    $stack0 = input.username;    // Java line 20\n    user = User.fetch
($stack0);    // Java line 20\n    ...\n}"
78                                 }
79                             },
80                             "properties" : {
81                                 "ir" : [ "$stack0 = input.<com.scalesec.vulnado.LoginRequest:java.lang.String username>;    // Java
line 20\", \"user = staticinvoke <com.scalesec.vulnado.User: com.scalesec.vulnado.User fetch(java.lang.
String)>($stack0);    // Java line 20\" ]
82                             }
83                         }
84                     },
85                     "logicalLocations" : [ {
86                         "name" : "LoginController.login()",
87                         "fullyQualifiedName" : "com.scalesec.vulnado.LoginController.login(com.scalesec.vulnado.LoginRequest)"
88                     } ],
89                     "message" : {
90                         "text" : "un"
91                     }
92                 },
93             },
94             "state" : {
95                 "un" : {
96                     "text" : "tainted",
97                     "properties" : {
98                         "taintTags" : [ "untrusted", "cross-site" ]
99                     }
100                 }
101             }
102         } ]
103     } ]

```

- **Physical and logical locations of the vulnerability**

This examples shows data for physical and logical locations of a vulnerability:

The data for execution steps in this section includes a code snippet and rendered data from intermediate representation (IR) data (user code is not usually displayed). Contrast uses this data to analyze what the scan sees.

1. This example shows the execution statement from IR.
2. This example shows the general area where an execution step occurs in the application.

```

44     "threadFlows" : [ {
45         "locations" : [ {
46             "location" : {
47                 "physicalLocation" : {
48                     "artifactLocation" : {
49                         "uri" : "com/scalesec/vulnado/LoginController.java"
50                     },
51                     "region" : {
52                         "startLine" : 19,
53                         "snippet" : {
54                             "rendered" : {
55                                 "text" : "@CrossOrigin(origins={\"*\"})\n@RequestMapping(value={\"/login\"},
56                                     method={\"POST\"}, produces={\"application/json\"}, consumes={\"application/
57                                     json\"})\nLoginResponse login(**@RequestBody LoginRequest input**) {\n ...\"}
58                             }
59                         },
60                     },
61                     "properties" : {
62                         "ir" : [ "@CrossOrigin(origins={\"*\"})\n@RequestMapping(value={\"/login\"},
63                             method={\"POST\"}, produces={\"application/json\"}, consumes={\"application/json\"}
64                             )\nLoginResponse login(**@RequestBody LoginRequest input**) {\", \" ...\", \"}\" ]
65                     }
66                 }
67             }
68         }
69     ]
70 }

```

• **Untrusted data location**

These examples shows scan results for untrusted data.

Scan looks at executions steps from code source to data sink. The scan results include any execution step that touches untrusted data.

If the importance result is essential, check this area of the code for vulnerabilities.

1. This example shows the location of tainted data that the scan is tracking.
2. This example shows the location of the tracked data that the execution step touches. The scan results indicate the importance is essential. This code needs to be checked for vulnerabilities.

```

"location" : {
  "physicalLocation" : {
    "artifactLocation" : {
      "uri" : "com/scalesec/vulnado/User.java"
    },
    "region" : {
      "startLine" : 47,
      "snippet" : {
        "rendered" : {
          "text" : "public static User fetch(String un) {\n ... \n $stack0 = new\nStringBuilder(); // Java line 47\n $stack1 = \"select * from users where\nusername = '\""; // Java line 47\n $stack0 = $stack0.append($stack1); //\nJava line 47\n $stack0 = $stack0.append(un); // Java line 47\n $stack1 =\n\"' limit 1\"; // Java line 47\n $stack0 = $stack0.append($stack1); //\nJava line 47\n query = $stack0.toString(); // Java line 47\n ... \n}"
        }
      }
    },
    "message" : {
      "text" : "Propagation event of untrusted data occurred at 'User.java:47' in the\nmethod 'User.fetch()' to variable 'query'"
    },
    "properties" : {
      "ir" : [ "$stack0 = new java.lang.StringBuilder; // Java line 47", "$stack1 =\n\"select * from users where username = '\""; // Java line 47", "$stack0 =\nvirtualinvoke $stack0.<java.lang.StringBuilder: java.lang.StringBuilder append\n(java.lang.String)>($stack1); // Java line 47", "$stack0 = virtualinvoke\n$stack0.<java.lang.StringBuilder: java.lang.StringBuilder append(java.lang.String)>\n(un); // Java line 47", "$stack1 = '\"' limit 1\"; // Java line 47", "$stack0\n= virtualinvoke $stack0.<java.lang.StringBuilder: java.lang.StringBuilder append\n(java.lang.String)>($stack1); // Java line 47", "query = virtualinvoke $stack0.\n<java.lang.StringBuilder: java.lang.String toString>(); // Java line 47" ]
    }
  },
  "logicalLocations" : [ {
    "name" : "User.fetch()",
    "fullyQualifiedName" : "com.scalesec.vulnado.User.fetch(java.lang.String)"
  } ],
  "message" : {
    "text" : "query"
  }
},
"state" : {
  "query" : {
    "text" : "tainted",
    "properties" : {
      "taintTags" : [ "untrusted", "cross-site" ]
    }
  }
},
"importance" : "essential"

```

## Scan analysis

The examples in this section show how to identify content in the SARIF file that can help you analyze scan results.

- **Classes that scan uses to trace data**

These classes affect scan execution time.

```
2344 "scannedData" : {  
2345   "scannedBodyClasses" : [ "com.scalesec.vulnado.ServerError",  
2346     "com.scalesec.vulnado.LoginResponse",  
2347     "org.springframework.lang.UsesSunMisc",  
2348     "com.scalesec.vulnado.Postgres",  
2349     "com.scalesec.vulnado.LinksController",  
2350     "com.scalesec.vulnado.BadRequest",  
2351     "com.scalesec.vulnado.Unauthorized",  
2352     "com.scalesec.vulnado.Comment",  
2353     "org.springframework.lang.NonNullFields",  
2354     "org.springframework.lang.NonNull",  
2355     "org.springframework.lang.UsesJava7",  
2356     "org.springframework.lang.UsesJava8",  
2357     "com.scalesec.vulnado.CowController",  
2358     "com.scalesec.vulnado.LoginController",  
2359     "org.springframework.lang.NonNullApi",  
2360     "org.springframework.lang.Nullable",  
2361     "org.springframework.lang.UsesSunHttpServer",  
2362     "com.scalesec.vulnado.CommentsController",  
2363     "com.scalesec.vulnado.Cowsay",  
2364     "com.scalesec.vulnado.VulnadoApplication",  
2365     "com.scalesec.vulnado.LoginRequest",  
2366     "com.scalesec.vulnado.LinkLister",  
2367     "com.scalesec.vulnado.User",  
2368     "java.util.Optional",  
2369     "com.scalesec.vulnado.CommentRequest" ],
```

- **Classes used for type hierarchy resolution**

Scan uses these classes only for type hierarchy resolution.

The library classes are either not relevant to security issues or Contrast has a specific policy for the relevant API.

If a class displayed in this section is related to custom code, it is possible that the scan results contain false negatives.

|      |  |  |  |  |   |
|------|--|--|--|--|---|
| 2134 |  |  |  |  | "nonScannedBodyClasses" : [                                 |
| 2135 |  |  |  |  | "java.nio.file.WatchEvent\$Modifier",                       |
| 2136 |  |  |  |  | "java.awt.Color", "java.awt.peer.WindowPeer",               |
| 2137 |  |  |  |  | "java.util.function.IntUnaryOperator",                      |
| 2138 |  |  |  |  | "sun.awt.datatransfer.DataTransferer",                      |
| 2139 |  |  |  |  | "java.awt.JobAttributes\$MultipleDocumentHandlingType",     |
| 2140 |  |  |  |  | "java.lang.Integer",  |
| 2141 |  |  |  |  | "java.awt.image.SampleModel",                               |
| 2142 |  |  |  |  | "javax.swing.border.Border",                                |
| 2143 |  |  |  |  | "java.awt.peer.ScrollbarPeer",                              |
| 2144 |  |  |  |  | "java.util.Vector",   |
| 2145 |  |  |  |  | "java.sql.DriverAction",                                    |
| 2146 |  |  |  |  | "java.sql.SQLType",   |
| 2147 |  |  |  |  | "org.springframework.core.ParameterizedTypeReference\$1",   |
| 2148 |  |  |  |  | "java.nio.file.Path",                                       |
| 2149 |  |  |  |  | "java.nio.channels.Channel",                                |
| 2150 |  |  |  |  | "org.springframework.core.io.Resource",                     |
| 2151 |  |  |  |  | "java.awt.peer.ContainerPeer",                              |
| 2152 |  |  |  |  | "javax.swing.KeyStroke",                                    |
| 2153 |  |  |  |  | "java.lang.CharSequence",                                   |
| 2154 |  |  |  |  | "java.awt.dnd.DropTargetDragEvent",                         |
| 2155 |  |  |  |  | "java.time.temporal.TemporalField",                         |
| 2156 |  |  |  |  | "org.springframework.beans.factory.InjectionPoint",         |
| 2157 |  |  |  |  | "java.util.logging.ErrorManager",                           |
| 2158 |  |  |  |  | "java.awt.Scrollbar",                                       |
| 2159 |  |  |  |  | "java.io.Serializable",                                     |
| 2160 |  |  |  |  | "java.util.concurrent.CompletionStage",                     |
| 2161 |  |  |  |  | "java.lang.LayerInstantiationException",                    |
| 2162 |  |  |  |  | "org.jsoup.parser.Token\$EndTag",                           |
| 2163 |  |  |  |  | "java.lang.invoke.BoundMethodHandle\$Specializer\$Factory", |
| 2164 |  |  |  |  | "java.lang.invoke.MemberName",                              |
| 2165 |  |  |  |  | "java.util.function.ToDoubleFunction",                      |
| 2166 |  |  |  |  | "java.io.ObjectInputStream\$GetField",                      |

- **Phantom classes**

Phantom classes are referenced classes but either Scan is unable to find bytecode for them or Scan was unable to decompile the code into IR.

Ideally, the scan results should contain no phantom classes. If the results include phantom classes, Scan was unable to find the data it needed to provide more accurate results. If you see application code or libraries displayed in this section, look at your code to determine if an issue exists.

|      |  |  |  |  |   |
|------|--|--|--|--|---|
| 2400 |  |  |  |  | "phantomClasses" : [ "BOOT-INF.classes.com.scalesec.vulnado.LoginController", |
| 2401 |  |  |  |  | "javax.annotation.Nonnull",   |
| 2402 |  |  |  |  | "groovy.lang.Closure",  |
| 2403 |  |  |  |  | "javax.annotation.meta.TypeQualifierDefault",                                 |

- **Discovered routes for untrusted data**

This example shows discovered routes where untrusted data enter the application.

Scan only looks at the data flow behavior from the functions displayed in this section. Scan does not analyze other functions related to data flow, such as weak cryptography.

```

2769     "routesDiscovered" : [ {
2770         "routeSignature" : "com.scalesec.vulnado.LoginController.login(com.scalesec.vulnado.
LoginRequest)"
2771     }, {
2772         "routeSignature" : "com.scalesec.vulnado.CowController.cowsay(java.lang.String)"
2773     }, {
2774         "routeSignature" : "com.scalesec.vulnado.CowController.cowsay2(java.lang.String)"
2775     }, {
2776         "routeSignature" : "com.scalesec.vulnado.LinksController.links(java.lang.String)"
2777     }, {
2778         "routeSignature" : "com.scalesec.vulnado.LinksController.linksV2(java.lang.String)"
2779     }, {
2780         "routeSignature" : "com.scalesec.vulnado.CommentsController.comments(java.lang.String)"
2781     }, {
2782         "routeSignature" : "com.scalesec.vulnado.CommentsController.createComment(java.lang.String,com.
scalesec.vulnado.CommentRequest)"
2783     }, {
2784         "routeSignature" : "com.scalesec.vulnado.CommentsController.deleteComment(java.lang.String,
java.lang.String)"
2785     } ]
2786 },
2787 "invocations" : [ {
2788     "commandLine" : "java -XX:MaxRAMPercentage=80 -jar /app/contrast-scan-java-cli.jar
--prescan-metadata /tmp/
cb9757b4-4fdf-4de9-bdf1-7769058307eb_e1a6403d-be7c-46ee-82aa-6b7e47ce97d2_metadata.json -o /tmp/
results.sarif.json /tmp/
cb9757b4-4fdf-4de9-bdf1-7769058307eb_e1a6403d-be7c-46ee-82aa-6b7e47ce97d2_vulnado-0.0.1-SNAPSHOT.
jar",
2789     "toolExecutionNotifications" : [ ],
2790     "executionSuccessful" : true

```

## View scan policies

Policies determine which vulnerabilities Contrast looks for in your code. At this time, editing or adding policies is not supported.



### NOTE

The policy view applies to Java binary scanning only.

1. Select **Scans** in the header.
2. Select a scan project.
3. Select **Policy**.  
The policy list displays the Java binary scan policies.
4. In the Policy tab, search for a specific policy by entering one or more characters in the Find box.

## Change scan settings

Scan settings let you change the name of a scan project and update metadata.

You can also:

- [Archive scan projects \(page 1187\)](#)
- [Delete scan projects \(page 707\)](#)
- [Configure dynamic scoring \(page 704\)](#)

## Before you begin

- If role-based access is turned on, you need a role with the View, edit, delete project action to update all settings except dynamic scoring.

For the dynamic scoring option, you need a role with the Manage organization action.

- If you are using organization users and groups, you need an Organization Admin role.

## Steps

1. Select **Scans** in the header.
2. Select a Scan project.
3. Select the **Settings** icon (⚙️) at the top of the list.
4. Enter a new name for the project.
5. Update metadata values for the scan project.  
If metadata values are configured, you can change the displayed values. If no metadata values are configured, you must [create them \(page 703\)](#) in the Scan projects settings for the organization.
6. Select **Save**.

## Archive scan projects

If you want to exclude one or more scan projects from the list of scan projects (for example, you are no longer using a project), you can archive them.

Contrast keeps the data associated with the archived project.

### Archive a single scan project

1. Select **Scans** in the header.
2. Select a scan project.
3. Select the settings icon (⚙️).
4. In the Scan project settings window, select **Archive**.



5. In the Archive project window, select **Archive**.  
The archived project is no longer visible in the list unless you use the Archived filter.

### Archive multiple scan projects

1. Select **Scans** in the header.
2. Select the checkbox next to all the scan projects you want to archive.
3. In the batch action menu at the bottom of the page, select the Archive (📁) icon.
4. In the Archive project window, select **Archive**.  
The archived projects are no longer visible in the list unless you use the Archived filter.

### Unarchive scan projects

To use or view details for an archived scan project, unarchive it.

## Before you begin

- An Organization Admin role is required.

## Steps

1. Select **Scans** in the header.
2. Display archived projects by selecting the small triangle ( ▾ ) at the top of the list and then, selecting **Archived**.
3. To unarchive one or more scan projects.
  - a. To unarchive a single scan project, hover over the end of a project row and select the **Unarchive** icon ( 🔄 ).
  - b. To unarchive multiple scan projects, select the checkbox next to the projects you want to scan. In the batch action menu at the bottom of the page, select the **Unarchive** icon ( 🔄 ).
4. In the Unarchive project window, select **Unarchive**.

## Integrate scans with build pipelines

The [Contrast CLI \(page 1286\)](#) has commands that let you run a scan without using the Contrast web interface.

This topic provides instructions for using the Contrast CLI to integrate scans into any build pipeline.

You can also use the [Contrast Maven plugin \(page 1384\)](#) to integrate Contrast Scan into your project's Maven build,

## Before you begin

- In the Contrast web interface, under **user menu > User settings > Profile**, locate and copy this information:
  - API key
  - Organization ID
  - Contrast URL
  - Authorization header
- Ensure that a WAR or JAR file is available in an accessible location.

## Steps

1. In your build pipeline workflow, add the command to download the latest version of the Contrast CLI .

```
npm install --location=global @contrast/contrast@2
```

2. Set environment variables for the API key, the organization ID, the Contrast URL, and the Authorization header.

This example shows how to set the environment variables with GitHub secrets. Use the appropriate method for your environment.

```
CT_API_KEY: ${ secrets.CONTRAST__API__API_KEY }
CT_AUTH_TOKEN: ${ secrets.CONTRAST__API__AUTH_TOKEN }
ORG_ID: ${ secrets.CONTRAST__API__ORGANIZATION_ID }
URL: ${ secrets.CONTRAST__API__URL }
```

3. Add a command similar to the following to start each scan:

```
contrast --scan ../scan-cli-testing/java/apps/param.war \
--api_key $CT_API_KEY \
--authorization $CT_AUTH_TOKEN \
```



```
--organization_id $ORG_ID \  
--host $URL \  
--project_name MY-Project \  
--language JAVA --wait_for_scan
```

When this command runs for the first time, Scan creates a project using the name specified in the `--project_name` option.

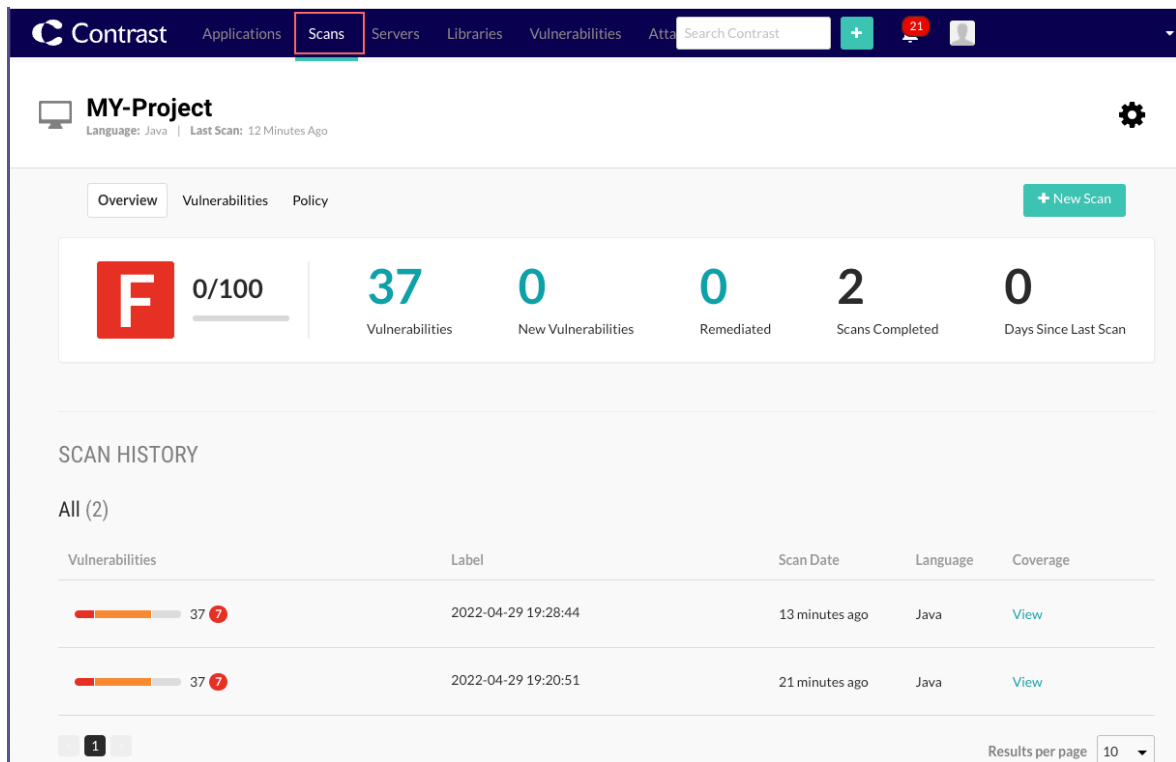
The output from the command looks similar to this example:

```
project created ID is 788f9734-b933-4f05-b391-c130931baf88  
Uploaded file successfully.  
Response: {  
  id: '5091d134-93ea-4873-8110-8cf99d14606e',  
  organizationId: '74f4cd04-6ca9-4eb7-a7a7-78909c2101cc',  
  projectId: '788f9734-b933-4f05-b391-c130931baf88',  
  filename: 'param.war',  
  createTime: '2022-04-04T10:06:16.952+00:00'  
}  
Timeout set to 5 minutes  
Waiting for results...  
New Results: 5  
Fixed Results: 0  
Total Results: 5
```

The next time you run the command for the same project, Scan adds the uploaded files to the original project. The output from the command looks similar to this example:

```
project already exists with this name. Getting ID...  
project ID is 788f9734-b933-4f05-b391-c130931baf88  
Uploaded file successfully.  
Response: {  
  id: '94b4e065-0e0f-46bb-b1d8-9f85bd03c602',  
  organizationId: '74f4cd04-6ca9-4eb7-a7a7-78909c2101cc',  
  projectId: '788f9734-b933-4f05-b391-c130931baf88',  
  filename: 'param.war',  
  createTime: '2022-04-04T10:07:01.230+00:00'  
}  
Timeout set to 5 minutes  
Waiting for results...  
New Results: 5  
Fixed Results: 0  
Total Results: 5
```

4. After the scan completes, go to the Contrast web interface to view the Scan project details and results.



## Examples

- [Scan integration with GitHub \(page 1190\)](#)
- [Scan integration with Jenkins \(page 1190\)](#)
- [Scan integration with GitLab \(page 1191\)](#)

### Example: Scan integration with GitHub

Review the [Scan integration steps \(page 1188\)](#) before you integrate Contrast Scan with GitHub.

This example shows how to set up a GitHub workflow.

```
- name: Set up contrast-cli
  run: |
    npm install --location=global @contrast/contrast@2.0.0
- name: Scan file
  env:
    CT_API_KEY: ${ secrets.CONTRAST_API_API_KEY }
    CT_AUTH_TOKEN: ${ secrets.CONTRAST_API_AUTH_TOKEN }
    ORG_ID: ${ secrets.CONTRAST_API_ORGANIZATION_ID }
    URL: ${ secrets.CONTRAST_API_URL }
  run: |
    contrast-cli --scan ./target/${ inputs.SERVICE_NAME }-${ steps.build-
service.outputs.version }}.jar \
      --api_key $CT_API_KEY \
      --authorization $CT_AUTH_TOKEN \
      --organization_id $ORG_ID \
      --host $URL \
      --project_name MY-Project \
      --language JAVA --wait_for_scan
```

### Example: Scan integration with Jenkins

Review the [Scan integration steps \(page 1188\)](#) before you integrate Scan with Jenkins.

Contrast Security can share this script to integrate scans with a Jenkins pipeline ([contact Contrast Support](#) to access these scripts):

- **Jenkins Pipelines script:** The `Jenkins_Script_SCAN` script uses the Contrast Scan local engine JAR file. The project JAR file is expected to be in a GitHub repository.

## Integration setup

This example describes how to set up a Jenkins integration for Scan.

1. Set up a Jenkins instance in your local environment (use the [Jenkins documentation](#)). If you already have a Jenkins instance, you can skip this step.
2. Install this software (if not already installed):
  - Java 11
  - Plugins for your environment (if needed)
3. Create a new pipeline and copy the Contrast script.
4. Set the Contrast credentials as global or environment variables:  
For example: `URL`, `USER_NAME`, `API_KEY`, `SERVER_KEY`, `ORGANIZATION`.
  - To add credential to Jenkins, select **Manage Jenkins > Manage Credentials > Add Credentials as Secret Text**.
5. Refer to all credentials and variables in your pipeline scripts.

## Example: Scan integration with GitLab

Review the [Scan integration steps \(page 1188\)](#) before you integrate Scan with GitLab.

This example shows how to set up a GitLab pipeline for these actions:

- Pulling code from a repository.  
This action might not be necessary if you're using GitLab as a code repository.
- Building the code
- Scanning a generated JAR file.

## Pipeline setup example

This sample YAML file shows the steps to set up the GitLab pipeline.

```
stages:                # List of stages for jobs, and their order of execution
  - pull
  - build
  - scan
#  - deploy

pull:
  stage: pull
  artifacts:
    paths:
      - WebGoat
  script:
    - git clone -b main https://github.com/WebGoat/WebGoat.git

build:
  stage: build
  image: maven:3.8.1-openjdk-17-slim
  artifacts:
    paths:
      - $CI_PROJECT_DIR
```

```
dependencies:
  - pull
script:
  - ls -l /tmp
  - cd WebGoat
  - mvn -DskipTests clean install

scan:          # This is the step for Contrast Scan
  stage: scan
  image: node:18.19-slim
  dependencies:
    - build
  script:
    - ls -la
    - npm install -g @contrast/contrast@2
    - contrast version
    - contrast auth --api-key $API_KEY --authorization $AUTH --organization-id $ORG_ID --host $URL
    - contrast scan -f $CI_PROJECT_DIR/WebGoat/target/webgoat-2023.7.jar --fail --severity high

deploy: #TODO
```

## Servers

In Contrast, you can see servers and configure how they function in development, test (QA), and production environments. You are then able to compare the differences across environments as code travels. Contrast sets up a shell for you to designate servers. Once that's in place, Contrast can begin to find weaknesses.

### Server settings

Each server entry in Contrast represents a Contrast agent that you installed for an application. Contrast creates a new, unique server entry when you configure these settings for each agent:

To define custom settings for servers, use these entries in the Contrast configuration file:

- **Server name:** The default value is the host name.
- **Server path:** The path from which the agent process is running.
- **Server type:** The type of server hosting your application.

Using custom values for these settings instead of default ones is useful if you want to avoid duplicate server entries.

Configure the server environment with this setting:

- **Server environment:** The environment in which you want to use this server.  
The valid values are `DEVELOPMENT`, `QA`, and `PRODUCTION`. These values are case-insensitive. The default value is `DEVELOPMENT`.

Contrast agents automatically recognize all supported server types. If the server type is not automatically recognized, it may be due to the agent running with an unsupported technology. Please review the *Supported Technologies* section for the respective [agent \(page 50\)](#). Running in unsupported environments may affect the functionality of some features like route discovery.

### Settings in a configuration file

These are the server settings that you customize in a configuration file.

```
# server
# Use the settings in this section to set
# metadata for the server hosting this agent.

server:

  # Override the reported server name.
  name: localhost

  # Override the reported server path.
  path: NEEDS_TO_BE_SET

  # Override the reported server type.
  type: NEEDS_TO_BE_SET

  # Override the reported server environment.
  # environment: DEVELOPMENT
```

## Agent configuration instructions

When you define custom settings for servers, use the configuration instructions for the agent you are using:

- [.NET Core configuration \(page 297\)](#)
- [.NET Framework configuration \(page 230\)](#)
- [Go configuration \(page 570\)](#)
- [Java configuration \(page 151\)](#)
- [Node.js configuration \(page 357\)](#)
- [Python configuration \(page 450\)](#)
- [Ruby configuration \(page 511\)](#)

## Contrast options

The Contrast web interface provides additional options for server configuration:

- [Configure a server \(page 1197\)](#)
- [Output data to syslog \(page 1201\)](#)

## View servers

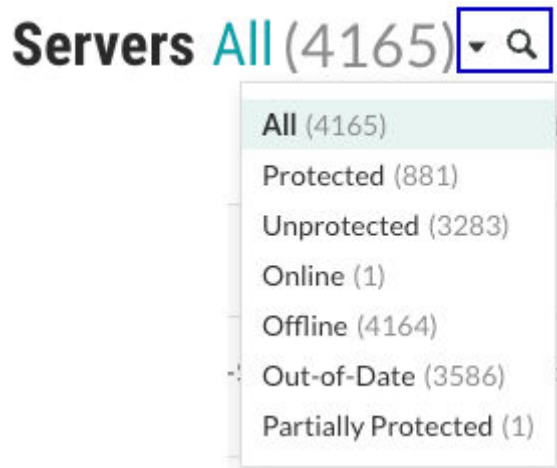
The Servers list shows details about the servers in your organization:

- **Name:** The name of the server.
- **First Seen:** The first time the agents for the applications associated with the server reported activity to Contrast.
- **Last Seen:** The last time the agents for the applications associated with the server reported activity to Contrast.
- **Environment:** The environment where the server is deployed: Development, QA, or Production.
- **Applications:** The applications associated with the server.

The Servers list also lets you manage Assess and Protect settings for individual servers.

## Steps

1. Select **Servers** in the header to view a list of all servers in your organization.
2. To filter the list by server status, select the small triangle ( ▾ ) at the top of the list.  
Alternatively, search for specific servers by name by selecting the magnifying glass icon ( 🔍 ).

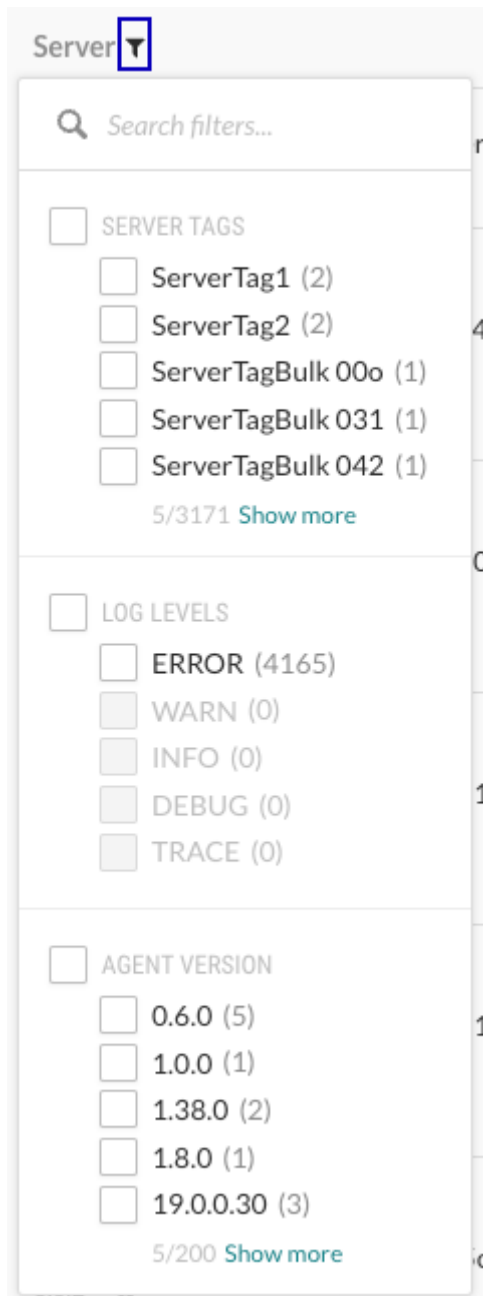


The filters are:

- **All:** Shows all servers in the organization.
- **Protected:** Servers with Protect turned on.
- **Unprotected:** Servers with Protect turned off.
- **Online:** Servers that Contrast can reach.
- **Offline:** Servers that Contrast is unable to reach.
- **Out-of-Date:** The agent version for applications associated with the server is old. Consider updating the agent to a newer version.
- **Partially protected:** Servers with Protect turned on but require a restart.

If you change the agent configuration for an application associated with the server, you might need to restart it for Protect to take effect.

3. To filter the list of servers, select the filter icon (▼) next to the Server column header.



The filters are:

- **Server tags:** Tags you assigned for each server.  
To assign a tag to a server, hover over the end of a row for a server and select the Tag (🔖) icon.
- **Log levels:** [Log levels \(page 1559\)](#) assigned to each server.
- **Agent version:** The version of the agents that the applications associated with the server are using.

- To filter by environment, select the filter icon (▼) next to the Environment column header.  
The filters are: Development, QA, and Production.
- Use the settings in the [Assess \(page 1435\)](#) and [Protect \(page 1437\)](#) columns to turn them on or off.
  - If you use only the Contrast web interface to turn Assess or Protect on or off, the setting for a specific server is green if ON and gray if OFF. You can change this setting in the Contrast web interface.



- If you used a method external to the Contrast web interface to configure the setting for Assess or Protect (for example, an agent configuration file), the setting is green but disabled if ON and grey but disabled if OFF. You cannot change this setting in the Contrast web interface.



- If the setting in the Contrast web interface is disabled, hover over the setting to see where it is configured. The [order of precedence \(page 111\)](#) determines which setting Contrast uses as the effective configuration.

6. To view [details about a specific server \(page 1196\)](#), select the server name.

## Server details

When you select a server from the Servers list and view the Overview tab, you see details about the server configuration and activity for applications associated with the server.

You can also manage the settings for Protect and Assess.

## Summary

The Summary at the top of the Overview tab shows these values:

### Assess and Protect settings

You can use configuration files, variables, or the Contrast web interface to configure the Protect and Assess settings. The method you use to configure these settings determines whether you can change them in the Contrast web interface.

- If you used only the Contrast web interface to turn Protect or Assess on or off, the setting is green if ON and gray if OFF. You can change this setting in the Contrast web interface.



- If you used a method external to the Contrast web interface to configure the setting for Protect or Assess (for example, an agent configuration file), the setting is green but disabled if ON and grey but disabled if OFF. You cannot change this setting in the Contrast web interface.



If the setting in the Contrast web interface is disabled, hover over it to see where the setting is configured. The [order of precedence \(page 111\)](#) determines which setting Contrast uses as the effective configuration.

- **Agent version:** The version of the agent associated with this server.
- **Libraries:** The number of open-source libraries that Contrast identifies for the applications associated with the selected server. It also displays the number of vulnerable libraries.  
Select the displayed number to view the libraries list.
- **Time since last startup:** The amount of time since the server last started.
- **Since last seen:** Time since the agent associated with this server reported activity to Contrast.

## Statistics

The statistics section shows these values:



- **Vulnerabilities:** If Assess is turned on, the number of vulnerabilities it identified for the applications associated with this server.  
Use the filter to change the view. Hover over the vulnerability bar to see additional details.
- **Attacks:** If Protect is turned on, the number of attacks identified in the applications for this server.  
Use the filter to change the view. Hover over the attacks bar to see additional details.
- **Application:** The applications associated with this server.  
Select an application link to see application details.

## Activity

The activity graph shows an aggregate of agent reports that Contrast received during the selected time frame.

## Configure server settings

Server settings let you configure how a server functions in each environment (development, test, and production).

## Servers and Assess analysis fine tuning

New servers automatically pick a tuning profile based on their configured server environment. For servers that existed before May 20, 2025, Contrast assigns the Development profile for Dev and QA environments, and the Production profile for Production environments, unless you enabled custom sampling. In that case, Contrast assigns your Custom profile with its specified values.

For servers configured for a Production environment and have Assess enabled, Contrast always obfuscates the captured sample user input values to avoid capturing any sensitive data.

## Steps

1. Select **Servers** in the header.
2. Find the server you want to modify using either of these methods:
  - Select the Filter icon (▼) at the top of the Server column.
  - Use the magnifying glass (🔍) to search.
3. Go to Server settings using either of these methods:
  - Hover over the end of the server's row and select the **Settings** icon (⚙️).
  - Select the name of the server and then, select the **Settings** icon (⚙️) at the top of the list.
4. Modify the settings, as needed:
  - Modify the server name.
  - Designate the environment in which the server will be running: Development, QA (test), or Production.
  - In the Server log file, override the existing server log file path by entering the preferred path.



### NOTE

Server log files are restricted to file types of LOG or TXT only.

- Set the [log level \(page 1559\)](#) for the server.
  - Set bot blocking.  
Bot blocking blocks traffic from scrapers, attack tools, and other unwanted automation.  
To view blocked bot activity, under **Attacks > Attack Events**, use the **Automated** filter options.
- Supported languages:** Java, .NET Framework, .NET Core, Ruby, and Python.

**NOTE**

You can configure bot blocking in the [YAML files \(page 112\)](#) for Java, .NET Framework, .NET Core, Ruby, and Python.

- Select **Enable output of Protect events to syslog. (page 1201)**

This setting is available when Protect is enabled.

Select the syslog message severity levels that the server outputs to syslog. Contrast offers syslog message categories according to the [syslog RFC 3164](#) specification for severity.

- **Fine-tune Assess analysis (page 1198)**

These settings only apply for a supported agent and servers with Assess enabled.

**NOTE**

Currently the Contrast PHP agent doesn't support this feature. The Contrast Go agent has partial support.

Use these settings to select an application sampling level that balances the sampling rate with application performance impact, based on the server environment.

- **Fine-tuned for Development:** The agent analyzes all URL observations. It is best for environments where code is changing frequently. This option has the most significant effect on application performance.
- **Fine-tuned for QA:** The agent analyzes most URL observations. It is best for environments that have short-lived or changing code. This option has a less significant effect on application performance than the Development option.
- **Fine-tuned for Production:** The agent analyzes fewer URL observations than the other options. It is best for environments that have stable code. This option has the least significant effect on application performance.
- **Custom:** Use this option to set custom values for analysis:
  - **Stack traces:** You can chose to have the agent capture **All** stack traces, **Some** stack traces, or **None**.  
The **Some** option captures stack traces for vulnerability source and sink events, but not propagation events in between. This data is typically enough details so that a developer can make a fix. If full details are needed, the associated route can be exercised in a lower environment.  
The exact behavior level of detail captured may also vary by agent language and version.
  - **Baseline:** The number of times that Contrast analyzes URLs to complete sampling. The default setting is **5**.
  - **Frequency:** The number of times that Contrast analyzes URLs after the baseline is achieved. The default setting is **10**.
  - **Window:** The number of seconds that Contrast retains samples before reverting to the baseline. The default setting is **180**.

## Assess analysis fine-tuning

Production servers with Contrast Assess enabled should always use the Production tuning or a Custom tuning profile that Contrast provides. For lower environments, if you notice performance issues after you instrument your application with a Contrast agent, consider fine-tuning the way Contrast does strategic analysis of your code. The Assess analysis fine-tuning settings are part of your [server configuration \(page 1197\)](#).

Contrast provides options that instruct the agent to only perform analysis on a rate-limited subset of requests. The agent intelligently prioritizes capturing requests to routes it has not seen before since

startup. If an application is responding to the same request often, the agent doesn't need to analyze it multiple times, but it will periodically re-instrument routes to capture any variations in the data flows.

Contrast includes pre-build performance tuning profiles that will evolve over time to make sure that most production applications have a healthy balance between the time it takes to get full coverage of an application and the amount of overhead introduced by this instrumentation.

## How analysis fine-tuning works

1. If the Contrast agent sees the same URL being called multiple times, it analyzes the URL based on the the number of times specified in a baseline setting.
2. Afterwards, if the Contrast agent continues to see the same URL, it only checks the URL based on an analyzation frequency setting.
3. Contrast retains samples for the number of seconds specified for a retention window setting. After the time specified for the retention window setting elapses, Contrast analyzes the URL again, according to the baseline setting.

The fine-tuning options that Contrast provides are designed to balance application performance with analysis frequency and depth. These pre-configured settings are based on the environment and whether the code is likely to be changing frequently:

- Frequently changing code in development or QA environments benefits from more frequent and complete analysis in a shorter retention window. This setting ensures that you find vulnerabilities as code evolves. In these environments, the frequency and depth of analysis takes precedence over application performance.
- Stable code in production environments benefits from less frequent and complete analysis in a longer retention window. This setting ensures that you still find vulnerabilities but without a significant effect on application performance. In these environments, application performance takes precedence over the depth and frequency of analysis.

## Use automatic diagnostic collection

Automatic diagnostic collection lets Contrast collect diagnostic information without requiring you to find or upload this information manually. Automatic collection makes it easier for you to work with Contrast support when you are troubleshooting technical issues.



### NOTE

Currently, this feature is in preview mode. Contrast Support contacts you if they need this feature enabled during troubleshooting activity.

When you turn on this feature, Contrast collects logs, system data, and other diagnostic information from Contrast agents and sends them to Contrast servers. Contrast support representatives access this information during troubleshooting tasks.

## Before you begin

- Currently, only Java agents support automatic diagnostic collection.
- The time span for diagnostic collection is one to 25 hours, based on the value you specify.

## Steps

1. Select **Servers** in the header.
2. Hover over the end of the row of a server and select the diagnostic (🔧) icon.
3. In Diagnostic collection, select the log level for the logs you want Contrast support to access:
  - **Trace logs:** Includes the trace messages generated during one or more sessions.
  - **Debug logs:** Includes information that helps to identify bugs or other issues.

### Diagnostic Collection

Turning on Diagnostic Collection automatically sends diagnostic data from Contrast agents to Contrast Support staff and servers. It removes the need for you to gather logs, memory dumps, or other information manually. Read the disclaimer before you turn on Diagnostic Collection.

Send 

Select Log Level \*  
DEBUG

 logs for next 

Enter Hours  
2

 hours.

⚠️ **Disclaimer**

By opting-in to the diagnostic collection, you agree to allow Contrast Security access to your diagnostic information. This includes, but is not limited to: logs, data dumps, memory dumps, configuration information, and other sources of sensitive Personal Identifiable Information (PII) or secrets. Turning on diagnostic collection instructs Contrast to send diagnostic information for the specified amount of hours. This feature might not work for on-premise customers.

Cancel Enable Diagnostic Collection

4. Specify the collection time span, from one to 25 hours. Contrast support can advise you regarding the amount of time required for troubleshooting tasks.
5. Select **Enable diagnostic collection**.

The color of the diagnostic icon changes to green (🟢) when you hover over the end of the server row.
6. Select the diagnostic icon (🔧) and copy the displayed key in Diagnostic Collection.. Give this key to your Customer support representative.

### Diagnostic Collection

Turning on Diagnostic Collection automatically sends diagnostic data from Contrast agents to Contrast Support staff and servers. It removes the need for you to gather logs, memory dumps, or other information manually. Read the disclaimer before you turn on Diagnostic Collection.

| Log Level | Collection Start          | Collection End            |
|-----------|---------------------------|---------------------------|
| DEBUG     | Invalid Date Invalid Date | Invalid Date Invalid Date |

Don't want diagnostics? ⛔ Stop Data Collection

**Key:** fab3cd29-59d5-4b1c-8086-989a27b60ba2

⚠️ **Disclaimer**

By opting-in to the diagnostic collection, you agree to allow Contrast Security access to your diagnostic information. This includes, but is not limited to: logs, data dumps, memory dumps, configuration information, and other sources of sensitive Personal Identifiable Information (PII) or secrets.. Turning on diagnostic collection instructs Contrast to send diagnostic information for the specified amount of hours. This feature might not work for on-premise customers.

Cancel

7. To turn off diagnostic collection, repeat steps 1 and 2. Then, select **Stop diagnostic collection**..

### Diagnostic Collection

Turning on Diagnostic Collection automatically sends diagnostic data from Contrast agents to Contrast Support staff and servers. It removes the need for you to gather logs, memory dumps, or other information manually. Read the disclaimer before you turn on Diagnostic Collection.

| Log Level | Collection Start          | Collection End            |
|-----------|---------------------------|---------------------------|
| DEBUG     | Invalid Date Invalid Date | Invalid Date Invalid Date |

Don't want diagnostics? Stop Data Collection

Key: fab3cd29-59d5-4b1c-8086-989a27b60ba2

**Disclaimer**

By opting-in to the diagnostic collection, you agree to allow Contrast Security access to your diagnostic information. This includes, but is not limited to: logs, data dumps, memory dumps, configuration information, and other sources of sensitive Personal Identifiable Information (PII) or secrets.. Turning on diagnostic collection instructs Contrast to send diagnostic information for the specified amount of hours. This feature might not work for on-premise customers.

Cancel

## Send output to syslog

Contrast lets you send security logs to a remote syslog server in addition to the Contrast Security log. [Syslog message format \(page 1204\)](#) describes the components in the messages that Contrast sends.

### Before you begin

- You must apply a Protect license to the server that has syslog output enabled.
- You may have to enable remote logging so that your syslog can receive outside messages.
- Syslog messages for a server are sent by the agent.
- Syslog output isn't supported over TCP.

### Steps

1. When configuring the [default organization server settings \(page 1453\)](#), select the checkbox to **Enable output of Protect events to syslog**, which reveals additional fields, and then enter the appropriate settings.
2. Select **Servers** in the header to enable and configure syslog output to an individual server or multiple servers at one time. If syslog defaults have already been [set at an organization level \(page 1453\)](#), the values will be pre-populated for server-level settings.
  - **Individual server:** To enable syslog on an individual server, hover over the grid row, and select the **Server settings** icon.
  - **Multiple servers:** Use the check marks to select multiple servers, and select the **Server Settings** icon in the batch action menu that appears at the bottom of the page.



#### NOTE

If one or more of the selected servers is not eligible to have syslog enabled, it will only be enabled on eligible servers.

3. In the **Server settings** window, select the box to **Send output of Protect events to syslog**. (For multiple servers, you will need to select **Edit** next to the checkbox first).

**NOTE**

If eligible servers selected are in different environments, you can choose to use the default settings for the applicable servers or manually configure the settings for all servers.

## Bulk Server Settings



This will override settings for all relevant selected servers.

Environment

Log Level

Stacktraces

Bot Blocking

☐ [Edit](#)☐ Enable sampling for higher performance [?](#) [Edit](#)☒ Enable output of Protect events to syslog [EDITED](#)

Syslog Server Host

Port

Facility

Attack Event Result

EXPLOITED

SUSPICIOUS

BLOCKED

BLOCKED (P)

PROBED

Syslog Message Severity

[Undo edits](#)[Cancel](#)[Save](#)

4. Enter the **Syslog server host**. This can be the full qualified domain name (not just the hostname) or the IP address. For example: *email.mydomainname.com* or 38.124.154.50.
5. Enter the **Port**.

6. Enter the **Facility**.
7. Enter the **Syslog message severity**.
8. **Save** the settings to enable syslog on the server.
9. When syslog is enabled, the server has a gray arrow icon beside its name in the grid. Hover over the icon to see the output location of Protect events.  
To edit server settings, repeat the steps above to update the values in the appropriate configuration form, and save your changes.

## Syslog message format

Syslog messages are formatted using the Common Event Format (CEF), a standard format that most Security Information and Event Management (SIEM) solutions use to facilitate the parsing and analysis of log data.

The following example shows the format that Contrast uses for syslog messages that it sends:

```
Aug 04 2024 192.168.219.65 CEF:0|Contrast Security|Contrast
Agent Java|4.5.2.0|SECURITY|The parameter undefined2 had
a value that was marked suspicious reflected -xss
- <script>alert('TURTLES-everywhere')</script>|WARN|pri=reflected-xss
src=10.80.49.96 spt=8443 request=/actuator/info requestMethod=GET
app=svc-basic outcome=SUSPICIOUS dvchost=my.example.hostname.com
computer=my.example.hostname.com contrastAgentServer=my-server-name from
contrast.yaml
```

The components in the Contrast syslog message are:

- **Date:** The timestamp of the local host indicating when the log was generated. For example: Aug 04 2024.  
The timestamp uses this format: MMM dd HH:mm:ss, which shows the current time zone of the server running the agent.
- **Host:** The host address where the log was generated. For example: 192.168.219.65.
- **CEF Version:** The version of the CEF format being used. For example: CEF:0.
- **Device Vendor:** The vendor of the security device. For example: Contrast Security.
- **Device Product:** The product that is generating the log. For example: Contrast Agent Java.
- **Device Version:** The version of the product generating the log. For example: 4.5.2.0 .
- **Signature ID:** The type of event. For example, SECURITY indicates a security-related event.
- **Message:** A description of the event. For example: The parameter undefined2 had a value that was marked suspicious reflected -xss -<script>alert('TURTLES-everywhere')</script>.
- **Log level:** The log level of the event. For example, WARN or DEBUG.
- **Extensions:** Other fields that provide further details about the event. Some examples include:
  - **pri:** Priority of the event.
  - **src:** Source IP address of the event.
  - **spt:** Source port.
  - **request:** The specific request that triggered the event.
  - **requestMethod:** The HTTP method used.
  - **app:** The application involved in the event.
  - **outcome:** The outcome of the event (for example, Suspicious or Blocked).
  - **dvchost:** The hostname of the machine where the event occurred.
  - **contrastAgentServer:** The value of the `contrast.server.name` property or the host name as a fallback.



## Syslog receivers

When you configure receivers for syslog output, consider these resources:

- [Contrast Protect connector for Microsoft Sentinel](#)
- [Configure Field Extraction Modules \(mmfields\) for rsyslog to parse CEF formatted logs](#)
- [Configure syslog-ng OSE for CEF formatted logs](#)

## Libraries

The security of the libraries used by an application impacts the security of your application as a whole.

Libraries can be public or private. Public libraries are identified with a [score \(page 1216\)](#) (A-F), public libraries are open-source libraries sourced from Maven (Java), NuGet (.NET), npm (Node.js), RubyGems (Ruby), PyPI (Python), pkg.go (Go), and Composer (PHP). Private libraries are commercial third-party libraries or custom-built libraries. Private libraries do not have a score assigned in Contrast.

Contrast agents automatically identify open-source libraries included in an application. Contrast identifies any vulnerabilities found in your libraries and confirms if the library is used at runtime.

To do this, Contrast creates a hash of the library file, which compares the file's content to a database of known library files. If the hash is in the database, Contrast can assign a [score \(page 1216\)](#) to the library, provide library version information and report on the total vulnerabilities (CVEs) found in the library.



### NOTE

If your library is a custom file, the hash won't be found in the database and the agent reports the library as "unknown" to the Contrast application. This may also happen if the library has recently been released or if you are using an airgap on-premises installation and have not recently [updated library definitions \(page 1497\)](#).

For Java clients, WebSphere repackages libraries at runtime, so their SHA-1 hash is different than anything known to Contrast. To preserve the SHA-1 during deployment, set the JVM system property `org.eclipse.jst.j2ee.commonarchivcore.ignore.web.fragment` to "true".

Also, any `wsadmin` calls must have the same parameter:

```
wsadmin -javaoption "-  
Dorg.eclipse.jst.j2ee.commonarchivcore.ignore.web.fragment=true  
"
```

In Contrast, select **Libraries** in the header to see an overview of all libraries across your portfolio and manage them in bulk. Select the details panel to view [CVE details \(page 1210\)](#).

You can view results from a manifest (for example, package.json or pom.xml) analyzed with [Contrast CLI \(page 1287\)](#) or [scanned \(page 1217\)](#) repos.

## See also

[View libraries \(page 1206\)](#)

[View open-source licenses \(page 1215\)](#)

[Learn about library scoring \(page 1216\)](#)

[CVE search \(page 1222\)](#)

## Contrast SCA supported languages

Contrast's SCA function supports the following languages:

### Runtime

| Language | Sources                                   |
|----------|---|
| Java     | maven central, redhat GA                  |
| .NET     | Nuget, framework/core downloads           |
| Node.js  | npm                                       |
| PHP      | composer (packagist), Wordpress packagist |
| Python   | pypi                                      |
| Ruby     | rubygems                                  |
| Go       | go index                                  |

### CLI and SCA in repository

For further details on the supported versions for CLI see the [Contrast CLI supported languages and package managers \(page 1279\)](#) page.

| Language      | CLI | SCA in repository |
|---------------|-----|-------------------|
| Java - Maven  | ✓   | ✓                 |
| Java - Gradle | ✓   | ✗                 |
| .NET          | ✓   | ✗                 |
| Node          | ✓   | ✓                 |
| PHP           | ✓   | ✓                 |
| Python        | ✓   | ✓                 |
| Ruby          | ✓   | ✓                 |
| Go            | ✓   | ✓                 |

### View libraries

There are multiple ways to get library information:

- Select **Libraries** in the header to view a grid list of all libraries used by your organization. Select a library name from that list for more details.
- You can also see library information for an individual application or server:
  - Select **Applications** in the header, then select an application name to see its details page. Select the **Libraries** tab.
  - Select **Servers** in the header, then select a server name to see its details page. Select the **Libraries** tab.

### Quick views and filters

Select the open/close filters icon ▼ to filter the libraries view.

The Quick Views filters include:

## Quick Views

Select a Quick View  
**Vulnerable (240)** ▼

## Filters

Applications ▼

Tags ▼

Grades ▼

Languages ▼

Usage ▼

Licenses ▼

Environments ▼

Servers ▼

Library Severity ▼

## Libraries

< Close filters ▼

☐ Score

☐ **F**

☐ **F**

☐ **F**

☐ **F**

☐ **F**

☐ **F**

☐ **F**

- **All:** Shows all libraries.
- **Vulnerable:** Shows only libraries that Contrast identified as containing CVEs.
- **Private:** Shows only commercial third-party libraries or custom-built libraries that Contrast discovered in your code.
- **Public:** Shows only the open-source libraries that Contrast discovered in your code.
- **High risk:** Shows only the libraries with a [score \(page 1216\)](#) of C or below.
- **Remediated:** Shows any libraries marked as remediated.

The filters include:

- **Applications:** Find by application name.
- **Tags:** Find by tag name.
- **Grades:** Find by grades.
- **Languages:** Locate vulnerable libraries by a specific language.
- **Usage:** Find by used or unused classes at runtime.
- **Licenses:** View libraries by licensed applications.
- **Environments:** Helps to easily locate any vulnerable libraries in production.
- **Servers:** Find vulnerable libraries by server type.
- **Library Severity:** Find by library severity.
- **Repositories:** Find by repository name.
- **Projects:** Find projects using the library.

More information about the filter types is available below. Note that some of the filters are visible under the static tab and not the runtime tab and vice versa.

Select **Show library stats** above the grid to analyze library data for your organization. Each graphic displays the statistical average as well as breakdowns for each category, including library scores and the number of years by which they are high risk. A library is considered high risk if it has a [score \(page 1216\)](#) that is grade C or below.

## Static and runtime tabs

Library information in Contrast is divided into two tabs:

- **Static:** Contains results from a [manifest](#) (for example, *package.json* or *pom.xml*) analyzed with [Contrast CLI \(page 1287\)](#).
- **Runtime:** Contains results for applications analyzed at runtime

| Score | Library  | Latest Version          | Vulnerabilities (CVEs) | Applications                                  | Usage   | Actions |
|-------|--|-------------------------|------------------------|---|---------|---------|
|       | spring-core-4.3.6.release.jar<br>v4.3.6.RELEASE (Jan 25, 2017)             | v6.1.5<br>Mar 14, 2024  | (8)                    | terraccota<br>terraccota-wdd                  | 462/789 |         |
|       | snakeyaml-1.17.jar<br>v1.17 (Feb 19, 2016)                                 | v2.2<br>Aug 27, 2023    | (8)                    | petclinic-wdd<br>terraccota<br>terraccota-wdd | Unused  |         |
|       | logback-classic-1.2.3.jar<br>v1.2.3 (Mar 21, 2017)                         | v1.5.3<br>Mar 4, 2024   | (1)                    | ts-24115-stg<br>terraccota<br>terraccota-wdd  | 71/175  |         |
|       | spring-boot-starter-web-1.5.1.release.jar<br>v1.5.1.RELEASE (Jan 30, 2017) | v3.2.3<br>Feb 22, 2024  | (1)                    | terraccota<br>terraccota-wdd                  | Unused  |         |
|       | logback-core-1.2.3.jar<br>v1.2.3 (Mar 21, 2017)                            | v1.5.3<br>Mar 4, 2024   | (2)                    | ts-24115-stg<br>terraccota<br>terraccota-wdd  | 181/373 |         |
|       | spring-web-4.3.6.release.jar<br>v4.3.6.RELEASE (Jan 25, 2017)              | v6.1.5<br>Mar 14, 2024  | (2)                    | terraccota<br>terraccota-wdd                  | 207/558 |         |
|       | spring-data-jpa-1.11.0.release.jar<br>v1.11.0.RELEASE (Jan 26, 2017)       | v3.2.3<br>Feb 16, 2024  | (2)                    | terraccota<br>terraccota-wdd                  | 23/169  |         |
|       | jackson-databind-2.8.6.jar<br>v2.8.6 (Jan 11, 2017)                        | v2.17.0<br>Mar 12, 2024 | (54)                   | terraccota<br>terraccota-wdd                  | 264/582 |         |
|       | hsqldb-2.3.3.jar<br>v2.3.3 (Jan 30, 2015)                                  | v2.7.2<br>May 30, 2023  | (1)                    | terraccota<br>terraccota-wdd                  | 264/587 |         |
|       | spring-webmvc-4.3.6.release.jar<br>v4.3.6.RELEASE (Jan 25, 2017)           | v6.1.5<br>Mar 14, 2024  | (1)                    | terraccota<br>terraccota-wdd                  | 186/496 |         |

The libraries columns include:

- **Score:** Visible only under the Runtime tab. Shown as a letter grade using this [scoring guide \(page 1216\)](#).
- **Severity:** Visible only under the Static tab. This represents the maximum severity level for all vulnerabilities (CVEs) present in the library. Use the filters to locate libraries based on severity level.

Note that the **Other** filter option locates any libraries with CVEs whose maximum severity is None (where CVSS score is 0) AND libraries without a CVE AND private or unknown libraries.

- **Library:** The name of the library.

Select a library name in the list to open the library details panel. The panel displays:

- A summary of the findings (*visible only under the Runtime tab*).
- Methods for fixing the detected vulnerabilities:
  - The minimum version of the library that has fewer vulnerabilities compared to the one you are using.  
Use this version if upgrading to the least stable version is not practical or efficient in your environment.
  - The last stable version has the fewest vulnerabilities compared to the library you are using.
- A list of known vulnerabilities (CVEs) that Contrast found within the library along with a list of the applications and servers where the library appears.
- The EPSS (*Exploit Prediction Scoring System*) calculation which provides a probability range between 0 to 1 (0 and 100%). A higher score indicates a vulnerability likely will be exploited within 30 days.
- **Latest version:** Most recent library version.



#### NOTE

**For .NET libraries.** The **Latest version** value relates to the package upgrade recommendation. The library version and hash are determined by the file the Contrast agent detects. The hash represents the library file version while the upgrade version represents the package version.

- **Vulnerabilities (CVES):** This shows the CVEs found in the library and can help prioritize remediation. Hover over the thermometer section to see the number of CVEs by severity. Click the thermometer to open the details panel.



If vulnerabilities exist, they display as a list and are color-coded by severity. Vulnerabilities with a critical severity status appear at the top of the list and are coded red.

- **Applications:** *Visible only under the Runtime tab.* Lists applications using the library.
- **Usage:** *Visible only under the Runtime tab.* This shows the total number of classes used at runtime out of the total number of classes that are in the library. If none of the classes have been used at runtime, this column shows "Unused." When your application loads a class, the Contrast agent reports usage. If the class has not been used before, the usage decreases. Click the number to [analyze the library usage \(page 1212\)](#). There you can see information on classes loaded as well as the risks and policy violations associated with the library.
- **Actions:** *Visible only under the Runtime tab.* This is where you can [tag \(page 1211\)](#), [send \(page 1212\)](#), or [delete \(page 1210\)](#) the library.
- **Status:** *Visible only under the Runtime tab and requires a minimum of the [Edit \(page 1555\)](#) organization role to be able to change the status.* (Contact Support to request enabling this column if not visible for your organization). Visible under the **Applications > Application name > Libraries** tab. There are three types to view/apply:
  - **Not a problem:** This library has acknowledged vulnerabilities, and the risks are acceptable, or the library is unused.
  - **Remediated:** The vulnerable library has been remediated.
  - **Reported:** When a library with vulnerabilities is detected by Contrast.

- **Projects:** *Visible only under the Static tab.* Lists the projects using the library.

## CVE details

To view the CVE details card, select the **Library** or **Vulnerabilities (CVES)** link and then select the CVE link under the *What's the risk?* section.

**Static** CVE-2023-6378

First seen in Contrast: 06/26/2024 NVD Published: 11/29/2023 NVD Last Modified: 11/29/2024 See NVD for latest information [🔗](#) [🔗](#) See in cve.org [🔗](#) [🔗](#)

**Severity and Metrics**

CVSS v3.1 **7.5** Impact Score **3.6** Exploitability Score **3.9**

EPSS **0**

**Vector**

CVSS:3.1/AV:N/AC:L/PR:N/UI:N/S:U/C:N/I:N/A/H

|                               |                               |                                  |                               |                        |                             |                       |                          |
|-------------------------------|-------------------------------|----------------------------------|-------------------------------|------------------------|-----------------------------|-----------------------|--------------------------|
| Attack vector (AV)<br>Network | Attack complexity (AC)<br>Low | Privileges required (PR)<br>None | User interaction (UI)<br>None | Scope (S)<br>Unchanged | Confidentiality (C)<br>None | Integrity (I)<br>None | Availability (A)<br>High |
|-------------------------------|-------------------------------|----------------------------------|-------------------------------|------------------------|-----------------------------|-----------------------|--------------------------|

Show less ^

**Description**

A serialization vulnerability in logback receiver component part of logback version 1.4.11 allows an attacker to mount a Denial-Of-Service attack by sending poisoned data.

**Organizational Impact**

|   |                                       |
|---|---------------------------------------|
| Applications<br><b>28 / 75 10 (0.37283623)%</b> | Servers<br><b>28 / 34 (82.35294)%</b> |
|---|---------------------------------------|

**Applications** Servers

Web-Application-wil  
spring-petclinic-2.6.0  
webgoat-adr-demo  
spring-petclinic-2.6.0  
Web-Application-bsow-adr-5  
Web-Application-wil  
Web-Application-thib  
Splunk-Adr-Test  
petclinic-protect  
webgoat-adr-demo  
petclinic-protect  
Splunk-Adr-Test  
Web-Application-thib  
Web-Application-bsow-adr-5

- **First Seen in Contrast** provides insight into your exposure window
- **Organizational Impact** displays precisely which applications and servers are affected
- Display of **CVSS**, **Impact Score**, **Exploitability Score**, and **EPSS** severity and metrics add comprehensive risk assessment and help prioritization for remediation. The EPSS (*Exploit Prediction Scoring System*) calculation provides a probability range between 0 to 1 (0 and 100%). A higher score indicates a vulnerability likely to be exploited within 30 days.
- Select **See NVD for latest information** or **See in cve.org** to view information about the specific CVE on the site. Note that the NVD site only provides a snapshot of information when the CVE was raised and may not be the most current description of the CVE.

## Discover or delete libraries



### NOTE

Visible under Runtime view only. Not available for libraries statically analyzed.

Libraries are associated with the applications that use them and the servers where these applications are deployed.

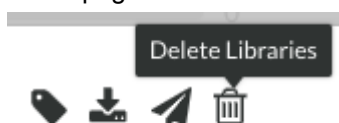
If an agent checks in with a library list that no longer includes a previously reported library, that library will no longer be associated with that server.

A library will be removed from an application once all servers reporting it have either checked in without it or the servers reporting it have been deleted. (Servers check in according to their [settings \(page 1453\)](#)).

Libraries can also be manually deleted from an application.

To delete libraries:

1. Select **Libraries** in the header and locate the row in the grid for the library you want to delete.
2. Click the **Delete** icon under the **Actions** column. You can also find the icon in the top right of the library details page.  
To delete multiple libraries at once, use the check marks in the left column to select the libraries you want to delete, then select the **Delete** icon from the batch action bar that appears at the bottom of the page.



3. In the window that appears, select **Delete** to confirm your choice. Once confirmed, the library is removed and no longer appears in your list. If an agent reports a previously deleted library, this will be added to the list of libraries again as this library is included in an application.

## Add tags to libraries

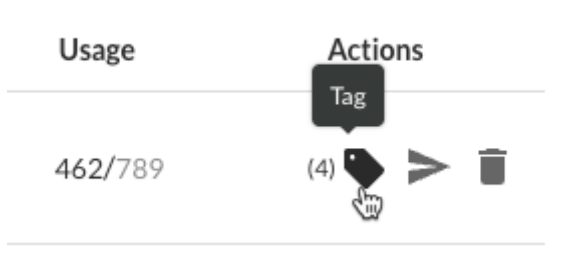


### NOTE

Visible under Runtime view only. Not available for libraries statically analyzed.

To add tags to libraries:

1. Select **Libraries** in the header and locate the row in the grid for the library you want to tag.
2. Select the **Tag** icon under the **Actions** column. This option is also available from the library details page in the top right corner.



3. In the window that appears, begin typing to see a list of tags. Select one or more from the dropdown, and/or type a new tag. To remove tags, select the **X**. Select **Save**.
4. To tag multiple libraries, use the check marks in the left column of the libraries grid to select libraries. In the batch action menu that appears at the bottom of the page, select the **Tag** icon.
5. To filter by tags, select the open/close filter option on the left-side and then expand the Tags option, then select the tags to filter.

- You can also see tags next to the library name on the library's details page, and remove them by selecting the **X**.

## Send library information



### NOTE

Visible under Runtime view only. Not available for libraries statically analyzed.

Send library details to your email address or to an integrated bugtracker service (that creates tickets for your developers) to track vulnerable libraries.

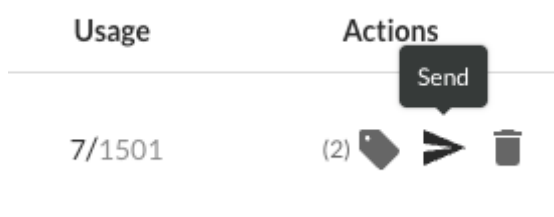
Contrast sends the following data to your email address or integrated bugtracker for each library that you choose.

- Name
- Version
- Vulnerabilities details
- Impacted applications and servers
- Versions behind (compared to the current/latest version)
- Usage (Currently available for Java and .NET only.)
- [Score \(page 1216\)](#)

To receive this information for a particular library:

- Select **Libraries** in the header and locate the row in the grid for the library you want to track.
- Click the **Send** icon under the **Actions** column and select either **Send by Email** or **Send to Bugtracker**.

This option is also available from the library details page in the top right corner.



- In the window that appears, select the [integrations \(page 1331\)](#) you want to use. Select the options then select **Send** to create the ticket. For email, enter the email address then select **Send** to send the email.
- To receive information for multiple libraries, use the check marks in the left column of the libraries grid to select libraries. In the batch action menu that appears at the bottom of the page, select the **Send** icon. All libraries selected must have at least one application in common.

## Analyze runtime library usage

Runtime library usage gives insight into which parts of a library are used by your applications, which can reduce investigation time for CVEs by showing how much a library impacts your application. This also improves collaboration because security teams can confirm with development teams that an application uses a vulnerable library at runtime.



**NOTE**

Only organizations with a [Contrast SCA license \(page 28\)](#) can see full usage details. To learn more, contact our sales department at [sales@contrastsecurity.com](mailto:sales@contrastsecurity.com).

Select **Libraries** in the header, click **Runtime** and view the **Usage** column to see if, and how much, a library is used at runtime. The usage number represents the number of items used by any instrumented applications, out of the total number of items known to be available in that library.

| Score | Library  | Latest Version         | Vulnerabilities (CVES) | Applications  | Usage   | Actions |
|-------|--|------------------------|------------------------|---|---------|---------|
|       | spring-core-4.3.6.release.jar<br>v4.3.6.RELEASE (Jan 25, 2017)             | v6.1.5<br>Mar 14, 2024 | (8)                    | terraccotta<br>terraccotta-wdd                                  | 462/789 |         |
|       | snakeyaml-1.17.jar<br>v1.17 (Feb 19, 2018)                                 | v2.2<br>Aug 27, 2023   | (8)                    | petclinic-wdd<br>terraccotta<br>terraccotta-wdd<br>ts-24115-stg | 1/175   |         |
|       | logback-classic-1.2.3.jar<br>v1.2.3 (Mar 31, 2017)                         | v1.5.3<br>Mar 4, 2024  | (1)                    | terraccotta<br>terraccotta-wdd                                  | 11/175  |         |
|       | spring-boot-starter-web-1.5.1.release.jar<br>v1.5.1.RELEASE (Jan 30, 2017) | v3.2.3<br>Feb 22, 2024 | (1)                    | terraccotta<br>terraccotta-wdd                                  | Unused  |         |
|       | logback-core-1.2.3.jar   | v1.5.3                 | (25)                   | ts-24115-stg<br>terraccotta                                     | 104/175 |         |

Items loaded may be classes, files, or functions, depending on the languages of the applications using this library. If a primary application contains multiple applications that use the same library, the classes loaded will be representative of each merge application.

When an application uses a library, the Contrast agent reports the items loaded within the library. As the application uses more items within a library, usage counts increase in Contrast.

If you have the appropriate license, you can also view full library usage details for a particular application:

1. Under **Applications**, select a specific application to see the details view.
2. Select the **Libraries** tab for the application.
3. Select the usage counts for a specific library. This opens an overview and usage panel.

| Library                                   | Usage   |
|---|---------|
| spring-core-4.3.6.release.jar             | 462/789 |
| snakeyaml-1.17.jar                        | 1/175   |
| logback-classic-1.2.3.jar                 | 11/175  |
| spring-boot-starter-web-1.5.1.release.jar | Unused  |
| logback-core-1.2.3.jar                    | 104/175 |

4. Click the **Usage** tab to view each class, file, or function used. Click the search icon to search for specific classes. You will also see the first time and last time Contrast observed it in use. [Library exports \(page 1214\)](#) will also include full usage data. Click the **Overview** tab to view *What*

*happened* (describes the issue(s)), as well as *What's the risk* (lists the Severity badge, CVSS Score, CVE title, and policy violations).



#### NOTE

For a merged application, Contrast will report when a class was first seen and last seen for all applications it contains within the corresponding **Last Seen** and **First Seen** columns.

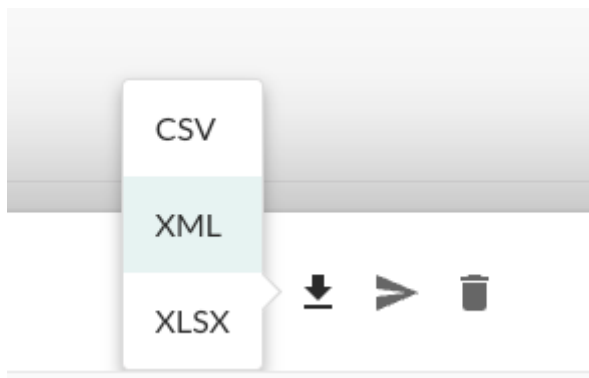
5. You can also [tag \(page 1211\)](#) and [send \(page 1212\)](#) information about the library.
6. Click the **More** menu (``) to view package details, repository location, [delete \(page 1210\)](#) the library, or export usage details in CSV format.
7. Select the **X** to close the details panel.

## Export library details

Use the export function to download library details.

To export library details:

1. Select **Libraries** in the header, then use the check marks in the left column of the libraries grid to select the library or libraries you want to use for the export. You can also click an individual library name to open the details panel.
2. In the batch action menu that appears at the bottom of the page, or in the upper right of the details panel, select the **Export** icon, then select the format you want to use for the export.



The export will download to your desktop. Note that the XLSX format export will contain two tabs: **Libraries** and **Vulnerabilities**.

## Data fields

Exports contain the following data fields for each library:

- Library Name
- Language
- Version
- Release Date
- Latest Version
- Grade
- SHA1
- CVE Count
- Application Count
- Server Count
- Number of Classes

- Number of Used Classes
- Licenses
- App Name
- Server Name
- Server Environment
- Policy Violation
- Severity
- Tags

In addition to the above, the XLSX format export also contains a Vulnerabilities tab with the Hash, Library Name, CVE Name, Severity, and Severity Code fields.



### TIP

To create more complex custom software composition analysis reports about your applications, you can use the [Libraries API](#) to access Contrast library data. You might also explore additional details on your libraries by using a manual method.

For example, this curl request retrieves a list of libraries in which each library includes a list of applications that use the library. The jq tool formats the data as CSV for use in a custom report.

```
$ curl -H "Authorization: $(echo -n $username:$servicekey  
base64)" -H "API-Key: $apikey" https://app.contrastsecurity.com/  
Contrast/api/ng/$org_id/libraries/filter?expand=apps  
jq -r '.libraries[]  
{name: .file_name, app_name: .apps[].name}  
[.name, .app_name]  
@csv'
```

## View open-source licenses



### IMPORTANT

Open-source license display is available to Contrast SCA customers only. Contact your Organization Administrator to enable SCA.

To view license details for your open-source libraries in SPDX format, select **Libraries** in the header. There are multiple ways to view license information:

- To view an individual library's license, hover over the library name in the grid.
- To find libraries with specific licenses, select the **filter** icon next to the **Library** column header and select the licenses you want to filter by.
- If you select a library name you will see details of that library. License information is also at the top of that page.
- Select **Package details** (either from the hover tip on the **Libraries** page, or by selecting the library name, then the information icon in the top right) to see the title, version and creator of that package.


- License details for each library are also included in any CSV or XML files [exported from Contrast \(page 1214\)](#).

## View dependency trees




When an open-source library is added to an application, all of the library's dependencies are also inherited. Some of these transitive dependencies may introduce vulnerable code into your applications. The [Contrast CLI \(page 1278\)](#) identifies all library dependencies and sends the data to Contrast where you can visualize these libraries as a hierarchical dependency tree.

To display library hierarchy for your application, Contrast must have access to your application code at pre-compile time—a different stage of the software development lifecycle (SDLC) than the Contrast agents collect. To do this, you must have installed and run the [Contrast CLI \(page 1278\)](#) for your applications.

To view an application's library dependency tree:

1. Select **Applications** in the navigation bar.
2. Select an application.
3. From the application's **Overview** page, select the **Libraries** tab.
4. Select the **dependency tree** icon  in the upper right to view the analysis of your application.

In this view, Contrast displays the dependency tree for your application's libraries based on the data collected by the [Contrast CLI \(page 1278\)](#).

- Use the quick view menu to view only the vulnerabilities. By default, all libraries are displayed. You can use the right arrows to expand individual sections for more information or you can select the Expand All option to view all the information at once.
- Libraries with known vulnerabilities are also identified with a vulnerabilities warning icon . View vulnerability details by clicking the icon.
- Click the search icon  to search for a specific library.
- You can also view a dependency tree's history by choosing a custom date.
- Click the filter icon  to view the dependencies based on developer and/or production libraries. By default, the production option is selected.
- The **Application** dropdown appears for [merged \(page 653\)](#) applications so you can see how vulnerable libraries were introduced for the merged application. You can view the dependency tree by parent and child applications.

## Library scoring guide

Contrast provides letter grades for the security of your application's libraries so that you can use them as a reference point during analysis. The grades map to scores as follows:

- A: 90 - 100
- B: 80 - 89
- C: 70 - 79
- D: 60 - 69
- F: 35 - 59

Scores are based on three penalty factors:

- **Time:** The age of the library is calculated based on the number of full years between the release of the latest version and the version used in the application, multiplied by 2.5.
- **Status:** The status is calculated based on the number of versions that have been released since the current library in your application, multiplied by 10.
- **Security:** The CVE penalty of the library is the highest severity of all known CVEs for this library, multiplied by 10.

**NOTE**

Organization administrators can [adjust the scoring method \(page 1459\)](#) to include only security criteria.

**TIP**

For example:

If you're using a library from January 2010 and the latest version came out in September 2013, the number of full years passed is two. So your time penalty would be:

$$2 \times 2.5 = 5$$

If you're using Version 1.1.1, but Versions 1.1.2 and 1.1.3 have been released, your penalty would be:

$$2 \times 10 = 20$$

If you have a library with the scores 2.4 and 2.2, the penalty would be:

$$2.4 \times 10 = 24$$

The final score of the library is calculated by subtracting each of the three penalty values from 100.

$$100 - 5 - 20 - 24 = 51$$

A score of 51 maps to a letter grade of F.

## Libraries and Software Composition Analysis

Use Contrast's repository scanning capabilities to look for known vulnerabilities in the software components that are included in a repository. If a vulnerability is found, it will report the vulnerability to the repository owner. The owner can then take steps to fix the vulnerability or to mitigate the risk posed by the vulnerability.

### Connect with repositories

Connect Contrast SCA to a GitHub, Bitbucket, or GitLab account and perform SCA scans.

- Connect with the [Contrast Security GitHub App \(page 1218\)](#)
- Connect to [Bitbucket \(page 1221\)](#)
- Connect to [GitLab \(page 1221\)](#)

**NOTE**

Connections to Bitbucket and GitLab are available by request only. [Contact Support](#) to enable the connection.

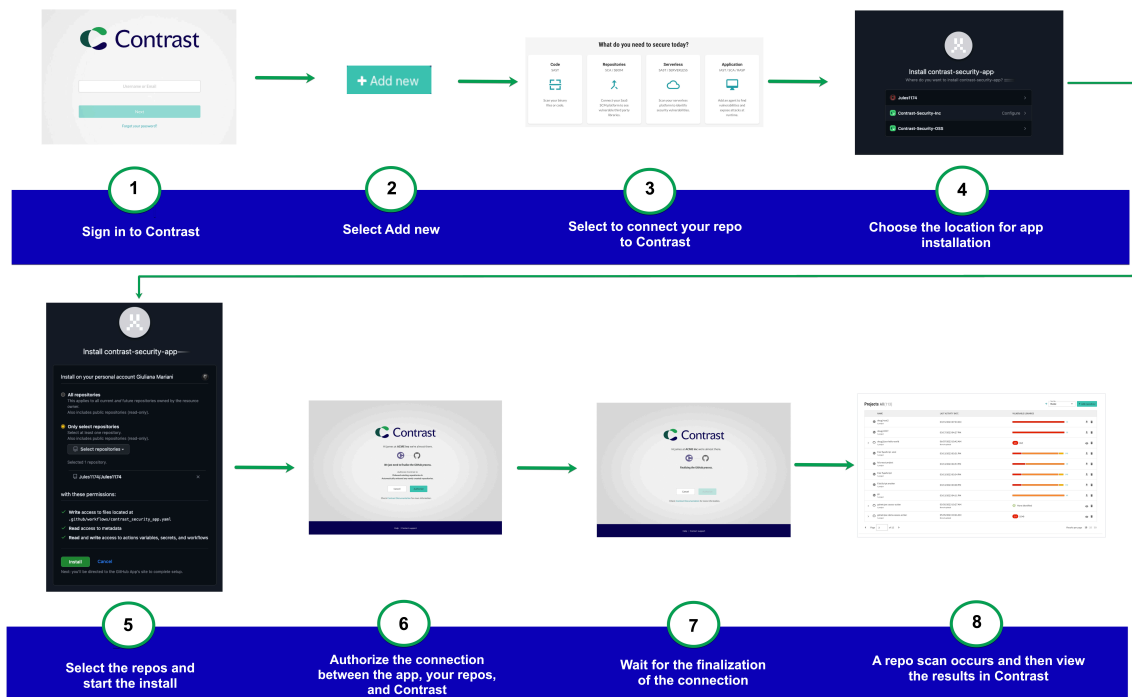
## Contrast Security GitHub App

Use the Contrast Security GitHub App (also known as **Contrast Security SCA** in the GitHub Marketplace) to scan GitHub repositories with Contrast. Detect vulnerable libraries with how-to-fix guidance, and automate your CI/CD to prevent risk, at an earlier step, in your team's code.

### How it works

For first-time use, sign in to Contrast, connect your GitHub account to Contrast and scan for library vulnerabilities in a repository.

Click the GitHub icon  to use the [Contrast Security GitHub App \(page 1218\)](#) to connect with Contrast.



Once connected and scanned you can view the results in the [Projects \(page 640\)](#) list in Contrast.

You can also [connect from the GitHub Marketplace \(page 1219\)](#) with the Contrast Security GitHub App.

With this app, you can:

- Scan a GitHub repository
- Automate the security analysis of dependencies so that vulnerabilities can be detected and resolved during code review rather than after detection or exploitation in testing or production environments
- Any commits to the default branch and PRs created to merge into the default branch will trigger the workflow file. In addition, you can manually trigger the workflow.
- Users with edit, rules admin, or admin permissions will have access to the app

### Next steps

- [Install and authorize \(page 1218\)](#)
- [GitHub repository connections \(page 1219\)](#)
- [Troubleshoot \(page 1220\)](#)

### Installation and authorization

Connect your GitHub account to see vulnerable third-party libraries. Once connected, you can monitor PR summaries and triggers for analysis and view them here in Contrast.

**NOTE**

There is another method for monitoring vulnerabilities in Contrast. [Integrate Contrast with Github \(page 1360\)](#) to view vulnerabilities in projects.

**Contrast and GitHub secrets**

Contrast cannot read GitHub secrets even though the screen contains READ/WRITE secrets. This is only a readout of the token name.

You will need the following credentials from your Contrast account to create the secrets in GitHub. You can find them in Contrast under **user menu > User settings > Profile**.

- API key (CONTRAST\_API\_KEY)
- Organization ID (CONTRAST\_ORGANIZATION\_ID)
- Authorization header (CONTRAST\_AUTH\_HEADER)

You will also need the address of the Contrast installation to which your agent would like to report (CONTRAST\_API\_URL). Defaults to: <https://app.contrastsecurity.com>.

The Contrast Security GitHub App creates repository secrets and action variables for use in the workflow so results are sent to the correct Contrast account. Closing a PR requires manually deleting these secrets and variables. You can find the secrets and variables under the `/settings/secrets/actions` page of your GitHub account.

**Before you begin**

- Make sure you have access to the Contrast web interface.
- Make sure you are logged in to your GitHub account.

**Steps****To install from within Contrast:**

1. Log in to Contrast and select **Add New** at the top right.
2. Select the **Connect GitHub** option and click **Next**.
3. On the install screen, select either to connect all the repositories or specific repositories.
4. Enter the URL of your Contrast host domain. For example, <https://app.contrastsecurity.com>.
5. Select **Install** and wait for the connection to be established between Contrast and GitHub.
6. Select **Authorize** to finalize the connection and to onboard your repositories.

Once complete, you can view your repository analysis results on the [Projects \(page 640\)](#) list.

**To install from the GitHub Marketplace:**

1. Go to the [Contrast Security GitHub app](#) on the GitHub Marketplace.
2. Select **Install it for free**.
3. Follow the steps to install and connect Contrast with your repositories.

Once complete, you can view your repository analysis results on the [Projects \(page 640\)](#) list.

**Add or disconnect GitHub repositories**

Add repositories to Contrast or disconnect repositories from Contrast.

**NOTE**

An Organization Editor role is required at minimum to be able to add repositories.

**Add a repository**

You can add additional repositories in Contrast with the **Add repository** button under the Projects view in Contrast or through GitHub.

**To add a repository through Contrast:**

1. Select **Projects** in the header.
2. Click the **Add repository** button in the upper-right of the window.
3. Log in to your GitHub account and select the repository you would like to connect to Contrast.

Once added, Contrast performs a scan of the repository and provides results in the [Projects \(page 640\)](#) list.

**To add a repository through GitHub:**

1. In Github, go to **Settings > Applications > Integrations** and locate the **Contrast Security GitHub App**.
2. Under **Repository access** select the repositories you want to connect to Contrast.
3. Click **Save**.

Once added, Contrast performs a scan of the repository and provides results in the [Projects \(page 640\)](#) list.

**Disconnect repositories**

To disconnect repositories from the Projects list in Contrast:

1. Select **Projects** in the header and locate the row in the grid for the project you want to disconnect.
2. Click the **Delete** icon under the actions column.

This action disconnects the repository and all associated projects in it. Note that this **does not** remove the repository from the Contrast Security GitHub App installation. If you also wish to remove Contrast's permissions to this repository, you will need to remove access through the GitHub App installation settings **after** disconnecting the repository here to ensure proper cleanup.

Remove access to your repositories and uninstall the Contrast Security GitHub App through Github. In Github, go to **Settings > Applications > Integrations** and locate the **Contrast Security App**. Select **Uninstall**.

**Troubleshoot**

If you cannot complete installation and onboarding through the GitHub App, try these options.

- **Look at cookies.** Clear the `ONBOARDING_SESSION` cookie manually
- **Reinstall the app.** Close the browser and uninstall the app; then reinstall the app

If you are unable to run any workflows:

- **Check Actions permissions in GitHub.** Ensure the **Disable actions** option is not selected under the permissions tab of your GitHub account settings. If the option is selected, the workflow will not run and perform the analysis.




## Bitbucket repositories with Contrast SCA



### NOTE

Connection to Bitbucket is available by request only. [Contact Support](#) to enable the connection.

Connect to your Bitbucket repository to view scan results from Bitbucket files.

1. Click the Bitbucket icon  under the [Projects \(page 640\)](#) tab.
2. Select **Configure** to add projects to your workspace.
3. Select **Update** to establish the connection.




### NOTE

A test commit is performed by Contrast before adding the changes to the bitbucket-pipelines.

Once connected, Contrast scans the repo and creates a group for each repo. You can find the results in the [Projects \(page 640\)](#) tab. If there are any updates to the repo, new scans will be triggered.

To disconnect from Bitbucket:

1. Click the Bitbucket icon  under the [Projects \(page 640\)](#) tab.
2. Select **Disconnect**.
3. Select the **Disconnect** button in the resulting window to disconnect all associated projects from Contrast.  
To disconnect individual projects, locate the row in the grid for the project you want to disconnect and click the Delete icon.


## GitLab repositories with Contrast SCA



### NOTE


Connection to GitLab is available by request only. [Contact Support](#) to enable the connection.

Connect to your GitLab repository to view scan results from GitLab files. To connect to GitLab you must have a GitLab Owner or Maintainer role to write the required variables into a GitLab repository.

1. Click the GitLab icon  under the [Projects \(page 640\)](#) tab.
2. Select **Configure** to add projects to your namespace.
3. Select **Update** to establish the connection.

Once connected, Contrast scans the repo and creates a group for each repo. You can find the results in the [Projects \(page 640\)](#) tab. If there are any updates to the repo, new scans will be triggered.

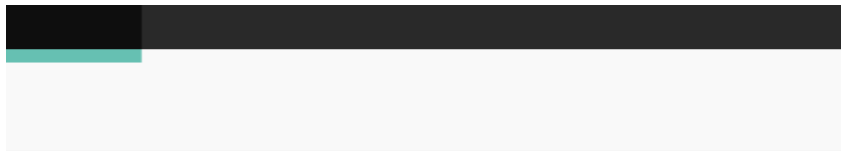
To disconnect from GitLab:

1. Click the GitLab icon  under the [Projects \(page 640\)](#) tab.
2. Select **Disconnect**.
3. Select the **Disconnect** button in the resulting window to disconnect all associated projects from Contrast.  
To disconnect individual projects, locate the row in the grid for the project you want to disconnect and click the Delete icon.

## CVE search

Use the search bar to locate specific CVEs in [libraries \(page 1205\)](#).

- Enter a CVE number in the search bar and the search results will auto-populate with the libraries where the CVE is found.



(26) ▼ 🔍 Find libraries by name or CVE

- You can then select the relevant library and the library details will open.
- Search supported in [Organization \(page 1433\)](#), [Application \(page 642\)](#), and [Server \(page 1192\)](#) libraries.

## Contrast Serverless

Contrast Serverless features dynamic scanning, static scanning, graph visualization, and resource observability that help you maintain awareness of your environments.

With Contrast Serverless you can:

- [Scan functions on demand \(page 1259\)](#)
- [View results \(page 1261\)](#)
- [Change inventory criteria \(page 1266\)](#)
- [Change Serverless scan settings \(page 1267\)](#)
- [View function and service relationships \(page 1268\)](#)

## See also

- [Integrate Contrast Serverless with JIRA \(page 1381\)](#)

## Contrast Serverless release notes

- [IDS release notes \(page 1223\)](#)

## IDS release notes

- [IDS Layer version 1.5.0 \(page 1223\)](#)
- [IDS Layer version 1.4.0 \(page 1223\)](#)
- [IDS Layer version 1.3.0 \(page 1224\)](#)
- [IDS Layer version 1.2.0 \(page 1225\)](#)
- [IDS Layer version 1.1.0 \(page 1225\)](#)
- [IDS Layer version 1.0.0 \(page 1226\)](#)

### IDS Layer version 1.5.0

**Release date:** September 4, 2023

#### Language versions currently supported:

- Node.js 12, Node.js 14, Node.js 16
- Python 3.8, Python 3.9

#### Minimum requirements:

- Memory: 256 MB
- Timeout: 5 seconds

**Included third-party packages:** See [here \(page 1226\)](#).

#### New and improved:

- Added a new ReDOS attack in Node.js
- Enhanced ReDOS instrumentation for Python to support more possible sinks
- Added a new `Unvalidated Input` attack in both Node.js and Python
- Added detection for Lambda triggers to enhance traces support
- Fixed false-positives in NOSQLI in DynamoDB
- We made several enhancements and addressed issues to enhance the overall performance and stability

#### Security fixes:

- Fixed CVE-2023-36665 `protobufjs` v7.1.1 in the Node.js layer
- Fixed CVE-2023-38704 `import-in-the-middle` v1.4.1 in the Node.js layer

#### Possible issues:

- Dependencies collision
  - See the included [third-party packages \(page 1226\)](#)
- Node.js
  - Handler function that is defined with both `async` and a callback like `async function (event, context, callback)` is not supported
  - Webpack library target to `commonjs2`, with typescript compiler option `module` different than `Commonjs` is not supported

### IDS Layer version 1.4.0

**Release date:** August 3, 2023

#### Language versions currently supported:

- Node.js 12, Node.js 14, Node.js 16

- Python 3.8, Python 3.9

**Minimum requirements:**

- Memory: 256 MB
- Timeout: 5 seconds

**Included third-party packages:** [See here \(page 1226\)](#).

**New and improved:**

- Added a new ReDOS attack in Python (Node.js is coming in the next release)
- Added a new NoSQLI attack for DynamoDB and MongoDB in both Python and NodeJS
- Added support to improve validation of DAST attacks if the Lambda is instrumented with IDS
- Improved performance of the CMDI rule
- We made several enhancements and addressed issues to enhance overall performance and stability

**Possible issues:**

- Dependencies collision:
  - See the included [third-party packages \(page 1226\)](#).
- Node.js:
  - Handler function that is defined with both `async` and a callback like `async function (event, context, callback)`, is not supported
  - Webpack library target to `commonjs2` with typescript compiler option module different than `Commonjs` is not supported

**IDS Layer version 1.3.0**

**Release date:** July 4, 2023

**Language versions currently supported:**

- Node.js 12, Node.js 14, Node.js 16
- Python 3.8, Python 3.9

**Minimum requirements:**

- Memory: 256 MB
- Timeout: 5 seconds

**Included third-party packages:** [See here \(page 1226\)](#).

**New and improved:**

- Improved layer size (reduced by 10MB)
- Optimized the array input evaluation
- Added support for SQLI in DynamoDB
- Optimized array evaluation in nested keys
- Improved event type identification and handling

**Possible issues:**

- Dependencies collision:
  - See the included [third-party packages \(page 1226\)](#)
- Node.js:
  - Handler function that is defined with both `async` and a callback like `async function (event, context, callback)`, is not supported

- Webpack library target to `commonjs2` with typescript compiler option module different than `Commonjs` is not supported

## IDS Layer version 1.2.0

**Release date:** June 4, 2023

### Language versions currently supported:

- Node.js 12, Node.js 14, Node.js 16
- Python 3.8, Python 3.9

### Minimum requirements:

- Memory: 256 MB
- Timeout: 5 seconds

**Included third-party packages:** See [here \(page 1226\)](#).

### New and improved:

- Added support for events from service with "Records" like SQS, SNS, S3, etc.
- Optimized the rules evaluation during the attack phase
- Added initial support for traces
- Optimized the performance of Cold Starts

### Bug fixes:

- Fixed unsupported syntax error in the NodeJS layer
- Fixed the evaluation of the rules - continue the evaluation even if one rule failed

### Possible issues:

- Dependencies collision:
  - See the included third-party packages
- Node.js:
  - Handler function that is defined with both `async` and a callback like `async function (event, context, callback)`, is not supported
  - Webpack library target to `commonjs2` with typescript compiler option module different than `Commonjs` is not supported

## IDS Layer version 1.1.0

**Release date:** May 22, 2023

### Language versions currently supported:

- Node.js 12, Node.js 14, Node.js 16
- Python 3.8, Python 3.9

### Minimum requirements:

- Memory: 256 MB
- Timeout: 5 seconds

**Included third-party packages:** See [here \(page 1226\)](#).

### New and improved:

- Removed false positive from LFI in Node.js
- Various performance optimizations

**Security fixes:**

- Prometheus vulnerability CVE-2019-3826

**Possible issues:**

- Dependencies collision:
  - See the included third-party packages
- Node.js
  - Handler function that is defined with both `async` and a callback like `async function (event, context, callback)`, is not supported
  - Webpack library target to `commonjs2` with typescript compiler option module different than `Commonjs` is not supported

**IDS Layer version 1.0.0**

**Release date:** May 11, 2023

**Language versions currently supported:**

- Node.js 12, Node.js 14, Node.js 16
- Python 3.8, Python 3.9

**Minimum requirements:**

- Memory: 256 MB
- Timeout: 5 seconds

**Included third-party packages:** See [here \(page 1226\)](#).

**New:**

- The initial release of the IDS (Instrumented Dynamic Scan)
- Supported attacks:
  - OWASP Top 10 Serverless

**Possible issues:**

- Dependencies collision:
  - See the included third-party packages
- Node.js:
  - Handler function that is defined with both `async` and a callback like `async function (event, context, callback)`, is not supported
  - Webpack library target to `commonjs2` with typescript compiler option module different than `Commonjs` is not supported

**Third-party packages**

Layer Wrapper Dependencies

- [IDS Layer version 1.5.0 \(page 1226\)](#)
- [IDS Layer version 1.4.0 \(page 1232\)](#)
- [IDS Layer version 1.0.0 - 1.3.0 \(page 1239\)](#)

**IDS Layer version 1.5.0**

The following are tables for the IDS Layer version 1.5.0.

## Node.js

| Name                                       | Version |
|--|---------|
| @cspotcode/source-map-support              | 0.8.1   |
| @grpc/grpc-js                              | 1.9.1   |
| @grpc/proto-loader                         | 0.7.9   |
| @jridgewell/resolve-uri                    | 3.1.1   |
| @jridgewell/sourcemap-codec                | 1.4.15  |
| @jridgewell/trace-mapping                  | 0.3.9   |
| @opentelemetry/api                         | 1.4.1   |
| @opentelemetry/api-logs                    | 0.41.2  |
| @opentelemetry/context-async-hooks         | 1.15.2  |
| @opentelemetry/core                        | 1.15.2  |
| @opentelemetry/exporter-jaeger             | 1.15.2  |
| @opentelemetry/exporter-metrics-otlp-http  | 0.41.2  |
| @opentelemetry/exporter-metrics-otlp-proto | 0.41.2  |
| @opentelemetry/exporter-trace-otlp-grpc    | 0.41.2  |
| @opentelemetry/exporter-trace-otlp-http    | 0.41.2  |
| @opentelemetry/exporter-trace-otlp-proto   | 0.41.2  |
| @opentelemetry/exporter-zipkin             | 1.15.2  |
| @opentelemetry/instrumentation             | 0.41.2  |
| @opentelemetry/instrumentation-aws-lambda  | 0.37.0  |
| @opentelemetry/instrumentation-aws-sdk     | 0.36.0  |
| @opentelemetry/instrumentation-fs          | 0.8.1   |
| @opentelemetry/instrumentation-http        | 0.41.2  |
| @opentelemetry/instrumentation-mongodb     | 0.37.0  |
| @opentelemetry/instrumentation-mysql2      | 0.34.1  |
| @opentelemetry/otlp-exporter-base          | 0.41.2  |
| @opentelemetry/otlp-grpc-exporter-base     | 0.41.2  |
| @opentelemetry/otlp-proto-exporter-base    | 0.41.2  |
| @opentelemetry/otlp-transformer            | 0.41.2  |
| @opentelemetry/propagation-utils           | 0.30.1  |
| @opentelemetry/propagator-aws-xray         | 1.3.1   |
| @opentelemetry/propagator-b3               | 1.15.2  |
| @opentelemetry/propagator-jaeger           | 1.15.2  |
| @opentelemetry/resource-detector-aws       | 1.3.1   |
| @opentelemetry/resources                   | 1.15.2  |
| @opentelemetry/sdk-logs                    | 0.41.2  |
| @opentelemetry/sdk-metrics                 | 1.15.2  |
| @opentelemetry/sdk-node                    | 0.41.2  |
| @opentelemetry/sdk-trace-base              | 1.15.2  |
| @opentelemetry/sdk-trace-node              | 1.15.2  |
| @opentelemetry/semantic-conventions        | 1.15.2  |
| @opentelemetry/sql-common                  | 0.40.0  |
| @protobufjs/aspromise                      | 1.1.2   |
| @protobufjs/base64                         | 1.1.2   |
| @protobufjs/codegen                        | 2.0.4   |
| @protobufjs/eventemitter                   | 1.1.0   |
| @protobufjs/fetch                          | 1.1.0   |
| @protobufjs/float                          | 1.0.2   |
| @protobufjs/inquire                        | 1.1.0   |
| @protobufjs/path                           | 1.1.2   |

|                         |          |
|-------------------------|----------|
| @protobufjs/pool        | 1.1.0    |
| @protobufjs/utf8        | 1.1.0    |
| @tsconfig/node10        | 1.0.9    |
| @tsconfig/node12        | 1.0.11   |
| @tsconfig/node14        | 1.0.3    |
| @tsconfig/node16        | 1.0.4    |
| @types/aws-lambda       | 8.10.119 |
| @types/node             | 20.5.7   |
| @types/shimmer          | 1.0.2    |
| abbrev                  | 1.1.1    |
| accepts                 | 1.3.8    |
| acorn                   | 8.10.0   |
| acorn-import-assertions | 1.9.0    |
| acorn-walk              | 8.2.0    |
| ansi-color              | 0.2.1    |
| ansi-regex              | 5.0.1    |
| ansi-styles             | 4.3.0    |
| anymatch                | 3.1.3    |
| arg                     | 4.1.3    |
| array-flatten           | 1.1.1    |
| asynckit                | 0.4.0    |
| available-typed-arrays  | 1.0.5    |
| aws-sdk                 | 2.1450.0 |
| axios                   | 1.5.0    |
| balanced-match          | 1.0.2    |
| base64-js               | 1.5.1    |
| binary-extensions       | 2.2.0    |
| body-parser             | 1.20.1   |
| body-parser             | 1.20.2   |
| brace-expansion         | 1.1.11   |
| braces                  | 3.0.2    |
| buffer                  | 4.9.2    |
| bufw                    | 1.3.0    |
| bytes                   | 3.1.2    |
| call-bind               | 1.0.2    |
| chokidar                | 3.5.3    |
| cjs-module-lexer        | 1.2.3    |
| cliui                   | 8.0.1    |
| cn-otel-node            | 0.0.1    |
| color-convert           | 2.0.1    |
| color-name              | 1.1.4    |
| combined-stream         | 1.0.8    |
| concat-map              | 0.0.1    |
| content-disposition     | 0.5.4    |
| content-type            | 1.0.5    |
| cookie                  | 0.5.0    |
| cookie-signature        | 1.0.6    |
| create-require          | 1.1.1    |
| debug                   | 2.6.9    |
| debug                   | 3.2.7    |
| debug                   | 4.3.4    |
| delayed-stream          | 1.0.0    |



|                         |        |
|-------------------------|--------|
| depd                    | 2.0.0  |
| destroy                 | 1.2.0  |
| diff                    | 4.0.2  |
| ee-first                | 1.1.1  |
| emoji-regex             | 8.0.0  |
| encodeurl               | 1.0.2  |
| error                   | 7.0.2  |
| escalade                | 3.1.1  |
| escape-html             | 1.0.3  |
| etag                    | 1.8.1  |
| events                  | 1.1.1  |
| express                 | 4.18.2 |
| fill-range              | 7.0.1  |
| finalhandler            | 1.2.0  |
| follow-redirects        | 1.15.2 |
| for-each                | 0.3.3  |
| form-data               | 4.0.0  |
| forwarded               | 0.2.0  |
| fresh                   | 0.5.2  |
| fsevents                | 2.3.3  |
| function-bind           | 1.1.1  |
| get-caller-file         | 2.0.5  |
| get-intrinsic           | 1.2.1  |
| glob-parent             | 5.1.2  |
| gopd                    | 1.0.1  |
| has                     | 1.0.3  |
| has-flag                | 3.0.0  |
| has-proto               | 1.0.1  |
| has-symbols             | 1.0.3  |
| has-tostringtag         | 1.0.0  |
| hexer                   | 1.5.0  |
| http-errors             | 2.0.0  |
| iconv-lite              | 0.4.24 |
| ieee754                 | 1.1.13 |
| ignore-by-default       | 1.0.1  |
| import-in-the-middle    | 1.4.2  |
| inherits                | 2.0.4  |
| ipaddr.js               | 1.9.1  |
| is-arguments            | 1.1.1  |
| is-binary-path          | 2.1.0  |
| is-callable             | 1.2.7  |
| is-core-module          | 2.13.0 |
| is-extglob              | 2.1.1  |
| is-fullwidth-code-point | 3.0.0  |
| is-generator-function   | 1.0.10 |
| is-glob                 | 4.0.3  |
| is-number               | 7.0.0  |
| is-typed-array          | 1.1.12 |
| isarray                 | 1.0.0  |
| jaeger-client           | 3.19.0 |
| jmespath                | 0.16.0 |
| lodash.camelcase        | 4.3.0  |

|                          |        |
|--------------------------|--------|
| lodash.merge             | 4.6.2  |
| long                     | 2.4.0  |
| long                     | 5.2.3  |
| lru-cache                | 6.0.0  |
| make-error               | 1.3.6  |
| media-typer              | 0.3.0  |
| merge-descriptors        | 1.0.1  |
| methods                  | 1.1.2  |
| mime                     | 1.6.0  |
| mime-db                  | 1.52.0 |
| mime-types               | 2.1.35 |
| minimatch                | 3.1.2  |
| minimist                 | 1.2.8  |
| module-details-from-path | 1.0.3  |
| ms                       | 2.0.0  |
| ms                       | 2.1.2  |
| ms                       | 2.1.3  |
| negotiator               | 0.6.3  |
| node-int64               | 0.4.0  |
| nodemon                  | 3.0.1  |
| nopt                     | 1.0.10 |
| normalize-path           | 3.0.0  |
| object-inspect           | 1.12.3 |
| on-finished              | 2.4.1  |
| opentracing              | 0.14.7 |
| parseurl                 | 1.3.3  |
| path-parse               | 1.0.7  |
| path-to-regexp           | 0.1.7  |
| picomatch                | 2.3.1  |
| process                  | 0.10.1 |
| protobufjs               | 7.2.5  |
| proxy-addr               | 2.0.7  |
| proxy-from-env           | 1.1.0  |
| pstree.remy              | 1.1.8  |
| punycode                 | 1.3.2  |
| qs                       | 6.11.0 |
| querystring              | 0.2.0  |
| range-parser             | 1.2.1  |
| raw-body                 | 2.5.1  |
| raw-body                 | 2.5.2  |
| readdirp                 | 3.6.0  |
| require-directory        | 2.1.1  |
| require-in-the-middle    | 7.2.0  |
| resolve                  | 1.22.4 |
| safe-buffer              | 5.2.1  |
| safer-buffer             | 2.1.2  |
| sax                      | 1.2.1  |
| semver                   | 7.5.4  |
| send                     | 0.18.0 |
| serve-static             | 1.15.0 |
| setprototypeof           | 1.2.0  |
| shimmer                  | 1.2.1  |

|                                 |        |
|---------------------------------|--------|
| side-channel                    | 1.0.4  |
| simple-update-notifier          | 2.0.0  |
| statuses                        | 2.0.1  |
| string-template                 | 0.2.1  |
| string-width                    | 4.2.3  |
| strip-ansi                      | 6.0.1  |
| supports-color                  | 5.5.0  |
| supports-preserve-symlinks-flag | 1.0.0  |
| thriftw                         | 3.11.4 |
| to-regex-range                  | 5.0.1  |
| toidentifier                    | 1.0.1  |
| touch                           | 3.1.0  |
| ts-node                         | 10.9.1 |
| tsc                             | 2.0.4  |
| type-is                         | 1.6.18 |
| typescript                      | 4.9.5  |
| undefsafe                       | 2.0.5  |
| unpipe                          | 1.0.0  |
| url                             | 0.10.3 |
| util                            | 0.12.5 |
| utils-merge                     | 1.0.1  |
| uuid                            | 8.0.0  |
| uuid                            | 8.3.2  |
| v8-compile-cache-lib            | 3.0.1  |
| vary                            | 1.1.2  |
| which-typed-array               | 1.1.11 |
| wrap-ansi                       | 7.0.0  |
| xml2js                          | 0.5.0  |
| xmlbuilder                      | 11.0.1 |
| xorshift                        | 1.2.0  |
| xtend                           | 4.0.2  |
| y18n                            | 5.0.8  |
| yallist                         | 4.0.0  |
| yargs                           | 17.7.2 |
| yargs-parser                    | 21.1.1 |
| yn                              | 3.1.1  |

## Python

| Name                                     | Version   |
|--|-----------|
| Deprecated                               | 1.2.14    |
| asgiref                                  | 3.7.2     |
| backoff                                  | 2.2.1     |
| certifi                                  | 2023.7.22 |
| charset-normalizer                       | 3.2.0     |
| dnspython                                | 2.4.2     |
| googleapis-common-protos                 | 1.60.0    |
| idna                                     | 3.4       |
| importlib-metadata                       | 6.8.0     |
| opentelemetry-api                        | 1.19.0    |
| opentelemetry-distro                     | 0.40b0    |
| opentelemetry-exporter-otlp-proto-common | 1.19.0    |

|  |        |
|--|--------|
| opentelemetry-exporter-otlp-proto-http       | 1.19.0 |
| opentelemetry-instrumentation                | 0.40b0 |
| opentelemetry-instrumentation-aiohttp-client | 0.40b0 |
| opentelemetry-instrumentation-asgi           | 0.40b0 |
| opentelemetry-instrumentation-asynccpg       | 0.40b0 |
| opentelemetry-instrumentation-boto           | 0.40b0 |
| opentelemetry-instrumentation-botocore       | 0.40b0 |
| opentelemetry-instrumentation-celery         | 0.40b0 |
| opentelemetry-instrumentation-dbapi          | 0.40b0 |
| opentelemetry-instrumentation-django         | 0.40b0 |
| opentelemetry-instrumentation-elasticsearch  | 0.40b0 |
| opentelemetry-instrumentation-falcon         | 0.40b0 |
| opentelemetry-instrumentation-fastapi        | 0.40b0 |
| opentelemetry-instrumentation-flask          | 0.40b0 |
| opentelemetry-instrumentation-grpc           | 0.40b0 |
| opentelemetry-instrumentation-jinja2         | 0.40b0 |
| opentelemetry-instrumentation-mysql          | 0.40b0 |
| opentelemetry-instrumentation-psycpg2        | 0.40b0 |
| opentelemetry-instrumentation-pymemcache     | 0.40b0 |
| opentelemetry-instrumentation-pymongo        | 0.40b0 |
| opentelemetry-instrumentation-pymysql        | 0.40b0 |
| opentelemetry-instrumentation-pyramid        | 0.40b0 |
| opentelemetry-instrumentation-redis          | 0.40b0 |
| opentelemetry-instrumentation-requests       | 0.40b0 |
| opentelemetry-instrumentation-sqlalchemy     | 0.40b0 |
| opentelemetry-instrumentation-sqlite3        | 0.40b0 |
| opentelemetry-instrumentation-starlette      | 0.40b0 |
| opentelemetry-instrumentation-tornado        | 0.40b0 |
| opentelemetry-instrumentation-urllib         | 0.40b0 |
| opentelemetry-instrumentation-urllib3        | 0.40b0 |
| opentelemetry-instrumentation-wsgi           | 0.40b0 |
| opentelemetry-propagator-aws-xray            | 1.0.1  |
| opentelemetry-proto                          | 1.19.0 |
| opentelemetry-sdk                            | 1.19.0 |
| opentelemetry-semantic-conventions           | 0.40b0 |
| opentelemetry-util-http                      | 0.40b0 |
| packaging                                    | 23.1   |
| protobuf                                     | 4.24.2 |
| pymongo                                      | 4.5.0  |
| requests                                     | 2.31.0 |
| setuptools                                   | 68.1.2 |
| typing_extensions                            | 4.7.1  |
| urllib3                                      | 2.0.4  |
| wrapt  | 1.15.0 |
| zipp   | 3.16.2 |

## IDS Layer version 1.4.0

The following are tables for the IDS Layer version 1.4.0.

### Node.js

| Name | Version |
|------|---------|
|------|---------|

|  |        |
|--|--------|
| @cspotcode/source-map-support              | 0.8.1  |
| @grpc/grpc-js                              | 1.9.1  |
| @grpc/proto-loader                         | 0.7.9  |
| @jridgewell/resolve-uri                    | 3.1.1  |
| @jridgewell/sourcemap-codec                | 1.4.15 |
| @jridgewell/trace-mapping                  | 0.3.9  |
| @opentelemetry/api                         | 1.4.1  |
| @opentelemetry/api-logs                    | 0.41.2 |
| @opentelemetry/api-metrics                 | 0.32.0 |
| @opentelemetry/context-async-hooks         | 1.15.2 |
| @opentelemetry/core                        | 1.14.0 |
| @opentelemetry/core                        | 1.15.2 |
| @opentelemetry/core                        | 1.9.1  |
| @opentelemetry/exporter-jaeger             | 1.15.2 |
| @opentelemetry/exporter-metrics-otlp-http  | 0.41.2 |
| @opentelemetry/exporter-metrics-otlp-proto | 0.41.2 |
| @opentelemetry/exporter-trace-otlp-grpc    | 0.35.1 |
| @opentelemetry/exporter-trace-otlp-grpc    | 0.41.2 |
| @opentelemetry/exporter-trace-otlp-http    | 0.35.1 |
| @opentelemetry/exporter-trace-otlp-http    | 0.41.2 |
| @opentelemetry/exporter-trace-otlp-proto   | 0.41.2 |
| @opentelemetry/exporter-zipkin             | 1.15.2 |
| @opentelemetry/instrumentation             | 0.32.0 |
| @opentelemetry/instrumentation             | 0.35.1 |
| @opentelemetry/instrumentation             | 0.40.0 |
| @opentelemetry/instrumentation             | 0.41.2 |
| @opentelemetry/instrumentation-aws-lambda  | 0.34.1 |
| @opentelemetry/instrumentation-aws-sdk     | 0.36.0 |
| @opentelemetry/instrumentation-fs          | 0.7.4  |
| @opentelemetry/instrumentation-http        | 0.40.0 |
| @opentelemetry/instrumentation-mongodb     | 0.36.1 |
| @opentelemetry/instrumentation-mysql2      | 0.32.1 |
| @opentelemetry/otlp-exporter-base          | 0.35.1 |
| @opentelemetry/otlp-exporter-base          | 0.41.2 |
| @opentelemetry/otlp-grpc-exporter-base     | 0.35.1 |
| @opentelemetry/otlp-grpc-exporter-base     | 0.41.2 |
| @opentelemetry/otlp-proto-exporter-base    | 0.41.2 |
| @opentelemetry/otlp-transformer            | 0.35.1 |
| @opentelemetry/otlp-transformer            | 0.41.2 |
| @opentelemetry/propagation-utils           | 0.30.1 |
| @opentelemetry/propagator-aws-xray         | 1.3.1  |
| @opentelemetry/propagator-b3               | 1.15.2 |
| @opentelemetry/propagator-jaeger           | 1.15.2 |
| @opentelemetry/resource-detector-aws       | 1.3.1  |
| @opentelemetry/resources                   | 1.15.2 |
| @opentelemetry/resources                   | 1.9.1  |
| @opentelemetry/sdk-logs                    | 0.41.2 |
| @opentelemetry/sdk-metrics                 | 1.15.2 |
| @opentelemetry/sdk-metrics                 | 1.9.1  |
| @opentelemetry/sdk-node                    | 0.41.2 |
| @opentelemetry/sdk-trace-base              | 1.15.2 |
| @opentelemetry/sdk-trace-base              | 1.9.1  |

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|-------------------------------------|----------|
| @opentelemetry/sdk-trace-node       | 1.15.2   |
| @opentelemetry/semantic-conventions | 1.14.0   |
| @opentelemetry/semantic-conventions | 1.15.2   |
| @opentelemetry/semantic-conventions | 1.9.1    |
| @protobufjs/aspromise               | 1.1.2    |
| @protobufjs/base64                  | 1.1.2    |
| @protobufjs/codegen                 | 2.0.4    |
| @protobufjs/eventemitter            | 1.1.0    |
| @protobufjs/fetch                   | 1.1.0    |
| @protobufjs/float                   | 1.0.2    |
| @protobufjs/inquire                 | 1.1.0    |
| @protobufjs/path                    | 1.1.2    |
| @protobufjs/pool                    | 1.1.0    |
| @protobufjs/utf8                    | 1.1.0    |
| @tsconfig/node10                    | 1.0.9    |
| @tsconfig/node12                    | 1.0.11   |
| @tsconfig/node14                    | 1.0.3    |
| @tsconfig/node16                    | 1.0.4    |
| @types/aws-lambda                   | 8.10.81  |
| @types/node                         | 20.5.7   |
| @types/shimmer                      | 1.0.2    |
| abbrev                              | 1.1.1    |
| accepts                             | 1.3.8    |
| acorn                               | 8.10.0   |
| acorn-import-assertions             | 1.9.0    |
| acorn-walk                          | 8.2.0    |
| ansi-color                          | 0.2.1    |
| ansi-regex                          | 5.0.1    |
| ansi-styles                         | 4.3.0    |
| anymatch                            | 3.1.3    |
| arg                                 | 4.1.3    |
| array-flatten                       | 1.1.1    |
| asynckit                            | 0.4.0    |
| available-typed-arrays              | 1.0.5    |
| aws-sdk                             | 2.1448.0 |
| axios                               | 1.5.0    |
| balanced-match                      | 1.0.2    |
| base64-js                           | 1.5.1    |
| binary-extensions                   | 2.2.0    |
| body-parser                         | 1.20.1   |
| body-parser                         | 1.20.2   |
| brace-expansion                     | 1.1.11   |
| braces                              | 3.0.2    |
| buffer                              | 4.9.2    |
| bufw                                | 1.3.0    |
| bytes                               | 3.1.2    |
| call-bind                           | 1.0.2    |
| chokidar                            | 3.5.3    |
| cjs-module-lexer                    | 1.2.3    |
| cliui                               | 8.0.1    |
| cn-otel-node                        | 0.0.1    |
| color-convert                       | 2.0.1    |

|                      |        |
|----------------------|--------|
| color-name           | 1.1.4  |
| combined-stream      | 1.0.8  |
| concat-map           | 0.0.1  |
| content-disposition  | 0.5.4  |
| content-type         | 1.0.5  |
| cookie               | 0.5.0  |
| cookie-signature     | 1.0.6  |
| create-require       | 1.1.1  |
| debug                | 2.6.9  |
| debug                | 3.2.7  |
| debug                | 4.3.4  |
| delayed-stream       | 1.0.0  |
| depd                 | 2.0.0  |
| destroy              | 1.2.0  |
| diff                 | 4.0.2  |
| ee-first             | 1.1.1  |
| emoji-regex          | 8.0.0  |
| encodeurl            | 1.0.2  |
| error                | 7.0.2  |
| escalade             | 3.1.1  |
| escape-html          | 1.0.3  |
| etag                 | 1.8.1  |
| events               | 1.1.1  |
| express              | 4.18.2 |
| fill-range           | 7.0.1  |
| finalhandler         | 1.2.0  |
| follow-redirects     | 1.15.2 |
| for-each             | 0.3.3  |
| form-data            | 4.0.0  |
| forwarded            | 0.2.0  |
| fresh                | 0.5.2  |
| fsevents             | 2.3.3  |
| function-bind        | 1.1.1  |
| get-caller-file      | 2.0.5  |
| get-intrinsic        | 1.2.1  |
| glob-parent          | 5.1.2  |
| gopd                 | 1.0.1  |
| has                  | 1.0.3  |
| has-flag             | 3.0.0  |
| has-proto            | 1.0.1  |
| has-symbols          | 1.0.3  |
| has-tostringtag      | 1.0.0  |
| hexer                | 1.5.0  |
| http-errors          | 2.0.0  |
| iconv-lite           | 0.4.24 |
| ieee754              | 1.1.13 |
| ignore-by-default    | 1.0.1  |
| import-in-the-middle | 1.3.5  |
| import-in-the-middle | 1.4.2  |
| inherits             | 2.0.4  |
| ipaddr.js            | 1.9.1  |
| is-arguments         | 1.1.1  |

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|--------------------------|--------|
| is-binary-path           | 2.1.0  |
| is-callable              | 1.2.7  |
| is-core-module           | 2.13.0 |
| is-extglob               | 2.1.1  |
| is-fullwidth-code-point  | 3.0.0  |
| is-generator-function    | 1.0.10 |
| is-glob                  | 4.0.3  |
| is-number                | 7.0.0  |
| is-typed-array           | 1.1.12 |
| isarray                  | 1.0.0  |
| jaeger-client            | 3.19.0 |
| jmespath                 | 0.16.0 |
| lodash.camelcase         | 4.3.0  |
| lodash.merge             | 4.6.2  |
| long                     | 2.4.0  |
| long                     | 5.2.3  |
| lru-cache                | 6.0.0  |
| make-error               | 1.3.6  |
| media-typer              | 0.3.0  |
| merge-descriptors        | 1.0.1  |
| methods                  | 1.1.2  |
| mime                     | 1.6.0  |
| mime-db                  | 1.52.0 |
| mime-types               | 2.1.35 |
| minimatch                | 3.1.2  |
| minimist                 | 1.2.8  |
| module-details-from-path | 1.0.3  |
| ms                       | 2.0.0  |
| ms                       | 2.1.2  |
| ms                       | 2.1.3  |
| negotiator               | 0.6.3  |
| node-int64               | 0.4.0  |
| nodemon                  | 3.0.1  |
| nopt                     | 1.0.10 |
| normalize-path           | 3.0.0  |
| object-inspect           | 1.12.3 |
| on-finished              | 2.4.1  |
| opentracing              | 0.14.7 |
| parseurl                 | 1.3.3  |
| path-parse               | 1.0.7  |
| path-to-regexp           | 0.1.7  |
| picomatch                | 2.3.1  |
| process                  | 0.10.1 |
| protobufjs               | 7.2.5  |
| proxy-addr               | 2.0.7  |
| proxy-from-env           | 1.1.0  |
| pstree.remy              | 1.1.8  |
| punycode                 | 1.3.2  |
| qs                       | 6.11.0 |
| querystring              | 0.2.0  |
| range-parser             | 1.2.1  |
| raw-body                 | 2.5.1  |



|                                 |        |
|---------------------------------|--------|
| raw-body                        | 2.5.2  |
| readdirp                        | 3.6.0  |
| require-directory               | 2.1.1  |
| require-in-the-middle           | 5.2.0  |
| require-in-the-middle           | 7.2.0  |
| resolve                         | 1.22.4 |
| safe-buffer                     | 5.2.1  |
| safer-buffer                    | 2.1.2  |
| sax                             | 1.2.1  |
| semver                          | 7.5.4  |
| send                            | 0.18.0 |
| serve-static                    | 1.15.0 |
| setprototypeof                  | 1.2.0  |
| shimmer                         | 1.2.1  |
| side-channel                    | 1.0.4  |
| simple-update-notifier          | 2.0.0  |
| statuses                        | 2.0.1  |
| string-template                 | 0.2.1  |
| string-width                    | 4.2.3  |
| strip-ansi                      | 6.0.1  |
| supports-color                  | 5.5.0  |
| supports-preserve-symlinks-flag | 1.0.0  |
| thriftw                         | 3.11.4 |
| to-regex-range                  | 5.0.1  |
| toidentifier                    | 1.0.1  |
| touch                           | 3.1.0  |
| ts-node                         | 10.9.1 |
| tsc                             | 2.0.4  |
| type-is                         | 1.6.18 |
| typescript                      | 4.9.5  |
| undefsafe                       | 2.0.5  |
| unpipe                          | 1.0.0  |
| url                             | 0.10.3 |
| util                            | 0.12.5 |
| utils-merge                     | 1.0.1  |
| uuid                            | 8.0.0  |
| uuid                            | 8.3.2  |
| v8-compile-cache-lib            | 3.0.1  |
| vary                            | 1.1.2  |
| which-typed-array               | 1.1.11 |
| wrap-ansi                       | 7.0.0  |
| xml2js                          | 0.5.0  |
| xmlbuilder                      | 11.0.1 |
| xorshift                        | 1.2.0  |
| xtend                           | 4.0.2  |
| y18n                            | 5.0.8  |
| yallist                         | 4.0.0  |
| yargs                           | 17.7.2 |
| yargs-parser                    | 21.1.1 |
| yn                              | 3.1.1  |

## Python

| Name   | Version   |
|--|-----------|
| Deprecated                                   | 1.2.14    |
| asgiref                                      | 3.7.2     |
| backoff                                      | 2.2.1     |
| certifi                                      | 2023.7.22 |
| charset-normalizer                           | 3.2.0     |
| dnspython                                    | 2.4.2     |
| googleapis-common-protos                     | 1.60.0    |
| idna   | 3.4       |
| importlib-metadata                           | 6.0.0     |
| importlib-metadata                           | 6.8.0     |
| opentelemetry-api                            | 1.19.0    |
| opentelemetry-distro                         | 0.40b0    |
| opentelemetry-exporter-otlp-proto-common     | 1.19.0    |
| opentelemetry-exporter-otlp-proto-http       | 1.19.0    |
| opentelemetry-instrumentation                | 0.40b0    |
| opentelemetry-instrumentation-aiohttp-client | 0.40b0    |
| opentelemetry-instrumentation-asgi           | 0.40b0    |
| opentelemetry-instrumentation-asynpg         | 0.40b0    |
| opentelemetry-instrumentation-boto           | 0.40b0    |
| opentelemetry-instrumentation-botocore       | 0.40b0    |
| opentelemetry-instrumentation-celery         | 0.40b0    |
| opentelemetry-instrumentation-dbapi          | 0.40b0    |
| opentelemetry-instrumentation-django         | 0.40b0    |
| opentelemetry-instrumentation-elasticsearch  | 0.40b0    |
| opentelemetry-instrumentation-falcon         | 0.40b0    |
| opentelemetry-instrumentation-fastapi        | 0.40b0    |
| opentelemetry-instrumentation-flask          | 0.40b0    |
| opentelemetry-instrumentation-grpc           | 0.40b0    |
| opentelemetry-instrumentation-jinja2         | 0.40b0    |
| opentelemetry-instrumentation-mysql          | 0.40b0    |
| opentelemetry-instrumentation-psycopg2       | 0.40b0    |
| opentelemetry-instrumentation-pymemcache     | 0.40b0    |
| opentelemetry-instrumentation-pymongo        | 0.40b0    |
| opentelemetry-instrumentation-pymysql        | 0.40b0    |
| opentelemetry-instrumentation-pyramid        | 0.40b0    |
| opentelemetry-instrumentation-redis          | 0.40b0    |
| opentelemetry-instrumentation-requests       | 0.40b0    |
| opentelemetry-instrumentation-sqlalchemy     | 0.40b0    |
| opentelemetry-instrumentation-sqlite3        | 0.40b0    |
| opentelemetry-instrumentation-starlette      | 0.40b0    |
| opentelemetry-instrumentation-tornado        | 0.40b0    |
| opentelemetry-instrumentation-urllib         | 0.40b0    |
| opentelemetry-instrumentation-urllib3        | 0.40b0    |
| opentelemetry-instrumentation-wsgi           | 0.40b0    |
| opentelemetry-propagator-aws-xray            | 1.0.1     |
| opentelemetry-proto                          | 1.19.0    |
| opentelemetry-sdk                            | 1.19.0    |
| opentelemetry-semantic-conventions           | 0.40b0    |
| opentelemetry-util-http                      | 0.40b0    |

|                   |        |
|-------------------|--------|
| packaging         | 23.1   |
| protobuf          | 4.24.2 |
| pymongo           | 4.5.0  |
| requests          | 2.31.0 |
| setuptools        | 68.1.2 |
| typing_extensions | 4.7.1  |
| urllib3           | 2.0.4  |
| wrapt             | 1.15.0 |
| zipp              | 3.16.2 |

## IDS Layer version 1.0.0 - 1.3.0

The following are tables for the IDS Layer versions 1.0.0 to 1.3.0.

### Node.js

| name                                       | version |
|--|---------|
| @babel/code-frame                          | 7.12.11 |
| @babel/helper-validator-identifier         | 7.19.1  |
| @babel/highlight                           | 7.18.6  |
| @cspotcode/source-map-support              | 0.8.1   |
| @eslint/eslintrc                           | 0.4.3   |
| @grpc/grpc-js                              | 1.8.14  |
| @grpc/proto-loader                         | 0.7.7   |
| @humanwhocodes/config-array                | 0.5.0   |
| @humanwhocodes/object-schema               | 1.2.1   |
| @isaacs/cliui                              | 8.0.2   |
| @jridgewell/resolve-uri                    | 3.1.1   |
| @jridgewell/sourcemap-codec                | 1.4.15  |
| @jridgewell/trace-mapping                  | 0.3.9   |
| @nodelib/fs.scandir                        | 2.1.5   |
| @nodelib/fs.stat                           | 2.0.5   |
| @nodelib/fs.walk                           | 1.2.8   |
| @opentelemetry/api                         | 1.3.0   |
| @opentelemetry/api                         | 1.4.1   |
| @opentelemetry/api-metrics                 | 0.32.0  |
| @opentelemetry/context-async-hooks         | 1.13.0  |
| @opentelemetry/core                        | 1.13.0  |
| @opentelemetry/exporter-jaeger             | 1.13.0  |
| @opentelemetry/exporter-metrics-otlp-http  | 0.34.0  |
| @opentelemetry/exporter-metrics-otlp-proto | 0.34.0  |
| @opentelemetry/exporter-trace-otlp-grpc    | 0.35.1  |
| @opentelemetry/exporter-trace-otlp-http    | 0.35.1  |
| @opentelemetry/exporter-trace-otlp-proto   | 0.34.0  |
| @opentelemetry/exporter-zipkin             | 1.8.0   |
| @opentelemetry/instrumentation             | 0.35.1  |
| @opentelemetry/instrumentation             | 0.39.1  |
| @opentelemetry/instrumentation-aws-lambda  | 0.34.1  |
| @opentelemetry/instrumentation-aws-sdk     | 0.33.0  |
| @opentelemetry/instrumentation-fs          | 0.7.2   |
| @opentelemetry/instrumentation-mysql2      | 0.32.1  |
| @opentelemetry/otlp-exporter-base          | 0.34.0  |

|   |  |
|---|--|
| @opentelemetry/otlp-grpc-exporter-base  | 0.35.1   |
| @opentelemetry/otlp-proto-exporter-base | 0.34.0   |
| @opentelemetry/otlp-transformer         | 0.34.0   |
| @opentelemetry/propagation-utils        | 0.29.3   |
| @opentelemetry/propagator-aws-xray      | 1.2.0  |
| @opentelemetry/propagator-b3            | 1.13.0   |
| @opentelemetry/propagator-jaeger        | 1.13.0   |
| @opentelemetry/resource-detector-aws    | 1.2.3  |
| @opentelemetry/resources                | 1.13.0   |
| @opentelemetry/sdk-metrics              | 1.8.0  |
| @opentelemetry/sdk-node                 | 0.34.0   |
| @opentelemetry/sdk-trace-base           | 1.13.0   |
| @opentelemetry/sdk-trace-node           | 1.13.0   |
| @opentelemetry/semantic-conventions     | 1.13.0   |
| @pkgjs/parseargs                        | 0.11.0   |
| @protobufjs/aspromise                   | 1.1.2  |
| @protobufjs/base64                      | 1.1.2  |
| @protobufjs/codegen                     | 2.0.4  |
| @protobufjs/eventemitter                | 1.1.0  |
| @protobufjs/fetch                       | 1.1.0  |
| @protobufjs/float                       | 1.0.2  |
| @protobufjs/inquire                     | 1.1.0  |
| @protobufjs/path                        | 1.1.2  |
| @protobufjs/pool                        | 1.1.0  |
| @protobufjs/utf8                        | 1.1.0  |
| @tsconfig/node10                        | 1.0.9  |
| @tsconfig/node12                        | 1.0.11   |
| @tsconfig/node14                        | 1.0.3  |
| @tsconfig/node16                        | 1.0.4  |
| @types/aws-lambda                       | 8.10.81  |
| @types/json-schema                      | 7.0.11   |
| @types/long                             | 4.0.2  |
| @types/minimist                         | 1.2.2  |
| @types/mocha                            | 10.0.1   |
| @types/mysql                            | git+ssh://git@github.com/types/<br>mysql.git#c26b1bc2bac17010081455e3127a90fb2eafcec9  |
| @types/mysql2                           | git+ssh://git@github.com/types/<br>mysql2.git#89378b2cb3974ea8cdd1d633b8f056e54e5d2384 |
| @types/node                             | 18.16.9  |
| @types/node                             | 20.1.4   |
| @types/normalize-package-data           | 2.4.1  |
| @types/semver                           | 7.5.0  |
| @typescript-eslint/eslint-plugin        | 4.33.0   |
| @typescript-eslint/experimental-utils   | 4.33.0   |
| @typescript-eslint/parser               | 4.33.0   |
| @typescript-eslint/scope-manager        | 4.33.0   |
| @typescript-eslint/types                | 4.33.0   |
| @typescript-eslint/typescript-estree    | 4.33.0   |
| @typescript-eslint/visitor-keys         | 4.33.0   |
| abbrev                                  | 1.1.1  |
| accepts                                 | 1.3.8  |
| acorn                                   | 7.4.1  |

|                        |          |
|------------------------|----------|
| acorn                  | 8.8.2    |
| acorn-jsx              | 5.3.2    |
| acorn-walk             | 8.2.0    |
| ajv                    | 6.12.6   |
| ansi-color             | 0.2.1    |
| ansi-colors            | 4.1.3    |
| ansi-escapes           | 4.3.2    |
| ansi-regex             | 5.0.1    |
| ansi-styles            | 4.3.0    |
| anymatch               | 3.1.3    |
| arg                    | 4.1.3    |
| argparse               | 1.0.10   |
| array-flatten          | 1.1.1    |
| array-union            | 2.1.0    |
| arrify                 | 1.0.1    |
| astral-regex           | 2.0.0    |
| asyncit                | 0.4.0    |
| available-typed-arrays | 1.0.5    |
| aws-sdk                | 2.1378.0 |
| axios                  | 1.4.0    |
| balanced-match         | 1.0.2    |
| base64-js              | 1.5.1    |
| binary-extensions      | 2.2.0    |
| body-parser            | 1.20.2   |
| brace-expansion        | 1.1.11   |
| braces                 | 3.0.2    |
| buffer                 | 4.9.2    |
| bufw                   | 1.3.0    |
| bytes                  | 3.1.2    |
| call-bind              | 1.0.2    |
| callsites              | 3.1.0    |
| camelcase              | 5.3.1    |
| camelcase-keys         | 6.2.2    |
| chalk                  | 4.1.2    |
| chardet                | 0.7.0    |
| chokidar               | 3.5.3    |
| cli-cursor             | 3.1.0    |
| cli-width              | 3.0.0    |
| cliui                  | 8.0.1    |
| color-convert          | 2.0.1    |
| color-name             | 1.1.4    |
| combined-stream        | 1.0.8    |
| concat-map             | 0.0.1    |
| content-disposition    | 0.5.4    |
| content-type           | 1.0.5    |
| cookie                 | 0.5.0    |
| cookie-signature       | 1.0.6    |
| create-require         | 1.1.1    |
| cross-spawn            | 7.0.3    |
| debug                  | 2.6.9    |
| debug                  | 4.3.4    |
| decamelize             | 1.2.0    |

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|----------------------------|--------|
| decamelize-keys            | 1.1.1  |
| deep-is                    | 0.1.4  |
| delayed-stream             | 1.0.0  |
| denque                     | 1.5.1  |
| depd                       | 2.0.0  |
| destroy                    | 1.2.0  |
| diff                       | 4.0.2  |
| dir-glob                   | 3.0.1  |
| doctrine                   | 3.0.0  |
| eastasianwidth             | 0.2.0  |
| ee-first                   | 1.1.1  |
| emoji-regex                | 8.0.0  |
| encodeurl                  | 1.0.2  |
| enquirer                   | 2.3.6  |
| error                      | 7.0.2  |
| error-ex                   | 1.3.2  |
| escalade                   | 3.1.1  |
| escape-html                | 1.0.3  |
| escape-string-regexp       | 4.0.0  |
| eslint                     | 7.32.0 |
| eslint-config-prettier     | 7.2.0  |
| eslint-plugin-es           | 3.0.1  |
| eslint-plugin-node         | 11.1.0 |
| eslint-plugin-prettier     | 3.4.1  |
| eslint-scope               | 5.1.1  |
| eslint-utils               | 3.0.0  |
| eslint-visitor-keys        | 2.1.0  |
| espre                      | 7.3.1  |
| esprima                    | 4.0.1  |
| esquery                    | 1.5.0  |
| esrecurse                  | 4.3.0  |
| estraverse                 | 4.3.0  |
| esutils                    | 2.0.3  |
| etag                       | 1.8.1  |
| events                     | 1.1.1  |
| execa                      | 5.1.1  |
| express                    | 4.18.2 |
| external-editor            | 3.1.0  |
| fast-deep-equal            | 3.1.3  |
| fast-diff                  | 1.2.0  |
| fast-glob                  | 3.2.12 |
| fast-json-stable-stringify | 2.1.0  |
| fast-levenshtein           | 2.0.6  |
| fastq                      | 1.15.0 |
| figures                    | 3.2.0  |
| file-entry-cache           | 6.0.1  |
| fill-range                 | 7.0.1  |
| finalhandler               | 1.2.0  |
| find-up                    | 4.1.0  |
| flat-cache                 | 3.0.4  |
| flatted                    | 3.2.7  |
| follow-redirects           | 1.15.2 |

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|---------------------------|---------|
| for-each                  | 0.3.3   |
| foreground-child          | 3.1.1   |
| form-data                 | 4.0.0   |
| forwarded                 | 0.2.0   |
| fresh                     | 0.5.2   |
| fs.realpath               | 1.0.0   |
| fsevents                  | 2.3.2   |
| function-bind             | 1.1.1   |
| functional-red-black-tree | 1.0.1   |
| generate-function         | 2.3.1   |
| get-caller-file           | 2.0.5   |
| get-intrinsic             | 1.2.1   |
| get-stream                | 6.0.1   |
| glob                      | 10.2.4  |
| glob-parent               | 5.1.2   |
| globals                   | 13.20.0 |
| globby                    | 11.1.0  |
| gopd                      | 1.0.1   |
| gts                       | 3.1.1   |
| hard-rejection            | 2.1.0   |
| has                       | 1.0.3   |
| has-flag                  | 3.0.0   |
| has-flag                  | 4.0.0   |
| has-proto                 | 1.0.1   |
| has-symbols               | 1.0.3   |
| has-tostringtag           | 1.0.0   |
| hexer                     | 1.5.0   |
| hosted-git-info           | 4.1.0   |
| http-errors               | 2.0.0   |
| human-signals             | 2.1.0   |
| iconv-lite                | 0.4.24  |
| ieee754                   | 1.1.13  |
| ignore                    | 5.2.4   |
| ignore-by-default         | 1.0.1   |
| import-fresh              | 3.3.0   |
| imurmurhash               | 0.1.4   |
| indent-string             | 4.0.0   |
| inflight                  | 1.0.6   |
| inherits                  | 2.0.4   |
| inquirer                  | 7.3.3   |
| ipaddr.js                 | 1.9.1   |
| is-arguments              | 1.1.1   |
| is-arrayish               | 0.2.1   |
| is-binary-path            | 2.1.0   |
| is-callable               | 1.2.7   |
| is-core-module            | 2.12.0  |
| is-extglob                | 2.1.1   |
| is-fullwidth-code-point   | 3.0.0   |
| is-generator-function     | 1.0.10  |
| is-glob                   | 4.0.3   |
| is-number                 | 7.0.0   |
| is-plain-obj              | 1.1.0   |

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|---------------------------------------|---------|
| is-property                           | 1.0.2   |
| is-stream                             | 2.0.1   |
| is-typed-array                        | 1.1.10  |
| is-typedarray                         | 1.0.0   |
| isarray                               | 1.0.0   |
| isexe                                 | 2.0.0   |
| jackspeak                             | 2.2.0   |
| jaeger-client                         | 3.19.0  |
| jmespath                              | 0.16.0  |
| js-tokens                             | 4.0.0   |
| js-yaml                               | 3.14.1  |
| json-parse-even-better-errors         | 2.3.1   |
| json-schema-traverse                  | 0.4.1   |
| json-stable-stringify-without-jsonify | 1.0.1   |
| json5                                 | 2.2.3   |
| kind-of                               | 6.0.3   |
| levn                                  | 0.4.1   |
| lines-and-columns                     | 1.2.4   |
| locate-path                           | 5.0.0   |
| lodash                                | 4.17.21 |
| lodash.camelcase                      | 4.3.0   |
| lodash.merge                          | 4.6.2   |
| lodash.truncate                       | 4.4.2   |
| long                                  | 4.0.0   |
| lru-cache                             | 6.0.0   |
| make-error                            | 1.3.6   |
| map-obj                               | 4.3.0   |
| media-typer                           | 0.3.0   |
| meow                                  | 9.0.0   |
| merge-descriptors                     | 1.0.1   |
| merge-stream                          | 2.0.0   |
| merge2                                | 1.4.1   |
| methods                               | 1.1.2   |
| micromatch                            | 4.0.5   |
| mime                                  | 1.6.0   |
| mime-db                               | 1.52.0  |
| mime-types                            | 2.1.35  |
| mimic-fn                              | 2.1.0   |
| min-indent                            | 1.0.1   |
| minimatch                             | 3.1.2   |
| minimist                              | 1.2.8   |
| minimist-options                      | 4.1.0   |
| minipass                              | 6.0.0   |
| module-details-from-path              | 1.0.3   |
| ms                                    | 2.0.0   |
| ms                                    | 2.1.2   |
| mute-stream                           | 0.0.8   |
| mysql2                                | 2.3.0   |
| named-placeholders                    | 1.1.3   |
| natural-compare                       | 1.4.0   |
| ncp                                   | 2.0.0   |
| negotiator                            | 0.6.3   |



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|-------------------------|--------|
| node-int64              | 0.4.0  |
| nodemon                 | 2.0.22 |
| nopt                    | 1.0.10 |
| normalize-package-data  | 3.0.3  |
| normalize-path          | 3.0.0  |
| npm-run-path            | 4.0.1  |
| object-inspect          | 1.12.3 |
| on-finished             | 2.4.1  |
| once                    | 1.4.0  |
| onetime                 | 5.1.2  |
| opentracing             | 0.14.7 |
| optionator              | 0.9.1  |
| os-tmpdir               | 1.0.2  |
| p-limit                 | 2.3.0  |
| p-locate                | 4.1.0  |
| p-try                   | 2.2.0  |
| parent-module           | 1.0.1  |
| parse-json              | 5.2.0  |
| parseurl                | 1.3.3  |
| path-exists             | 4.0.0  |
| path-is-absolute        | 1.0.1  |
| path-key                | 3.1.1  |
| path-parse              | 1.0.7  |
| path-scurry             | 1.9.1  |
| path-to-regexp          | 0.1.7  |
| path-type               | 4.0.0  |
| picomatch               | 2.3.1  |
| prelude-ls              | 1.2.1  |
| prettier                | 2.8.8  |
| prettier-linter-helpers | 1.0.0  |
| process                 | 0.10.1 |
| progress                | 2.0.3  |
| protobufjs              | 7.2.3  |
| proxy-addr              | 2.0.7  |
| proxy-from-env          | 1.1.0  |
| pstree.remy             | 1.1.8  |
| punycode                | 1.3.2  |
| punycode                | 2.3.0  |
| qs                      | 6.11.0 |
| querystring             | 0.2.0  |
| queue-microtask         | 1.2.3  |
| quick-lru               | 4.0.1  |
| range-parser            | 1.2.1  |
| raw-body                | 2.5.2  |
| read-pkg                | 5.2.0  |
| read-pkg-up             | 7.0.1  |
| readdirp                | 3.6.0  |
| redent                  | 3.0.0  |
| regexpp                 | 3.2.0  |
| require-directory       | 2.1.1  |
| require-from-string     | 2.0.2  |
| require-in-the-middle   | 5.2.0  |

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|---------------------------------|------------------------|
| require-in-the-middle           | 7.1.0                  |
| resolve                         | 1.22.2                 |
| resolve-from                    | 4.0.0                  |
| restore-cursor                  | 3.1.0                  |
| reusify                         | 1.0.4                  |
| rimraf                          | 5.0.0                  |
| run-async                       | 2.4.1                  |
| run-parallel                    | 1.2.0                  |
| rxjs                            | 6.6.7                  |
| safe-buffer                     | 5.2.1                  |
| safer-buffer                    | 2.1.2                  |
| sax                             | 1.2.1                  |
| semver                          | 7.5.1                  |
| send                            | 0.18.0                 |
| seq-queue                       | 0.0.5                  |
| serve-static                    | 1.15.0                 |
| setprototypeof                  | 1.2.0                  |
| shebang-command                 | 2.0.0                  |
| shebang-regex                   | 3.0.0                  |
| shimmer                         | 1.2.1                  |
| side-channel                    | 1.0.4                  |
| signal-exit                     | 3.0.7                  |
| simple-update-notifier          | 1.1.0                  |
| slash                           | 3.0.0                  |
| slice-ansi                      | 4.0.0                  |
| spdx-correct                    | 3.2.0                  |
| spdx-exceptions                 | 2.3.0                  |
| spdx-expression-parse           | 3.0.1                  |
| spdx-license-ids                | 3.0.13                 |
| sprintf-js                      | 1.0.3                  |
| sqlstring                       | 2.3.3                  |
| statuses                        | 2.0.1                  |
| string-template                 | 0.2.1                  |
| string-width                    | 4.2.3                  |
| string-width-cjs                | npm:string-width@4.2.3 |
| strip-ansi                      | 6.0.1                  |
| strip-ansi-cjs                  | npm:strip-ansi@6.0.1   |
| strip-final-newline             | 2.0.0                  |
| strip-indent                    | 3.0.0                  |
| strip-json-comments             | 3.1.1                  |
| supports-color                  | 5.5.0                  |
| supports-color                  | 7.2.0                  |
| supports-preserve-symlinks-flag | 1.0.0                  |
| table                           | 6.8.1                  |
| text-table                      | 0.2.0                  |
| thriftw                         | 3.12.0                 |
| through                         | 2.3.8                  |
| tmp                             | 0.0.33                 |
| to-regex-range                  | 5.0.1                  |
| toidentifier                    | 1.0.1                  |
| touch                           | 3.1.0                  |
| trim-newlines                   | 3.0.1                  |

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|------------------------------|---------------------|
| ts-node                      | 10.9.1              |
| tsc                          | 2.0.4               |
| tslib                        | 1.14.1              |
| tsutils                      | 3.21.0              |
| type-check                   | 0.4.0               |
| type-fest                    | 0.20.2              |
| type-is                      | 1.6.18              |
| typedarray-to-buffer         | 3.1.5               |
| typescript                   | 4.9.5               |
| typescript                   | 5.0.4               |
| undefsafe                    | 2.0.5               |
| unpipe                       | 1.0.0               |
| uri-js                       | 4.4.1               |
| url                          | 0.10.3              |
| util                         | 0.12.5              |
| utils-merge                  | 1.0.1               |
| uuid                         | 8.0.0               |
| v8-compile-cache             | 2.3.0               |
| v8-compile-cache-lib         | 3.0.1               |
| validate-npm-package-license | 3.0.4               |
| vary                         | 1.1.2               |
| which                        | 2.0.2               |
| which-typed-array            | 1.1.9               |
| word-wrap                    | 1.2.3               |
| wrap-ansi                    | 7.0.0               |
| wrap-ansi                    | 8.1.0               |
| wrap-ansi-cjs                | npm:wrap-ansi@7.0.0 |
| wrappy                       | 1.0.2               |
| write-file-atomic            | 3.0.3               |
| xml2js                       | 0.5.0               |
| xmlbuilder                   | 11.0.1              |
| xorshift                     | 1.2.0               |
| xtend                        | 4.0.2               |
| y18n                         | 5.0.8               |
| yallist                      | 4.0.0               |
| yargs                        | 17.7.2              |
| yargs-parser                 | 20.2.9              |
| yargs-parser                 | 21.1.1              |
| yn                           | 3.1.1               |

## Python

| name                     | version  |
|--------------------------|----------|
| deprecated               | 1.2.13   |
| asgiref                  | 3.6.0    |
| backoff                  | 2.2.1    |
| certifi                  | 2023.5.7 |
| charset-normalizer       | 3.1.0    |
| googleapis-common-protos | 1.59.0   |
| idna                     | 3.4      |
| importlib-metadata       | 6.0.1    |
| opentelemetry-api        | 1.17.0   |

|  |         |
|--|---------|
| opentelemetry-distro                         | 0.38b.0 |
| opentelemetry-distro                         | 0.38b0  |
| opentelemetry-exporter-otlp-proto-http       | 1.17.0  |
| opentelemetry-instrumentation                | 0.38b0  |
| opentelemetry-instrumentation-aiohttp-client | 0.38b0  |
| opentelemetry-instrumentation-asgi           | 0.38b0  |
| opentelemetry-instrumentation-asynpg         | 0.38b0  |
| opentelemetry-instrumentation-boto           | 0.38b0  |
| opentelemetry-instrumentation-botocore       | 0.38b0  |
| opentelemetry-instrumentation-celery         | 0.38b0  |
| opentelemetry-instrumentation-dbapi          | 0.38b0  |
| opentelemetry-instrumentation-django         | 0.38b0  |
| opentelemetry-instrumentation-elasticsearch  | 0.38b0  |
| opentelemetry-instrumentation-falcon         | 0.38b0  |
| opentelemetry-instrumentation-fastapi        | 0.38b0  |
| opentelemetry-instrumentation-flask          | 0.38b0  |
| opentelemetry-instrumentation-grpc           | 0.38b0  |
| opentelemetry-instrumentation-jinja2         | 0.38b0  |
| opentelemetry-instrumentation-mysql          | 0.38b0  |
| opentelemetry-instrumentation-psycpg2        | 0.38b0  |
| opentelemetry-instrumentation-pymemcache     | 0.38b0  |
| opentelemetry-instrumentation-pymongo        | 0.38b0  |
| opentelemetry-instrumentation-pymysql        | 0.38b0  |
| opentelemetry-instrumentation-pyramid        | 0.38b0  |
| opentelemetry-instrumentation-redis          | 0.38b0  |
| opentelemetry-instrumentation-requests       | 0.38b0  |
| opentelemetry-instrumentation-sqlalchemy     | 0.38b0  |
| opentelemetry-instrumentation-sqlite3        | 0.38b0  |
| opentelemetry-instrumentation-starlette      | 0.38b0  |
| opentelemetry-instrumentation-tornado        | 0.38b0  |
| opentelemetry-instrumentation-wsgi           | 0.38b0  |
| opentelemetry-propagator-aws-xray            | 1.0.1   |
| opentelemetry-proto                          | 1.17.0  |
| opentelemetry-sdk                            | 1.17.0  |
| opentelemetry-semantic-conventions           | 0.38b0  |
| opentelemetry-util-http                      | 0.38b0  |
| protobuf                                     | 4.23.0  |
| requests                                     | 2.30.0  |
| setuptools                                   | 67.7.2  |
| typing_extensions                            | 4.5.0   |
| urllib3                                      | 2.0.2   |
| wrapt  | 1.15.0  |
| zipp   | 3.15.0  |

## Contrast Serverless supported languages

The following programming languages are supported for Contrast Serverless.

| Language | Runtime version                |
|----------|--------------------------------|
| Java     | 8.x, 11.x, 17.x                |
| .NET     | .NET 5.x, 6.x<br>.NET Core 3.1 |

| Language | Runtime version        |
|----------|------------------------|
| Node.js  | 12.x, 14.x, 16.x, 18.x |
| Python   | 3.6, 3.7, 3.8, 3.9     |

## Contrast Serverless supported platforms

The following platforms are supported for Contrast Serverless.

- AWS Lambda
- Microsoft Azure

## Multi-region support

Contrast Serverless provides support for multiple regions in a single AWS account to help organizations with teams that work within different regions.

With this, you will be able to onboard agents to multiple regions within the same AWS account. You will also be able to view and manage the account and region separately for each combination of account and region.



### NOTE

All supported regions can be added to a single AWS account.

## Supported regions

Contrast Serverless supports the following regions:

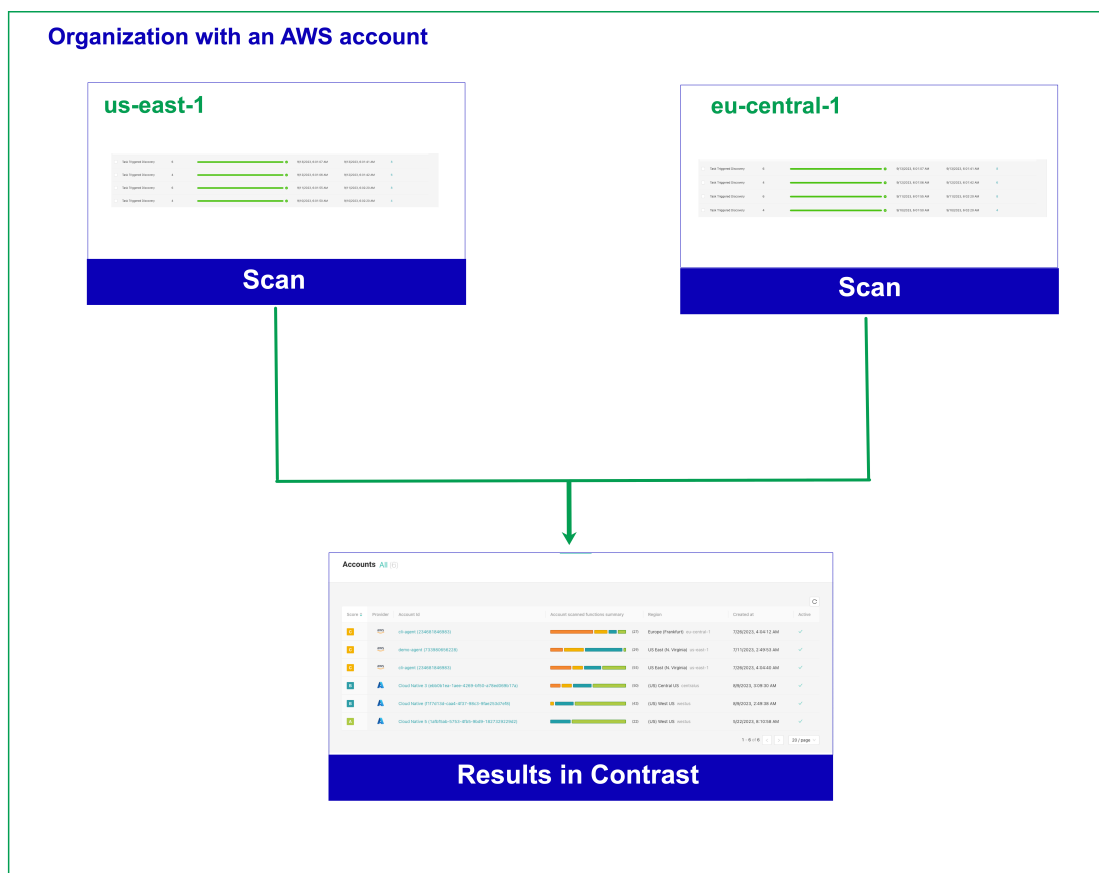
| Serverless environment name | Site  | Supported regions  |
|-----------------------------|---|--|
| AppUS                       | <a href="https://cs001.contrastsecurity.com">https://cs001.contrastsecurity.com</a><br><a href="https://app.contrastsecurity.com">https://app.contrastsecurity.com</a><br><a href="https://eval.contrastsecurity.com">https://eval.contrastsecurity.com</a><br><a href="https://security-research.contrastsecurity.com">https://security-research.contrastsecurity.com</a><br><a href="https://ce.contrastsecurity.com">https://ce.contrastsecurity.com</a> | us-east-1<br>us-east-2<br>eu-west-1<br>eu-west-2<br>eu-central-1<br>eu-north-1<br>ap-northeast-1<br>ap-northeast-3<br>ap-southeast-1<br>us-west-1<br>us-west-2<br>ca-central-1 |
| AppTWO                      | <a href="https://apptwo.contrastsecurity.com">https://apptwo.contrastsecurity.com</a>   | us-east-1<br>eu-central-1<br>eu-west-1   |
| AppJAPAN                    | <a href="https://app.contrastsecurity.jp">https://app.contrastsecurity.jp</a>   | ap-northeast-1<br>ap-northeast-3   |
| AppUK                       | <a href="https://cs002.contrastsecurity.com">https://cs002.contrastsecurity.com</a>   | eu-west-2  |
| AppEU                       | <a href="https://eval003.contrastsecurity.com">https://eval003.contrastsecurity.com</a><br><a href="https://cs003.contrastsecurity.com">https://cs003.contrastsecurity.com</a>  | eu-west-1<br>eu-west-2<br>eu-central-1<br>us-east-1  |
| Staging (dev1eu)            | <a href="https://teamserver-staging.contsec.com">https://teamserver-staging.contsec.com</a>   | eu-central-1<br>us-east-1<br>eu-west-1   |

## How it works

- With one AWS account for an organization, onboard the first region, then onboard the next region and so on.

Example: A development team has to onboard an account in *us-east-1*, which has the same applications (but different modules/code packages) used by another development team in *eu-central-1*.

- Once the regions are set up, you can run scans as usual and then see the results and graphs in Contrast.
- In Contrast, you will see the different on-boarded accounts based on region location.
- All account details including the region details, the number of functions in the account, the severity, and so on will be visible as usual in Contrast.
- You can also continue to manage the functions used by the team/region (based on tagging), and the ability to see all application functions on the graph, regardless of the different regions.



## Inventory

When you connect to an AWS account from Contrast, it automatically discovers all Lambda functions and their relationships with different resources (such as S3, API Gateway, and DynamoDB) within the tested environment.

By default, Contrast scans all functions in the inventory unless [you specify otherwise. \(page 1266\)](#)

## Inventory criteria

Contrast lets you specify criteria that determine the scope of functions to be scanned, based on these criteria:

- **Tag:** This option lets you include or exclude functions associated with a specified tag and, optionally, a tag value.
- **Name:** This option lets you include or exclude functions with a specific name, prefix, or suffix.

## Scan types and monitoring

Contrast Serverless supports these types of scans and monitoring:

### Static scans

This scan automatically scans, in close to real-time, relevant static code and configuration assessments to discover new vulnerabilities in the following categories:

- Least privilege: Discovers IAM vulnerabilities (over permissive functions) within serverless workload before deployment and recommends permission remediations.
- Contrast SCA - Provides SCA for open-source libraries using the Contrast SCA engine.

The scan has no permanent effect on your code.

### Dynamic scans

This scan type looks at dynamic assessments based on a specific update introduced to the tested environment. These scans are invoked with S3, API Gateway, and Dynamo DB functions.

It executes automatically, close to real-time, providing dynamic assessments, based on the specific update introduced to the tested environment. The dynamic scans are based on the interpretation of the OWASP Top 10 benchmark. For example:

- SQL injection
- Code injection
- Local file inclusion (LFI)

During a dynamic scan, Contrast tries to send malicious input to the code and then, exercises the code to discover vulnerabilities. This action does not affect your code, however, a scanned function is invoked.

### Instrumented Dynamic analysis



#### NOTE

It is required to use *testing coverage* when performing an instrumented dynamic scan.

This option is recommended for selection when specifying scan settings.

In AWS accounts, instrumented dynamic analysis uncovers all exploitable AWS Lambda functions. With support for the latest AWS Lambda services you can uncover security issues in AWS Step Functions – a service that coordinates multiple Lambda functions into flexible workflows.

Uncover OWASP Top Ten vulnerabilities including:

- Injections (content, OS command, limited SQL, code)
- Cross-site scripting (XSS)
- Local file inclusion (LFI)

In addition, it provides improved AWS account observability and increased security coverage by uncovering all serverless account assets including *unused functions* (shadow functions). These

unused functions are usually not maintained and contain outdated dependencies leading to potential vulnerabilities.

## Continuous monitoring

Once you connect to an account from Contrast, Contrast Serverless monitors this account. As you make changes to your functions' code or configurations, Contrast automatically initiates a new scan.

## Get started with Contrast Serverless for AWS

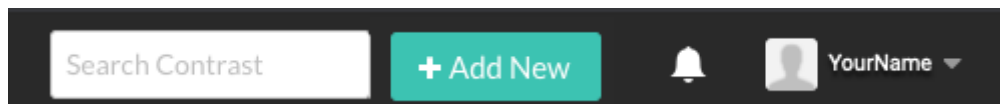
To start using Contrast Serverless, open Contrast and connect to your AWS account to create a new stack.

### Before you begin

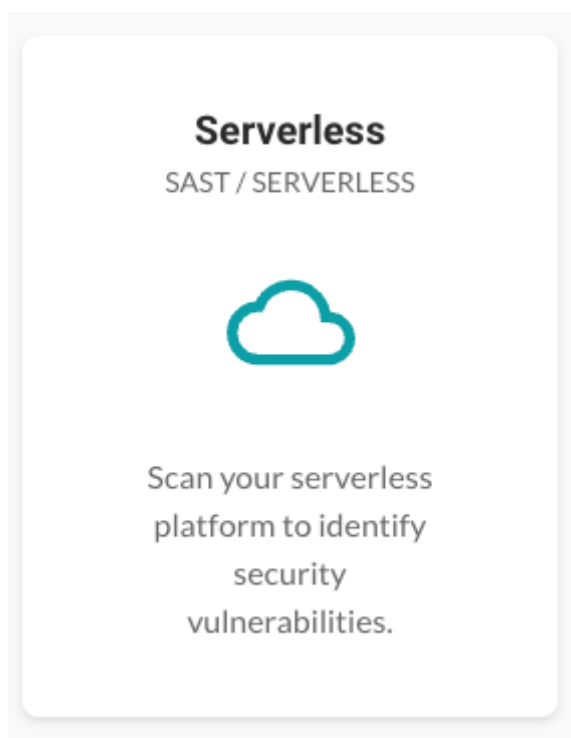
- Have your AWS account information available.
- Minimum [permissions \(page 1253\)](#) required to deploy/update/delete a Contrast Serverless stack.

### Steps

1. In the Contrast application, select **Add New** at the top of the page.



2. Select the **Serverless** card.



3. Select the **AWS** option under the **Cloud provider** section.
4. (Optional) Specify scan settings:
  - **Inventory:** Inventory consists of the functions that you want Contrast to scan. The default value is to scan all functions in your AWS account.
  - **Initial scan:** This setting determines actions that Contrast takes to scan your functions.



| Static analysis  | Dynamic analysis  |
|--|---|
| <p>Covers:</p> <ul style="list-style-type: none"> <li>• <b>Least Privilege:</b> Detects unused permissions. For Java, .NET Core 6, .NET Core 7, Node.js, and Python.</li> <li>• <b>CVEs:</b> Detects vulnerable dependencies. For Java, .NET Core 6, .NET Core 7, Node.js, and Python.</li> <li>• <b>SAST:</b> Detects custom-code vulnerabilities. For Java.</li> <li>• <b>Malware:</b> Detects malicious files. For Python.</li> </ul> | <p>Covers:</p> <ul style="list-style-type: none"> <li>• The stress testing of an application to detect any possible vulnerabilities.</li> <li>• The <b>Instrumented Dynamic analysis</b> option enables Contrast Serverless to find function exploits in the entire account environment and across all services. See <a href="#">Scan types and monitoring (page 1251)</a> for more information. To get the analysis fully configured for your accounts, follow the steps under the <i>Instrumented Dynamic Scan Instructions</i> section. For Node.js and Python.</li> </ul> |

- **Deployment:** Deploy with a new stack in AWS or download the CFT to use in your pipeline. You can [change these settings \(page 1267\)](#) at any time in the Settings tab.

5. Select **Create new stack**.
6. On the displayed AWS page, enter your account information and select **Create stack**. Alternatively, you can download a CloudFormation template and use it in your development pipeline. This action connects to the AWS CloudFormation Stacks console for your account and starts the first scan.
7. Approve the stack deployment in your account. The stack deployment takes approximately two minutes to complete.
8. Return to the Contrast application and verify that the Account is connected and the Scan started messages are displayed.
9. To view details about functions and scan results, select **function** in the Account connected message or select the **Serverless** tab.

## Next steps

- [Scan functions on demand \(page 1259\)](#)
- [View results \(page 1261\)](#)
- [Change inventory criteria \(page 1266\)](#)
- [Change scan settings \(page 1267\)](#)

## AWS policy and permissions for running Contrast Serverless

This is a sample of how to obtain the policy and permissions for your AWS account with Contrast Serverless.

### Obtain a policy

This is a sample updated policy for an account.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "CustomResources",
      "Effect": "Allow",
      "Action": [
        "sns:Publish"
      ],
      "Resource": "*"
    },
    {
      "Sid": "SNS2",
      "Effect": "Allow",
      "Action": [
```

```
        "sns:CreateTopic",
        "sns:GetTopicAttributes",
        "sns:DeleteTopic",
        "sns:TagResource"
    ],
    "Resource": "*"
},
{
    "Sid": "IAM",
    "Effect": "Allow",
    "Action": [
        "iam:AttachRolePolicy",
        "iam:CreatePolicy",
        "iam:CreateRole",
        "iam:CreateServiceLinkedRole",
        "iam:DeletePolicy",
        "iam:DeleteRole",
        "iam:DeleteRolePolicy",
        "iam:DetachRolePolicy",
        "iam:GetPolicy",
        "iam:GetRole",
        "iam:GetRolePolicy",
        "iam:ListPolicyVersions",
        "iam:ListRoleTags",
        "iam:PassRole",
        "iam:PutRolePolicy",
        "iam:TagRole",
        "iam:UntagRole"
    ],
    "Resource": "*"
},
{
    "Sid": "S3",
    "Effect": "Allow",
    "Action": [
        "s3:CreateBucket",
        "s3:DeleteBucket",
        "s3:DeleteBucketPolicy",
        "s3:GetBucketPolicy",
        "s3:PutBucketPolicy",
        "s3:PutBucketPublicAccessBlock",
        "s3:PutBucketTagging",
        "s3:PutEncryptionConfiguration",
        "s3:PutLifecycleConfiguration",
        "s3:PutBucketNotification"
    ],
    "Resource": "*"
},
{
    "Sid": "Lambda",
    "Effect": "Allow",
    "Action": [
        "lambda:GetFunction",
        "lambda:CreateFunction",
        "lambda:DeleteFunctionEventInvokeConfig",
```

```
        "lambda:DeleteFunction",
        "lambda:TagResource",
        "lambda:PutFunctionEventInvokeConfig"
    ],
    "Resource": "*"
},
{
    "Sid": "S3LambdaCode",
    "Effect": "Allow",
    "Action": [
        "s3:GetObject"
    ],
    "Resource": "*"
},
{
    "Sid": "EventsRule",
    "Effect": "Allow",
    "Action": [
        "events:DeleteRule",
        "events:DescribeRule",
        "events:PutRule",
        "events:PutTargets",
        "events:RemoveTargets"
    ],
    "Resource": "*"
},
{
    "Sid": "CloudTrail",
    "Effect": "Allow",
    "Action": [
        "cloudtrail:AddTags",
        "cloudtrail:CreateTrail",
        "cloudtrail>DeleteTrail",
        "cloudtrail:StartLogging",
        "cloudtrail:PutEventSelectors"
    ],
    "Resource": "*"
},
{
    "Sid": "CloudFormation",
    "Effect": "Allow",
    "Action": [
        "cloudformation:GetTemplateSummary",
        "cloudformation:CreateStack",
        "cloudformation:DescribeStackEvents"
    ],
    "Resource": "*"
}
]
```

Run the AWS iam create-policy:

```
```aws iam create-policy --policy-name Contrast-create-stack --policy-
document '{
    "Version": "2012-10-17",
```

```
"Statement": [
  {
    "Sid": "CustomResources",
    "Effect": "Allow",
    "Action": ["sns:Publish"],
    "Resource": "*"
  },
  {
    "Sid": "SNS2",
    "Effect": "Allow",
    "Action": [
      "sns:CreateTopic",
      "sns:GetTopicAttributes",
      "sns>DeleteTopic",
      "sns:TagResource"
    ],
    "Resource": "*"
  },
  {
    "Sid": "IAM",
    "Effect": "Allow",
    "Action": [
      "iam:AttachRolePolicy",
      "iam:CreatePolicy",
      "iam:CreateRole",
      "iam:CreateServiceLinkedRole",
      "iam>DeletePolicy",
      "iam>DeleteRole",
      "iam>DeleteRolePolicy",
      "iam:DetachRolePolicy",
      "iam:GetPolicy",
      "iam:GetRole",
      "iam:GetRolePolicy",
      "iam:ListPolicyVersions",
      "iam:ListRoleTags",
      "iam:PassRole",
      "iam:PutRolePolicy",
      "iam:TagRole",
      "iam:UntagRole"
    ],
    "Resource": "*"
  },
  {
    "Sid": "S3",
    "Effect": "Allow",
    "Action": [
      "s3:CreateBucket",
      "s3>DeleteBucket",
      "s3>DeleteBucketPolicy",
      "s3:GetBucketPolicy",
      "s3:PutBucketPolicy",
      "s3:PutBucketPublicAccessBlock",
      "s3:PutBucketTagging",
      "s3:PutEncryptionConfiguration",
      "s3:PutLifecycleConfiguration",
```

```
    "s3:PutBucketNotification"
  ],
  "Resource": "*"
},
{
  "Sid": "Lambda",
  "Effect": "Allow",
  "Action": [
    "lambda:GetFunction",
    "lambda:CreateFunction",
    "lambda:DeleteFunctionEventInvokeConfig",
    "lambda:DeleteFunction",
    "lambda:TagResource",
    "lambda:PutFunctionEventInvokeConfig"
  ],
  "Resource": "*"
},
{
  "Sid": "S3LambdaCode",
  "Effect": "Allow",
  "Action": ["s3:GetObject"],
  "Resource": "*"
},
{
  "Sid": "EventsRule",
  "Effect": "Allow",
  "Action": [
    "events:DeleteRule",
    "events:DescribeRule",
    "events:PutRule",
    "events:PutTargets",
    "events:RemoveTargets"
  ],
  "Resource": "*"
},
{
  "Sid": "CloudTrail",
  "Effect": "Allow",
  "Action": [
    "cloudtrail:AddTags",
    "cloudtrail:CreateTrail",
    "cloudtrail:DeleteTrail",
    "cloudtrail:StartLogging",
    "cloudtrail:PutEventSelectors"
  ],
  "Resource": "*"
},
{
  "Sid": "CloudFormation",
  "Effect": "Allow",
  "Action": [
    "cloudformation:GetTemplateSummary",
    "cloudformation:CreateStack",
    "cloudformation:DescribeStackEvents"
  ],
  "Resource": "*"
}
```

```

    "Resource": "*"
  }
}
}'''

```

And obtain a response:

```

{
  "Policy": { ...
    "PolicyName": "Contrast-serverless-create-stack",
    "PolicyId": "ANPAV3I66HSEE4ILG6XJ3",
    "Arn": "arn:aws:iam::402181209224:policy/Contrast-serverless-create-stack",
    "Path": "/",
    "DefaultVersionId": "v1",
    "AttachmentCount": 0,
    "PermissionsBoundaryUsageCount": 0,
    "IsAttachable": true,
    "CreateDate": "2023-01-24T16:36:49+00:00",
    "UpdateDate": "2023-01-24T16:36:49+00:00"
  }
}

```

Then attach a user policy:

```

aws iam attach-user-policy --policy-arn
arn:aws:iam::402181209224:policy/Contrast-serverless-create-stack --user-
name
<USER-NAME></USER-NAME>

```

And obtain a response:

```

4ppsec@TMEIAMED-C02DX3Q2ML85:~/cn-mono (*)
[> aws iam list-attached-user-policies --user-name xrays --profile xrays
{
  "AttachedPolicies": [
    {
      "PolicyName": "Contrast-serverless-create-stack",
      "PolicyArn": "arn:aws:iam::402181209224:policy/Contrast-serverless-create-stack"
    }
  ]
}

```

You can now run a deployment.

## Get started with Contrast Serverless for Azure

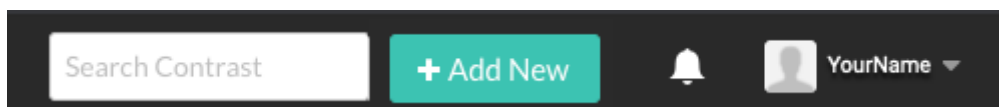
To start using Contrast Serverless with Azure, open Contrast and connect to your Azure account to create a new stack.

### Before you begin

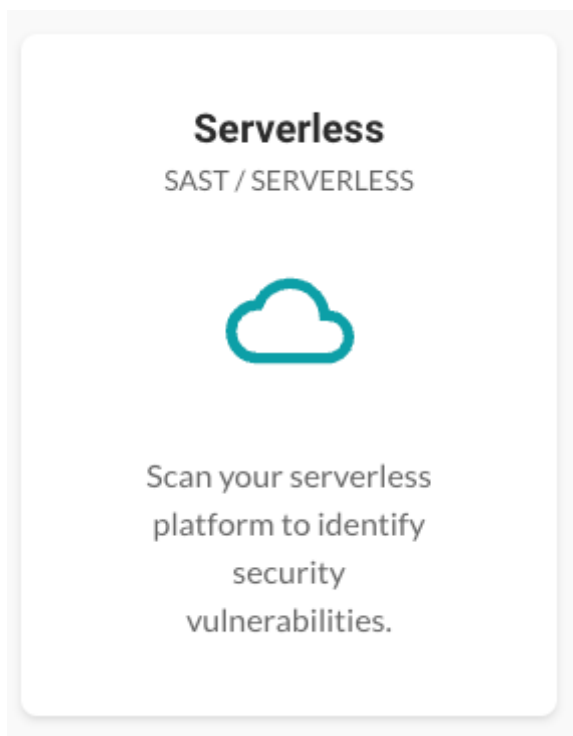
- Make sure you have an Azure account with an active subscription.
- Make sure you have permission to create an App registration on the Active Directory Tenant.
- Make sure you have an *Owner* role in the account. This allows for assigning roles to the App registrations.

### Steps

1. In the Contrast application, select **Add New** at the top of the page.



2. Select the **Serverless** card.



3. Select the **Azure** option under the **Cloud provider** section.
4. (Optional) Specify scan settings:
  - **Inventory:** Not available for Azure.
  - **Initial scan:** This setting determines actions that Contrast takes to scan your functions.

| Static analysis                                                                                                                                                                                                                                                                                                                                                                                                                        | Dynamic analysis                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <p>Covers:</p> <ul style="list-style-type: none"><li>• <b>Least Privilege</b>- Detects unused permissions. For Java, .NET Core 6, .NET Core 7, Node.js, and Python.</li><li>• <b>CVEs</b> - Detects vulnerable dependencies. For Java, .NET Core 6, .NET Core 7, Node.js, and Python.</li><li>• <b>SAST</b> - Detects custom-code vulnerabilities. For Java.</li><li>• <b>Malware</b> - Detects malicious files. For Python.</li></ul> | <p>Not available for Azure.</p> |

You can [change these settings \(page 1267\)](#) at any time in the Settings tab.

5. Continue with the steps under the **Deployment** section.
6. Return to the Contrast application and verify that the Account is connected and Scan started messages are displayed.

## Next steps

- [Scan functions on demand \(page 1259\)](#)
- [View results \(page 1261\)](#)

## Scan functions on demand

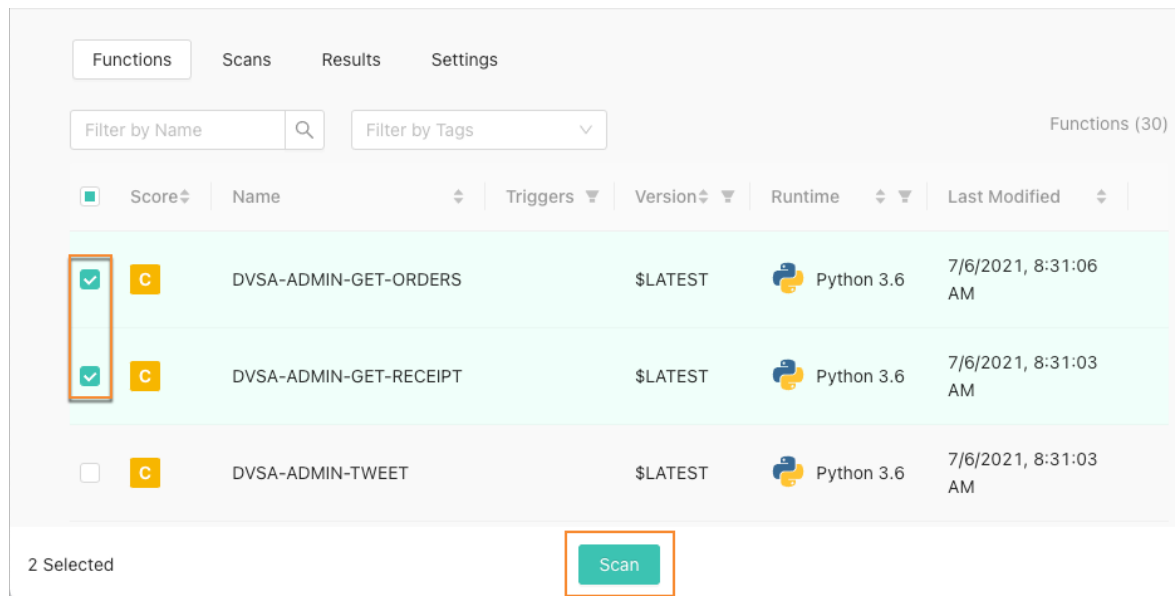
Although scans of all functions in your accounts occur automatically, you can also scan a specific function on demand.

## Before you begin

- Identify the functions that you want to scan.

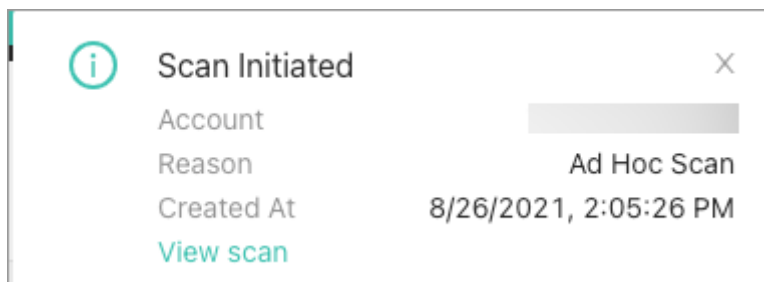
## Steps

- Select **Serverless** in the header.
- Select the account from the list.
- Select the check box next to one or more functions that you want to scan.



- Select **Scan**.
- In the Confirm Scan window, verify or change the scan type settings for the selected functions and select **OK**.

The **Scan Initiated** message displays.



- To view the scan results, select **View scan** in the Scan initiated message to view the scan results. Alternatively, select the **Scan** tab and select an **Ad hoc scan**.

If Contrast detects multiple occurrences of the same vulnerabilities in scanned functions, Contrast updates the existing reported vulnerabilities with new data (for example, timestamp or use), rather than creating new vulnerabilities.

## Functions table explained

The Functions table contains information about:

- Score:** The [contextual risk score \(page 1272\)](#) for the function
- Name:** The function name
- Triggers:** The service that triggered the event
- Version:** The function version



- **Runtime:** The runtime language
- **Last Modified:** The last time the function was modified
- **Last Scanned:** The last execution time of the scan
- **Issues:** The items found during the scan that may or may not require attention. These results are generated from the Contrast Serverless and AWS Inspector sources. This displays only if you have Contrast Serverless and AWS Inspector support for the results.


## View results


View results to see details about vulnerabilities for permissions, dependencies, exploits, and CVEs.

## Before you begin

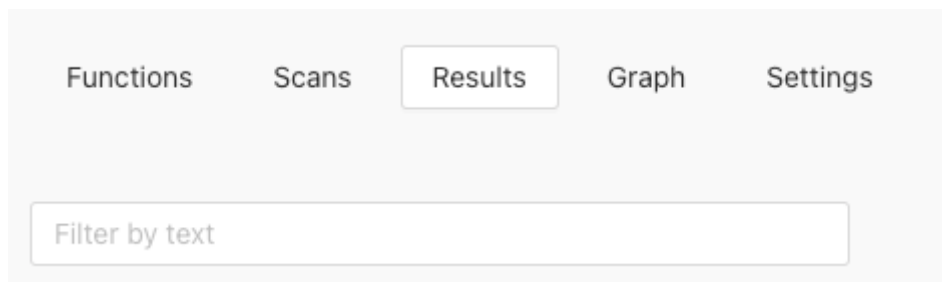
- Ensure that at least one scan is complete.

## Steps

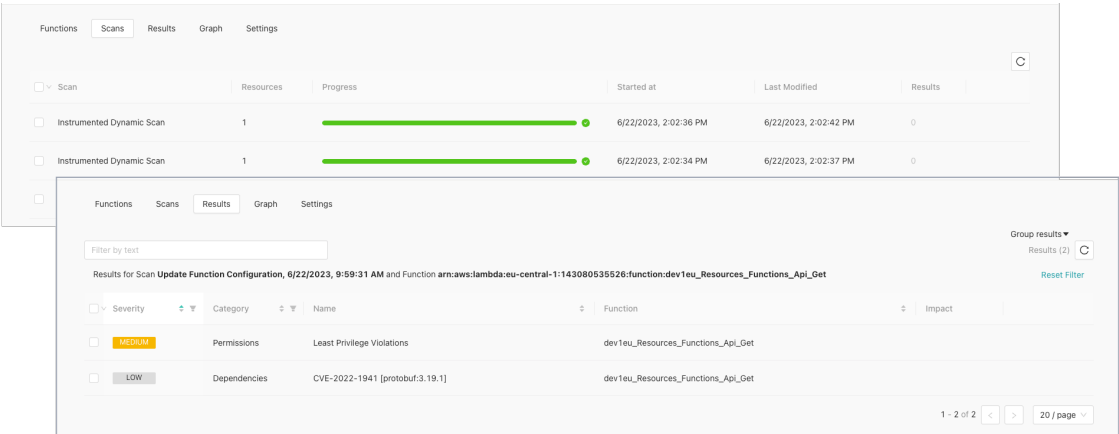
1. Select **Serverless** in the header.
2. To view results for all scans, select **Results**. See [Scan status details \(page 1264\)](#) for more information about the meaning of the scan results.
3. To filter results in the Results tab, select the **Filter** icon (  ) next to the column headers.
  - a. The **Severity** is based on vulnerabilities in the application. See the [Application scoring guide \(page 1557\)](#) for information about the levels.
  - b. The **Category** is based on vulnerabilities in the type of function.
  - c. The **Function** is based on the function found in your account.  
Note that results can also be grouped by **Category** or **Function** by selecting the option under **Group results** on the upper-right side of the screen.
  - d. The **Source** is based on the platform providing the results. It is either from Contrast or AWS Inspector. Click the icon to view details about the results. Note that AWS Inspector results will display only if you have AWS Inspector support for your accounts.

To clear the filters, select the green **Filter** icon (  ) icon next to the column headers and select **Reset** in the filter window.

4. To search for a function in the Results tab, type a search term in the search field.



5. To view results for a single scan, from the Scans tab, select a scan row.  
This action shows a scan details page.
6. To view result details for a function:
  - a. From the Results tab, select a row in the list.
  - b. From the scan details page, select a number in the Results column for a function.



The results detail page looks similar to this example:

## Least Privilege Violations



MEDIUM

Category: Permissions | Function: `arn:aws:lambda:eu-central-1:143080535526:function:dev1eu_Resources_Functions_Api_Get` | ID: LEAST\_PRIVILEGE...

## Description

The Attached Role `arn:aws:iam::143080535526:role/dev1eu_Resources_Functions_Api_Get_Role` has an over permissive policy that may violate the principle of least privilege. For more information on AWS least privilege: [docs.aws.amazon.com/IAM/latest/UserGuide/best-practices.html#grant-least-privilege](https://docs.aws.amazon.com/IAM/latest/UserGuide/best-practices.html#grant-least-privilege)

## What happened

- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `AddLayerVersionPermission` for service `lambda`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `AddPermission` for service `sns`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `CancelKeyDeletion` for service `kms`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `CreateAlias` for service `kms`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `CreateKey` for service `kms`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `DeleteAlias` for service `kms`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `DeleteMessage` for service `sqs`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `DescribeEventBus` for service `events`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `DescribeKey` for service `kms`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `EnableKey` for service `kms`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `GetBucketPolicy` for service `s3`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `GetQueueAttributes` for service `sqs`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `GetQueueUrl` for service `sqs`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `GetTopicAttributes` for service `sns`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `ListAliases` for service `kms`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `PutBucketPolicy` for service `s3`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `PutPermission` for service `events`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `ReceiveMessage` for service `sqs`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `RemoveLayerVersionPermission` for service `lambda`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `RemovePermission` for service `events`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `RemovePermission` for service `sns`
- `dev1euResourcesLambdaPolicy_V2-c743f03`: Unused permission `ScheduleKeyDeletion` for service `kms`

## Violating policies

`dev1euResourcesLambdaPolicy_V2-c743f03`[View violating policy](#)

## Remediation

Replace the existing policy with one of the following:

[JSON](#)   [TERRAFORM](#)   [YAML](#)

```
[
  {
    "PolicyName": "dev1euResourcesLambdaPolicy_V2-c743f03",
    "PolicyDocument": {
      "Version": "2012-10-17",
      "Statement": [
        {
          "Sid": "1",
          "Effect": "Allow",
          "Action": [
            "logs:CreateLogGroup",
            "logs:CreateLogStream",
            "logs:PutLogEvents"
          ],
          "Resource": [
            "arn:aws:logs:*:*:*"
          ]
        },
        {
          "Sid": "2",
          "Effect": "Allow",
          "Action": [
            "dynamodb:GetItem",
            "dynamodb:Query",
            "dynamodb:Scan",
            "dynamodb:PutItem",
            "dynamodb:UpdateItem",
            "dynamodb:BatchWriteItem",
            "dynamodb>DeleteItem"
          ],
          "Resource": [
            "arn:aws:dynamodb:eu-central-1:143080535526:table/dev1eu_resources.functions",
            "arn:aws:dynamodb:eu-central-1:143080535526:table/dev1eu_resources.resources",
            "arn:aws:dynamodb:eu-central-1:143080535526:table/dev1eu_resources.lookup",
            "arn:aws:dynamodb:eu-central-1:143080535526:table/dev1eu_resources.locks"
          ]
        }
      ]
    }
  }
]
```

## Result details

The result details displayed here depend on the category of a vulnerability.

All results include this information:

- **Description:** A description of the vulnerability.
- **What happened:** What occurred when the scan discovered the vulnerability
- **Remediation:** Steps to take to fix the vulnerability.

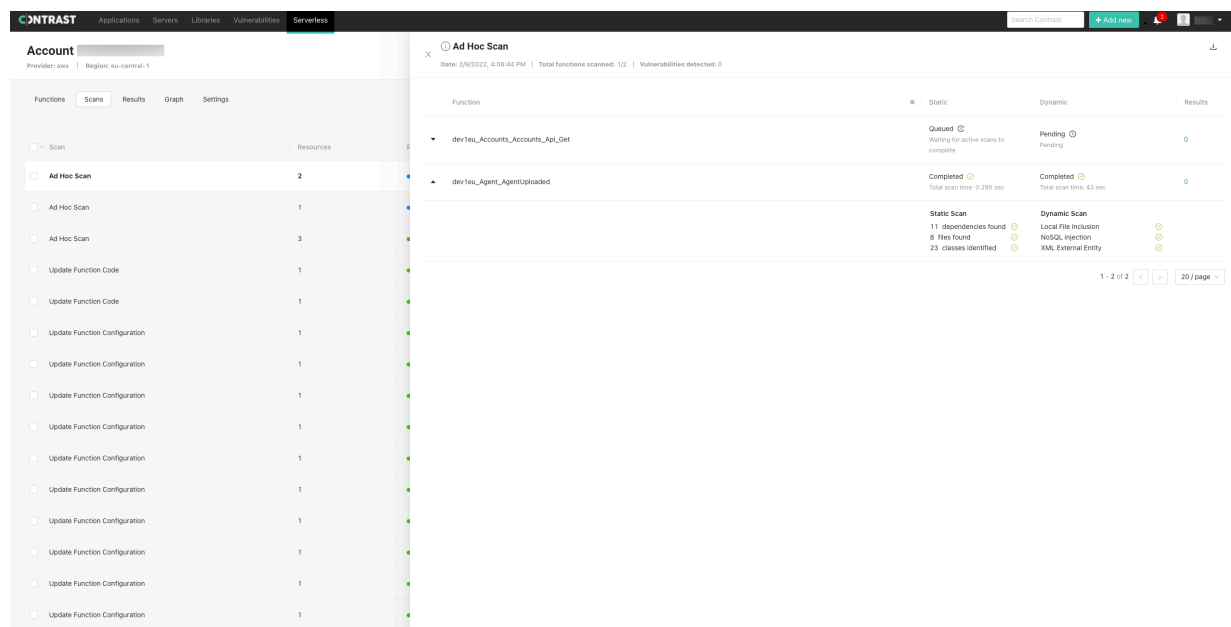
You might also see these details:

- **Violated policies:** Policies that the vulnerability violates.
- **Impact:** The area that the vulnerability affects, for example ses, s3, logs, or dynamodb.
- **Severity and metrics:** A severity score calculated to the vulnerability as well as metrics for the areas that the vulnerability impacts.

## Scan status details

Under the Serverless Scan tab, you can see what the system is scanning as well as the types of scans the functions are tested against.

Once on the **Scan** page, click the scan name to open the scan status details tab.



Here's a list of the static and dynamic scan statuses with their details.

| Status        | Description                                                                                                                            |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Scanning..... | Scan in progress                                                                                                                       |
| Pending       | Pending static scan results                                                                                                            |
| Queued        | Waiting for X active scans to complete<br>Where X is the number of active scans. Scan is queued and will start soon.                   |
| Completed     | Scan complete                                                                                                                          |
| Unsupported   | Unsupported Lambda runtime<br>The function runtime language is unsupported.                                                            |
|               | Unsupported Lambda trigger                                                                                                             |
|               | The function has an unsupported trigger configuration OR no identified trigger configuration.                                          |
| Excluded      | Scan disabled in <a href="#">Settings (page 1267)</a><br>To scan, change the Inventory settings or run an ad-hoc scan on the function. |

| Status   | Description                                                                               |
|----------|-------------------------------------------------------------------------------------------|
| Canceled | Newer scan initiated                                                                      |
|          | A newer version of the function is already in queue.                                      |
|          | Lambda state inactive                                                                     |
|          | Lambda reached limit of 5 layers                                                          |
|          | Contrast cannot scan functions that already contain the maximum limit of 5 layers.        |
|          | Lambda scan already in progress                                                           |
|          | Lambda last update status failed                                                          |
| Failed   | Unable to verify agent                                                                    |
|          | Unable to decrypt/encrypt the environment variables                                       |
|          | Agent failure                                                                             |
|          | Contrast unable to invoke the Cloud Agent function OR scan failed during static analysis. |
|          | Agent modified                                                                            |
|          | Misconfigured Lambda handler                                                              |
|          | Parsing error                                                                             |

- Click the arrow icon to expand the details to view the dependencies, files, and classes found in the scan.
- Click the number under the Results column to open the [Results \(page 1261\)](#) tab.

## Download serverless scan results

After a scan completes, you can download the results as a CSV file.

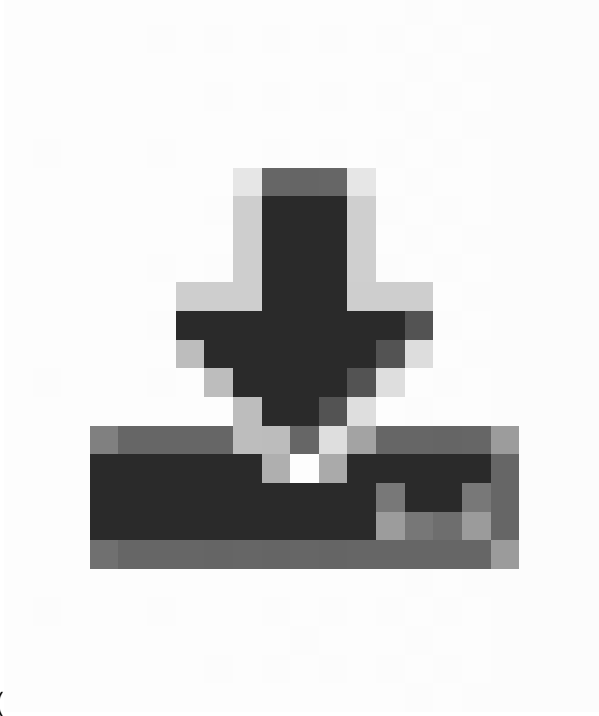
### Before you begin

- Identify the scan with results you want to download.

### Steps

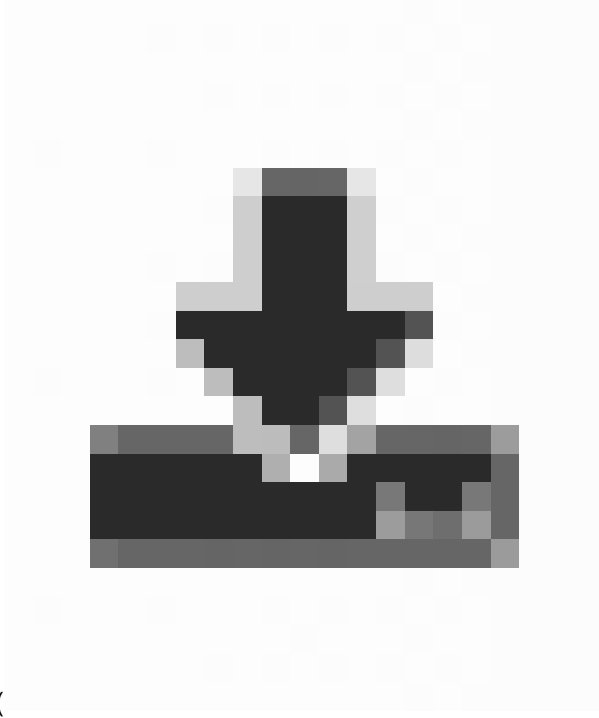
1. Select **Serverless** in the header.
2. Select either the **Scans** tab or the **Results** tab.
3. To download scan results from the **Scans** tab, hover over the end of a row for a scan and select the download icon.
4. To download scan results from the **Results** tab:

- a. Hover over the end of a row for a scan and select the download icon



OR

- b. Click the scan row to open the details page and then select the download icon



Results are downloaded as CSV files.

### Change inventory criteria

The inventory criteria that you specify determine the functions scanned by Contrast Serverless. By default, Contrast scans all functions discovered in your AWS account.

Excluding a function excludes it from the inventory and scan results.

## Before you begin

- Identify the functions you want to include or exclude in scans.

## Steps

- Select **Serverless** in the header.
- Select the **Settings** tab.
- Under Inventory, specify the criteria:
  - Include or exclude a tag associated with one or more functions. Optionally, specify a value for the tag to further refine the inventory.
  - Include or exclude functions by name. The options are: **Name is**, **Name starts with**, or **Name ends with**.

The screenshot shows the 'Settings' tab in the Contrast interface. Under the 'Inventory' section, there is a heading 'Contrast will discover all functions in your AWS account.' followed by the instruction 'To edit tags, names or environment variables that limit the scan inventory, edit the inventory criteria:'. Below this, there are two rows of input fields. The first row has a dropdown set to 'Include', a dropdown set to 'Tag', a text input with 'Build123', and a placeholder 'Tag value - leave empty for any'. The second row has a dropdown set to 'Exclude', a dropdown set to 'Name', a dropdown set to 'starts with', and a text input with 'cron'. At the bottom of the form, there is a link '+ Add criteria' and a note 'Any functions or results that no longer apply will be marked as inactive.'

- Select **Save and Rescan**.  
Contrast rescans the inventory automatically based on the new criteria.

## Change serverless scan settings

The scan settings affect the type of scan that Contrast Serverless performs on all functions.

You can [change these settings \(page 1259\)](#) for a manual scan of selected functions.

## Before you begin

- Determine if you want to use static scans, dynamic scans, or both.

## Steps

- Select **Serverless** in the header.
- Select the **Settings** tab.
- Under **Scan**, select the types of scans that you want to use:
  - Static analysis:** This scan type looks at relevant static code and configuration assessments to discover new vulnerabilities.  
During a static scan, Contrast adds a Lambda function to your account. Once the scan completes, the function exits.
  - Dynamic analysis:** For AWS accounts only. This scan type looks at dynamic assessments based on the specific update introduced to the tested environment.  
During a dynamic scan, Contrast tries to send malicious input to the code and then exercises the code to discover vulnerabilities.  
For more information about the Instrumented Dynamic analysis option see [Scan types and monitoring \(page 1251\)](#).

**IMPORTANT**

Serverless scans do not change your function code.

4. Select **Save**.

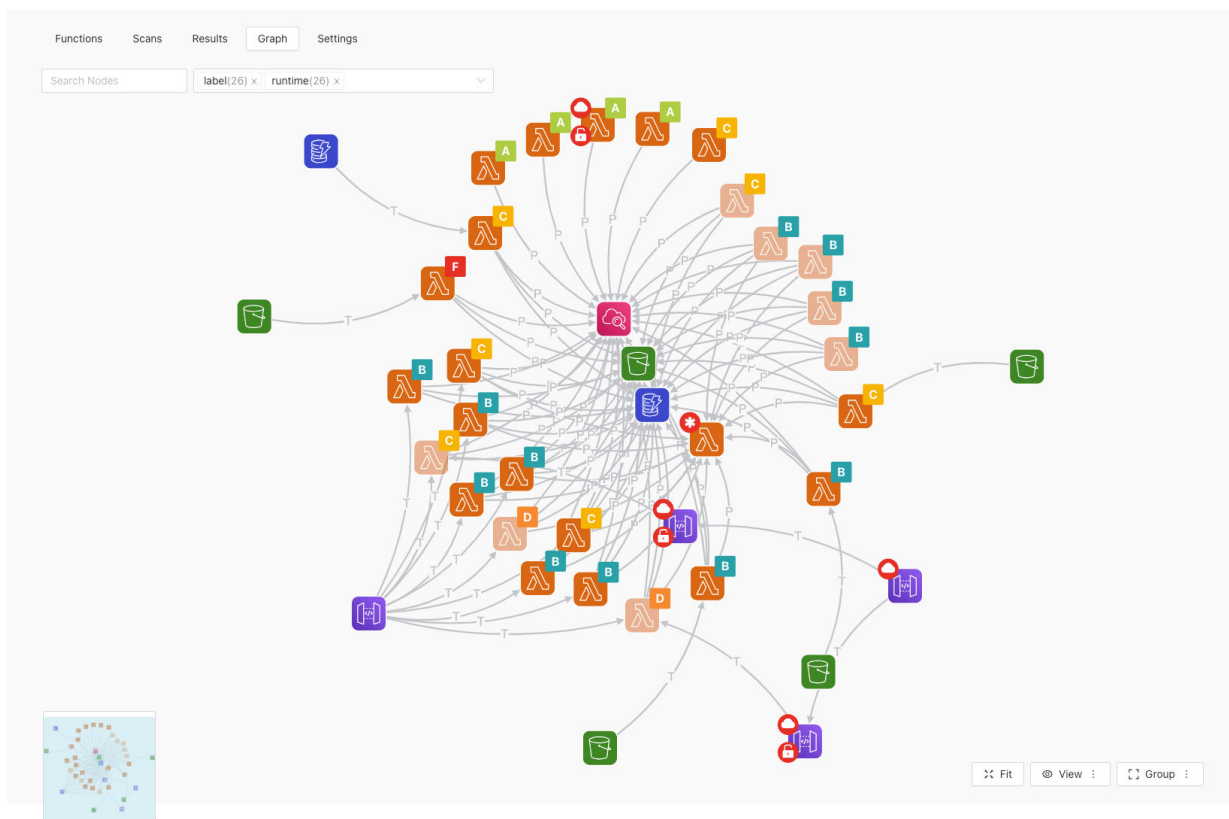
**View function and service relationships**

The Graph tab displays a diagram that shows the relationship between functions and services. You can also view details about each element in the diagram, including:

- Tags
- Vulnerability results
- Permissions
- Security posture score: The security posture score is based on the function's trigger configuration. Internet-accessible triggers and misconfigurations, such as open buckets and unauthenticated APIs, receive lower scores.
- Unused functions (shadow functions) from dynamic instrumented analysis

**WARNING**

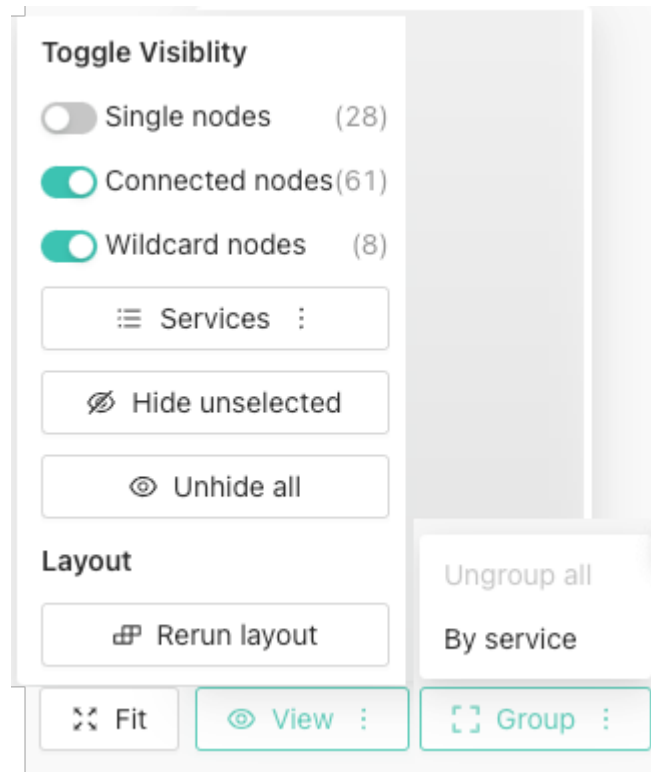
There is a limit to the results available in this graph. See [Graph limits \(page 1270\)](#) for more information.



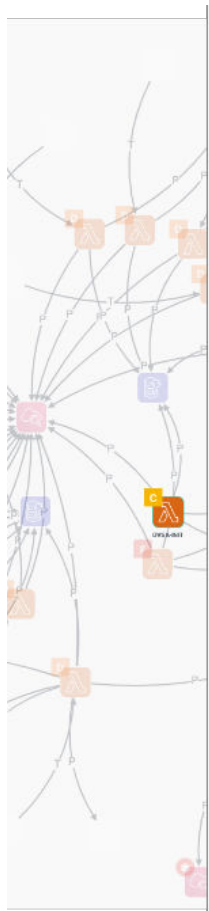


## Steps

1. Select **Serverless** in the header.
2. Select the **Graph** tab.
3. To adjust the view, use the options at the bottom of the graph.



- **Fit:** This allows you to resize the graph to fit your display
  - **View:** This allows you to filter the view by nodes and services. You can also hide or unhide nodes.
  - **Group:** You can group services together
4. Select the element to view details about individual elements.  
Contrast displays a details window for the selected element. Select the tags to filter the view.



### DVSA-INIT

Runtime: python3.6 | Version: \$LATEST | Last Modified: 8/31/2021, 9:19:21 AM | Account: 7 | Region: us-east-1 | [View in AWS console](#)

#### AWS Tags

| KEY                            | VALUE                                                                                                        |
|--------------------------------|--------------------------------------------------------------------------------------------------------------|
| aws:cloudformation:logical-id  | InitFunctionLambda                                                                                           |
| aws:cloudformation:stack-id    | arn:aws:cloudformation:us-east-1:733980656228:stack/serverlessrepo-DVSA/f546cbd0-76c3-11eb-a1ca-12dc156c2e93 |
| aws:cloudformation:stack-name  | serverlessrepo-DVSA                                                                                          |
| lambda:createdBy               | SAM                                                                                                          |
| serverlessrepo:applicationId   | arn:aws:serverlessrepo:us-east-1:889485553959:applications/DVSA                                              |
| serverlessrepo:semanticVersion | 1.2.4                                                                                                        |
| STAGE                          | dev                                                                                                          |

**1 Result**  
**MEDIUM** Least Privilege Violations

## Graph limits

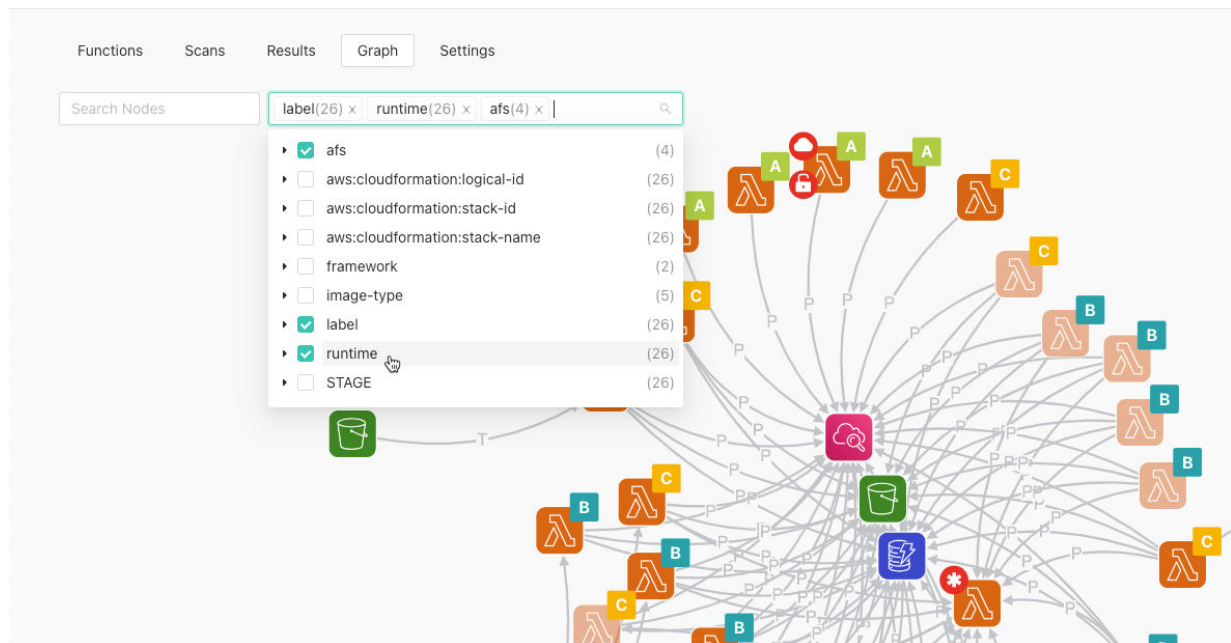
Due to performance considerations, we currently disable graph rendering when the element count exceeds a specific number of 8000.

### What is the element count?

Since this is a performance, rather than a product measure, the elements count is not the number of AWS/Azure resources but rather the number of renderable elements; this means all **Nodes** and **Edges** (connections). Therefore it is not possible to predict the specific number of elements that will result from rendering any single Function and its related components as the actual element number depends solely on the graph structure, which is unique to each environment.

### What can I do if I have too many elements and the graph does not render?

To allow you to still render the graph even if your account is too large, we added a filtering option (**tag filters**) using resource tags.



Using the filter will reduce the number of returned resources and will display only the functions that contain the selected tags and their related resources. This will help you stay under the element limit but if the selection is too large, you may run into the same problem. The tag selection works the same way as the **Functions** tab.



## IMPORTANT

The tag filter is currently the only approach that will actually limit the number of rendered elements that count against the limit. Search or hiding certain elements will have no effect.

## Adding/updating tags

If you have functions that do not have a tag assigned, you will not be able to see them using the tag filter. To properly utilize this feature, all your functions need to have tags assigned using a few different values so you can filter down to parts of your system. Potential tag ideas are `application`, `service`, `runtimeLanguage`, `team` or some other custom groupings depending on your needs.

Use the method that suits you best, either adding them directly in the AWS Console or using your IaC solution.

## When will I see the new tags in the graph?

While we do a near-immediate update of the **Functions** tab based on change events such as `TagResource`, this does not apply to the graph as we do not currently support partial updates and only run full scheduled discoveries. In most environments, this would be at 6 AM GMT. This means that you have to wait until the next discovery for the tags to appear.

CloudNative developers can also trigger the graph discovery prematurely using the `Resources Utils TriggerGraphDiscovery V1` Lambda function.

Alternatively, changing [Inventory settings \(page 1266\)](#) will trigger both **Resources** and **Graph** discoveries over the entire account. If the Inventory settings are empty, adding a dummy **Exclude** rule would be considered a change but would still include everything.

In summary, new tags will appear if either:

- Graph discovery runs daily on schedule at 6 AM GMT (some regions may have different time settings)
- `Resources_Utills_TriggerGraphDiscovery_V1` Lambda function is triggered with the specific organization ID/account ID
- Changes in Inventory settings

## Account Inventory Settings

During onboarding or later in **Settings**, you can change the **Inventory settings** to limit the scope of what you see in the system and what is scanned. Here you can use both **Function** tags and names.

However, keep in mind that modifying this will change the scope of the whole system, including what you see in **Functions** and what is actually scanned and protected. Depending on your use case it could also be a reasonable way to limit the size of the graph.

## Contextual risk scores

Contrast's contextual risk scoring system provides insight into where there are actual risk points and what should be prioritized. The function contextual score helps you gauge the general performance of each function.

| <input type="checkbox"/> Score    | Name                    |
|-----------------------------------|-------------------------|
| <input type="checkbox"/> <b>A</b> | DVSA-ORDER-GET          |
| <input type="checkbox"/> <b>B</b> | DVSA-ORDER-BILLING      |
| <input type="checkbox"/> <b>C</b> | DVSA-USER-CREATE        |
| <input type="checkbox"/> <b>D</b> | DVSA-ADMIN-GET-ORDERS   |
| <input type="checkbox"/> <b>F</b> | DVSA-ADMIN-ORDERS-MYSQL |

Functions will have a letter grade **A** to **F**, which represents the overall posture of the function, and a numeric score from 35 to 100.

- **A**: 90 -100
- **B**: 80-89
- **C**: 70-79
- **D**: 60-69
- **F**: 35-59

The overall contextual Risk Score is calculated as follows: **Average = (Vulnerability score + Impact score + Likelihood score) / 3.**

## Vulnerability score

The vulnerabilities identified during the function scans (static and dynamic).

- Types of vulnerabilities:
  - Custom code exploits (Static and Dynamic)
  - Dependencies (CVEs)
  - Least Privilege violations
- To calculate the custom code vulnerability score, start with 100 points and subtract penalty points for the number of vulnerabilities found in a function multiplied by a penalty weight for their severity.
  - Critical: Multiply the number of vulnerabilities by 20
  - High: Multiply the number of vulnerabilities by 10
  - Medium: Multiply the number of vulnerabilities by 5
  - Low: Multiply the number of vulnerabilities by 1
  - For example: If the function has 0 Critical, 1 High, 0 Medium and 2 Low vulnerabilities, the score would be:  $100 - (20 \times 0) - (10 \times 1) - (5 \times 0) - (1 \times 2) = 88$

### Impact (access level) score

The permission (IAM roles) given to the function. The more permissions the function has, the higher the risk.

To calculate the impact score, we inspect and score each of the 5 permission categories: List, Read, Write, Tagging, and Permissions Management for each service. Then, we start with 100 points and subtract penalty points for the access level of each service.

For example, given the following IAM policy:

```
{
  "Effect": "Allow" ,
  "Action": [
    "s3:GetObject",
    "sqs:*"
  ],
  "Resource": "*"
}
```

The score for each service access level would be calculated as the following:

```
{
  "s3": {
    "Read": 6,
    "Write": 3,
    "List": 3,
    "Tagging": 1,
    "Permissions management": 12
  },
  "sqs": {
    "Read": 3,
    "Write": 3,
    "List": 1,
    "Tagging": 1,
    "Permissions management": 6
  }
}
```

The overall score would be calculated as follows:

- s3: [6], sqs: [3,3,1,1,6] -->  $100 - (6+3+3+1+1+6) = 80$

## Likelihood (accessibility) score

The likelihood of an attacker reaching the function is based on the function trigger configuration.

Each service has a different score based on the ability of attackers to access the function as well as based on the trigger configuration (for example, authenticated/unauthenticated).

For example:

If the function has an EventBus set as a trigger, the chances for a potential attacker to access the Lambda function would be lower than accessing a Lambda with an API Gateway set as a trigger. Moreover, if the API Gateway is configured without any authentication (i.e., Open), then the function can be accessible by anyone, anywhere.

So the likelihood score for a function:

- with an EventBus as a trigger would be: 90
- with an (authenticated) API Gateway as a trigger would be: 75
- with an unauthenticated API Gateway as a trigger would be: 5 (the lowest possible score)
- without a trigger would be: 100 (the highest possible score)

## Upgrade Contrast Serverless

Contrast Serverless is set to auto-update in most cases. If there is a need to manually upgrade you can follow the steps listed on this page.

### Before you begin

- Create a role/user with the minimum required policies. See [this example \(page 1253\)](#) for how to set it up.

### Steps

1. If you have not made any manual changes to the Contrast Serverless stack before your previous deployment, simply [uninstall \(page 1278\)](#) the current Contrast Serverless stack.  
If you made manual changes to the previous Contrast Serverless stack, it is recommended that you [create a stack change-set \(page 1276\)](#) and then continue with the following steps.
2. Click **Add New** in the toolbar.
3. Download a new template from Contrast by selecting **Download CFT**.

## Let's get started

Create a new stack based on these defaults, or specify function criteria.

### Cloud provider

Select the cloud provider that holds your account

AWS

Azure

### Inventory

Contrast will discover all functions in your AWS account.

To specify tags, names or environment variables that limit the scan inventory, add criteria:

+ Add Criteria

### Initial scan

Scan all functions in your account, then continuously scan all changes to identify:

☒ Functions matching inventory criteria

#### ☒ Static analysis

☒ Least privilege - Detecting unused permissions

☒ CVEs - Detecting vulnerable dependencies

☒ SAST - Detecting custom-code vulnerabilities

☒ Malware - Detecting malicious files

☐ Dynamic analysis - Fuzzing custom-code vulnerabilities (invokes functions)

### Deployment

Deploy with a new stack in AWS, or download the CFT to use in your pipeline.

Create new stack



Download CFT

4. Select either JSON or YAML.
5. Update the stack.

Update stack

Prerequisite - Prepare template

Prepare template

Every stack is based on a template. A template is a JSON or YAML file that contains configuration information about the AWS resources you want to include in the stack.

☐ Use current template

☒ Replace current template

☐ Edit template in designer

Specify template

A template is a JSON or YAML file that describes your stack's resources and properties.

Template source

Selecting a template generates an Amazon S3 URL where it will be stored.

☐ Amazon S3 URL

☒ Upload a template file

Upload a template file

Choose file

ContrastCloudNative\_CFT.yaml

JSON or YAML formatted file

S3 URL: https://s3.eu-central-1.amazonaws.com/cf-templates-1mtxj8diu6zvc-eu-central-1/2023-01-24T164553.73520xv-ContrastCloudNative\_CFT.yaml

View in Designer

Cancel

Next

6. Click **Submit** on the resulting screen.

Use Contrast

1275

Capabilities

**The following resource(s) require capabilities: [AWS::IAM::ManagedPolicy]**

This template contains Identity and Access Management (IAM) resources that might provide entities access to make changes to your AWS account. Check that you want to create each of these resources and that they have the minimum required permissions. [Learn more](#)

☒ I acknowledge that AWS CloudFormation might create IAM resources.

[View change set](#) [Cancel](#) [Previous](#) [Submit](#)

## Stack change-set

To create a stack change-set, follow these steps.

### Before you begin

- Identify Contrast Serverless stack on the AWS CloudFormation console.

### Steps

1. Log in to your Contrast dashboard and download a new template from Contrast by selecting **Download CFT**.

#### Let's get started

Create a new stack based on these defaults, or specify function criteria.

**Cloud provider**

Select the cloud provider that holds your account

[AWS](#) [Azure](#)

**Inventory**

Contrast will discover all functions in your AWS account.

To specify tags, names or environment variables that limit the scan inventory, add criteria:

[+ Add Criteria](#)

**Initial scan**

Scan all functions in your account, then continuously scan all changes to identify:

☒ Functions matching inventory criteria

☒ **Static analysis**

- ☒ **Least privilege** - Detecting unused permissions
- ☒ **CVEs** - Detecting vulnerable dependencies
- ☒ **SAST** - Detecting custom-code vulnerabilities
- ☒ **Malware** - Detecting malicious files

☐ Dynamic analysis - Fuzzing custom-code vulnerabilities (invokes functions)

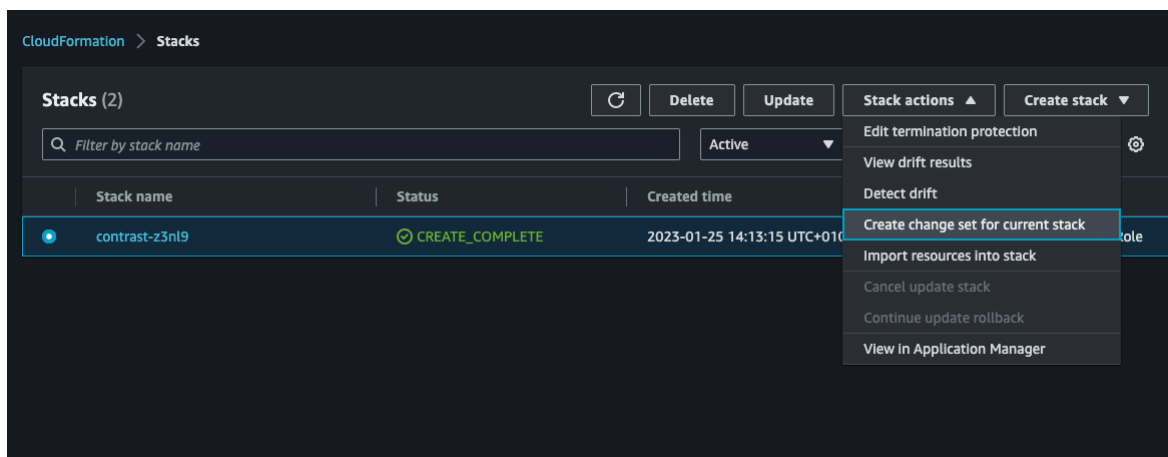
**Deployment**

Deploy with a new stack in AWS, or download the CFT to use in your pipeline.

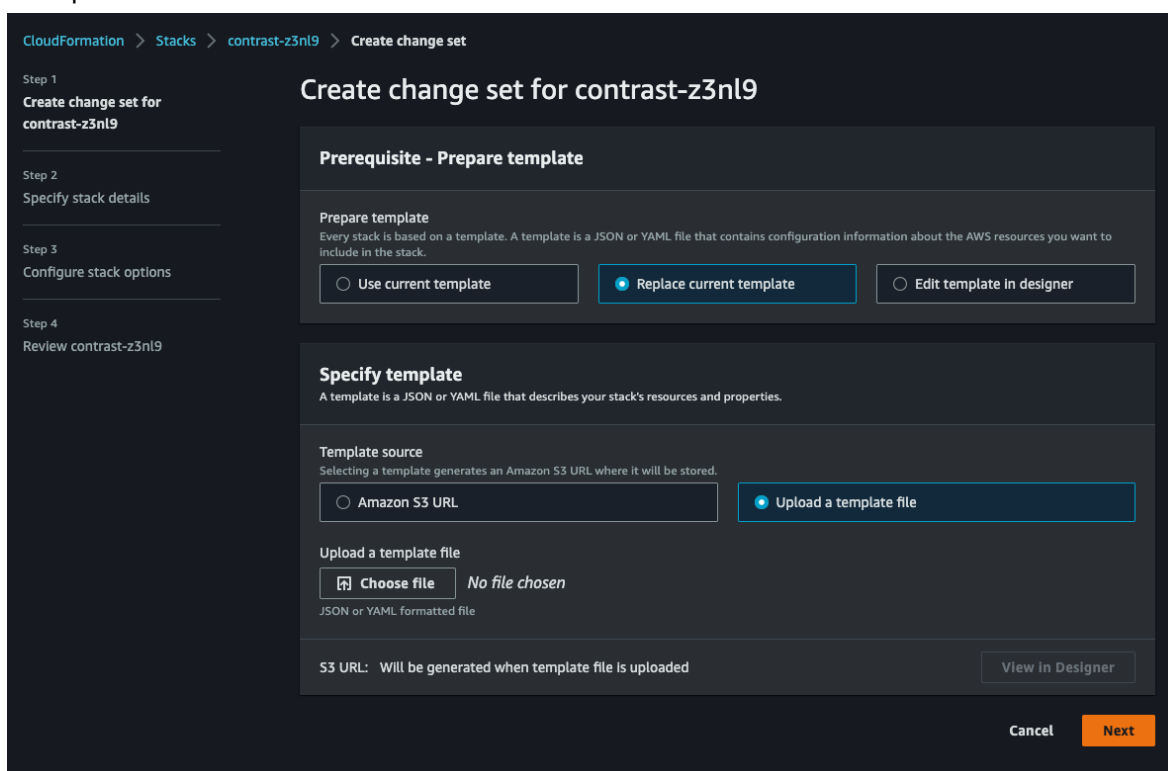
[Create new stack](#) [Download CFT](#)

2. Select either JSON or YAML.
3. Log in to your AWS account or use the AWS CLI/API.
4. Select **Contrast Serverless Stack**.
5. Select **Stack actions** > **Create change set for current stack**.





6. Select **Replace current template** > **Upload a template file** and upload the template downloaded in step 1.



## Block accounts

You can block all Contrast Serverless activities for an account.

1. Select **Serverless** in the header.
2. Select the **Settings** tab.
3. Scroll to the bottom of the page and click **Block Account**.

This will block all activities including automatic and user-requested scans and function updates.



### NOTE

Contact [Contrast Support](#) to unblock accounts.

## Offboard Contrast Serverless

Offboarding a Contrast Serverless account from Azure requires the use of a script to remove the deployment.

### Before you begin

- Identify the objects that you want to remove

### Steps

- Select **Serverless** in the header.
- Select the account to be offboarded.
- Select the **Settings** tab.
- Scroll down to the **Offboard Account** section and copy the script.
- Execute in a shell with an authenticated `az` command. For example, Azure CloudShell in Bash mode.

## Uninstall Contrast Serverless

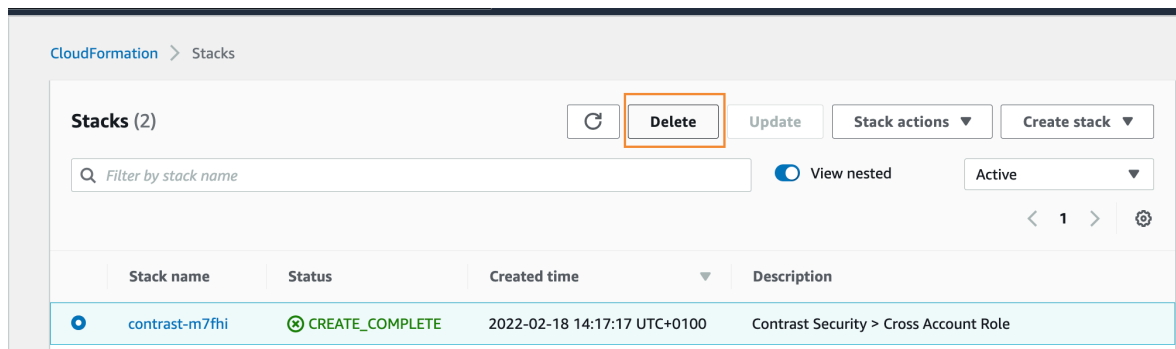
Uninstalling Contrast Serverless requires the deletion of a stack in the AWS console.

### Before you begin

- Identify the objects that you want to remove

### Steps

- Log in to your AWS account or use the AWS CLI/API.
- Continue with the steps for deleting a stack. See [AWS Stack deletion](#).



## Contrast CLI

Contrast CLI delivers SCA, SAST, and serverless capabilities at the command line. You can use the CLI locally or automate it in your CI/CD pipeline.

### Before you start

A few things to keep in mind:

- Enterprise Contrast users can [install \(page 1279\)](#) and then start using the Contrast CLI.
- The legacy Contrast CLI will be deprecated as of October 2022.

### About Contrast CLI

Contrast Security brings security testing right to the developer's laptop. Make code and serverless security simple and efficient with quick scan times, market-leading accuracy, actionable results, and seamless integration.

Contrast CLI delivers:

- The fastest and most accurate SAST scanner
- Immediate and actionable results - scan code and serverless environments
- SCA capabilities by showing dependencies between open-source libraries, including where vulnerabilities were introduced

Start by [installing the Contrast CLI \(page 1279\)](#).

## Contrast CLI supported languages and package managers

Contrast CLI supports these languages when using the `audit` command.

| Package manager                                                           | Language                    | Files required                                                                                                                      | Notes                                                                                                                                                                                                       |
|---------------------------------------------------------------------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Composer                                                                  | PHP                         | <i>composer.json</i> and <i>composer.lock</i>                                                                                       |                                                                                                                                                                                                             |
| PyPI                                                                      | Python                      | <i>pipfile</i> and <i>pipfile.lock</i>                                                                                              |                                                                                                                                                                                                             |
| NuGet                                                                     | .NET Core<br>.NET Framework | MSBuild 15.0 or greater and <i>packages.lock.json</i> .                                                                             | If the <i>packages.lock.json</i> file is unavailable it can be generated by setting <code>RestorePackagesWithLockFile</code> to <code>true</code> within each <i>*.csproj</i> file and running dotnet build |
| RubyGems                                                                  | Ruby                        | <i>gemfile</i> and <i>gemfile.lock</i>                                                                                              |                                                                                                                                                                                                             |
| Maven Central                                                             | Java                        | <i>pom.xml</i>                                                                                                                      | Maven build platform including the dependency plugin                                                                                                                                                        |
|                                                                           |                             | <i>build.gradle</i>                                                                                                                 | gradlew dependencies or <code>./gradlew dependencies</code>                                                                                                                                                 |
| npm<br><br>This includes client-side and server-side JavaScript packages. | JavaScript                  | <i>package.json</i> and a lockfile (either <i>package-lock.json</i> or <i>yarn.lock</i> )<br><br>V2 and V3 lock files are supported |                                                                                                                                                                                                             |
| Gopm                                                                      | Go                          | <i>go.mod</i>                                                                                                                       |                                                                                                                                                                                                             |

## Install Contrast CLI

Use these procedures to install Contrast CLI.

### With Homebrew

Install from Contrast's tap with Homebrew by running the following commands.

```
brew tap contrastsecurity/tap
brew install contrast
```

### With NPM/YARN



#### NOTE

Currently, only Node.js 20.18.3+ is supported.

Install using npm or yarn `@contrast/contrast`.

Use this command:

```
npm install --location=global @contrast/contrast@2
```

## With Binaries

- Go to [artifacts](#). If you prefer to automate using the latest version of the CLI, point to [latest-version.txt](#).
- Download the latest package.
- You must allow *execute* permissions on the file depending on your OS.

Once installed, continue by [authenticating your account \(page 1280\)](#).

## Authenticate your credentials

Authenticate to store your credentials before scanning for vulnerabilities.

Run the following `auth` command to store your credentials locally.

```
contrast auth
--api-key <your API key>
--authorization <your authorization header>
--host <your host domain>
--organization-id <your organization ID>
```

In Contrast, under **user menu** > **User settings** > **Profile**, locate and copy this information:

- API key
- Organization ID
- Authorization header

You will also need your Contrast URL for the `--host` line.

Once authenticated, [perform an analysis \(page 1280\)](#).

## Security analysis

Use Contrast CLI to perform security analysis.

### Run a SAST scan

1. In the terminal, type the following code: `contrast scan -f <file name>`.
2. In the results click the link to view the [scan results \(page 1168\)](#).

### Find vulnerable libraries

1. In the terminal, type the following code: `contrast audit`.
2. If you used the `--track` flag with the audit command, click the link in the results to open the [library view \(page 1206\)](#).

### Find vulnerabilities in your AWS lambda functions

1. In the terminal, type the following code: `contrast lambda--function-name [option]`.
2. In the results, review any recommendations and update policies based on the provided information.

### Find vulnerabilities with Contrast Assess

1. Install or update a Contrast agent:
  - [Use Assess CLI with Java agents \(page 1281\)](#)
  - [Use Assess CLI with .NET agents \(page 1282\)](#)
  - [Use Assess CLI with Node.js agents \(page 1283\)](#)

- [Use Assess CLI with Python agents \(page 1283\)](#)
  - [Use Assess CLI with Ruby agents \(page 1284\)](#)
  - [Use Assess CLI with Go agents \(page 1285\)](#)
2. In the terminal, type the following code: `contrast assess`  
This command generates the agent configuration file that the Contrast CLI and the agent share. The default locations for the configuration file are:
    - **MacOS and Linux**  
`/etc/contrast/contrast_security.yaml`
    - **Windows**  
`%ProgramData%\Contrast\contrast_security.yaml`You have the option of specifying a different location with `--config-path`.

**NOTE**

If your user does not have write permissions to the directory where the configuration file is located, use `sudo` or a similar mechanism to create the folder. For example:

```
sudo mkdir /etc/contrast
```

Then, grant all users read and write permissions. For example:

```
sudo chmod 777 /etc/contrast
```

3. Run your application in your IDE or a second terminal window.
4. Exercise your application, either interactively or using automated API or end-to-end tests.
5. View the results in the terminal where you entered the Contrast Assess CLI command.

## Use Assess CLI with Java agents

Use this procedure if you are using Contrast Java agents and want to use the CLI to find vulnerabilities while running API or end-to-end testing.

### Before you begin

- Verify your application can use the Assess CLI by checking the [Java supported technologies \(page 55\)](#).

### Steps

1. To install the latest Java agent , download it from from [Maven Central](#).

**IMPORTANT**

Do not create a configuration (YAML) file for the agent. The Assess CLI generates this file automatically.

2. Open a terminal window and enter the Assess CLI command:

```
contrast assess
```

This command generates the agent configuration file that the Contrast CLI and the agent share. [CLI commands \(page 1286\)](#) describes the options for this command, including the path for the configuration file.

You see output similar to this:

```
Configuration file found at "user_path"  
Waiting for the session to be created.
```

3. In your IDE or a second terminal window, run your application with this command:

```
java -javaagent:<YourContrastJarPath> -jar <AppName>.jar
```

Alternative methods:

- **IntelliJ:** Modify the run configuration to include the following command as a VM argument:

```
-javaagent:<YourContrastJarPath>
```

Replace `<YourContrastJarPath>` with the path for the Java agent's `contrast.jar` file.  
Using the updated run configuration automatically runs your Java application with the Contrast agent.

- **VS code:** Modify `vmArgs` setting in your launch configuration to include the following command as a VM argument:

```
-javaagent:<YourContrastJarPath>
```

Replace `<YourContrastJarPath>` with the path for the Java agent's `contrast.jar` file.  
Add the agent under the `vmArgs` setting

4. Exercise your application, either interactively or using automated API or end-to-end tests.
5. View the results in the terminal window where you entered the Assess CLI command.

## Use Assess CLI with .NET agents

Use this procedure if you are using Contrast .NET agents and want to find vulnerabilities while running API or end-to-end testing.

### Before you begin

- Verify that your application can use the Assess CLI by checking the [.NET Core supported technologies \(page 70\)](#) or [.NET Framework supported technologies \(page 63\)](#).

### Steps

1. Install or update your agent manually.
  - [.NET Core \(page 272\)](#)
  - [.NET Framework \(page 215\)](#)



#### IMPORTANT

Do not create a configuration (YAML) file for the agent. The Assess CLI creates this file automatically.

2. Open a terminal window and enter the Assess CLI command.

```
contrast assess
```

This command generates the agent configuration file that the Contrast CLI and the agent share. [CLI commands \(page 1286\)](#) describes the options for this command, including the path for the configuration file.

You see output similar to this:

```
Configuration file found at "user_path"  
Waiting for the session to be created.
```

3. Run your application using your IDE or a second terminal window.
4. Exercise your application, either interactively or using automated API or end-to-end tests.
5. In the terminal window where you entered the Assess CLI command, view the results.

## Use Assess CLI with Node.js agents

Use this procedure if you are using Contrast Node.js agents and want to find vulnerabilities while running API or end-to-end testing..

### Before you begin

- Verify your application can use the Assess CLI by checking the [Node.js supported technologies \(page 81\)](#).
- Contrast Assess is intended for server-side applications only. Assess does not detect vulnerabilities in client-side code.
- The Node.js agent can only instrument JavaScript applications. If you are using TypeScript for your server-side code, [transpile it to JavaScript \(page 356\)](#).

### Steps

1. Install the latest version of the agent from the application's root directory with this command:

```
npm install @contrast/agent
```

If you want to use yarn, use this command:

```
yarn add @contrast/agent
```



#### IMPORTANT

Do not create a configuration (YAML) file for the agent. The Assess CLI creates this file automatically.

2. Open a terminal window and enter the Assess CLI command.

```
contrast assess
```

This command generates the agent configuration file that the Contrast CLI and the agent share. [CLI commands \(page 1286\)](#) describes the options for this command, including the path for the configuration file.

You see output similar to this:

```
Configuration file found at "user_path"  
Waiting for the session to be created.
```

3. In your IDE or a second terminal window, run your application with a command similar to this one:

```
node -r @contrast/agent <server.js>
```

Replace `<server.js>` with your Node.js application's server start command. Adjust the command based on your application specifics.

This command requires the Contrast agent for Node.js and instruments your application's source code as it is read by the Node.js engine.

4. Exercise your application, either interactively or using automated API or end-to-end tests.
5. View the results in the terminal window where you entered the Assess CLI command.

## Use Assess CLI with Python agents

Use this procedure if you are using Contrast Python agents and want to find vulnerabilities while running API or end-to-end testing..

### Before you begin

- Verify your application can use the Assess CLI by checking the [Python supported technologies \(page 94\)](#).

### Steps

1. Install the agent using `pip`:

```
pip install contrast-agent
```



#### TIP

If you have a `requirements.txt` file, you can add `contrast-agent` to that file, and install with `pip install -r requirements.txt`.



#### IMPORTANT

Do not create a configuration (YAML) file for the agent. The Assess CLI creates this file automatically.

2. Verify that `autoconf` is installed on the system where you will run the agent.
3. Open a terminal window and enter the Assess CLI command:

```
contrast assess
```

This command generates the agent configuration file that the Contrast CLI and the agent share. [CLI commands \(page 1286\)](#) describes the options for this command, including the path for the configuration file.

You see output similar to this:

```
Configuration file found at "user_path"  
Waiting for the session to be created.
```

4. Run your application using your IDE or a second terminal window.
5. Exercise your application, either interactively or using automated API or end-to-end tests.
6. In the terminal window where you entered the Assess CLI command, view the results.

### Use Assess CLI with Ruby agents

Use this procedure if you are using Contrast Ruby agents and want to find vulnerabilities while running API or end-to-end testing..

### Before you begin

- Verify your application can use the Assess CLI by checking the [Ruby supported technologies \(page 100\)](#).

### Steps

1. Add this entry to your `gemfile`:

```
gem 'contrast-agent'
```



## 2. Install or update your agent:

- Install the agent with this command:

```
bundle install
```

- Update the agent with this command:

```
bundle update contrast-agent
```



### IMPORTANT

Do not create a configuration (YAML) file for this agent. The Assess CLI creates this file automatically.

## 3. Configure middleware (Grape, Rails, or Sinatra)

- **Grape:** Add the middleware directly to your application class extending the `Grape::API` or to your `config.ru` file if a class is not available.

```
require 'contrast-agent'
use Contrast::Agent::Middleware, true
```

- **Rails:** No code change required.
- **Sinatra:** Add the middleware directly to your application class extending the `Sinatra::Base` or to your `config.ru` file if a class is not available.

```
require 'contrast-agent'
use Contrast::Agent::Middleware, true
```

## 4. Verify that `autoconf` is installed on the system where you will run the agent.

## 5. Open a terminal window and enter the Assess CLI command:

```
contrast assess
```

This command generates the agent configuration file that the Contrast CLI and the agent share. [CLI commands \(page 1286\)](#) describes the options for this command, including the path for the configuration file.

You see output similar to this:

```
Configuration file found at "user_path"
Waiting for the session to be created.
```

6. Run your application using your IDE or a second terminal window.
7. Exercise your application, either interactively or using automated API or end-to-end tests.
8. In the terminal window where you entered the Assess CLI command, view the results.

## Use Assess CLI with Go agents

Use this procedure if you are using Contrast Go agents and want to find vulnerabilities while running API or end-to-end testing.

Running an application with the Go agent is different than most other Contrast agents. The Go agent is injected into the application's source code at compile time.

### Before you begin

- You can use the [Contrast Go Test Bench](#) application to test the Assess CLI.
- Verify your application can use the Assess CLI by checking the [Go supported technologies \(page 103\)](#).

### Steps

1. Open a terminal window and install the [Contrast Go agent \(page 567\)](#) in your environment (version 1.19 minimum),

**IMPORTANT**

Do not create a configuration (YAML) file for the agent. The Assess CLI creates this file automatically.

2. Verify that the compiler is installed using this command:

```
go version
go version go1.19.1 darwin/arm64
```

3. Install, compile, and run your application.

To verify that the application is running without Contrast implementation, open a browser and navigate to the application. Enter `CTRL-C` to stop the application.

For example, if you are using the Contrast Go Test Bench application, you would navigate to `localhost:8080`.

4. Enter the Assess CLI command:

```
contrast assess
```

This command generates the agent configuration file that the Contrast CLI and the agent share. [CLI commands \(page 1286\)](#) describe the options for this command, including the path for the configuration file.

You see output similar to this:

```
Configuration file found at "user_path"
Waiting for the session to be created.
```

5. In your IDE or in a second terminal window, compile and run your application, which is now instrumented with the Contrast Go agent.

For example: if you are using the Contrast Go Test Bench application, the commands would look like this:

```
go-test-bench on main [!?] via v1.19.1 took 1h52m1s
contrast-go run ./cmd/gin/app.go
```

6. Open a third terminal window and exercise your application, either interactively or using automated API or end-to-end tests.

For example, if you are using the Contrast Go Test Bench application, the commands would look like this:

```
go-test-bench on main [!?] via v1.19.1 took 4s
go run ./cmd/exercise
```

7. In the first terminal window that you opened, view the results.

## Contrast CLI commands

The following is a listing of the commands available to basic and advanced users of Contrast CLI.

**Usage:** `contrast [command] [options]`

## Authentication/connectivity

### auth

If you already have a Contrast account, run the following `auth` command to store your credentials locally.

- **Usage:** `contrast auth`

```
contrast auth
--api-key <your API key>
--authorization <your authorization header>
--host <your host domain>
--organization-id <your organization ID>
```

You can then [run an analysis \(page 1280\)](#) with the commands.

## config

Displays stored credentials.

- **Usage:** `contrast config`

Example:

```
contrastuser@userc-C02GD0LUMD6TTY ~ % contrast config
{
  version: '1.0.24',
  host: 'https://app.contrastsecurity.com',
  apiKey: 'wwEHMnYEIAujE03fFGH',
  organizationId: '0fdelb36-6986-4a14-b16d-6258aa913e5bceerfj',
  authorization:
    'Z211bG1hbmEubWFyaWFuaUBjb250cmFzdHNlY3VyaXR5LmNvbTpDUktMUTE3T1czMDU2NjlLO
    PDS',
  numOfRuns: 0
}
```

- **Options:**

- `-c, --clear`

Removes stored credentials.

## version

Displays Contrast CLI version.

- **Usage:** `contrast version`

Example:

```
contrastuser@usercsa-C02GD0LUMD6TTY ~ % contrast version
1.0.24
```

## Main functions

### audit

Searches for a dependency configuration file in the working directory to perform a security audit of dependencies and returns the results.

- **Usage:** `contrast audit [option]`

Example:

```
contrastuser@usercsa-C02GD0LUMD6TTY ~ % contrast audit
Searching for package manager files from /Users/contrastuser/Documents/

Contrast SCA audit started...
Contrast audit complete

Found 4 vulnerable libraries with 4 CVEs

CONTRAST-001 - [CRITICAL]  minimist-1.2.5 introduces 1 vulnerability
```

```
Issue: 1 Critical
      [C]CVE-2021-44906
Advice: Update to version 1.2.6

CONTRAST-002 - [CRITICAL]  json-schema-0.2.3 introduces 1 vulnerability
Issue: 1 Critical
      [C]CVE-2021-3918
Advice: Update to version 0.4.0

CONTRAST-003 - [HIGH]    glob-parent-5.1.1 introduces 1 vulnerability
Issue: 1 High
      [H]CVE-2020-28469
Advice: Update to version 5.1.2

CONTRAST-003 - [HIGH]    ansi-regex-0.2.1 introduces 1 vulnerability
Issue: 1 High
      [H]CVE-2021-3807
Advice: Update to version 6.0.1
```

- **Options:**

- **--fail**  
Fail a build based on the severity of CVEs found. Use with the **--severity** flag. For example, **contrast audit --fail --severity high**. Returns all failures if no severity level is specified. If a failure is detected the CLI will exit with code 2.
- **--file**  
Specify a directory or the file where dependencies are declared. (By default, Contrast CLI will search for project files in the current directory.) If multiple project files are found in the directory, you will be prompted to confirm the file to audit.  
**Alias:** -f
- **--help**  
Displays usage information for all `audit` command options.
- **--ignore-dev**  
Excludes developer dependencies from the results. All dependencies are included by default.  
**Alias:** -i
- **--legacy**  
Creates an application in Contrast (a legacy workflow). It displays a [dependency tree \(page 1216\)](#) for your piece of code and utilizes metadata. Note that this is only available for Contrast CLI V2.0 and later.
- **--name**  
Set a custom project name. If the name is already in use, it will replace the results for that project. Avoid special characters.
- **--resource-group**  
Specify a resource group when generating SCA projects. Resource groups specify the applications, projects, and organization settings that users can access, based on their assigned roles. See [Resource groups \(page 1572\)](#) for more information.
- **--save**  
Generate and save an SBOM (Software Bill of Materials). Valid options are: **--save cyclonedx** and **--save spdx** (CycloneDX is the default format).  
**Alias:** -s
- **--severity**  
Specify the minimum severity of CVE to fail a build. Use with the **--fail** flag. For example, **contrast audit --fail --severity high**. Severity levels are *critical*, *high*, *medium*, *low*, or *note*.
- **--track**

By default, results are not held or stored, which would allow you to do local checks via your console. Add the `--track` flag to view your projects' SCA results under the **Static** view on the [Libraries \(page 1206\)](#) page in the Contrast web interface. Note that this is only available for Contrast CLI V2.0.

- **Advanced options:**

- `--api-key`  
Required for Enterprise users. Agent API key provided by Contrast. See [agent keys \(page 109\)](#) to find your keys.
- `--application-id`  
The ID of the application cataloged by Contrast.
- `--application-name`  
The name of the application cataloged by Contrast.
- `--app-groups`  
Assign your application to one or more preexisting groups when onboarding an application. Group lists should be comma separated.
- `--authorization`  
Required for Enterprise users. Authorization header provided by Contrast.
- `--code`  
The application code the application should use in Contrast.
- `--host`  
Required for Enterprise users. The host name. For example, `https://app.contrastsecurity.com`.
- `--maven-settings-path`  
Displays the path to the maven *settings.xml* file.
- `--metadata`  
Define a set of key=value pairs (that conforms to RFC 2253) for specifying user-defined metadata associated with the application.
- `--organization-id`  
Required for Enterprise users. The ID of your organization in Contrast. See [agent keys \(page 109\)](#) to find the ID.
- `--tags`  
Apply labels to an application. Labels must be formatted as a comma-delimited list. For example, `label1,label2,label3`.

- **Proxy settings:**

- `--cacert`  
Displays the path to the CaCert (certificate authority (CA) certificates) file.
- `--cert`  
Displays the path to the Cert (certificate) file.
- `--cert-self-signed`  
For Contrast on-premises (EOP) users with a local install, will bypass the SSL certificate and recognize a self-signed certificate.
- `--key`  
Displays the path to the Certificate Key.
- `--proxy`  
Allows for connection via a proxy server. If authentication is required, provide the username and password with the protocol, host, and port. For example, "http://username:password@<host>:<port>".

To use `audit` in pipelines for failing builds, see the [Contrast SCA Action](#).

## assess

Reports vulnerabilities found at run-time on a server using a Contrast agent.

- Example:

[illegible]

```
input=..%2F..%2F..%2F..%2F..%2F..%2F..%2F..%2F..%2F..%2F..%2Fetc%2Fpa
sswd
  Location: /opt/homebrew/Cellar/go/1.19.1/libexec/src/os/file.go, line
316, in os.Open()
  Dataflow: "../../../../../../../../../../../../../../../../etc/passwd"
  Issue: Because there is untrusted data being used as part of the
file path, it may be possible
        for an attacker to read sensitive data or write, update, or
delete arbitrary files on the
        container's file system. The ability to write arbitrary files
to the file system is also
        called Unrestricted or Arbitrary File Uploads.
```

#### • Options:

- `--config-path <path>`  
Specifies the path or directory for the `contrast_security.yaml` file that the Assess CLI and the agent share.  
If not specified, the default paths are:
  - **MacOS and Linux:** `/etc/contrast`
  - **Windows:** `%ProgramData%\Contrast\`
 Alias: `-c`
- `--file <filename>`  
Specifies the path or directory for the vulnerability results file so Contrast can read it and display the results in the terminal. The file name is `contrast-assess-{Date}.jsonl.`, where the date is in epoch milli-seconds, For example: `contrast-assess-1691520302714.jsonl.`  
Alias: `-f`
- `--help`  
Displays usage information for all `assess` command options.
- `--no-watch [true|false]`  
If set to `true` when using Assess with a Contrast agent, the CLI does not watch (or poll) Contrast for available vulnerabilities. The CLI retrieves the vulnerabilities only once for a specific `buildNumber`. The default setting is `false`.  
Alias: `-n`
- `--output-path <path>`  
Specifies the path or directory where you want the vulnerability results file located. The output file is in JSONL format. The file name is `contrast-assess-{Date}.jsonl.`, where the date is in epoch milli-seconds, For example: `contrast-assess-1691520302714.jsonl.`  
Alias: `-o`
- `--report-notes [true|false]`  
If set to `true`, the access command displays vulnerabilities with a notes severity level. The default value is `false` which displays higher priority vulnerabilities.  
Alias: `-r`

#### sarif

Generates a SARIF file (`contrast.sarif`) that contains findings from Contrast Assess and Contrast SCA for a specific application ID.



#### NOTE

You can also use the `sarif` API to generate the SARIF file.

- **Usage:** `contrast sarif [option]`

Example

```
contrast sarif
--application-id 8f32952c-987c-4b9e-882c-a2b59a2fb4ee
--severity high
--metadata
'repo=TS,commit=commit-49-61670e50-1e9c-11ef-9109-059d9bfadadd,developer=D
ev-49-61670e50-1e9c-11ef-9109-059d9bfadadd'
```

- **Options:**

- `--application-id <id>`  
The ID of the application cataloged by Contrast.
- `--severity [type]`  
Set the severity level to filter the findings included in the SARIF output. Severity levels are **critical**, **high**, **medium**, **low** or, **note**.  
The severity level you specify is the minimum level that the report includes. For example, if you specify `--severity high`, the report includes findings with a severity of **high** and **critical**.
- `--metadata`  
Define a set of key=value pairs (that conforms to RFC 2253) for specifying user-defined metadata associated with the application.
- `--tool-type`  
Filters the type of findings included in the report. The valid types are **SCA** and **ASSESS**. For example, `--tool-type ASSESS` includes Assess findings only.  
If you don't specify this option, the report includes findings for both SCA and Assess.

- **Advanced options:**

- `--api-key`  
Required for Enterprise users. Agent API key provided by Contrast. See [agent keys \(page 109\)](#) to find your keys.
- `--authorization`  
Required for Enterprise users. Authorization header provided by Contrast.
- `--code`  
The application code the application should use in Contrast.
- `--host`  
Required for Enterprise users. The host name. For example, `https://app.contrastsecurity.com`.
- `--organization-id`  
Required for Enterprise users. The ID of your organization in Contrast. See [agent keys \(page 109\)](#) to find the ID.

- **Proxy settings:**

- `--cacert`  
Displays the path to the CaCert (certificate authority (CA) certificates) file.
- `--cert`  
Displays the path to the Cert (certificate) file.
- `--cert-self-signed`  
For Contrast on-premises (EOP) users with a local install, will bypass the SSL certificate and recognize a self-signed certificate.
- `--key`  
Displays the path to the Certificate Key.
- `--proxy`  
Allows for connection via a proxy server. If authentication is required, provide the username and password with the protocol, host, and port. For example, "http://username:password@<host>:<port>".



## scan

Performs a security SAST scan.

- **Usage:** `contrast scan [option]`

Example:

```
contrastuser@usercsa-C02GD0LUMD6TTY ~ % contrast scan
Searching for files to scan from from /Users/contrast/Documents/
Searched 3 directory levels & found...
- spring-petclinic-1.5.1.jar
- webgoat-server-8.2.2.jar
- webgoat.jar

Java Scan requires a .war or .jar file. Javascript Scan requires a .js
or .zip file.
To start a Scan enter "contrast scan -f <path-to-file>"
contrastuser@usercsa-C02GD0LUMD6TTY ~ % contrast scan -f webgoat.jar
Found existing project...
Uploading...
Uploaded file successfully.
Contrast Scan started.
```

### Here are your top priorities to fix

```
CRITICAL      sql-injection (2)
                1. org/owasp/webgoat/plugin/challenge6/Assignment6.java @43
                2. org/owasp/webgoat/plugin/challenge5/challenge6/
Assignment5.java @38
```

- `--branch`  
Specifies a branch in a repository to be scanned. When specified, scan results are aggregated against results for the current branch and not the main project.  
Alias: `-b`
- `--fail`  
Fail a build based on the severity of the vulnerability found. Use with the `--severity` flag. For example, **`contrast scan --fail --severity high`**. Returns all failures if no severity level is specified. If a failure is detected the CLI will exit with code 2.
- `--file`  
Path of the file you want to scan. Contrast searches for a .jar, .war, .js or .zip file in the working directory if a file is not specified.  
Alias: `-f`
- `--help`  
Displays usage information for all `scan` command options.
- `--host`  
Required for Enterprise users. The host name. For example, `https://app.contrastsecurity.com`.
- `--language`  
Valid values are JAVA and JAVASCRIPT.



### IMPORTANT

This option is not valid if you are using the multi-language source code scan engine.

Alias: `-l`

- `--memory`  
Memory override for the multi-language source code scan engine. The default memory setting is 2 GB.
- `--name`  
Contrast project name. If not specified, Contrast uses *contrast.settings* to identify the project or creates a project.  
Alias: `-n`
- `-r`  
Contrast resource group name. This option is required for host-based customers if role-based access control is turned on.
- `--save`  
Download the results to a Static Analysis Results Interchange Format (SARIF) file. The file is downloaded to the current working directory with a default name of *results.sarif*. You can view the file with any text editor.  
Alias: `-s`
- `--severity`  
A Contrast vulnerability severity level that returns a build failure status code that you can use to gate builds in pipelines.  
Valid values are: *critical*, *high*, *medium*, *low*, and *note*.  
The specified value is the minimum level of severity that returns a build failure status code. For example, if you specify `--severity high`, a finding of that severity or higher returns a build failure status code.  
Use with the `--fail` flag. For example, **`contrast scan --fail --severity high`**.
- `--timeout`  
Time in seconds to wait for the scan to complete. Default value is 300 seconds.  
Alias: `-t`
- **Options:**
- **Advanced options:**
  - `--api-key`  
Required for Enterprise users. Agent API key provided by Contrast. See [agent keys \(page 109\)](#) to find your keys
  - `--authorization`  
Required for Enterprise users. Authorization header provided by Contrast.
  - `--ff`  
Fire and forget. Do not wait for the result of the scan.
  - `--host`  
Required for Enterprise users. The host name. For example, `https://app.contrastsecurity.com`.
  - `--label`  
Adds a label to the scan. Defaults to *Started by CLI tool at [current date]*.
  - `--organization-id`  
Required for Enterprise users. The ID of your organization in Contrast. See [agent keys \(page 109\)](#) to find the ID.
  - `--project-id`  
The ID associated with a scan project. To find the ID, select a scan project in Contrast and locate the last number in the URL.
- **Proxy settings:**
  - `--cacert`  
Displays the path to the CaCert (certificate authority (CA) certificates) file.
  - `--cert`  
Displays the path to the Cert (certificate) file.
  - `--cert-self-signed`

For Contrast on-premises (EOP) users with a local install, will bypass the SSL certificate and recognize a self-signed certificate.

- `--key`  
Displays the path to the Certificate Key.
- `--proxy`  
Allows for connection via a proxy server. If authentication is required, provide the username and password with the protocol, host, and port. For example, "http://username:password@<host>:<port>".

## lambda

Name of AWS lambda function to scan.

- **Usage:** `contrast lambda --function-name <function> [options]`
- **Alias:** `-f`
- **Options:**
  - `--endpoint-url`  
AWS Endpoint override. Similar to AWS CLI.  
Alias: `-e`
  - `--help`  
Displays usage information for all `lambda` command options.
  - `--region`  
Region override. Defaults to `AWS_DEFAULT_REGION`. Similar to AWS CLI.  
Alias: `-r`
  - `--profile`  
AWS configuration profile override. Similar to AWS CLI.  
Alias: `-p`
  - `--json`  
Return response in JSON (versus default human-readable format).  
Alias: `-j`
  - `--verbose`  
Returns extended information to the terminal.  
Alias: `-v`
  - `--list-functions`  
Lists all available lambda functions to scan.
  - `--help`  
Displays usage guide.  
Alias: `-h`
- **Proxy settings:**
  - `--cacert`  
Displays the path to the CaCert (certificate authority (CA) certificates) file.
  - `--cert`  
Displays the path to the Cert (certificate) file.
  - `--cert-self-signed`  
For Contrast on-premises (EOP) users with a local install, will bypass the SSL certificate and recognize a self-signed certificate.
  - `--key`  
Displays the path to the Certificate Key.
  - `--proxy`  
Allows for connection via a proxy server. If authentication is required, provide the username and password with the protocol, host, and port. For example, "http://username:password@<host>:<port>".

## Help and learn

### help

Displays usage guide. To list detailed help for any CLI command, add the **-h** or **--help** flag to the command.

- **Usage:** `contrast help`

Example:

```
contrastuser@usercsa-C02GD0LUMD6TTY ~ % contrast help
Contrast CLI @ v1.0.24
Contrast Scan CLI
Pre-requisites  Java, Javascript and .NET supported

To scan a Java project you will need a .jar or .war file for analysis

To scan a Javascript project you will need a single .js or a .zip of
multiple .js files

To scan a .NET c# webforms project you will need a .exe or a .zip file
for
analysis

The file argument is optional. If no file is given, Contrast will search
for
a .jar, .war, .exe or .zip file in the working directory.

Submitted files are encrypted during upload and deleted in 24 hours.

Scan Options
-l, --language string    (optional): Valid values are JAVA, JAVASCRIPT and
DOTNET
--label string           (optional): adds a label to the scan - defaults
to 'Started by CLI tool at
current date'

-n, --name string        (optional): Contrast project name. If not
specified, Contrast uses
contrast.settings to identify the project or creates a project.

-f, --file string        (optional): Path of the file you want to scan. If
no file is specified,
Contrast searches for a .jar, .war, .exe or .zip file in the working
directory.

-t, --timeout number     (optional): Time in seconds to wait for scan to
complete. Default value is
300 seconds.
```

`--fail` (optional): Use with `contrast scan` or `contrast audit`. Detects failures based on the severity level specified with the `--severity` command. For example, `"contrast scan --fail --severity high"`. Returns all failures if no severity level is specified.

`--severity type` (optional): Use with `"contrast scan --fail --severity high"` or `"contrast audit --fail --severity high"`. Set the severity level to detect vulnerabilities or dependencies. Severity levels are critical, high, medium, low or note.

`-s, --save string` (optional): Saves the Scan Results SARIF to file. Advanced

`-o, --organization-id string` (required for Contrast Enterprise): The ID of your organization as provided by Contrast UI

`--api-key string` (required for Contrast Enterprise): An agent API key as provided by Contrast UI

`--authorization string` (required for Contrast Enterprise): An authorization header as provided by Contrast UI

`--host string` (required for Contrast Enterprise): host name e.g. `https://app.contrastsecurity.com`

`--proxy string` (optional): Allows for connection via a proxy server. If authentication is required please provide the username and password with the protocol, host and port. For instance: `"https://username:password@<host>:<port>"`.

`--key string` (optional): Path to the Certificate Key

`--cacert string` (optional): Path to the CaCert file

`--cert string` (optional): Path to the Cert file

`--cert-self-signed` (optional): For EOP users with a local Teamserver install, this will bypass the SSL certificate and recognise a self signed certificate.

`-p, --project-id string` (optional): The ID associated with a scan project. Replace `<ProjectID>` with the ID for the scan project. To find the ID, select a scan project in Contrast and locate the last number in the URL.

```
-l, --language string      (optional): Valid values are JAVA,
                             JAVASCRIPT and DOTNET
--ff                        (optional): Fire and forget. Do not wait
                             for the result of the scan.
--label string             (optional): adds a label to the scan -
                             defaults to 'Started by CLI tool at
                             current date'
```

Need More Help? NEW users  
Check out: <https://support.contrastsecurity.com>

Learn more at: <https://www.contrastsecurity.com/developer>

Join the discussion: <https://www.contrastsecurity.com/developer/community>

Existing Contrast Licensed user?  
Read our docs: <https://docs.contrastsecurity.com/en/run-contrast-cli.html>

Want to UP your game? type 'contrast learn'

Advance your security knowledge and become an All-star coder with  
Contrast Secure Code Learning Hub.

- **Alias:** -h

## learn

Launch [Contrast's Secure Code Learning Hub](#).

- **Usage:** contrast learn  
Example:

```
contrastuser@usercsa-C02GD0LUMD6TTY ~ % contrast learn
Opening Contrast's Secure Code Learning Hub...
If the page does not open you can open it directly via https://
www.contrastsecurity.com/developer/learn
```

## Legacy Contrast CLI



### IMPORTANT

Legacy Contrast CLI will be deprecated as of October 2022. We encourage you to begin using the [new Contrast CLI \(page 1278\)](#).

Use the Contrast command line interface (CLI) to analyze libraries at the earliest stage of the software development life cycle (SDLC).

The Contrast CLI runs on Node.js but can be used on any application to provide composition analysis capabilities at the command line. For details about the supported platforms and languages, see the [Contrast CLI supported languages \(page 1299\)](#) page.

With this composition analysis you can:

- Identify vulnerable libraries
- Fail a build based on CVE severity
- View a [dependency tree \(page 1216\)](#) to understand the dependencies between libraries and where vulnerabilities have been introduced
- Identify node.js libraries at risk for dependency confusion
- Generate SBOM

Contrast does this by supplementing existing runtime instrumentation from Contrast agents, with data from pre-compile analysis (typically not available at runtime).

Install the [Contrast CLI \(page 1299\)](#) so you can [register new applications \(page 1300\)](#) and begin analyzing your libraries during the development phase using the [command line options. \(page 1302\)](#)

## Legacy Contrast CLI - supported languages

We support the following languages for Contrast CLI:

| Language                     | Requirements                                                                                    | Notes                                                                                                                                                                                                                                              |
|------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Java                         | Maven                                                                                           | A Maven project must be defined with a <code>pom.xml</code> file, and have the <a href="#">☑Apache Maven Dependency plugin</a> . To test if the CLI works with your project, build a dependency tree by running <code>mvn dependency:tree</code> . |
|                              | Gradle (v4.8 or above)                                                                          | A <code>build.gradle</code> file is required and <b>gradle dependencies</b> or <b>gradlew dependencies</b> must also be supported.                                                                                                                 |
| .NET Framework and .NET Core | MSBuild 15.0 or greater and a <code>packages.lock.json</code> file                              | If the <code>packages.lock.json</code> file is not present, it can be generated by setting <code>RestorePackagesWithLockFile</code> to <b>true</b> within each <code>csproj</code> and running .NET build.                                         |
| Node.js                      | You must have either a <code>package-lock.json</code> or a <code>yarn.lock</code> file present. | Vulnerability reporting is supported for front-end technologies like React or Angular.                                                                                                                                                             |
| PHP                          | You must have the <code>compose.lock</code> and the <code>composer.json</code> files present.   |                                                                                                                                                                                                                                                    |
| Python                       | The <code>pipfile</code> and <code>pipfile.lock</code> files.                                   |                                                                                                                                                                                                                                                    |
| Ruby                         | The <code>gemfile</code> and <code>gemfile.lock</code> files.                                   |                                                                                                                                                                                                                                                    |
| Go                           | The <code>go.mod</code> file.                                                                   |                                                                                                                                                                                                                                                    |



### NOTE

Only single language applications are supported at this time.

## Legacy Contrast CLI - Install

To install the [Contrast CLI \(page 1298\)](#):

1. [Install Node.js](#). The Contrast CLI is executed as a Node.js package, so this is required. Versions 10, 12, and 14 are currently supported.
2. Instrument your application.



### NOTE

It is also possible to [register an application \(page 1300\)](#) that has not yet been instrumented. However, all applications should be instrumented so that your application has a [library score \(page 1216\)](#) and the data in the library grid is populated.

3. Use the `cli_proxy` property in your agent configuration to establish communication with Contrast over a proxy.  
If authentication is required, provide the username and password with the protocol, host and port.  
For example:

```
http://username:password@<host>:<port>
```

4. Be sure the source code for target applications is available locally. Follow the requirements for your application's [language \(page 1299\)](#).
5. Run the following command:

```
npm install -g @contrast/contrast-cli
```

Alternatively, you can install the CLI with Yarn with the following command:

```
yarn global add @contrast/contrast-cli
```

**NOTE**

The Contrast CLI must be installed globally.

6. Once the installation is complete you can [register an application \(page 1300\)](#) to begin analyzing your code.

## Legacy Contrast CLI - Register applications

Once you [install the Contrast CLI \(page 1299\)](#) you must first register applications in order to see the results in Contrast.

**TIP**

You may want to invoke the Contrast CLI as part of your automated build process.

1. Locate your application ID. The application ID is the last URI segment in the Contrast URL in your browser.



2. Locate your [keys \(page 638\)](#). You will need:
  - API key
  - Organization ID
  - Authorization header
  - Server host name from the Contrast URL

**NOTE**

You only need to enter the server host name. For example, if the Contrast URL is `https://app.contrastsecurity.com/file/path/`, just enter:

```
--host app.contrastsecurity.com
```



3. To begin analysis, use one of these options:

- Replace <APIKey>, <AuthorizationKey>, <OrganizationID>, <Host> and <ApplicationID> with your API key, authorization header, Organization ID, host name and application ID, then run the CLI.

```
contrast-cli \  
--api_key <APIKey> \  
--authorization <AuthorizationKey> \  
--organization_id <OrganizationId> \  
--host <Host> \  
--application_id <ApplicationId>
```

- Place credentials within a YAML file, using the same replacements:

```
cli:  
  api_key: <APIKey>  
  authorization: <AuthorizationKey>  
  organization_id: <OrganizationId>  
  host: <Host>  
  application_id: <ApplicationId>
```

Replace <path/to/yaml> with your YAML path, and run this command to initiate:

```
contrast-cli --yaml_path <path/to/yaml>
```



#### NOTE

If you need to go through a communication protocol like Transport Layer Security (TLS) for example add the following parameters to the YAML file:

```
key: pathToKey  
cert: pathToCert  
cacert: pathToCaCert
```

4. After you see a success message, you are ready to [view the dependency tree \(page 1216\)](#).

**TIP**

It is possible to add a new application to Contrast without instrumenting the application by using the `--catalogue_application` and `--application_name` options. However, it is best to [instrument the application \(page 51\)](#) so that the [library score \(page 1216\)](#) and library grid are populated in Contrast.

For example:

```
contrast-cli \  
--catalogue_application \  
--api_key <YourApiKey> \  
--authorization <YourAuthorizationKey> \  
--organization_id <YourOrganizationID> \  
--host <YourHost> \  
--application_name <YourApplicationName> \  
--language <YourApplicationLanguage>
```

Replace `<APIKey>` with your API key, `<AuthorizationKey>` with the authorization header, `<OrganizationID>` with your organization ID, `<Host>` with your host name, `<ApplicationName>` with your application name, and `<ApplicationLanguage>` with your application language. Allowable language values are JAVA, DOTNET, NODE, PHP, PYTHON, RUBY, and GO.

You will know the catalogue operation was successful if an application ID is displayed in the console.

**NOTE**

You can also register an application and create an SBOM report at the same time with [a set of CLI commands \(page 1302\)](#).

## Legacy Contrast CLI - commands

The CLI offers a command line help guide with the `-h` or `--help` option. The help guide contains the following commands to help you understand more about Contrast configuration, applications, and vulnerabilities.

In the following examples, replace `<string>` or `<level>` with the string or level value that applies to your particular situation.

### General commands

Commands for connection and configuration.

| Command                                        | Description                                                                  |
|------------------------------------------------|------------------------------------------------------------------------------|
| <code>--api_key &lt;string&gt;</code>          | An agent <a href="#">API key (page 109)</a> provided by Contrast. (required) |
| <code>--application_id &lt;string&gt;</code>   | The ID of the application cataloged by Contrast. (required)                  |
| <code>--application_name &lt;string&gt;</code> | The name of the application cataloged by Contrast. (optional)                |

| Command                                       | Description                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>--authorization &lt;string&gt;</code>   | User authorization credentials provided by Contrast. (required)                                                                                                                                                                                                                                                                                                               |
| <code>-h, --help</code>                       | Displays the help guide.                                                                                                                                                                                                                                                                                                                                                      |
| <code>--host &lt;string&gt;</code>            | The name of the host and, optionally, the port expressed as <code>&lt;host&gt;:&lt;port&gt;</code> . Does not include the protocol section of the URL ( <i>https://</i> ). Defaults to <i>app.contrastsecurity.com</i> . (optional)                                                                                                                                           |
| <code>--language &lt;string&gt;</code>        | Valid values are JAVA, DOTNET, NODE, PHP, PYTHON, RUBY, and GO. If there are multiple project configuration files in the <code>project_path</code> , language is required. (required for catalogue)                                                                                                                                                                           |
| <code>--organization_id &lt;string&gt;</code> | The ID of your organization (page 109) in Contrast. (required)                                                                                                                                                                                                                                                                                                                |
| <code>--project_path &lt;string&gt;</code>    | The directory root of a project/application that you want to analyze. Defaults to the current directory. (optional; required if running on Windows).                                                                                                                                                                                                                          |
| <code>--proxy &lt;string&gt;</code>           | Allows for connection over a proxy server. If authentication is required, provide the username and password with the protocol, host and port. For example, <i>http://username:password@&lt;host&gt;:&lt;port&gt;</i> . (optional)                                                                                                                                             |
| <code>--silent</code>                         | Silences JSON output. (optional)                                                                                                                                                                                                                                                                                                                                              |
| <code>--sub_project &lt;string&gt;</code>     | Specifies the subproject within a Gradle application. (optional)                                                                                                                                                                                                                                                                                                              |
| <code>-v, --version</code>                    | Displays the CLI version you are currently using.                                                                                                                                                                                                                                                                                                                             |
| <code>--yaml_path &lt;string&gt;</code>       | <p>The path to display parameters from the YAML file (optional)</p> <p>If <code>yaml_path</code> is used, the following connection parameters are ignored from the terminal:</p> <ul style="list-style-type: none"> <li><code>yamlOnly:</code></li> <li><code>key:pathToKey</code></li> <li><code>cert:pathToCert</code></li> <li><code>cacert:pathToCaCert</code></li> </ul> |



## NOTE

Parameters in these commands may need to be quoted to avoid issues with special characters. For example:

```
--application_name = "My_app_name_${+}=( / \ "
```

## SCA

Commands related to Contrast SCA examination.

| Command                                  | Description                                                                                                                                                                                 |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Catalog applications</b>              |                                                                                                                                                                                             |
| <code>--app_groups &lt;string&gt;</code> | Assigns your application to one or more pre-existing groups when using the <code>catalogue</code> command. Group lists should be comma separated. (optional)                                |
| <code>--catalogue_application</code>     | Catalog an application (required). If the application name does not exist, create the application and send the dependency tree, else append the dependency tree to an existing application. |
| <code>--code &lt;string&gt;</code>       | The application code this application should use in Contrast. (optional)                                                                                                                    |

| Command                                                                        | Description                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| --metadata <string>                                                            | Define a set of key=value pairs (which conforms to RFC 2253) for specifying user-defined metadata associated with the application. (optional)                                                                                                       |
| --tags <string>                                                                | Apply labels to an application. Labels must be formatted as a comma-delimited list. Example - label1,label2,label3 (optional)                                                                                                                       |
| Snapshot - default command does not have a command on the terminal. Java only. |                                                                                                                                                                                                                                                     |
| --maven_settings_path <PathToFile>                                             | Allows you to specify an alternative location for your maven settings.xml file. Replace <PathToFile> with the full path for the file. Add this path to the full set of keys when you register your application with the CLI (page 1300). (optional) |
| Register an application                                                        |                                                                                                                                                                                                                                                     |
| --cli_api_key <string>                                                         | Use this set of commands (values described in the tables above and below) to register an application and get an SBOM report at the same time.                                                                                                       |
| --cli_authorization <string>                                                   |                                                                                                                                                                                                                                                     |
| --cli_organization_id <string>                                                 | Note: The "cli_" prefix in the parameters will be deprecated in a future release.                                                                                                                                                                   |
| --cli_host <string>                                                            |                                                                                                                                                                                                                                                     |
| --language <string>                                                            |                                                                                                                                                                                                                                                     |
| --application_name <string>                                                    |                                                                                                                                                                                                                                                     |
| --sbom                                                                         |                                                                                                                                                                                                                                                     |
| Reports                                                                        |                                                                                                                                                                                                                                                     |
| --cve_severity <level>                                                         | Combined with --report, allows the user to report libraries with vulnerabilities above a chosen severity level (page 1323). For example, cve_severity medium only reports vulnerabilities at Medium or higher severity.                             |
| --cve_threshold <number>                                                       | Sets the number of CVEs allowed before a build is failed. If there are more CVEs than the threshold, the build will fail.                                                                                                                           |
| --fail                                                                         | Fails the build if any vulnerabilities are found. Can be used in combination with cve_severity to fail builds with vulnerabilities at severity levels defined by the user.                                                                          |
| --report                                                                       | Shows a report of vulnerabilities in the application from compile time.                                                                                                                                                                             |
| --ignore_dev                                                                   | Combined with the --report command excludes developer dependencies from the vulnerabilities report. By default, all dependencies are included in a report.                                                                                          |
| SBOM                                                                           |                                                                                                                                                                                                                                                     |
| --sbom                                                                         | Generate and download a Software Bill of Materials (SBOM) (page 1326) in CycloneDX JSON format                                                                                                                                                      |

**TIP**

The `--report` command can be used to return details of all vulnerable libraries in the terminal response. Every CVE found will have output like this:

```
org.webjars/jquery-ui/1.11.4 is vulnerable
```

```
CVE-2016-7103 MEDIUM Cross-site scripting (XSS) vulnerability
in jQuery UI before 1.12.0 might allow remote attackers to
inject arbitrary web script or HTML via the closeText parameter
of the dialog function.
```

The vulnerable records returned can be restricted by using the `--cve_severity` parameter which sets the minimum threshold for a CVE to be reported.

To prevent an application from being deployed with a library above a severity threshold the `--fail` parameter can be used as part of an automated CI/CD pipeline. For example, you can run the CLI using a YAML file with:

```
contrast-cli --yaml_path path/to/yaml --report --cve_severity
high --fail
```

**Scan**

Commands related to Contrast Scan. See also [Integrate scans with builds \(page 1188\)](#).

Contrast Scan supports EXE and ZIP files for .NET projects. The language must be set to DOTNET and the ZIP should be a ZIP of the `./bin` folder that contains your dlls.

| Command                                         | Description                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>--project_id &lt;ProjectID&gt;</code>     | <p>The ID associated with a scan project. Replace <code>&lt;ProjectID&gt;</code> with the ID for the scan project. To find the ID, select a scan project in Contrast and locate the last number in the URL.</p> <p><b>Recommended:</b> For the first scan, use the <code>--project_name</code> command instead of this one. Scan creates the project for you.</p> |
| <code>--project_name &lt;ProjectName&gt;</code> | <p>The name of the scan project. If the name includes spaces, enclose it in double quotes ("").</p> <p>If you specify a new name, Scan creates the project. If you specify the name of an existing project, Scan adds the uploaded file to that project.</p>                                                                                                      |
| <code>--save_scan_results</code>                | If provided, will save the SARIF file as <i>results.json</i> to the current directory. (optional)                                                                                                                                                                                                                                                                 |
| <code>--scan&lt;FileToBeScanned&gt;</code>      | Starts a static scan of the specified WAR or JAR file. Replace <code>&lt;FileToBeScanned&gt;</code> with the path of the WAR or JAR file that you want to upload for scanning.                                                                                                                                                                                    |
| <code>--scan_results_file_name</code>           | Must be JSON file format. If provided, will override the default name to save the SARIF file. (optional)                                                                                                                                                                                                                                                          |
| <code>--scan_timeout</code>                     | Set a specific time span (in seconds) before the function times out. The default timeout is 20 seconds if <code>scan_timeout</code> is not set.                                                                                                                                                                                                                   |
| <code>--wait_for_scan</code>                    | Waits for the result of the scan.                                                                                                                                                                                                                                                                                                                                 |

**Vulnerabilities**

Once you [instrument an application \(page 51\)](#), Contrast shows you all the vulnerabilities it's discovered, addressing some of the [most common vulnerabilities](#) and many others.

Contrast agents discover any code flaws that are in your applications, and report them. Contrast then presents and classifies these vulnerabilities with a severity level to help you prioritize and mark the vulnerabilities as needed.

- [View vulnerabilities \(page 1307\)](#)
- [View application vulnerabilities \(page 1308\)](#)
- [Analyze vulnerabilities \(page 1316\)](#)
- [Track vulnerabilities \(page 1314\)](#)
- [Fix vulnerabilities \(page 1317\)](#)

## Use Contrast AI guidance ☺

Contrast AI provides additional information about how to fix vulnerabilities that the Contrast IAST (Assess) technology discovers. The guidance it generates is specific to the frameworks and libraries that your application uses.

Contrast AI collects information about your frameworks and libraries from existing data stored in Contrast. It uses this information along with Anthropic to generate customized guidance for fixing a selected vulnerability.



### LEGAL DISCLAIMER

When you use [Contrast AI] Intelligent Remediation Guidance, you submit data to the Anthropic services made available through the technical environment referred to as Amazon Bedrock that is hosted and managed by Amazon Web Services, Inc. ("Services"). Both the submission of data to the Services and the output generated by the Services will be subject to the [terms of service of Anthropic](#). Use of Contrast AI is entirely at your own risk.

## Before you begin

- Ensure that the [Contrast AI setting \(page 1442\)](#) is turned on at the organization level.
- This feature is available for hosted customers in the USA only.
- This feature is currently supported for vulnerabilities that Contrast IAST (Assess) technology finds.
- Contrast caches responses from the large language model (LLM) for 24 hours.

## Steps

To find Contrast AI details for vulnerabilities that the Contrast IAST technology finds:

1. In the header, select **Vulnerabilities**.
2. Select a vulnerability in the list.
3. Select the **How-to-Fix** tab.
4. Select **Use Contrast AI**.  
Contrast AI generates supplementary information based on your application's technology.

## View vulnerabilities at an organization level

### Before you begin

- Exercise (browse or use) your application so Contrast can find weaknesses and present results in the Contrast application.
- To see your application's vulnerability data in more detail, configure your Contrast agent to report [session metadata](#) (page 656).
- To view the Protected in <environment> column, Protect must be turned on and you need these permissions:
  - If you are using role-based access control, you need a role with the View application and Access Protect actions.
  - If you are using organization users and groups, a SuperAdmin must turn on Protect for the user.

### Steps

1. In the header, select **Vulnerabilities**.
2. To display vulnerabilities for licensed applications only, select **Show licensed only** at the top of the vulnerabilities list.
3. To filter by columns, select the **Filter** icon (▼) next to the column headers. These filter options are available if applicable to the selected application:
  - **Severity:** Available filters are: Critical, High, Medium, Low, and Note.
  - **Vulnerability:** Available filters are:
    - **Vulnerability tags:** Vulnerabilities associated with custom tags that you created.
    - **Type:** Types of vulnerabilities.
    - **Servers:** Vulnerabilities for applications associated with selected servers.
    - **Environments:** Vulnerabilities for applications in selected environments: Development, QA, and production.
    - **Sinks:** Vulnerabilities that originate from a common sink.  
A sink is common custom code shared between multiple data-flow vulnerabilities.  
Filtering by sink can help you identify a line of code that is causing multiple vulnerabilities.
    - **URLs:** Vulnerabilities associated with a specific URL.
    - **Compliance policy:** Vulnerabilities associated with a compliance policy
  - **Protected in <environment>:** Available filters are:
    - **Off:** Protection is turned off.
    - **Monitor:** The protection rule that is mapped to the vulnerability is in Monitor mode.
    - **Monitor at perimeter:** The protection rule that is mapped to the vulnerability is in Monitor at perimeter mode.
    - **Block:** The protection rule that is mapped to the vulnerability is in Block mode.
    - **Block at perimeter:** The protection rule that is mapped to the vulnerability is in Block at perimeter mode.
    - **No rule available:** Contrast does not have a protection rule for the vulnerability.
  - **Application:** Available filters are:
    - **Application names:** Names associated with applications.
    - **Custom tags:** Tags assigned to applications.
    - **Languages:** The languages used for applications.
    - **Technologies:** Technologies that applications use. For example, JSON or jQuery.
    - **Application importance:** The importance level you set in the application settings.
    - **Application metadata:** Application metadata associated with applications.
  - **Last detected:** Available filters are: First or Last detected and Time range. Select **Custom** to enter specific dates and times.

- **Status:** Available filters are Status and whether Contrast is tracking the vulnerability. To remove filters, select **Clear** next to the column header.



4. To view vulnerability details, select a name. You can view details for these categories:
  - HTTP information
  - Steps on how to fix this vulnerability
  - Details about the identity, timing and location of the vulnerability including build numbers, reporting servers, category and security standards
  - Use the **Activity** tab to add new comments to the associated Jira issue (if it is [configured \(page 1379\)](#)) and, the other way around, if a comment is added to the Jira issue it will appear under the Activity tab.

## See also

[View application vulnerabilities \(page 1308\)](#)

## View application vulnerabilities

From the Applications list, you can view vulnerabilities for a specific application.

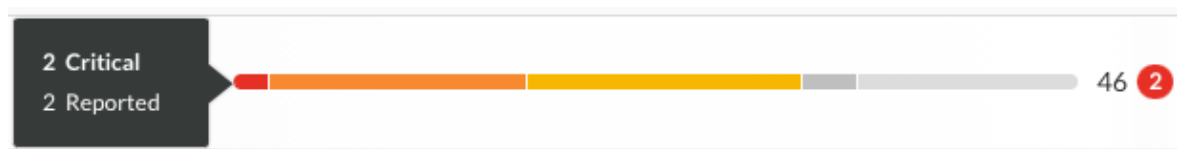
### Before you begin

- Exercise (browse or use) your application so Contrast can find weaknesses and present results in the Contrast application.
- To see your application's vulnerability data in more detail, configure your Contrast agent to report [session metadata \(page 656\)](#).
- To view the Protected in <environment> column, Protect must be turned on and you need these permissions:
  - If you are using role-based access control, you need a role with the View application and Access Protect actions.
  - If you are using organization users and groups, a SuperAdmin must turn on Protect for the user.

## Steps

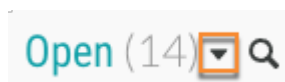
1. Select **Applications** in the header.

The Applications list displays the number of open vulnerabilities for each application. To view details for specific types of vulnerabilities (for example, critical or high), in the Open Vulnerabilities column, select the relevant section of the bar.



An open vulnerability has a status of Reported, Suspicious, or Confirmed.




2. Alternatively, In the Applications list, select an application name and then, select the **Vulnerabilities** tab. You see a list of vulnerabilities for that application.
3. In the Vulnerabilities tab, to filter vulnerabilities, select the small triangle at the very top of the list.



These filter options are available:

- Open



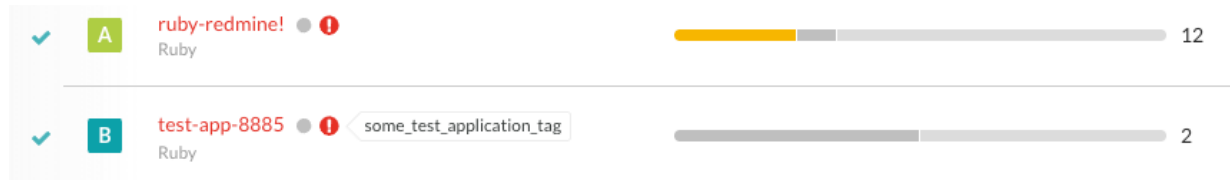
- High confidence
  - Policy violation
  - Pending review
4. To search for specific vulnerabilities, select the magnifying glass icon (  ).
  5. To view a timeline of the vulnerabilities, select the **trend line** symbol (  ) above the list .  
Use the buttons above the chart to view data by **Severity** or **Discovery**. Hover over the trend lines to see a breakdown of the data for that point in time (number of vulnerabilities, time stamp, or status).  
Any filters you apply in the list also update the data in the chart. Use the filter for the **Last detected** column to update the time span shown in the timeline.
  6. To filter by columns , select the Filter icon  next to the column headers. These filters are available, if applicable to the selected application:
    - **Severity:** Available filters are: Critical, High, Medium, Low, and Note.
    - **Vulnerability:** Available filters, if applicable to the selected application, are:
      - **Vulnerability tags :** Custom tags you assigned to vulnerabilities
      - **Bugtrackers:** Whether you are using bugtracking integrations to track vulnerabilities.
      - **Type:** Types of vulnerabilities
      - **Modules:** Application modules associated with a vulnerability, including modules in a merged application.
      - **Servers:** Servers hosting the application.
      - **Environments:** Development, QA, and production
      - **Sinks:** Vulnerabilities that originate from a common sink  
A sink is common custom code shared between multiple data-flow vulnerabilities.  
Filtering by sink can help you identify a line of code that is causing multiple vulnerabilities.
      - **URLs:** Vulnerabilities associated with a specific URL.
      - **Compliance policy:** Vulnerabilities associated with selected compliance policies
      - **Routes:** Vulnerabilities associated with selected routes.
    - **Protected in <environment>:** Available filters are:
      - **Off:** Protection is turned off.
      - **Monitor:** The protection rule that is mapped to the vulnerability is in Monitor mode.
      - **Monitor at perimeter:** The protection rule that is mapped to the vulnerability is in Monitor at perimeter mode.
      - **Block:** The protection rule that is mapped to the vulnerability is in Block mode.
      - **Block at perimeter:** The protection rule that is mapped to the vulnerability is in Block at perimeter mode.
      - **No rule available:** Contrast does not have a protection rule for the vulnerability.
    - **Application:** Modules included in a merged application.  
If you are viewing vulnerabilities for a merged application, this filter shows view vulnerabilities for the modules in the merged application. This column is not displayed for applications that aren't merged.
    - **Last detected:** Available filters are: First or Last detected and Time range. Select **Custom** to enter specific dates and times.
    - **Status:** Available filters are Status and whether Contrast is tracking the vulnerability.
    - **Session:** This column is visible if you configured session metadata in an agent configuration file but haven't selected a session metadata filter. Use Session column filter to refine the results.  
Use the **View by** menu at the top of the list to filter the data by the session metadata values that you included in your agent configuration file. This filter updates the values shown in the Session column.  
The View by menu is visible if you configured session metadata in an agent configuration file but haven't selected a session metadata filter.

## Open vulnerabilities for merged applications

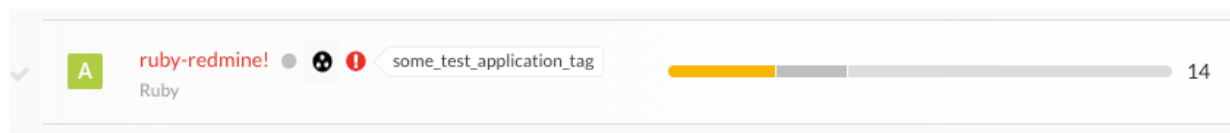
For merged applications, the Open Vulnerabilities column in the Applications list displays the number of vulnerabilities for all application modules in the primary application. The Applications list displays the primary application but not the modules in the primary application.

### Example:

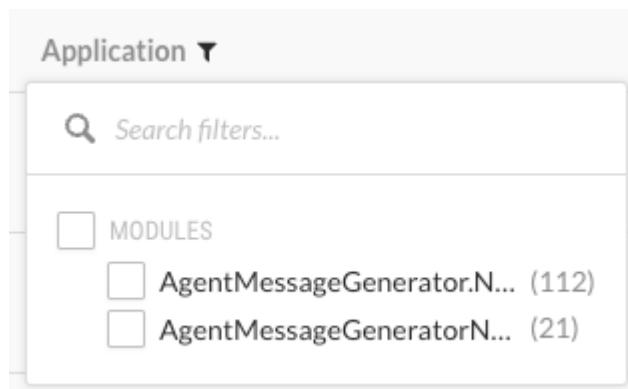
Before you merge applications, the Open Vulnerabilities column looks similar to this:



After you merge applications, the bar in the Open Vulnerabilities column shows vulnerabilities for the primary application and all the merged modules.



When you view the vulnerabilities tab for a merged application, use the filter for the Application column to view the modules where Contrast found the vulnerability.



### See also

[View vulnerabilities at an organization level \(page 1307\)](#)

## View vulnerability rates

The chart for open and closed vulnerability rates shows trends for the vulnerabilities for all applications in your organization.

### Steps

1. Display the new dashboard by selecting **View your new dashboard**.

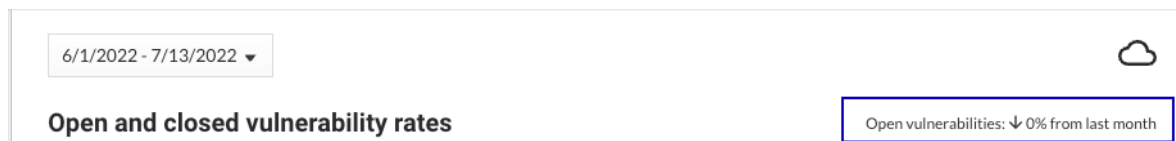
[View your new dashboard \(BETA\)](#)

2. In the new dashboard, find the chart for **Open and closed vulnerability rates**.
3. Select a time frame for the chart:

- **Last 7 days:** Displays vulnerabilities rates for the seven days before the current date. The chart shows data points for each day.
- **Last 30 days:** Displays vulnerability rates for the 30 days before the current date. The chart shows data points for each day.
- **Last 12 months:** Displays vulnerability rates for the 12 months before the current date. The chart shows data points for each month.
- **Custom:** Displays vulnerability rates for a selected time frame. The chart shows data points for each day, each week, or each month, depending on the selected time frame.

If no data exists for part of a selected time frame, the chart displays no data for that part of the time frame. For example, if you selected a time frame of the Last 12 months but started using Contrast only nine months ago, the chart displays no data for the first three months of the time frame.

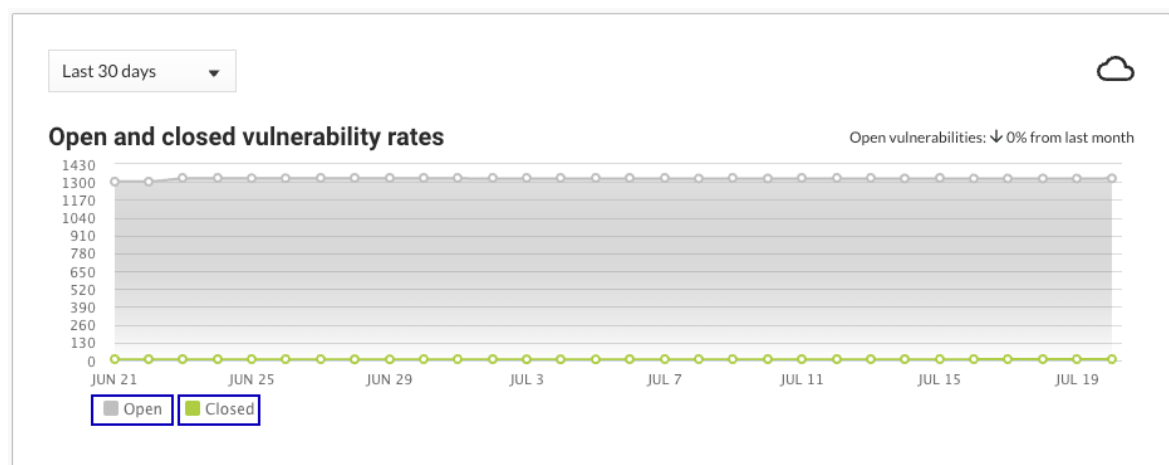
- To view the percentage of change during the selected time frame, look at the value at the top of the chart



- To filter the chart to display only open or only closed vulnerabilities, select the keys at the bottom of the chart.

Select the keys again to clear your selection.

- To view only open vulnerabilities, select the **Closed** key.
- To view only closed vulnerabilities, select the **Open** key.



## Add and delete vulnerabilities

When you instrument an application, vulnerabilities are automatically detected and they become **visible in Contrast (page 1307)**. Depending on your particular security concerns, you can assess the risk of these vulnerabilities, eliminate false positives and prioritize fixes.

You may decide to delete a vulnerability if it is no longer useful.

To do this:

1. Select **Vulnerabilities** in the header.
2. Hover over the grid row with the vulnerability you want to delete and use the **Delete** icon in the right column. You can also find the icon in the top right of the vulnerability details page.  
To delete multiple vulnerabilities at once, use the check marks in the left column to select the vulnerabilities you want to delete, then select the **Delete** icon from the batch action bar that appears at the bottom of the page.



3. In the window that appears, select **Delete** to confirm your choice. Once confirmed, the vulnerability is removed and no longer appears in your list unless Contrast discovers it again.

## Group vulnerabilities by sink

Grouping vulnerabilities lets you combine vulnerabilities that share the same sink. The vulnerabilities in a group can affect multiple applications.

Grouping vulnerabilities reduces the number of entries that the vulnerability list shows. You can still see the data for individual vulnerabilities in a group.

## Before you begin

Group by sink applies only to vulnerabilities for applications with an Assess license. If you group by sink, **Show licensed only** is selected automatically.

## Steps

1. Select **Vulnerabilities** in the header.
2. At the top of the list, select **Group by sink**.



Depending on the filters you use for the list, you might need to scroll down to find the groups. A group looks similar to this example:

|          |   |                                                             |          |              |          |
|----------|---|-------------------------------------------------------------|----------|--------------|----------|
| CRITICAL | 2 | SQL Injection<br>sqlite3_adapter.rb, line 232, in execute() | Multiple | 2 months ago | Reported |
|----------|---|-------------------------------------------------------------|----------|--------------|----------|

The number indicates the number of vulnerabilities in the group.

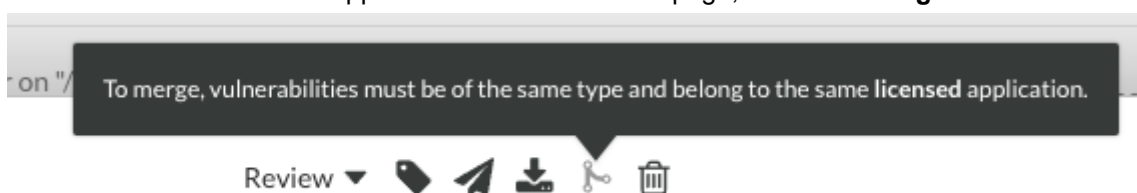
The values for the Severity, Application, and Status columns change to **Multiple**, if the vulnerabilities in a group have different severities, apply to different applications, or have different statuses.

3. To further refine the view, select one or more **Vulnerability** filters.
4. To view individual vulnerabilities in a group, select the group.  
Contrast shows a list of only the vulnerabilities in the group.
5. To remove all groups, clear the **Group by sink** checkbox.

## Merge vulnerabilities

If you find vulnerabilities of the same type from the same application, you can merge them to consolidate findings. To do this:

1. Select **Vulnerabilities** in the header.
2. Use the check marks in the left column to select two or more vulnerabilities you'd like to merge.
3. In the batch action bar that appears at the bottom of the page, select the **Merge** icon.

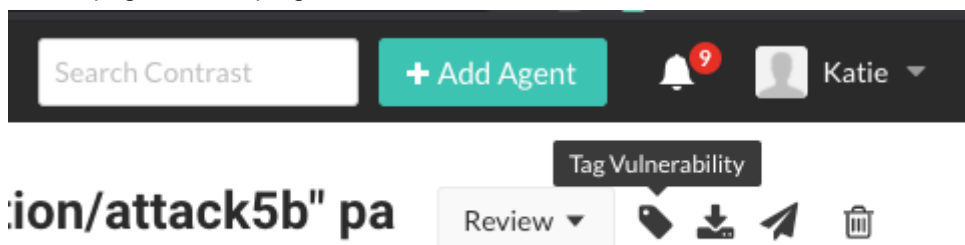


4. In the window that appears, select the vulnerability that you want to represent the merge.

## Add a tag to a vulnerability

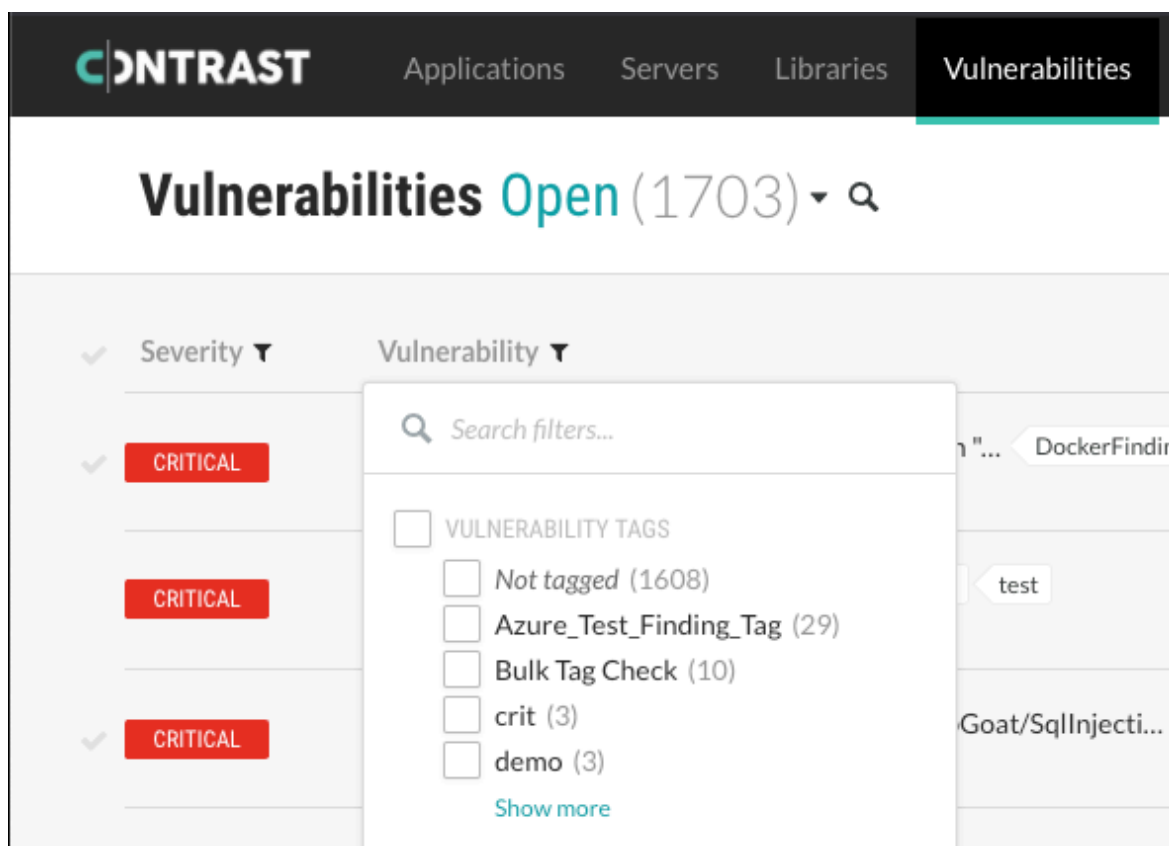
You can tag vulnerabilities to better organize vulnerabilities and improve search in Contrast. To do this:

1. Select **Vulnerabilities** in the header, then hover over the row in the grid for the vulnerability you want to tag.
2. In the far right column, select the **Tag** icon. This option is also available from the vulnerability details page in the top right corner.



To tag multiple vulnerabilities, use the check marks in the left column of the vulnerabilities grid to select the ones you want to tag. In the batch action menu that appears at the bottom of the page, select the **Tag** icon.

3. In the window that appears, begin typing to see a list of tags. Select one or more from the dropdown, and/or type a new tag. To remove tags, select the **X**. Select **Save**.
4. To filter by tags, select the filter next to the **Vulnerability** column of the grid, then select the tags to filter.



5. You can also see tags next to the vulnerability name on the vulnerability's details page, and remove them by selecting the **X**.

## Track vulnerabilities

If you are using a bugtracker integration, you can track vulnerabilities in multiple ways:

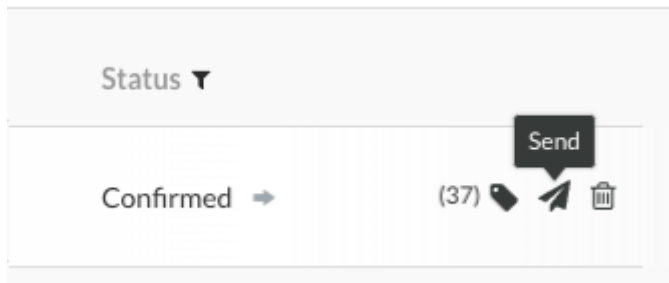
- Send vulnerability data to other members of your organization.
- Plan and maintain timely patching to prevent attacks.
- Streamline workflows by sending vulnerability information directly to your bugtracking tool.
- Receive notifications of any new high or critical vulnerabilities in your application.

### Before you begin

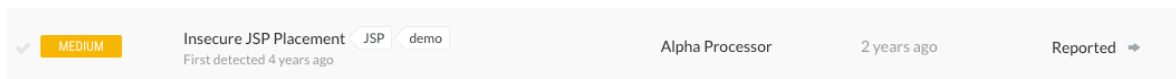
Be sure Contrast is integrated with at least one [bugtracker \(page 1331\)](#) tool.

### Steps

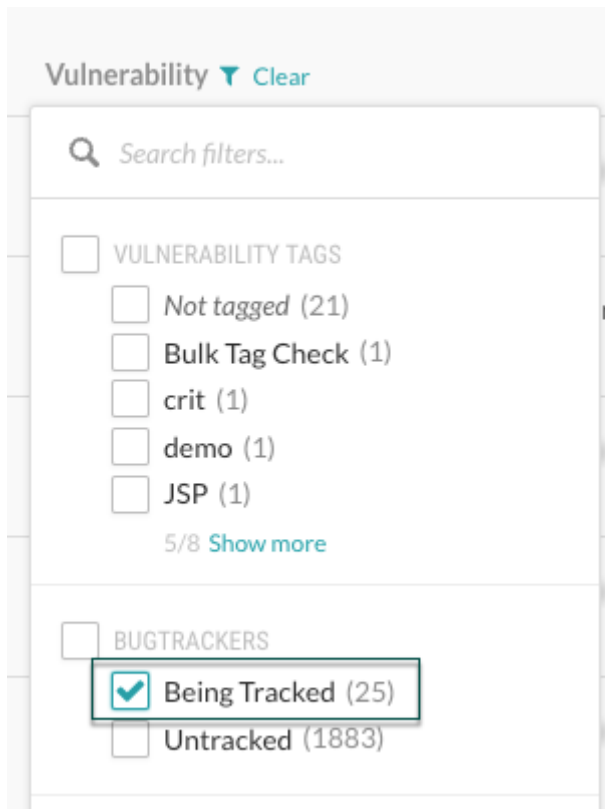
1. Select **Vulnerabilities** in the header.
2. To track a single vulnerability, hover over the end of the row for the vulnerability you want to track.
3. In the far right column, select the **Send** icon.  
This option is also available from the vulnerability details page.



4. To track multiple vulnerabilities:
  - a. Select the check marks next to each vulnerability you want to track.
  - b. In the batch action menu at the bottom of the page, select the **Send Vulnerability** icon (🚀).
  - c. Select **Send to bugtracker**.  
You can also choose to send the tracking data by email.
5. In the Send vulnerability window, select the bugtracker tool you want to use from the dropdown (if you are integrated with multiple tools), add any related information, and select **Send**.  
The vulnerability status updates automatically to **Reported** and an arrow icon displays next to the status of the vulnerability. Hover over the arrow for more information, including the bugtracker name and corresponding ticket numbers.



6. To quickly see which vulnerabilities are tracked, use the filter in the **Vulnerability** column and select **Being Tracked**.

**TIP**

You can also [export vulnerability data \(page 1317\)](#) to a CSV or XML file for custom processing, or use the API to gather data outside the web interface.

## Map Application and Detection Response (ADR) rules to Assess findings

Contrast can associate Assess findings with ADR rules. Doing so helps you make intelligent decisions about how to triage vulnerabilities.

This workflow illustrates how to get the best results from this association.

### Before you begin

- If role-based access control is turned on, you need a role with these actions: Access protect and View applications.
- If you are using organization users and groups, you need an Organization Admin role.
- If you select the Group by sink option on the Vulnerabilities list, no ADR rule status is displayed if a vulnerability group includes multiple applications, as different applications may be configured differently.

### Configure ADR rules

Configure the mode and environment for the ADR (Protect) rules that you want to use:

1. Under the user menu select **Policy management**.
2. Select **Protect rules**.


3. Select **Configure the default policy** at the top of the list.
4. [Change the mode for specific rules \(page 1415\)](#) to **Block** or **Monitor**.

## Configure rule mapping

Choose the environment to which the rule mode applies:

1. Under the user menu, select **Organization settings**.
2. Select **Applications**.
3. Under Map Protect rules to Assess finding, select an environment.  
The default setting is **Production**.  
Contrast applies the mode you configured for the mapped ADR rules to the selected environment.

## Determine actions to take

1. [Exercise your application \(page 586\)](#).  
As Contrast detects vulnerabilities, it displays them on the Vulnerabilities list. The Protected in environment column indicates the mode for the ADR rule mapped to each vulnerability. The column refers to the rule setting in the Contrast web interface.  
A case could exist where a specific agent is misconfigured to set Protect to Off. In this case, that server won't be protected until Protect is configured to On.
2. Take action:
  - You can change the mode for a rule to **Monitor** or **Block**.
    - To change the mode for a single rule, select the **Map** icon () at the end of the row for a vulnerability.
    - To change the mode for multiples rules at one time, [change the rule modes at an organization level \(page 1415\)](#).
  - You can choose to [lower the severity of a vulnerability \(page 1177\)](#) because an ADR rule is protecting your application against that vulnerability.

## Analyze vulnerability events

Contrast provides information on what it observed when navigating your application by using vulnerability events. These events include the exact location where the vulnerability was found in the code and how the code was used. There are several types of events:

- **Source events:** Source events occur at the start of a scope. You can use the file and line number of the source event to see exactly where the call was made, and use the stacktrace in the source to understand how the program invoked the notable method. You can also view all the data related to the method, including the:
  - **Object:** The underlying object instance on which this call is invoked (if not a static call).
  - **Return:** The object returned from this call (or null, if void).
  - **Parameters:** The objects passed into this call.
- **Propagation events:** Each vulnerability may contain one or more propagation events. These events contain the same information as the source event, but they also have a type that indicates how the data was propagated. For example, a P2R propagation event takes the data from one or more of the parameters (the "P" in "P2R") and transfers it into the method return value (the "R" in "P2R").
- **Tag events:** These events add a tag, such as **validated** or **html-encoded**, to a vulnerability. These tags help eliminate false positives and provide clean, reliable results. They also contain the same contextual information as the other types of events. While tag events may occur within a vulnerability, they have nothing to do with the vulnerability discovered.
- **Trigger events:** The trigger is the last event in the vulnerability. The trigger is the call that makes the rule engine in the Contrast JVM Plugin perform its analysis, notice the vulnerability and generate the trace.





## IMPORTANT

Contrast only detects the actual behavior of an application. If a vulnerability doesn't represent a legitimate problem, an administrator **should update the applicable policy (page 1402)** to prevent this issue from occurring again. The most commonly reported false alarm is that the application has a custom control that Contrast doesn't know about.

On-premises users can add a custom method call to the appropriate tag list in the Contrast policy. For example, your custom HTML-encoder method that takes a string and returns an HTML-encoded string should add the **html-encoded** tag to the data.

You can use **Security controls (page 1402)** or **Application exclusions (page 1424)** to remediate false positives.

## Fix vulnerabilities

When a vulnerability arises, you need to assess the risk according to your particular security needs. If you decide to fix this vulnerability:

1. Learn more about the particular vulnerability by selecting the vulnerability name to open the details page. Then select the **How to fix** tab to see suggested steps to resolve the issue.
2. Fix the vulnerability as you see fit.
3. Check a fixed vulnerability. There are three ways to do this:
  - **Replay the request:** If the issue is remediated, you can replay the HTTP request. Select the **HTTP Info** tab to see if the issue is fixed. If it isn't fixed, the issue reappears with a status of Reported.
  - **Check build number:** For each application, you can assign a build version number. Use **session metadata (page 656)** to learn more about a vulnerability using the build number. Add this property to the `-javaagent` command:

```
-Dcontrast.override.appversion
```

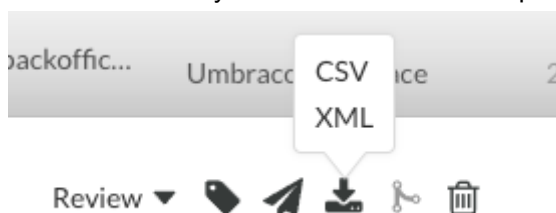
Provided you have set a build number during startup, you can use this as a filter and verify whether the issue still exists for this build version by clicking the Advanced link and the Build Number dropdown.

- **Check by time unit tests:** You can also filter by the time at which your unit tests were run, and set a date range to view your vulnerabilities in the Set Date Range input field above the vulnerabilities grid.


## Export vulnerability findings

To export vulnerability details:

1. Select **Vulnerabilities** in the header, then use the check marks in the left column of the vulnerabilities grid to select the vulnerability or vulnerabilities you want to use for the export.
2. In the batch action menu that appears at the bottom of the page, select the **Export** icon, then select the format you want to use for the export (CSV or XML).



Contrast begins to export the data.

3. Check the Notifications panel () to see when the export is completed. The notification contains a link for you to download the exported data.

Exports contain the following information for each vulnerability:

- Vulnerability Name
- Vulnerability ID
- Category
- Rule Name
- Severity
- Status
- Number of Events
- First Seen
- Last Seen
- Application Name
- Application ID
- Application Code
- CWE ID
- Request Method
- Request Port
- Request Protocol
- Request Version
- Request URI
- Request Qs
- Request Body
- Instance ID



### TIP

To create more complex custom software composition analysis reports about your applications, you can use the [Application API](#) to access Contrast vulnerability data.

You may also explore additional details on your vulnerabilities using a manual method.

For, example, this curl request retrieves a list of vulnerabilities that also shows a list of the applications in which each vulnerability was found. The jq tool formats the data as CSV for use in a custom report.

```
curl \
  -H "Authorization: $(echo -n $username:$servicekey |
base64)" \
  -H "API-Key: $apikey" \
  https://app.contrastsecurity.com/Contrast/api/ng/$orgid/
orgtraces/filter?expand=request | \
  jq -r '.traces[] | {uuid: .uuid,
protocol: .request.protocol} | [.uuid, .protocol] | @csv'
```

## Find CWEs associated with CVEs

If you want to find a Common Weakness Enumeration (CWE ) that's associated with a Common Vulnerabilities and Exposures (CVE), use the National Vulnerability Database (NVD) .

While many CVEs have associated CWEs, some might not be classified under a specific CWE or may be associated with multiple CWEs

## Steps

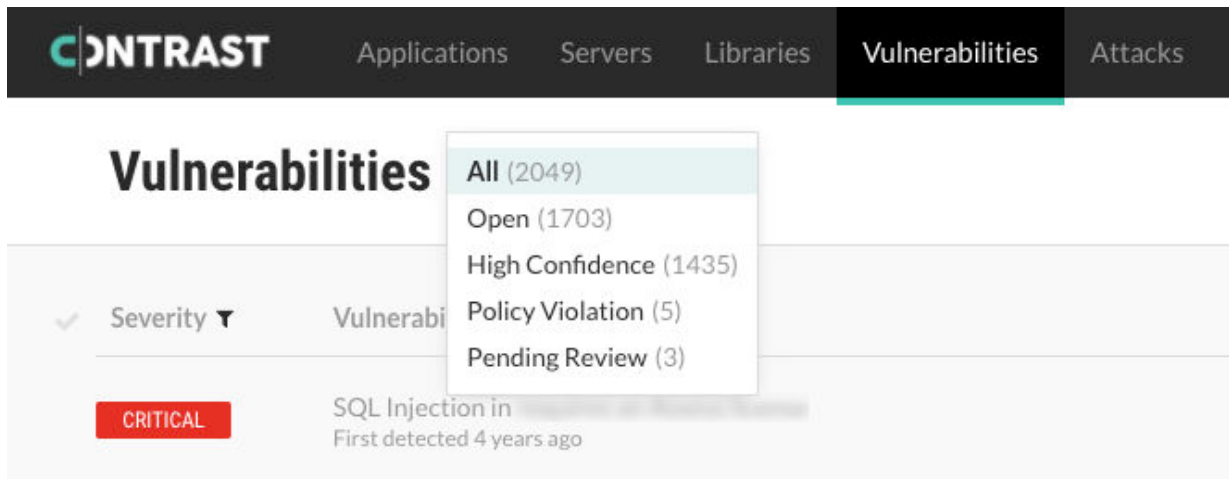
1. Navigate to the [NVD website](#).
2. Search for the CVE.
  - a. From the NVD menu, select **Search**.
  - b. Select **Vulnerabilities - CVE**.
  - c. In Keyword search, enter the CVE identifier (for example, **CVE-2020-12345**).
  - d. Select **Search**.
3. In the search results, select the CVE link.
4. To view the CWE details, under Weakness Enumeration, select any of the CWE links in the displayed list.  
Selecting a CWE link displays the CWE details in the [CWE website](#).

## Vulnerability status

Vulnerability status is shown in the vulnerabilities grid and can be any of the statuses shown in this table. You can edit the vulnerability status.

| Status                          | When to set this status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reported</b>                 | This is the default status of a vulnerability after it is discovered by Contrast. The vulnerability in this application could possibly be exploited.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Confirmed</b>                | Confirm that the vulnerability is a true finding by reviewing the source code or exploiting it.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Suspicious</b>               | The vulnerability appears to be a true finding based on the details provided, but requires more investigation to determine its validity.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Not a problem</b>            | <p>The vulnerability is being accounted for without any source code changes. To set this status, you must select one of these reasons. Vulnerabilities set to this status will not revert back to <b>Reported</b> if found again.</p> <ul style="list-style-type: none"> <li>• <b>Attack is defended by an external security control:</b> There is another component in the environment, such as a WAF, which will prevent this vulnerability from being exploited.</li> <li>• <b>False positive:</b> This vulnerability was reported incorrectly. <a href="#">Contact Support</a> to figure out why Contrast flagged this trace as a vulnerability.</li> <li>• <b>Goes through an internal security control:</b> There is custom, corrective code inside the application that will prevent this vulnerability from being exploited.</li> <li>• <b>URL is only accessible by trusted power users:</b> This vulnerability may only exist in specific environments, such as test, and may not exist in production environments.</li> <li>• <b>Other:</b> Select this option if there is another reason that no source code changes are required in order to fix this vulnerability. It is possible to <a href="#">replace Other with a custom value (page 1321)</a> that explains why the vulnerability is <b>Not a problem</b>.</li> </ul> |
| <b>Remediated</b>               | The vulnerability has been fixed by changing source code or config files within the application.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Fixed</b>                    | The vulnerability has been fixed by changing the source code or because of a reason given under the <b>Not a problem</b> status. A vulnerability set to this status will not revert back to <b>Reported</b> if found again. (This option is only available to administrators.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Remediated-Auto-verified</b> | This status can only be automatically set. (It can't be manually set by a user.) If a vulnerability is not reported within the time limit set in the <a href="#">vulnerability policy (page 1406)</a> , it will automatically be set to <b>Remediated-auto-verified</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

Policies that are set to **Reported**, **Confirmed**, **Suspicious** are considered to be open. Policies that are set to **Not a problem**, **Remediated**, **Fixed**, or **Remediated-Auto-verified** are considered to be closed. You can filter vulnerabilities by **Open** to see only open statuses, or by **All** to see both open and closed statuses.

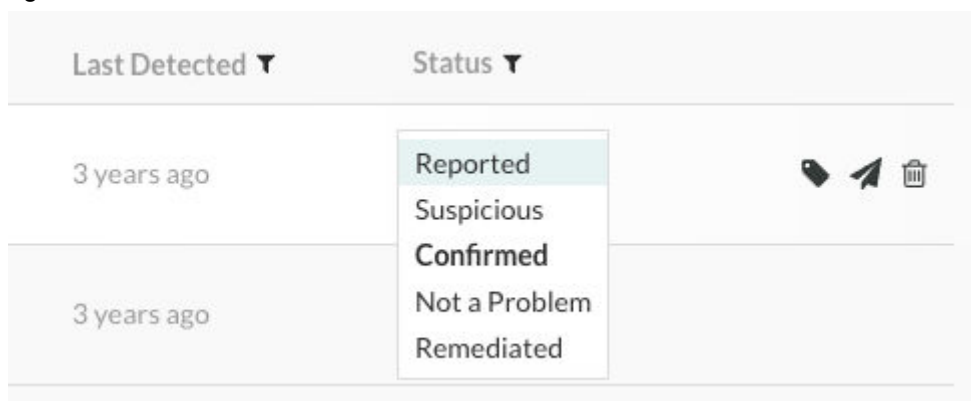


If the agent reports a vulnerability and Contrast has never seen it before, Contrast creates a new entry for the vulnerability. If that vulnerability already exists, Contrast updates the existing entry, issue count and number of days since it was last detected. All vulnerabilities will be reopened with the same pre-existing status, except those that were previously set to **Remediated** or **Remediated-Auto-verified**. Those will be reopened as **Reported**.

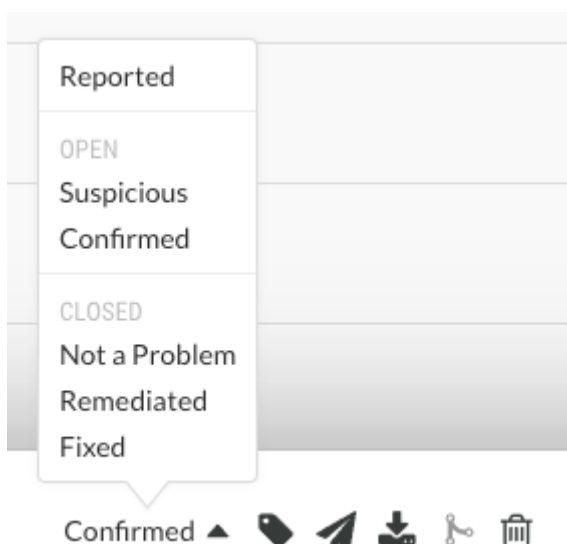
### Edit vulnerability status

To change the status of one or more vulnerabilities:

1. Select **Vulnerabilities** in the header.
2. To edit a single vulnerability status, find the vulnerability you want to edit and select the status in the **Status** column. You can also change the status from a vulnerability's overview page in the top right corner.



To edit multiple vulnerabilities at a time, use the check marks in the left column to select the vulnerabilities you want to edit. In the batch action menu that appears at the bottom of the page, you will see the current status. Click to expand the menu.



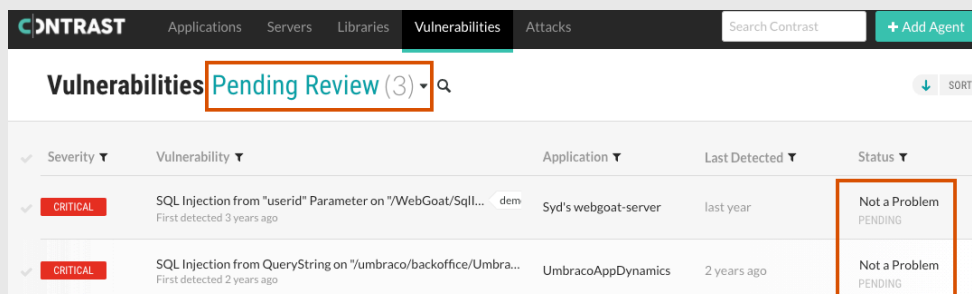
3. Select a new status according to [these criteria](#) (page 1319).



## NOTE

An Organization Administrator can [require approval](#) (page 1460) before some vulnerabilities can be closed.

If this is the case, you will be required to submit a reason for your status change, and it will be set to **Pending** until it can be reviewed by an Organization Administrator or a RulesAdmin. Hover over **Pending** in the **Status** column to see the date it was submitted.



You may change the status of a pending vulnerability. If approval isn't required for the new status, the vulnerability is no longer marked as **Pending**.

You will receive a notification when your status change request is approved or denied by an administrator. If denied, the vulnerability will go back to its previous state; but, the administrator must provide a reason for the decision. That reason will appear in the vulnerability's **Activity** tab.

4. In the window that appears, select a reason (in the case of **Not a problem**) and enter an explanation for the status change. It is possible to [set a custom reason](#) (page 1321) that vulnerabilities are **Not a problem**.

## Set a custom reason that vulnerabilities are Not a problem

Security teams may determine that a specific vulnerability does not need to be remediated with a code change and set the vulnerability status to **Not a problem**. This helps teams focus on fixing vulnerabilities and prevents Contrast from reporting these vulnerabilities again.

When you use **Not a problem** as a vulnerability status, you must select a reason. Contrast provides [standard reasons \(page 1319\)](#) as well as an **Other** option.

You can change the label **Other** to a value that is meaningful to your organization. To do this:

1. Go to **Policy management** settings for your organization.
2. Select **Vulnerability management**.
3. Select **Set a custom label for Other**.
4. Enter the reason you prefer. This is limited to 25 characters.
5. **Save** your change.

The screenshot shows the 'Policy management' page in the Contrast application. On the left is a sidebar with categories: ASSESS (Assess Rules, Security Controls, Vulnerability Management), PROTECT (Protect Rules, CVE Shields, Virtual Patches, Log Enhancers, IP Management), and GENERAL (Application Exclusions, Compliance Policy). The 'Vulnerability Management' option is selected. The main content area is titled 'VULNERABILITY BEHAVIOR' and contains two sections. The 'Approval workflow' section has a checked checkbox 'Require administrator approval when closing vulnerabilities' and two dropdown menus: 'Remediated' and 'All Severities'. The 'Not a Problem status options' section has a checked checkbox 'Set a custom label for Other' and a text input field containing 'Risk accepted' with a '12 characters left' indicator. A green 'Save' button is at the bottom right.

Now, when marking vulnerabilities as **Not a problem**, the values listed will include the custom reason instead of **Other**.



## NOTE

When you change **Other** to a custom label or change it back to **Other**, all the vulnerabilities with that label will change to the new label for your organization.

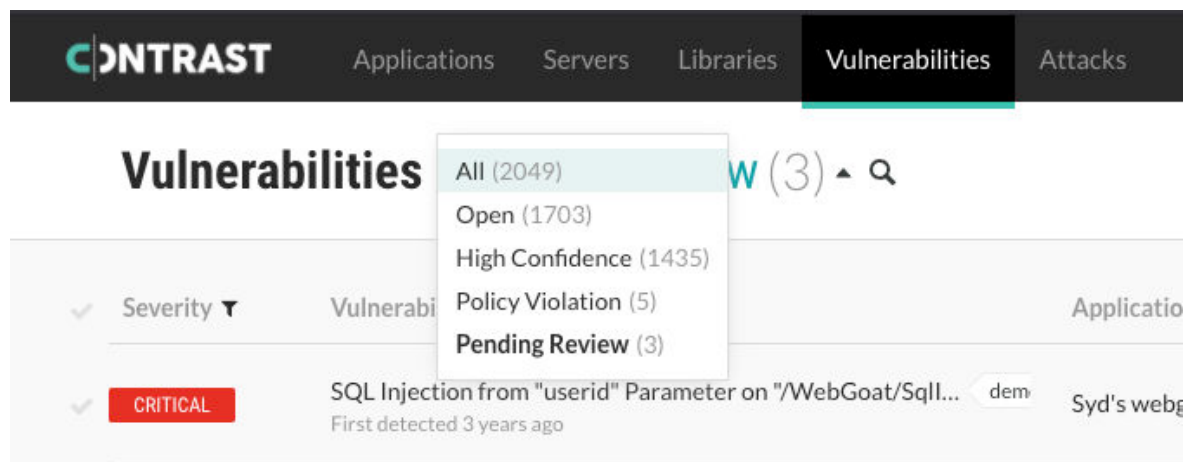
## Review pending vulnerability status changes

If an Organization Administrator has [required approval for a particular vulnerability \(page 1460\)](#), the [status \(page 1319\)](#) won't change until it is approved. This can apply to manual vulnerability status changes, two-way bugtracker integrations, as well as auto-verification policies.

You must be an Organization RulesAdmin with RulesAdmin permissions for the target application in order to approve or deny vulnerability closures.

To do this:

1. Select the link in your notification in the Contrast application, or select **Vulnerabilities** in the header, then select the filter at the top of the grid to view all pending reviews.



2. Use the check marks in the left column to select one or more vulnerabilities. In the batch action menu that appears at the bottom of the page, select **Review**. Then select **Approve** or **Deny**. You can also select **Review** in the top right from a vulnerability overview page.
3. If you deny the status change, you must provide a reason. Denied vulnerabilities revert to their previous status. Approved vulnerabilities take the new status and are no longer marked **Pending**. Either way the results of the review will display in the vulnerability's **Activity** tab.

## Edit vulnerability severity

Contrast classifies vulnerabilities in an application into five severity levels. The classifications are based on the likelihood and impact of a vulnerability in the application, from most to least severe:

- Critical
- High
- Medium
- Low
- Notes

To change a vulnerability's severity level:

1. Select **Vulnerabilities** in the header.
2. Select the colored badge in the **Severity** column and choose a new level from the menu. (You cannot update the severity of multiple vulnerabilities at once.)

## Reports

All Contrast reports, with the exception of the Software bill of materials, are delivered as time-stamped PDFs that are downloaded locally.

These reports are available:

- [Attestation reports \(page 1323\)](#)
- [DISA STIG viewer checklists \(page 1325\)](#)
- [Software bill of materials \(page 1326\)](#)
- [Remediation summary report \(page 1329\)](#)
- [Vulnerability trend report \(page 1327\)](#)
- [Organization statistics \(page 1329\)](#)
- [Report dashboard \(page 1606\)](#) (aggregated vulnerabilities)

## Attestation reports

Attestation reports provide evidence of vulnerability remediation based on the most current application information. Meet compliance and auditing requirements with these PDF reports.

As of November 7, 2023, this report replaces the Security standards report. The Attestation report provides similar information as the Security standards report. It will help you meet compliance requirements and Identify areas of urgent attention.

**NOTE**

This report expires seven days after you create it. Contrast deletes the report after this time.

Attestation reports include:

- An itemized list of the specific filter settings used to run the report
- A summary of the security posture for the application
- Vulnerabilities assessment for both custom code and open-source libraries. Note that critical severities will not be displayed in this section if CVSS 3.1 has not been turned on for existing organizations. To enable this, contact [Contrast Support](#).
- Route coverage as a security assessment metric
- An optional compliance policy assessment and detailed information about open vulnerabilities for the application
- An appendix that describes methodologies and terminologies

**Before you begin**

An Attestation report has the following limits:

- 1,350 vulnerabilities with details
- 18,000 vulnerabilities without details
- 15,000 routes with observations
- 30,000 routes without observations

If your report exceeds these limits, an error message displays and the report doesn't generate. If this situation occurs, change your report selections to reduce the amount of information in the report.

**Steps to generate an Attestation report**

1. Select **Applications** in the header.
2. Select an application in the Applications grid.
3. Select the **Reports** icon (📄) located at the top-right of the application's page.
4. Select **Generate Attestation Report** from the list.
5. In the Attestation report window, select the **Vulnerabilities**, **Environments**, and additional **Security Standards** that you want to include in the report.



**Attestation Report** ×

Attestation reports provide evidence of vulnerability remediation based on the most current application information. Meet compliance and auditing requirements with these PDF reports.

**Vulnerabilities**

All Rules (83)

☐ Include vulnerability details  
☐ Include route observations

**Environments**

All Environments (3)

**Security Standards**

Choose standards...

Note: Applying security standards will result in the inclusion of an additional security standards section in the generated report.

📘 Total routes and vulnerabilities: 0 routes and 1 vulnerabilities

Cancel Generate

The default is to show all vulnerabilities and environments, but you can filter them by selecting the fields and then, selecting filters. Choose an option from **Security Standards** to include an additional Security Standards section in the generated report.

Optionally, you can choose to include detailed information about open vulnerabilities and observed routes.

The following table includes the categories that you can use to create a custom report.

| Category              | Default | Filter options                                                                                                                                                                                                                                                                                                          |
|-----------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vulnerabilities       | All     | <ul style="list-style-type: none"><li>• Status (Reported, Suspicious, Confirmed, Not a Problem, Remediated, Fixed, Remediated - Auto-Verified)</li><li>• Severity (Note, Low, Medium, High Critical)</li><li>• Assess Rules</li></ul>                                                                                   |
| Vulnerability details | None    | Include vulnerability details by selecting the checkbox for it.                                                                                                                                                                                                                                                         |
| Route observations    | None    | Include details about observed routes by selecting the checkbox for it.                                                                                                                                                                                                                                                 |
| Environments          | All     | <ul style="list-style-type: none"><li>• Development</li><li>• QA</li><li>• Production</li></ul>                                                                                                                                                                                                                         |
| Security Standards    | None    | <ul style="list-style-type: none"><li>• DISA ASD STIG</li><li>• IPA-7.0</li><li>• OWASP 2013 Top 10</li><li>• OWASP 2017 Top 10</li><li>• OWASP 2021 Top 10</li><li>• OWASP Top 10 API Vulnerabilities 2019</li><li>• PCI DSS - 2.0</li><li>• PCI DSS - 3.0</li><li>• PCI DSS - 3.2.1</li><li>• PCI DSS - 4.0</li></ul> |

6. Select **Generate**.

After Contrast generates the report, the **Notifications** panel displays a download link for it. Select the link to download the report.

## DISA STIG Viewer checklists

DISA's Security Technical Implementation Guide (STIG) is the basis for evaluation of the security of all government applications. The STIG is intended to be used throughout the life cycles of these applications in order to provide security assurance for these applications. Contrast's compliance

reporting can provide a listing of the vulnerabilities found in your application that violate guidelines of multiple STIGs.



### IMPORTANT

An application must have an Assess license to run a DISA STIG report.

Before DISA STIG reports can be run, a SuperAdmin must enable it. Select **SuperAdmin** in the user menu, then select **Organizations** in the header. In the window that appears, select the box to **Enable DISA STIG Checklist reporting** and select **Save**.

STIG Viewer creates custom checklists with multiple STIGs for compliance reporting. You must import your application's checklist to get the DISA STIG report on those vulnerabilities from Contrast.

To run a STIG Viewer checklist:

1. Go to the **Applications** page and select an application.
2. In the application's **Overview** page, click the reporting icon and select **Generate STIG Viewer Checklist**.
3. In the window that appears, import a STIG Viewer checklist (.ckl) file. This file must be a checklist exported from the STIG Viewer application.
4. Click **Generate** to download an updated STIG Viewer checklist (.ckl) file.

## Software bill of materials (SBOM)

A Software Bill of Materials (SBOM) might be required for compliance with government security regulations.

You can generate an SBOM through Contrast, through a simple API, or with a command through the Contrast command line interface (CLI).

The Contrast SBOM meets the specifications of the OWASP's CycloneDX SBOM standard and the international open SPDX standard. It contains information about the software that your application uses including:

- Libraries - Open source and third-party components present in a codebase
- Licenses that govern the software components
- Versions of software components used in the codebase



### NOTE

Currently supports CycloneDX 1.6 and SPDX 3.0.


The Contrast SBOM also meets the requirements of the National Telecommunications and Information Administration (NTIA). It includes the author name, supplier name, component name and version, component relationship, timestamp and other unique identifiers like PURL and package SPDX identifier.

## Before you begin

- A Contrast Assess license is required for export via Contrast
- Supported languages: Java, .NET Framework, .NET Core, Node.js, Python, Ruby, Go, PHP

## Steps

There are three options for generating an SBOM report.

1. **To generate a report with Contrast:**
  - a. Select **Applications** in the header.
  - b. Select an application name from the list to view the application's **Overview** tab.
  - c. Select the **Reports** icon (  ) located at the top-right of the application list.
  - d. In the dropdown, select **Generate Software Bill Of Materials (SBOM)**
  - e. Select the CycloneDx or SPDX option in the dialog and select the **Generate** button to generate and download a copy of the SBOM.
2. **To generate a report with API:**
  - a. For CycloneDX: Make a **GET**<HOST>/Contrast/api/ng/<ORG\_ID>/applications/<APP\_ID>/libraries/sbom/cyclonedx request.
  - b. For SPDX: Make a **GET**<HOST>/Contrast/api/ng/<ORG\_ID>/applications/<APP\_ID>/libraries/sbom/spdx request.See [REST API](#) for more information about using APIs.
3. **To generate a report with CLI:**
  - Use the `--save` command. Choose the type with `--save cyclonedx` or `--save spdx`. See [CLI commands \(page 1287\)](#) for more information.



### NOTE

- .NET support is currently limited for CLI.
- Use the CLI to generate the SBOM for [static SCA \(page 1206\)](#) results.
- The SBOM generated via CLI will provide class usage information of the application the CLI is registered to that has library data.

## Vulnerability trend reports

Use the vulnerability trend reports to recognize the vulnerabilities your applications face and how well they're being managed.

To view vulnerability trend reports:

1. Select **Reports** in the user menu. Select **View** to see the graphs in more detail.
2. Select **New** to see a graph of new vulnerabilities. Select **Total** to see a graph of all reported vulnerabilities compared to all remediated vulnerabilities.  
Each black data point represents the total number of Suspicious, Confirmed and Reported vulnerabilities for that date. Each green data point represents the total number of vulnerabilities marked as **Not a problem**, **Remediated** or **Fixed**. Hovering over each data point generates a tooltip with status breakdowns.
3. Each report defaults to all applications, servers and rules. Filter vulnerabilities by clicking in the fields above the graph. The following table outlines the categories that you can use to create a custom report.

| Field        | Default     | Filter options                                                                                                   |
|--------------|-------------|------------------------------------------------------------------------------------------------------------------|
| Date         | Last 7 days | Last 30 days<br>Last 12 weeks<br>Last 12 months                                                                  |
| Applications | All         | Importance (Critical, High, Medium, Low, Unimportant)<br>Application Tags<br>Licensed (List of all applications) |
| Servers      | All         | Environment (development, test, production)<br>Server Tags<br>Servers (List of all servers)                      |
| Rules        | All         | Severity (Critical, High, Medium, Low, Note)<br>Vulnerability Tags<br>Vulnerability Rules (List of all rules)    |

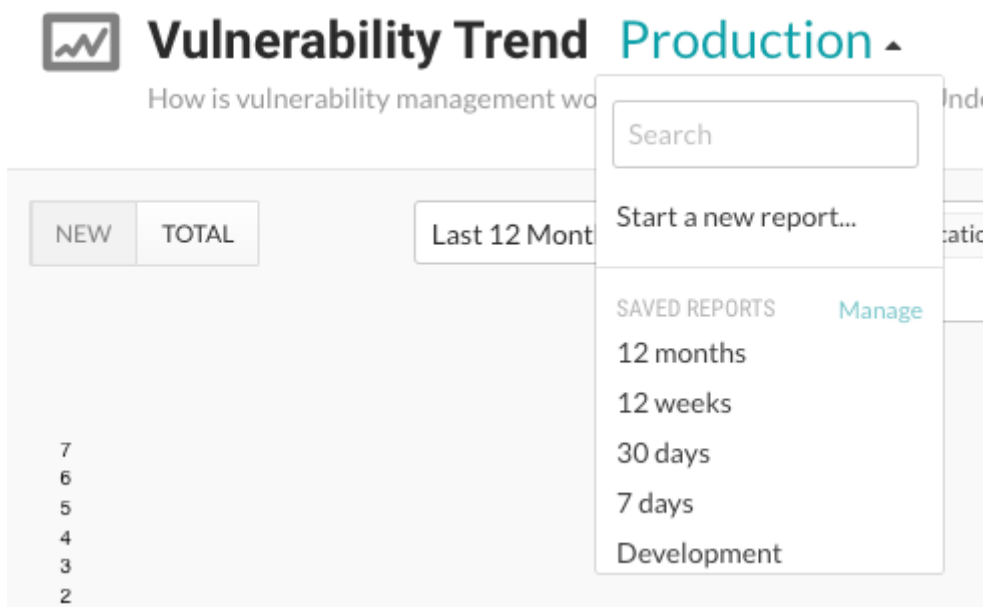
4. Select **View**, then select the **Save report** icon in the top right to save this filter criteria to a report. Name the report in the window that appears and select **Save**. Saved reports are unique to the user, so you have your own defined list of saved vulnerability trend reports. You can edit or delete these reports at any time.

If you change filter options while viewing a saved report, the star icon changes to an unsaved state and **Edited** appears next to the report name. You can then use the same icon to **Save existing** or **Save as new**. Choose **Save existing** to update the saved report name with the current filters and remove the **Edited** status. Choose **Save as new** to save the report view with the current filters as a new report under a different name.

Click **Remove** to permanently delete the saved report that you're currently viewing.

To clear unsaved edits to an existing report and start over with the report defaults, choose the **Start a new report** option in the dropdown.

When you've created more than five saved reports, you will see a **Manage** link in the **Saved reports** dropdown. Select **Manage** to open this window. Here you can rename reports (click on the name to edit), search for reports, or use the check boxes next to each report (or use the **Select all** check box) to select which ones you want to remove.



5. You can also create a timestamped PDF export of the Vulnerability Trend to capture a snapshot of your vulnerability management. Select the **Export** icon in the upper right hand corner of the page. Contrast downloads the report to your desktop. Each PDF report includes a summary of

the variables included in your customized view, the trend graphic, and a table of the metrics and breakdowns of each data point.

## Organization statistics

Select **Reports** in the user menu to find [vulnerability trends \(page 1327\)](#), as well as organization level information on:

- **Licenses:** View the number of overall licenses for Assess and Protect, as well as the number of unlicensed applications and servers that exist in your organization.
- **Applications:** The inner ring designates the breakdown by language. Choose the categories you want to compare in the outer ring by selecting **Technology** or **Grade** in the dropdown.
- **Servers:** Select **Container** or **Environment** in the dropdown to choose how the numbers are analyzed.

Use the filters in the dropdowns to choose which data to compare at a glance.

Select **View** for more details including:

- **Licenses:** Under **Activity**, view an activity trend chart of data on license consumption over the past year.  
Hover over a data point on the Assess or Protect trend lines to see how many licenses were used each month. The dotted line shows the number of licenses purchased.  
Click on the vertical bars in the chart to view your hourly usage of Protect licenses for each day. Peak hourly usage is represented by bright green shading at the top of the bars. Select **Back to license activity** to return to your view of license activity data.  
Select **View Protect usage** below the activity chart to see data for the current month and a usage statistics. Use the dropdown to view data for a different month.  
Under **Consumption**, you can see a thermometer chart and a timeline for Assess and Protect. The thermometer chart shows the total number of licenses purchased compared to the number being used. The timeline shows how many licenses are about to expire on given dates.  
The circular charts on the right show breakdowns by fraction and percentage for Assess and Protect. If your organization doesn't own any Protect or Assess licenses, the chart shows the count of unlicensed assets.
- **Applications:** Under **Status** you can see the total number of applications broken down by the number that are licensed, unlicensed and archived, as well as how many licenses are available in your organization.  
The circular Language Breakdown chart shows the number of applications, broken down by language in the inner band, and by technology in the outer band. Hover for more details.  
Under **High risk** and **Expirations** you can see the number of applications with critical open vulnerabilities and expiring licenses.  
Under **Protection coverage** you see the number of applications on production servers that have incomplete coverage. Select **View breakdown** for more details.  
Applications that were added within the last week and applications that reside on an offline server are listed separately in the sidebar.
- **Servers:** Under **Environments**, you can see all deployed servers by environment.  
Under **Container breakdown** you can see the number of deployed servers for each language in a given environment. Use the dropdown to view data for a different environment.  
Under **Snapshots**, you can see the number of servers with Assess and Protect enabled, as well as all servers online compared to the total number of servers in the given environment.  
The right sidebar includes a list of new, offline, deleted and expiring servers.

## Remediation summary package ☹

The remediation summary package contains a set of charts, in PDF format, that help you determine how well your remediation process is working. The Remediation summary section on the Reports page has a download button that lets you download the report package.

Contrast updates the charts on a monthly basis. This date is displayed below the Download charts button.

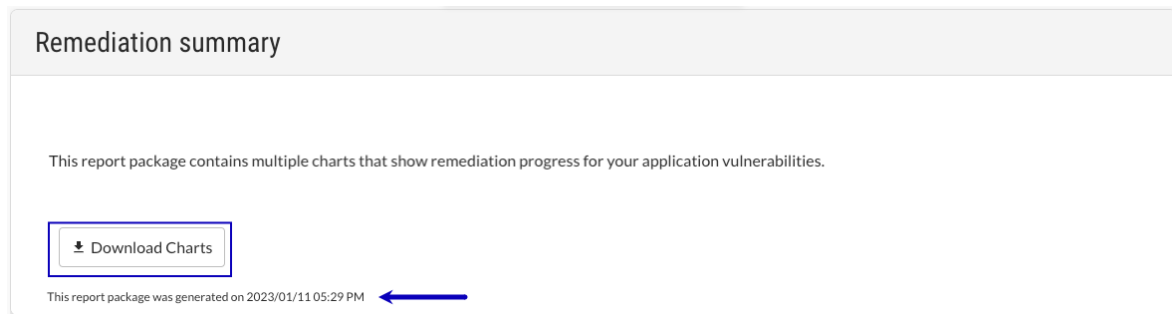
The report package also includes a `README` file that provides guidance for interpreting the charts.

## Before you begin

- [Diagnostic reporting \(page 1532\)](#) must be enabled.  
The Reports page does not display the Remediation summary section if diagnostics are disabled.
- The View applications action is required.

## Steps

1. From the user menu, select **Reports**.
2. In the Remediation summary section, select **Download charts**.



3. Save the ZIP file in a convenient location.
4. Extract the files and view the `README` file and the individual charts.

# Integrations

Documentation is provided for supported integrations that are part of the core, recommended way that Contrast works. Contrast may be compatible with other tools or scenarios developed by the community that are not supported. For specific information on third-party tools and technologies, consult the documentation for that product. Also, there are additional articles in the [Contrast Support Portal](#) around specific use cases or workarounds.






## NOTE


Note that supported integrations are further documented in the left-hand navigation menu. Community integrations are linked to external documentation. Links to documentation in the Contrast Support Portal or third-party sites are indicated by the [external link icon](#).

You must have the organization administrator role in Contrast to view the integrations available to your organization.

## ADR integrations


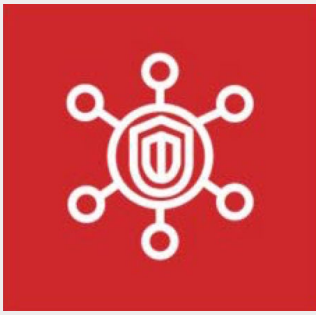



Integrate Contrast ADR with SIEM tools.

|                                                                                                |                                  |                                                      |
|------------------------------------------------------------------------------------------------|----------------------------------|------------------------------------------------------|
|             | Contrast Security ADR for Splunk | <a href="#">Contrast ADR with Splunk (page 1391)</a> |
| <br>DATADOG | Datadog                          | <a href="#">Source Code</a>                          |
|             | Sumo Logic                       | <a href="#">Source Code</a>                          |

|                                                                                   |                       |                                                                                                |
|-----------------------------------------------------------------------------------|-----------------------|------------------------------------------------------------------------------------------------|
|  | <b>Azure Sentinel</b> | <a href="#">☑ Contrast Protect Azure Sentinel Solution</a><br><a href="#">☑ Azure Sentinel</a> |
|-----------------------------------------------------------------------------------|-----------------------|------------------------------------------------------------------------------------------------|

## Platform integrations

Integrate Contrast with your platform tools.


|                                                                                     |                             |                                                                       |
|-------------------------------------------------------------------------------------|-----------------------------|-----------------------------------------------------------------------|
|    | <b>Amazon Security Lake</b> | <a href="#">Amazon Security Lake with Contrast Assess (page 1344)</a> |
|   | <b>AWS Security Hub</b>     | <a href="#">AWS Security Hub with Contrast Assess (page 1343)</a>     |
|  | <b>Jira Cloud</b>           | <a href="#">Jira Cloud integration with Contrast Scan</a>             |
|  | <b>ServiceNow</b>           | <a href="#">ServiceNow Integration (page 1387)</a>                    |
|  | <b>Wiz</b>                  | <a href="#">Wiz integration (page 1398)</a>                           |

## Integrations



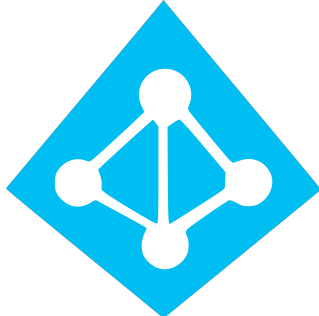

Integrate Contrast with your existing tools to streamline your workflows.

### AWS









|                                                                                   |                              |                                                                  |
|-----------------------------------------------------------------------------------|------------------------------|------------------------------------------------------------------|
|  | <b>AWS Elastic Beanstalk</b> | <a href="#">Java agent with AWS Elastic Beanstalk (page 134)</a> |
|-----------------------------------------------------------------------------------|------------------------------|------------------------------------------------------------------|

## Azure

|                                                                                     |                               |                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <b>Microsoft Azure</b>        | <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> <a href="#">.NET and Azure App Service</a></li> <li><input checked="" type="checkbox"/> <a href="#">.NET and Azure Arm</a></li> <li><input checked="" type="checkbox"/> <a href="#">.NET and Terraform</a></li> </ul> |
|   | <b>Azure DevOps</b>           | <ul style="list-style-type: none"> <li><a href="#">Azure Pipelines Extension (page 1349)</a></li> <li><input checked="" type="checkbox"/> <a href="#">Azure Pipelines Marketplace</a></li> </ul>                                                                                                 |
|  | <b>Azure Active Directory</b> | <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> <a href="#">Azure Active Directory single sign-on (SSO) integration</a></li> </ul>                                                                                                                                    |
|  | <b>Azure Boards</b>           | <a href="#">Azure Boards Integrations (page 1346)</a>                                                                                                                                                                                                                                            |








## Contrast SDKs and Webhooks

|                                                                                     |                       |                                                                  |
|-------------------------------------------------------------------------------------|-----------------------|------------------------------------------------------------------|
|    | <b>Contrast CLI</b>   | <a href="#">Contrast CLI (page 1278)</a><br><a href="#">☑NPM</a> |
|    | <b>Java SDK</b>       | <a href="#">☑Contrast Java SDK</a>                               |
|   | <b>JavaScript SDK</b> | <a href="#">☑Contrast SDK Javascript</a><br><a href="#">☑NPM</a> |
|  | <b>.NET SDK</b>       | <a href="#">☑Contrast SDK .NET</a><br><a href="#">☑nuget</a>     |
|  | <b>Python SDK</b>     | <a href="#">☑Contrast SDK Python</a>                             |

|                                                                                   |                 |                                              |
|-----------------------------------------------------------------------------------|-----------------|----------------------------------------------|
|  | <b>Webhooks</b> | <a href="#">Generic Webhooks (page 1356)</a> |
|-----------------------------------------------------------------------------------|-----------------|----------------------------------------------|

## GitHub and GitHub actions



Learn about the different ways you can [integrate Contrast technologies with GitHub \(page 1361\)](#)

|                                                                                     |                                                                |                                                    |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------|
|    | <b>Github</b>                                                  | <a href="#">GitHub Integration (page 1360)</a>     |
|   | <b>Contrast Amazon Elastic Kubernetes Service Build Deploy</b> | <a href="#">☑ Contrast Amazon EKS Build Deploy</a> |
|  | <b>Contrast Azure Kubernetes Service Build Deploy</b>          | <a href="#">☑ Contrast AKS Build Deploy</a>        |
|  | <b>Contrast Azure Spring Cloud Deploy</b>                      | <a href="#">☑ Azure Spring Cloud Deploy</a>        |
|  | <b>Contrast SCA Action</b>                                     | <a href="#">☑ Contrast SCA Action</a>              |
|  | <b>Contrast Scan Analyze</b>                                   | <a href="#">☑ Contrast Scan Analyze</a>            |
|  | <b>Contrast Verify</b>                                         | <a href="#">☑ Contrast Verify</a>                  |



## Jira

|                                                                                   |             |                                              |
|-----------------------------------------------------------------------------------|-------------|----------------------------------------------|
|  | <b>Jira</b> | <a href="#">Jira Integration (page 1378)</a> |
|-----------------------------------------------------------------------------------|-------------|----------------------------------------------|

## Microsoft Teams and Slack

|                                                                                    |                        |                                               |
|------------------------------------------------------------------------------------|------------------------|-----------------------------------------------|
|   | <b>Microsoft Teams</b> | <a href="#">Teams Integration (page 1385)</a> |
|  | <b>Slack</b>           | <a href="#">Slack Integration (page 1388)</a> |

## Cloud integrations

|                                                                                     |                          |                                                                                                       |
|-------------------------------------------------------------------------------------|--------------------------|-------------------------------------------------------------------------------------------------------|
|  | <b>Google App Engine</b> | <a href="#">☑️Configure the Java agent for Google App Engine</a><br><a href="#">Google App Engine</a> |
|  | <b>Red Hat OpenShift</b> | <a href="#">☑️Contrast Security containers</a>                                                        |





**VMware Tanzu™****VMware Tanzu**  
(formerly Pivotal Cloud Foundry)[Configure Java for VMware Tanzu \(page 136\)](#)[Configure Node.js for VMware Tanzu \(page 338\)](#)


## Continuous integration and build tools

**Bamboo**[Bamboo Plugin \(page 1354\)](#)[☑ Contrast Security for Bamboo Marketplace](#)[☑ Contrast Bamboo Plugin Source Code](#)**CircleCI**[☑ Orb Registry](#)[☑ Contrast Security Orb for CircleCI](#)**GitLab****GitLab**[☑ How to integrate Contrast in a GitLab pipeline](#)**Gradle**[Gradle Plugin \(page 1364\)](#)[☑ Gradle.org and Contrast Plugin](#)[☑ Contrast Gradle Plugin Source Code](#)[☑ Sample Project](#)**Jenkins**[Jenkins Plugin \(page 1369\)](#)[☑ Contrast Continuous Application Security](#)[☑ Jenkins Source Code](#)



|                                                                                   |                     |                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>Maven</b></p> | <p><a href="#">Maven Plugin (page 1384)</a></p> <ul style="list-style-type: none"> <li><a href="#">☑Maven Central Repository</a></li> <li><a href="#">☑Contrast Maven Plugin Source Code</a></li> <li><a href="#">☑Sample Project</a></li> </ul> |
|-----------------------------------------------------------------------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## IDE plugins



|                                                                                     |                                  |                                                                                                                                                                           |
|-------------------------------------------------------------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <p><b>Eclipse</b></p>            | <ul style="list-style-type: none"> <li><a href="#">☑Contrast Security for Eclipse Marketplace</a></li> </ul>                                                              |
|   | <p><b>IntelliJ</b></p>           | <p><a href="#">Contrast IntelliJ Plugin (page 1366)</a></p> <ul style="list-style-type: none"> <li><a href="#">☑Contrast Security for IntelliJ Marketplace</a></li> </ul> |
|  | <p><b>Visual Studio</b></p>      | <p><a href="#">Visual Studio Plugin (page 1395)</a></p> <ul style="list-style-type: none"> <li><a href="#">☑Contrast for Visual Studio Marketplace</a></li> </ul>         |
|  | <p><b>Visual Studio Code</b></p> | <p><a href="#">Visual Studio Code Plugin (page 1396)</a></p> <ul style="list-style-type: none"> <li><a href="#">☑Contrast Security Plugin Marketplace</a></li> </ul>      |

|                                                                                   |                                     |                                                                                                       |
|-----------------------------------------------------------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------|
|  | <p><b>Visual Studio for Mac</b></p> | <p><a href="#">Visual Studio for Mac Plugin (page 1397)</a></p> <p><a href="#">Extension file</a></p> |
|-----------------------------------------------------------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------|

## Incident management systems

|                                                                                     |                                                       |                                                              |
|-------------------------------------------------------------------------------------|-------------------------------------------------------|--------------------------------------------------------------|
|    | <p><b>PagerDuty</b></p>                               | <p><a href="#">PagerDuty Integration (page 1386)</a></p>     |
|   | <p><b>Splunk on-call</b><br/>(formerly VictorOps)</p> | <p><a href="#">VictorOps Integration (page 1394)</a></p>     |
|  | <p><b>Splunk</b></p>                                  | <p><a href="#">How to integrate Contrast with Splunk</a></p> |

## Work tracking platforms

|                                                                                     |                                                     |                                                                                             |
|-------------------------------------------------------------------------------------|-----------------------------------------------------|---------------------------------------------------------------------------------------------|
|  | <p><b>Kenna Security</b></p>                        | <p><a href="#">Kenna toolkit</a></p> <p><a href="#">Running Contrast Security tasks</a></p> |
|  | <p><b>Rally</b><br/>(formerly CA Agile Central)</p> | <p><a href="#">Agile Central Integration (page 1342)</a></p>                                |

|                                                                                   |                                                        |                                                                                                      |
|-----------------------------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------------------------------------------------------------|
|  | <b>Solutions Business Manager</b><br>(formerly Serena) | <a href="#">Serena Business Manager Integration (page 1386)</a>                                      |
|  | <b>ThreadFix</b>                                       | <a href="#">☑ Contrast Remote Provider (ThreadFix)</a><br><a href="#">☑ Contrast Remote Provider</a> |

## Integration release notes

### May 2025

**Release date:** May 20, 2025

#### New and improved:

- Gradle Plugin 3.0.0
  - Plugin released to the [☑ Gradle Plugin Portal](#).
  - Added Assess Support for Gradle Plugin: The verify goal verifies that none of the vulnerabilities found by Contrast Assess during integration testing violates the project's security policy (fails the build when violations are detected). (JAVA-8252)
- Contrast Java SDK 3.4.3 (JAVA-9200)
  - Added tags to `Server Model`. (JAVA-9200)

#### Bug fixes:

- Maven Plugin 2.13.3
  - Fixed an issue where the Maven plugin failed to download the agent when the target folder was cleaned or did not exist. (JAVA-8975)

### April 2025

**Release date:** April 15, 2025

#### New and improved:

- Revised and improved the [Contrast Azure Pipelines \(page 1349\)](#) extension. (PROD-3504)
- Updated the [Contrast Azure Boards \(page 1346\)](#) integration to include options for [excluding sensitive data in tickets \(page 1349\)](#), [bi-directional integration, \(page 1348\)](#) [managing credentials \(page 1347\)](#) in Contrast configurations, and sending Contrast session metadata to tickets. (PROD-3144, PROD-3143, PROD-3114, and PROD-3370)
- Updated the Java agent to support Maven 3.9.9 and the Gradle plugin. (PROD-2855)
- Added a link to the Contrast AI guidance in the How to Fix information sent to Jira tickets. (PROD-3431)
- Added a link to the Contrast AI guidance in the How to Fix information sent to Azure Boards tickets. (PROD-3576)



**Bug fixes:**

- Fixed an issue that caused an interruption with a Jira connection following a maintenance window. (PROD-3513)

**March 2025**

**Release date:** March 18, 2025

**New and improved:**

- Contrast ADR has a new API-based [integration with Splunk \(page 1391\)](#) to provide timely actionable attack exploit events across your entire application portfolio. (PROD-3269)

**February 2025**

**Release date:** February 20, 2025

**New and improved:**

- **Preview:** Update [Visual Studio Code IDE plugin \(page 1608\)](#) to support SAST. (PROD-3112)
- Update to [IntelliJ IDE support \(page 1366\)](#) for static and runtime. (PROD-2753)

**January 2025**

**Release date:** January 21, 2025

**New and improved:**

- **NEW:** Addition of a [Wiz integration \(page 1398\)](#) to send runtime security information regarding applications from Contrast to a Wiz deployment. (PROD-2694)
- To ensure our customers can continue using MS Teams after the January 2025 Webhook URL deprecation, as Microsoft has already shared [here](#), we have added support for the new power automate integration. This will be enabled by request, and we recommend customers follow the instructions in the [integration documents \(page 1385\)](#) to prepare for the change. Once complete, please [contact Support](#) to enable this integration. Note, if you use the MS Teams integration and do not make these changes by January 31st, the integration will fail. (PROD-3092)
- Added the ability to [synchronize comments \(page 1379\)](#) under the **Activity** tab to link the comments between the **Activity** tab and the Jira issue. Note that the Jira administrator must [register and configure a webhook in Jira](#) using the *Comment...* actions. (PROD-3118)
- Added the ability to [delete expired credentials \(page 1382\)](#). (PROD-3119)
- Users can select the ability to [mask sensitive information being sent to Jira \(page 1379\)](#). Remove sensitive information from the *Issue* title and additional fields when creating the ticket. (PROD-3120)
- Support for the Japanese language was added to the MS Teams Integration. (PROD-3261)
- Added the feature to [show session metadata \(page 1379\)](#) associated with the [vulnerability \(page 1307\)](#) in the Jira ticket. (PROD-3369)

**Bug fixes:**

- Fixed a bug that would cause bi-directional status updates to stop working between the Contrast vulnerability record and the Jira ticket. (PROD-3117)

**December 2024**

**Release date:** December 10, 2024

**Advance notice regarding Contrast MS Teams Integration**

- On January 31st, 2025, the Microsoft Webhook-based connectors within the O365 Connectors service in Teams are transitioning to a new URL structure due to the implementation of further service

hardening updates. This will impact the Contrast MS Teams Integration. As a result, we will update the MS Teams integration to support this change as part of our January release. We ask customers using the MS Teams integration to follow this [guide](#) to prepare themselves for the change. More information on our upcoming change can be found on the [Microsoft Teams preview \(page 1385\)](#) page.

## Integrate with Agile Central

Integrate Agile Central with Contrast to automatically track vulnerabilities in your applications.

Before you start, be sure you have:

- An Agile Central account URL.
- Permission to create issues in the target project.
- A running Agile Central instance accessible via HTTP to Contrast.
- A project to associate the application instrumented by Contrast.

To connect with Agile Central:

1. Go to **Organization settings > Integrations** in the **user menu**.
2. Select **Connect** in the Agile Central row.
3. In the **Connect with Agile Central** form, add the name for the bugtracker entry, as well as the **URL** and **API Key** in the given fields. The Agile Central URL must be accessible from Contrast instance being configured.



### NOTE

To find your Agile Central API key, log in to the Agile Central Application manager, and select **API Keys**. Contrast saves the username, password and Agile Central URL entered in your configuration as a set of credentials.

4. Once you complete the fields, select **Test connection**. The test verifies that Contrast can reach the Agile Central instance and that the specified user can log in.
5. Once connected, select the **Applications** that you want to be available to this integration.
6. Choose a **Project name** and **Owner** from the dropdowns.
7. In the **Default priority** section, use the dropdowns to choose a priority level for each vulnerability severity.
8. Choose the **Environment** for which you want to generate tickets.
9. Choose a **Defect state**.
10. Add a name that the tickets are **Submitted by**.



### NOTE

While none of these configuration fields are required, Agile Central may populate tickets with their own default values for any fields you leave blank.

11. To add another integration once you're connected in Contrast, select **Add Configuration** in the Agile Central row.
12. To automatically create tickets for newly discovered vulnerabilities, check the designated box in the configuration form. In the multiselect field that appears, choose the **Rules** and **Severity** levels of the vulnerabilities for which you want to generate tickets.

**NOTE**

This selection doesn't generate tickets retroactively.

## Manage Agile Central credentials

Contrast saves the latest set of credentials that you enter in your Agile Central configurations to help you set up new connections faster. The API key and URL values that you enter in your first configuration become the default credentials for your following configurations.

In subsequent configurations, Contrast will pre-populate the fields with the default credentials, but allow you to modify the values as needed. You can also manage your saved sets of credentials to simultaneously update all of the affected configurations.

To create or edit a configuration with credentials that are different than your default set:

1. Select the **Manage credentials** link.
2. In the **URL** field, use the dropdown to choose a set of saved credentials; or, manually update the values in the **URL**, **Username** and **Password** fields.
3. Once you've updated the fields, select **Test Connection**.
4. Select **Save**. If you're using new credentials, you must choose to override the existing set of credentials under the given name, or save the new values as a new credential set under a different name.
5. To modify an existing set of saved credentials, select **Rename** if needed. Then select **Test Connection** and **Save**.

**NOTE**

Any updates to a set of credentials will affect all configurations using that set.

## Integrate with AWS Security Hub using Contrast Assess

Integrate Contrast Assess with AWS Security Hub to ensure a steady and secure transfer of security insights and findings directly to AWS, which helps in maintaining and enhancing your security posture through streamlined integration.

### Before you begin

Before you start you must have:

- AWS Account Number
- AWS Region
- The Contrast application from which to send insights

### Configure

There are two required steps to configure this integration:

- Configure AWS Security Hub to accept findings from Contrast
- Configure Contrast Assess to send findings to AWS Security Hub

### Configure AWS Security Hub to accept findings from Contrast

To allow AWS Security Hub to accept findings from Contrast:

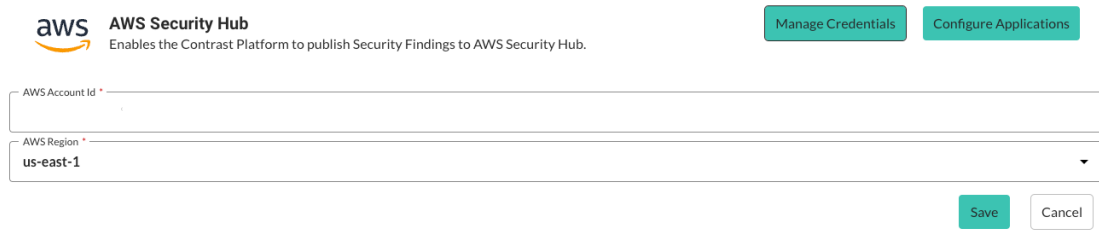
1. Open the AWS Security Hub console associated with the AWS account and region where you want to receive findings from Contrast.

2. Go to the **Integrations** section and search for *Contrast Security*.
3. Locate the Contrast Security tile, click **Accept findings** and follow the subsequent prompts to complete the setup.
4. Continue with configuring Contrast Assess to send findings to AWS Security Hub.

## Configure Contrast Assess to send findings to AWS Security Hub

After configuring the AWS Security Hub, the next step is to configure Contrast Assess to send the findings to the AWS Security Hub:

1. In Contrast, go to the **user menu** and select **Organization settings > Integrations**.
2. Find and select the **AWS Security Hub** integration section.
3. Select **Manage Credentials**.

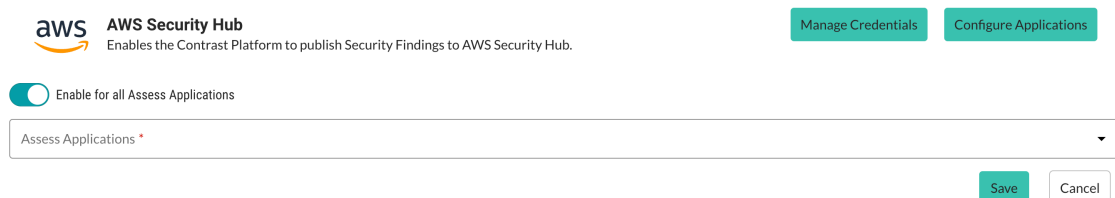


4. Enter the **AWS Account** number and select the **AWS Region**.
5. Select **Save**.
6. Continue by setting up applications in Contrast Assess.

## Set up applications in Contrast Assess

Once your credentials are set up, proceed to configure the applications:

1. In the **AWS Security Hub** integration section in Contrast, select **Configure Applications**.
2. Select whether to activate the AWS Security Hub integration for all Assess applications or select specific application names from a list, choosing which insights to forward.



3. Select **Save**.

## Retry mechanism

In case synchronization between Contrast Assess and AWS Security Hub fails, a retry mechanism ensures data reliability:

- If an event fails to sync, it will be stored and retried every night at midnight GMT.
- The retry count will increase by one with a maximum of three retries for up to 72 hours. After the third unsuccessful retry, the event will be discarded.
- If a vulnerability creation event fails and is stored, any subsequent update or delete action relating to that failed event will be stored and replayed in chronological order to maintain the correct state.

## Integrate with Amazon Security Lake using Contrast Assess

Integrate Contrast Assess with Amazon Security Lake to push findings and other relevant security data automatically.

## Before you begin

Before you start, you must have:

- AWS Region

## Create a Custom Source in AWS

1. In AWS, go to [Amazon Security Lake](#).
2. Select **Custom Source**.
3. Click **Create New Source**.
4. Enter a **Data source name** of your choice.
5. Set the **OCSF Event class** to *Security Finding*.
6. Input the **AWS account ID** and **External ID**.  
These IDs are under the *Amazon Security Lake* section on Contrast's **Integrations** page. From the user menu in Contrast select **Organization settings > Integrations**.
7. Once a custom source is created, retrieve the generated **Role ARN** and the **S3 ARN**. You will need these to connect to AWS.
8. Continue with connecting to Amazon Security Lake.

## Connect to Amazon Security Lake

1. In Contrast, go to the user menu and select **Organization settings > Integrations**.
2. Find and select the **Amazon Security Lake** integration section.
3. Select **Manage Credentials**.

The screenshot shows the 'Amazon Security Lake' configuration page in Contrast. The page has a header with the AWS logo and the text 'Amazon Security Lake Enables the Contrast Platform to send OCSF Security Finding data to Amazon Security Lake on your behalf.' Below the header, there are two tabs: 'Credentials' and 'Applications'. The 'Credentials' tab is active. The page contains the following fields and controls:

- External ID:** 35346c29-adc8-4be1-831f-bcf72bf86662. There is a 'Rotate' button next to it.
- AWS Account Id:** 763284681916.
- Role ARN:** An empty text field.
- S3 ARN:** An empty text field.
- AWS Region:** A dropdown menu with 'us-east-1' selected.
- Buttons:** 'Save' (green) and 'Cancel' (grey) buttons at the bottom right.

4. Enter the generated **Role ARN** and the **S3 ARN** from before.
5. Choose the **AWS Region** from the list or enter it manually.
6. Select **Save**.
7. Continue by setting up applications in Contrast Assess.

## Set up applications in Contrast Assess

Once your credentials are set up, proceed to configure the applications:

1. In the **Amazon Security Lake** integration section in Contrast, select **Applications**.
2. Select whether to activate the Amazon Security Lake integration for all Assess applications or select specific application names from a list.
3. Select **Save**.

## Retry mechanism

In case synchronization between Contrast Assess and Amazon Security Lake fails, a retry mechanism ensures data reliability:

- If an event fails to sync, it will be stored and retried every night at midnight GMT.
- The retry count will increase by one with a maximum of three retries for up to 72 hours. After the third unsuccessful retry, the event will be discarded.
- Suppose a vulnerability creation event fails and is stored. Any subsequent update or delete action relating to that failed event will be stored and replayed in chronological order to maintain the correct state.

## Integrate with Azure Boards

With an Azure Boards integration with Contrast, you can: automatically generate tickets for bugtracking, synchronize comments and push notifications for your applications.

- Automatically generate tickets or work items for bugtracking, synchronization of comments, and push notifications for your applications.  
The integration sends session metadata that you configured in the agent configuration file to Azure Boards work items.
- Configure a two-way integration
- Exclude sensitive information that Contrast sends to Azure Boards

## Azure Boards requirements

- Account credentials for Azure Boards or TFS: username and personal access token (PAT).
- Scope to read and write work items with your PAT.
- An Azure Boards or TFS instance, accessible by HTTP to Contrast.
- An instrumented application in Contrast that is also associated to an Azure Boards project.

## See also

- Microsoft's [Azure Boards documentation](#).
- [Connect with Azure Boards \(page 1346\)](#)
- [Automatically create tickets \(page 1347\)](#)
- [Two-way integration \(page 1348\)](#)
- [Exclude sensitive information \(page 1349\)](#)
- [Set personal access tokens \(page 1349\)](#)

## Connect to Azure Boards

### Steps

1. In Contrast, go to **Organization settings > Integrations**.
2. For the Azure Boards integration, select **Connect**.
3. Enter the following values:
  - **Name:** Label that will display when Contrast sends findings to bugtrackers in Azure Boards.
  - **URL:** Azure Boards or TFS URL. Contrast must be able to access this.
  - **Version:** Contrast uses API v2 to support Azure DevOps Services, TFS 2015 and TFS 2017.
  - **Personal access token:** An alternate password to authenticate to your host.
4. Select **Test connection**. This may take a few minutes, depending on the number of Azure Boards or TFS projects. The test verifies that Contrast can reach the Azure Boards or TFS instance you entered, and it accepts the user's PAT to login.
5. Once Azure Boards is connected, select the Contrast **Applications** you want to make available to this bugtracker.
6. Enter values for **Project**, **Assignee** and **Work Item Type**.
7. Select a **Team**, then select an **Area** within the team. This will send tickets to a specific backlog.

8. Set the **Default priority** for vulnerability severity levels. This prioritizes tickets to fix vulnerabilities for the selected applications, based on severity. At this point, Contrast will make an API call and return a list of Azure Boards or TFS ticket states.
9. You can also set up the following options for Azure Boards:
  - [Two-way integration \(page 1348\)](#) to automatically update vulnerability status in Contrast
  - [Automatic ticket creation \(page 1347\)](#)
  - Exclude sensitive information from issue titles and additional fields when creating tickets
  - Send tags as labels when creating tickets

## See also

- [Set personal access tokens \(page 1349\)](#)
- [Manage credentials \(page 1347\)](#)

## Manage Azure Boards credentials

Contrast saves the most recent credentials for an Azure Boards integration to help you set up new connections faster. The values for the Azure Boards URL and version that you enter in your first configuration are the default credentials for the next Azure Boards integration. Contrast pre-populates the next Azure Boards configuration with these default credentials, but you can modify or delete them.

## Change Azure Boards credentials

1. Go to the **user menu > Organization Settings > Integrations**.
2. Under Azure Boards, select **Manage Credentials**.
3. From the dropdown in the Credentials box, select the credentials you want to change.
4. If you want to rename the credentials, select **Rename**.
5. If you want to change the URL, enter a new URL
6. Select a version.
7. Enter an Azure Personal Access Token.
8. Select **Test connection** to be sure the changes work.
9. Select **Save**.

## Delete Azure Boards credentials

1. Go to the **user menu > Organization Settings > Integrations**.
2. Under Azure Boards, select **Manage Credentials**.
3. From the dropdown in the Credentials box, select the credentials you want to change or delete.
4. Select **Delete credential** at the bottom of the page.
5. When prompted to confirm the deletion, select **Continue** in the Delete credential window.

## See also

- [Connect with Azure Boards \(page 1346\)](#)
- [Set Azure Boards personal access tokens \(page 1349\)](#)

## Automatically create tickets

You can **automatically create tickets** every time Contrast discovers new vulnerabilities.

## Steps

1. In the [Azure Boards integration panel \(page 1346\)](#), select **Automatically create tickets for new vulnerabilities discovered**. This displays a multi-select field for **Rules** and **Severity**.
2. Select the rules or severity levels of vulnerabilities that should trigger a new ticket in Azure Boards or TFS. **Critical** and **High** are the default selections.

**NOTE**

This setting only works for new vulnerabilities discovered after you select it.

**See also**

- [Connect with Azure Boards \(page 1346\)](#)
- [Two-way integration \(page 1348\)](#)
- [Set personal access tokens \(page 1349\)](#)

**Two-way integration**

You can use a two-way integration with Azure Boards. This will automatically update the status of a vulnerability in Contrast when you close or reopen an issue in Azure Boards or TFS that links to the vulnerability .

**Steps**

1. In the [Azure Boards integration panel \(page 1346\)](#), select **Enable two-way integration**. This displays Vulnerability Status fields.
2. Select the dropdowns to set a vulnerability status for each Azure Boards or TFS ticket state.
3. **Save** the two-way integration. Contrast will populate the vulnerability status in Azure Boards or TFS tickets.
4. When you update the state of a ticket in Azure Boards or TFS, Contrast will automatically generate comments in the **Discussion** tab for that vulnerability. Each comment includes the name of the bugtracker and a link to the ticket.

**NOTE**

If you select the vulnerability status **Not a problem** as a ticket state in Azure Boards or TFS, Contrast also requires you to select a **Reason**. The default value is **Other**.

**CAUTION**

For multiple vulnerabilities sent to Azure Boards or TFS as a single issue, the ticket state applies to all vulnerabilities associated with that ticket. Conversely, when you link multiple tickets to a single vulnerability, you must update all associated tickets before you can update the vulnerability. For example, if you change a ticket state from **New** to **Active**, Contrast updates the vulnerability status only if all tickets related to that vulnerability also have an **Active** state.

**See also**

- [Set personal access tokens \(page 1349\)](#)
- [Connect to Azure Boards \(page 1346\)](#)
- [Automatically create tickets \(page 1347\)](#)



## Exclude sensitive information with Azure Boards

You can set up a Contrast Azure Boards configuration to mask sensitive information that it sends to tickets or work items in Azure Boards.

### Steps

1. Under Organization settings, select **Integrations**.
2. Under Azure Boards, select **Show configurations** and select the configuration you want to update.
3. In the [Azure Boards integration panel \(page 1346\)](#), select **Allow exclusion of sensitive information from issue titles and additional fields when creating tickets**.
4. **Save** the configuration.

### See also

- [Connect to Azure Boards \(page 1346\)](#)
- [Automatically create tickets \(page 1347\)](#)

## Set Azure Boards personal access tokens

Personal Access Tokens (PAT's) are used by Contrast to access Azure Boards. PAT's can be set to provide full access or "a la carte" access.

### Steps

1. Navigate to **User Settings** in Azure.
2. Select **Personal access tokens**. Existing personal access tokens are displayed.
3. Click **New Token**. The **Create a new personal access token** modal displays.
4. Enter required fields and scopes for your new PAT in the **Create a new personal access token** modal.



#### NOTE

**Read, write, & manage** under **Work items** must be selected to work with Contrast.

##### Work Items

Work items, queries, backlogs, plans, and metadata



Read



Read & write



Read, write, & manage

5. Click **Create** to finish and save your new personal access token.

### See also

- [Connect with Azure Boards \(page 1346\)](#)
- [Automatically create tickets \(page 1347\)](#)
- [Two-way integration \(page 1348\)](#)

## Azure Pipelines extension

Use the Azure Pipeline extension to integrate Contrast with your deployment workflow. The following instructions guide you through the steps to set up and configure the extension for your Contrast instance.

Before you begin to set up the extension, make sure that you have the privileges to install a Microsoft extension. If not, you can [request the extension](#) for a project.

## Install and configure the Azure Pipelines extension

Use these procedures to install the extensions and create a service connection.

### Install the extension

Follow the [Microsoft instructions](#) to install the extension **Contrast ADO Pipeline Integration**.

### Create a service connection

The Contrast Server Connection service connection lets Azure DevOps integrate with Contrast.

1. Go to your **Project Settings** at the bottom of the sidebar. You'll need to be part of the Project administration group or have enough permissions to alter the settings.
2. In the **Pipelines** section of the settings menu, select **Service connections**.
3. Select **New Service connection** and then **Contrast Server Connection**.
4. Complete all the fields with required data:
  - **Contrast URL:** The URL for your Contrast instance. Exclude `/Contrast` at the end; only the host name is required.
  - **Contrast credentials:** Copy these credentials from your [personal keys \(page 638\)](#) under the **user menu > User settings** in the Contrast web interface:
    - Organization UUID (Organization ID)
    - Service Key
    - API Key
  - **Contrast username:** The user name you use to log in to Contrast.
5. Optionally, select the **Logging** option.  
If enabled, logs are stored in the pipeline artifact, providing visibility into the task execution and Contrast API interactions.

## Configure a task in the Azure Pipelines extension

Use this procedure to configure a release or build pipeline task.

### Steps

1. Select the pipeline where you want to add the task then select **Edit**.
2. For release pipelines, select a stage for which you want to add the task.
3. To add the task, click the ellipsis (...) menu and select **Add an agentless job**.
4. Select the **+** button next to your agentless job, and add the **Contrast Assess Security** task.
5. To choose a connection and application, select a **Service Connection** from the **Contrast Service Connection** menu. You can also select **Manage** to go to the **Service connections settings** in your **Project Settings**.
6. Optionally, select a different vulnerability source. The default selection is Assess.  
If you select **Assess-Libraries** as the Vulnerability source, Contrast looks at the number of instances where that library is used according to the specified severity criteria, not the number of libraries. For example, you could have 11 libraries with 45 vulnerable instances of those libraries.
7. Select one of your applications from the **Application** menu.
8. To configure the task, use the **Allowed Status** and **Build Number** fields to filter your results from Contrast. Leave them blank if you don't want to filter results. The values set in these fields will be validated against the conditions you configure in the following fields.
9. Proceed to your severity counters, where you must set the maximum number of vulnerabilities allowed per severity. If your selected application has more vulnerabilities than allowed for that severity level, your task will fail.

For build pipelines only: If you want to prevent the execution of a job if the task fails, you must set the job to depend on the agentless job that includes the Contrast task.

1. Select the job you want to prevent from executing.
2. In the **Dependencies** section, add the **Agentless job**.

**NOTE**

You can only use this task for an agentless job.

## Add a release gate to a pipeline in Azure Pipelines

Release gates offer a safeguard to prevent deployment to environments if vulnerabilities for a given application exceed a certain threshold.

### Before you begin

- Microsoft Documentation offers more information on how to [define a gate for a stage](#) and [how to configure a gate](#).
- Microsoft Documentation offers more information on how to [define a gate for a stage](#) and [how to configure a gate](#).
- Optionally, create a Contrast Security service connection.

### Add and configure a gate

1. Find the release pipeline where you want to add the gate and select **Edit**.
2. Choose the stage and deployment conditions for the gate. They can either be pre-conditions or post-conditions. You can add multiple gates to the same conditions.
3. Under **Gates**, enable the gate you created.
4. Select **Add** and then **Verify application vulnerabilities**.
5. Select your Contrast service connection.  
If you haven't already created a service connection, select **New** next to the service connection dropdown to create the Contrast service connection. Fill in all the fields and select **OK**.  
Select **Refresh list**, then select your newly created connection.
6. Hover on the field or select **Refresh** to see a list of applications. Select the one that is most appropriate to the release pipeline.
7. If you want, you can select which vulnerability status or build numbers will be used for filtering when retrieving the data for the gate evaluation.
8. Set the maximum amount of vulnerabilities allowed per severity or total threshold based on a threshold definition of Split or Combined.  
If any validations fail when your pipeline reaches this gate, the pipeline will keep requesting samples until it becomes valid, or until the evaluation times out.

**TIP**

- You can customize **Evaluation** options to configure the time between the re-evaluation of gates. For instance, you can set this value to 24 hours so that the gates will evaluate every day. This way you can remediate vulnerabilities and pass the required gate conditions without having to re-initiate the execution of the pipeline from start (or obtain manual approvals if they exist).
- **Split threshold definition:** If you set the threshold definition to **Split**, specify the maximum allowed vulnerabilities for each severity level. The evaluation compares each severity value against its defined threshold.
- **Combined threshold definition:** If you set the threshold definition to **Combined**, specify the total allowed threshold for the sum of all severity levels. The evaluation compares the combined severity count against the defined total threshold.

## Find logs for Azure Pipelines

When you turn on logging, pipeline task details are captured and stored as log files in the pipeline artifact.

### Before you begin

Verify that the **Logging** option in the [service connection \(page 1350\)](#) is selected.

### Steps

1. Run the pipeline task.  
The log file with the task results is stored as a pipeline artifact.
2. **Build pipelines:** Locate the log file:
  - a. Go to **Azure DevOps** → **Pipelines** → **Runs**.
  - b. Select a pipeline run.
  - c. Go to **Artifacts**.
  - d. Select **Logs**.
  - e. Download the log file.
3. **Release pipelines:** Locate the log file:
  - a. Go to **Azure DevOps** → **Pipelines** → **Releases**.
  - b. Select a release.
  - c. Hover on the stage and select **Logs**.
  - d. Select **Download all logs**.

## Use Azure Service Fabric with the .NET Framework or .NET Core agent

If you are using a container image, follow the instructions to [install in containers \(page 221\)](#). Otherwise, to add the Contrast .NET Framework or .NET Core agent to an Azure Service Fabric service:

**TIP**

For Standalone Executable services, the `ServiceManifest.xml` file is located in the top-level Azure Service Fabric project (for example, the `sfproj` file).

1. Install the appropriate NuGet package to the main project for the service.
  - **.NET Framework:** Install `Contrast.NET.Azure.AppService`. All files in the `contrastsecurity` folder must have `Copy to Output Directory` set to `Copy if newer`.
  - **.NET Core:** Install `Contrast.SensorsNetCore`. All files in the `contrast` folder have `Copy to Output Directory` set to `Copy if newer`.
2. Set `ServiceManifest/CodePackage/EntryPoint/ExeHost/WorkingDirectory` in `ServiceManifest.xml` to `CodePackage`.

```
<CodePackage Name="Code" Version="1.0.0">
  <EntryPoint>
    <ExeHost>
      <Program>DemoNetFxStatelessService.exe</Program>
      <WorkingFolder>CodePackage</WorkingFolder>
    </ExeHost>
  </EntryPoint>
</CodePackage>
```

3. Set environment variables in `ServiceManifest.xml` to configure the profiler.

- **.NET Framework:**

```
<CodePackage>
  <EnvironmentVariables>
    <EnvironmentVariable Name="COR_ENABLE_PROFILING"
Value="1" />
    <EnvironmentVariable Name="COR_PROFILER"
Value="{EFEB8EE0-6D39-4347-A5FE-4D0C88BC5BC1}" />
    <EnvironmentVariable
Name="COR_PROFILER_PATH_32" Value=".\contrastsecurity\runtimes\win-
x86\native\ContrastProfiler.dll" />
    <EnvironmentVariable
Name="COR_PROFILER_PATH_64" Value=".\contrastsecurity\runtimes\win-
x64\native\ContrastProfiler.dll" />
    <EnvironmentVariable Name="CONTRAST_CONFIG_PATH"
Value="contrast_security.yaml" />
  </EnvironmentVariables>
</CodePackage>
```

- **.NET Core:**

```
<CodePackage>
  <EnvironmentVariables>
    <EnvironmentVariable Name="CORECLR_ENABLE_PROFILING"
Value="1" />
    <EnvironmentVariable Name="CORECLR_PROFILER"
Value="{8B2CE134-0948-48CA-A4B2-80DDAD9F5791}" />
    <EnvironmentVariable Name="CORECLR_PROFILER_PATH_32"
Value="contrast\runtimes\win-x86\native\ContrastProfiler.dll" />
    <EnvironmentVariable Name="CORECLR_PROFILER_PATH_64"
Value="contrast\runtimes\win-x64\native\ContrastProfiler.dll" />
    <EnvironmentVariable Name="CONTRAST_CONFIG_PATH"
Value="contrast_security.yaml" />
  </EnvironmentVariables>
</CodePackage>
```

4. Configure the agent with either:
  - **A YAML file:** Add it to the main project for the service. Make sure `Copy to Output Directory` for the file is set to `Copy if newer`. Add an environment variable to `ServiceManifest.xml` specifying the location of the file, like this:

```
<CodePackage>
  <EnvironmentVariables>
    <EnvironmentVariable Name="CONTRAST_CONFIG_PATH"
Value="contrast_security.yaml" />
  </EnvironmentVariables>
</CodePackage>
```

- **Environment variables:** Add them to `ServiceManifest.xml`, like this:

```
<CodePackage>
  <EnvironmentVariables>
    <EnvironmentVariable Name="CONTRAST__API__URL "
Value="https://teamserver-staging.contsec.com"/>
    <EnvironmentVariable Name="CONTRAST__API__API_KEY "
Value="aBcD0123"/>
    <EnvironmentVariable Name="CONTRAST__API__SERVICE_KEY "
Value="ABCD0123"/>
    <EnvironmentVariable Name="CONTRAST__API__USER_NAME "
Value="agent_123@Team"/>
```

5. Deploy the Azure Service Fabric application as usual.

## Contrast - Bamboo plugin

This plugin adds functionality to Bamboo so that you can configure profiles for connecting to Contrast and verify builds against vulnerability thresholds.

### Install and configure

To install and configure the Bamboo plugin:

1. Download the Contrast Bamboo plugin ( *contrast-bamboo-plugin-#.#.#.jar*) from the [Bamboo Marketplace](#).
2. Select **Add-Ons** from the top-left settings menu.
3. Select **Upload add-on**.
4. When prompted to upload a file, select *contrast-bamboo-plugin-#.#.#-SNAPSHOT.jar*.
5. Verify you see the plugin under **User-installed add-ons**.
6. Now that the plugin is installed, configure a profile for Contrast. Select **Contrast Profiles** under **Add-Ons** in the side navigation bar.
7. In the **Profile Configuration** page, select **New Profile** and complete the form.



#### NOTE

If you are a hosted customer, you do not need to enter a Contrast URL.

8. Select **Test Connection** to verify that your settings are correct. A success notification will appear when a connection is established.

### Configure vulnerability thresholds

The Bamboo plugin can be added as a task to build jobs to check for vulnerability conditions that you configure. This checks Contrast for the number and type of vulnerabilities in the applications.

To add a task to a build job:

1. Select **Create a New Build Plan** (you can also use an existing plan).
2. Enter a project name, plan name and link to the repository host. The project key and plan key is auto-generated.
3. Once you create the plan, add a task to the build process by selecting **Add Task**.
4. In the window that appears, find the **Contrast CI for Assess** task and select it.  
The **Tasks** configuration page relies on a Contrast profile, as well as a server name, application name and a **Passive** parameter. The server name isn't required, but should correspond to a server name in Contrast if used. The application name must be on the designated server.  
If you select the **Passive** parameter, the plugin will query all vulnerabilities for the application (not just build-specific vulnerabilities). If you do this, you don't have to run the application with its integration tests before the Contrast post-build action in the Bamboo build.

- Next, define conditions for when to fail a build:
  - Threshold Count:** The minimum number of findings required to fail the build.
  - Threshold Severity:** The minimum severity at which to count a finding towards the threshold count.
  - Threshold Vulnerability Type:** The type of finding required to count a finding towards a threshold count.



#### NOTE

Using the **Any** option means that any severity or vulnerability type is counted towards the maximum threshold count.

- Select **Add New Threshold Condition** to configure multiple conditions for each task.
- Select **Save**.
- Enable the build plan by selecting the checkbox in the bottom left.

## Eclipse

For applications instrumented with a Contrast agent, you can view vulnerability information directly in the Eclipse IDE during development for faster remediation. You will see affected lines of code and can view more details about the vulnerability in Contrast.

This plugin is available for Mac/OS, Linux, and Windows and supports the latest versions of Eclipse.

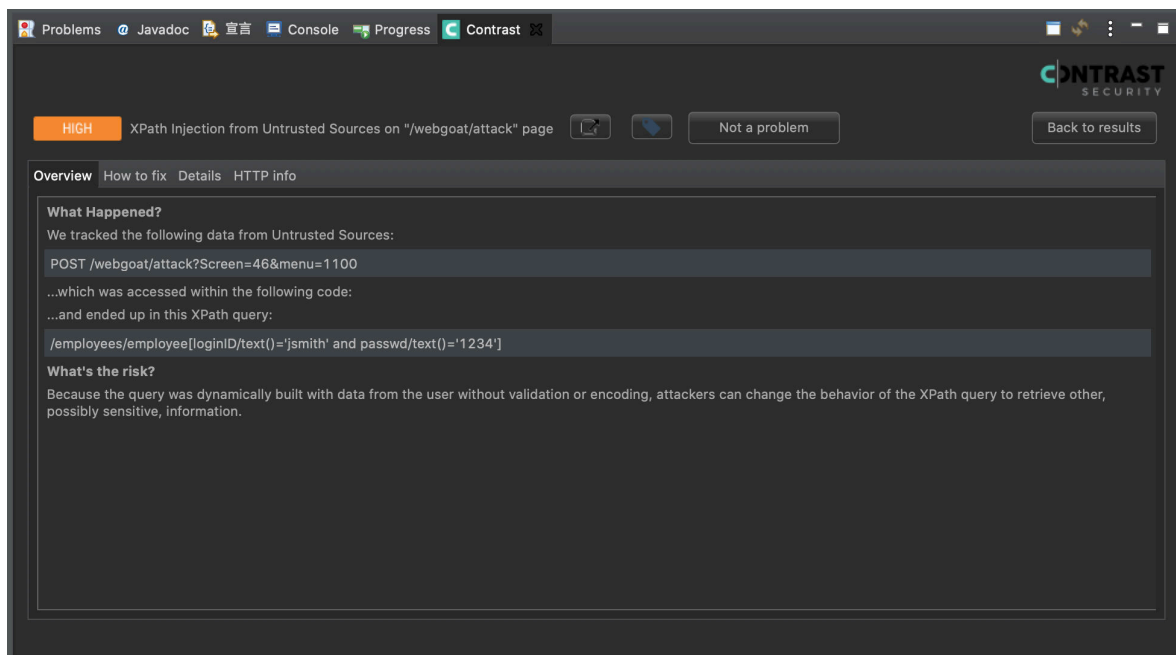
To install the Eclipse plugin, visit the [Eclipse marketplace](#) or:

- In Eclipse, select **Help > Eclipse Marketplace**.
- Search “Contrast Security”.
- Select **Install**.
- Configure the plugin at **Window > Show View > Other**.
- Search “Contrast” and add the view that appears in the search.
- Enter the **Username**, **API Key**, **Organization ID** and **Service Key** in the configuration page. You can [find these keys \(page 638\)](#) in user settings.
- Select **Add**.
- The **Vulnerabilities** view shows a list of all the vulnerabilities from Contrast. You can sort and filter them.

| Severity | Vulnerability                                                                                       | Application               |
|----------|-----------------------------------------------------------------------------------------------------|---------------------------|
| CRITICAL | SQL Injection from Untrusted Sources on "/webgoat/attack" page                                      | AgentMessageGeneratorNode |
| CRITICAL | NoSQL Injection from Untrusted Sources on "/webgoat/attack" page                                    | AgentMessageGeneratorNode |
| HIGH     | XPath Injection from Untrusted Sources on "/webgoat/attack" page                                    | AgentMessageGeneratorNode |
| HIGH     | Cross-Site Scripting from Untrusted Sources on "/order/internal/validate-sell.html" page            | AgentMessageGeneratorNode |
| HIGH     | Path Traversal from Untrusted Sources on "/webgoat/attack" page                                     | AgentMessageGeneratorNode |
| HIGH     | OS Command Injection from Untrusted Sources on "/WebGoat-6.0.1/attack" page                         | AgentMessageGeneratorNode |
| MEDIUM   | Unvalidated Redirect from Untrusted Sources on "/ticketbook/redirect.jsp" page                      | AgentMessageGeneratorNode |
| MEDIUM   | Session Cookie Has No 'secure' Flag in                                                              | AgentMessageGeneratorNode |
| MEDIUM   | Session Cookie Has No 'HttpOnly' Flag in                                                            | AgentMessageGeneratorNode |
| MEDIUM   | 'MD5' hash algorithm used at                                                                        | AgentMessageGeneratorNode |
| MEDIUM   | Server-Side Request Forgery (SSRF) from "url" Parameter on "/server-side-request-forgery/ssrf" page | AgentMessageGeneratorNode |
| NOTE     | Parameter Pollution detected                                                                        | AgentMessageGeneratorNode |
| NOTE     | Pages Without Anti-Clickjacking Controls detected                                                   | AgentMessageGeneratorNode |
| NOTE     | Anti-Caching Controls Missing detected                                                              | AgentMessageGeneratorNode |
| NOTE     | 'DES' encryption algorithm used at Cipher.java                                                      | AgentMessageGeneratorNode |



9. Select the vulnerability title for information about that particular vulnerability. From there you can select **How to fix** for remediation instructions to fix the vulnerability. Select **Details** and double-click on the Java stack traces to focus on a particular source code line. You can also change the vulnerability status here.



10. Select the **Go to page** icon to open Contrast and see more vulnerability information.

## Generic webhooks

Contrast supports a generic webhook integration to receive [notifications \(page 1457\)](#) on any URL that receives POST messages. You can add [custom variables \(page 1358\)](#) to your payload like `$ApplicationName` and `$ServerId` when a [Contrast event \(page 1360\)](#) triggers them.

A generic webhook stays connected as long as the receiving end returns any 2XX HTTP response code. If the generic webhook receives too many non-2XX response codes, it disconnects.

### Connect

To connect a generic webhook:

1. Retrieve the URL from which you want Contrast to receive notifications.
2. In the user menu, select **Organization settings > Integrations**.
3. In the **Generic webhook** integration option, select **Connect**.
4. Name the webhook, and paste the URL in the designated field.
5. Select the application(s) that you want to filter.
6. In the **Payload** field, enter a [variable \(page 1358\)](#). For example:

```
{
  "title": "$Title",
  "message": "$Message"
}
```

7. Select **Add**.

To test the webhook:

1. Go to **Organization settings > Notifications**.
2. In the dropdown under **Integrations**, select the generic webhook name.



3. For each **Subscription** (event type) you want to be notified of, click the toggle in the **Integrations** column.
4. Cause an event type to occur, and confirm that you get a notification at the URL specified.




## NOTE


If this webhook fails to return a successful response after 5 attempts, it will be disconnected. To restore the configuration, you must retest the connection and resave it.

You can configure the integration so that all Organization Administrators are notified in the Contrast application and by email when Contrast disconnects a generic webhook.


To do this, go to the same location: **Organization settings > Integrations > Generic webhook > Show configurations**. Select the name of the connection you want to configure. Then select the **Notify on disconnect** checkbox to receive notifications and click **Save**.

Connect with  webhook ×

Name

URL 

Applications

Payload (Optional) 

☒ Send as HTML

☒ Notify on disconnect

If this webhook fails to return a successful response after 5 attempts, it will be disconnected. All organization administrators will be notified in Contrast and by email.

Cancel

Test URL

Add

## Generic webhook variables

You can customize your [generic webhook \(page 1356\)](#) response with data from Contrast events such as `NEW_VULNERABILITY` and `SERVER_OFFLINE`. Each event contains variables you can call in your payload request. Variables are either for general use or for an application, server or vulnerability.

| Variables                                       | Description                                                                                                                                                                              |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>General variables</b>                        |                                                                                                                                                                                          |
| <code>\$EventType</code>                        | The event type responsible for triggering the webhook<br>For example: <code>SERVER_OFFLINE</code>                                                                                        |
| <code>\$Message</code>                          | A message summarizing the event that triggered the webhook                                                                                                                               |
| <code>\$OrganizationId</code>                   | The unique ID Contrast assigns to an organization when it is created                                                                                                                     |
| <code>\$OrganizationName</code>                 | The name of your organization                                                                                                                                                            |
| <code>\$Title</code>                            | Always returns "Contrast Security"                                                                                                                                                       |
| <b>Application variables</b>                    |                                                                                                                                                                                          |
| <code>\$ApplicationChild</code>                 | Returns true if the application is a child application, false if not                                                                                                                     |
| <code>\$ApplicationCode</code>                  | A secondary shorthand that appears in the title of an application, and is blank by default<br>For example: <code>TEST</code>                                                             |
| <code>\$ApplicationContextPath</code>           | The context path of the application<br>For example: <code>/example/somethingelse</code>                                                                                                  |
| <code>\$ApplicationFirstSeen</code>             | When the application was first seen, in Unix time<br>For example: <code>1572033840000</code>                                                                                             |
| <code>\$ApplicationHasParentApp</code>          | Returns true if the application has a parent, false if not                                                                                                                               |
| <code>\$ApplicationImportance</code>            | Enumerated value of the application Importance level<br>For example: <code>MEDIUM</code>                                                                                                 |
| <code>\$ApplicationId</code>                    | The unique ID Contrast assigns to an application when it is created<br>For example: <code>49fe2978-1833-4441-83db-2b7o486d9413</code>                                                    |
| <code>\$ApplicationImportanceDescription</code> | The importance level assigned to the application For example: <code>Medium</code>                                                                                                        |
| <code>\$ApplicationLanguage</code>              | The programming language of the application                                                                                                                                              |
| <code>\$ApplicationLastSeen</code>              | When the application was last seen, in Unix time For example: <code>1572033840000</code>                                                                                                 |
| <code>\$ApplicationLicenseLevel</code>          | Whether or not the application has an Assess license Values: <code>Licensed</code> , <code>Unlicensed</code>                                                                             |
| <code>\$ApplicationMaster</code>                | Returns true if the application is a primary application, false if not                                                                                                                   |
| <code>\$ApplicationName</code>                  | The name of the application                                                                                                                                                              |
| <code>\$ApplicationParentAppId</code>           | The unique ID Contrast assigns to an application when it's created, in this case, the parent application, if it exists<br>For example: <code>49fe2978-1833-4441-83db-2b7o486d9413</code> |
| <code>\$ApplicationTags</code>                  | A comma separated list of the Application tags.                                                                                                                                          |
| <code>\$ApplicationTotalModules</code>          | The number of modules your application has                                                                                                                                               |
| <b>Server variables</b>                         |                                                                                                                                                                                          |
| <code>\$Environment</code>                      | The environment of the server For example: <code>DEVELOPMENT</code> or <code>PRODUCTION</code>                                                                                           |
| <code>\$ServerId</code>                         | The ID of the server involved in the event<br>If more than one server is involved, this is a comma-delimited list of server IDs.                                                         |
| <code>\$ServerName</code>                       | The name of the server involved in the event<br>If more than one server is involved, this is a comma-delimited list of server names                                                      |

| Variables                                     | Description                                                                                                                             |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Vulnerability variables</b>                |                                                                                                                                         |
| \$Severity                                    | If this event is triggered by a vulnerability, this is the severity of the vulnerability                                                |
| \$Status                                      | If this event is triggered by a vulnerability, this is the status of the vulnerability                                                  |
| \$TraceId                                     | If this event is triggered by a vulnerability, this is the vulnerability ID                                                             |
| \$VulnerabilityAgentLanguage                  | The application language or framework name of the where the vulnerability was discovered (for example,.Java, .NET, Ruby, and so forth.) |
| \$VulnerabilityAppVersionTags                 | The application versions the vulnerability is found in<br>For example: v1.2.3                                                           |
| \$VulnerabilityAutoRemediatedExpirationPeriod | Auto-remediated expiration period for the vulnerability, in Unix time<br>For example: 1572033840000                                     |
| \$VulnerabilityBugTrackerTickets              | A comma delimited list of tickets created when the vulnerability was sent to bugtracker<br>For example: ticket1, ticket2, ticket3       |
| \$VulnerabilityCategory                       | The category of vulnerability found For example: Injection                                                                              |
| \$VulnerabilityClosedTime                     | When the vulnerability was closed, in Unix time<br>For example: 1572033840000                                                           |
| \$VulnerabilityConfidence                     | Confidence of the vulnerability                                                                                                         |
| \$VulnerabilityDefaultSeverity                | Default severity of the vulnerability                                                                                                   |
| \$VulnerabilityDiscovered                     | When the vulnerability was first discovered, in Unix time<br>For example: 1572033840000                                                 |
| \$VulnerabilityEvidence                       | The evidence of the vulnerability                                                                                                       |
| \$VulnerabilityInstanceUuid                   | The unique ID Contrast assigns to a vulnerability instance when it is created<br>For example: R33T-N00B-TGIF-RM6P                       |
| \$VulnerabilityFirstTimeSeen                  | When the vulnerability was first seen, in Unix time For example: 1572033840000                                                          |
| \$VulnerabilityImpact                         | The impact level of the vulnerability Values: Low, Medium, High                                                                         |
| \$VulnerabilityLastTimeSeen                   | Last time the vulnerability was seen, in Unix time For example: 1572033840000                                                           |
| \$VulnerabilityInstanceLastTimeSeen           | Last time the vulnerability was seen, in Unix time For example: 1572033840000                                                           |
| \$VulnerabilityLicenseLevel                   | License level of the vulnerability                                                                                                      |
| \$VulnerabilityLikelihood                     | The likelihood of the vulnerability<br>Values: Low, Medium, High                                                                        |
| \$VulnerabilityReportedToBugTracker           | When the vulnerability was sent to a bugtracker, in Unix time<br>For example: 1572033840000                                             |
| \$VulnerabilityReportedToBugTrackerTime       | Returns true If the vulnerability was sent to a bugtracker                                                                              |
| \$VulnerabilityRule                           | Rule associated with the vulnerability                                                                                                  |
| \$VulnerabilityRuleName                       | Name of the rule associated to the vulnerability                                                                                        |
| \$VulnerabilityRuleTitle                      | Title of the rule associated to the vulnerability                                                                                       |
| \$VulnerabilitySubStatus                      | Substatus of the vulnerability                                                                                                          |
| \$VulnerabilityTags                           | Custom tags associated with the vulnerability<br>For example: my-custom-tag                                                             |
| \$VulnerabilityTitle                          | Title of the vulnerability                                                                                                              |
| \$VulnerabilitySubStatusKeyCode               | Key code of the vulnerability substatus                                                                                                 |
| \$VulnerabilityTotalTracesReceived            | Total number of times the vulnerability was received                                                                                    |
| \$VulnerabilityUuid                           | The unique ID used to look up a vulnerability                                                                                           |

| Variables              | Description                                                                                                        |
|------------------------|--------------------------------------------------------------------------------------------------------------------|
| \$VulnerabilityVisible | true if the vulnerability is licensed and visible, false if not                                                    |
| \$VulnerabilityRule    | If event is triggered by a vulnerability, this is the rule that the vulnerability violated                         |
| \$VulnerabilityTags    | If event is triggered by a vulnerability, this is a comma-delimited list of tags associated with the vulnerability |

## Events and generic webhook variables

You can customize your [generic webhook \(page 1356\)](#) response with data from Contrast events such as `NEW_VULNERABILITY` and `SERVER_OFFLINE`. Each event contains [general \(page 1358\)](#), [application \(page 1358\)](#), [server \(page 1358\)](#) or [vulnerability \(page 1359\)](#) variables you can call in your payload request.

| Event                             | Variables                                                                                                                                                      |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ATTACK_END                        | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a>                                             |
| ATTACK_EVENT_COMMENT              | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a>                                             |
| ATTACK_UPDATE                     | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a>                                             |
| EXPIRING_LICENSE                  | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a>                                                                                  |
| NEW_ASSET (if new application)    | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> and <a href="#">Server (page 1358)</a> (if new application)                      |
| NEW_ATTACK_APPLICATION            | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a>                                             |
| NEW_ATTACK_UPDATE                 | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a>                                             |
| NEW_ATTACK                        | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a>                                             |
| NEW_VULNERABILITY_COMMENT         | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a> , <a href="#">Vulnerability (page 1359)</a> |
| NEW_VULNERABILITY                 | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a> , <a href="#">Vulnerability (page 1359)</a> |
| NEW_VULNERABLE_LIBRARY            | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a>                                                                                  |
| SERVER_OFFLINE                    | <a href="#">General (page 1358)</a> , <a href="#">Server (page 1358)</a>                                                                                       |
| VULNERABILITY_CHANGESTATUS_CLOSED | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a> , <a href="#">Vulnerability (page 1359)</a> |
| VULNERABILITY_CHANGESTATUS_OPEN   | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a> , <a href="#">Vulnerability (page 1359)</a> |
| VULNERABILITY_DUPLICATE           | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a> , <a href="#">Vulnerability (page 1359)</a> |

## Integrate with GitHub

Set up an integration to automatically send issues to GitHub when Contrast finds them in your applications.

Before you start, be sure you have:

- GitHub account credentials (username and personal access token). When you [generate your personal access token](#), be sure to enable the **repo** permissions.
- Access to a GitHub organization and repository for the application.
- Write permission ([push access](#)) to the repository. This is required to set labels, milestones and assignees in the configuration form.
- A running GitHub instance accessible via HTTP to Contrast.

To connect with GitHub:

1. Go to **Organization settings > Integrations** in the **user menu**.
2. Click **Connect** in the row for GitHub.
3. In the **Connect with GitHub** form, add the name for the bugtracker entry, the username for the account connected to GitHub and the password for the specified username in the appropriate fields. The GitHub URL must be accessible from the Contrast instance being configured.

4. Automatically create issues in GitHub for newly discovered vulnerabilities by checking the box at the bottom of the configuration form. In the multiselect field that appears, choose the **Rules** and **Severity** levels of the vulnerabilities for which you want to generate tickets. The default selections are **Critical** and **High**.
5. Once you complete the fields, select **Test connection**. This process may take a few moments depending on the number of your GitHub organizations and repositories. The test verifies that the GitHub instance can be reached by Contrast and that the specified user is able to log in.
6. Once a connection is made, select the **Applications** that you want to be available to this bugtracker.
7. Select the values for the **GitHub organization** and **Repository** fields using the dropdowns.

**NOTE**

If you change the **GitHub organization** or **Repository** values, you must re-enter the values for optional fields.

8. Optionally, add **Labels**, **Assignees** and a **Milestone** for GitHub issues using the given fields.

**NOTE**

For multiple vulnerabilities sent in bulk to GitHub as a single issue, the GitHub ticket status applies to all vulnerabilities associated with that ticket. For multiple issues tied to a single vulnerability, the vulnerability can only be closed when all the tickets are closed.

**See also**

[Integrate Contrast with GitHub and GitHub Advanced Security \(page 1361\)](#)

[Integration example: Assess and GitHub \(page 1363\)](#)

[GitHub actions \(page 1364\)](#)

**Integrate Contrast with GitHub and GitHub Advanced Security**

Contrast supports multiple methods of integrating GitHub source code management (SCM) with Contrast technologies.

For an example of how to integrate Assess with a GitHub workflow, visit [Assess and GitHub. \(page 1363\)](#)

**Integrate Contrast Scan with GitHub**

| I want to use GitHub to...    | Procedure                                                                                                                                                                                                                                                                                                                                                                                                                  | Related links                                                                                                                                |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Scan code in my master branch | <p>Use the <a href="#">Contrast Scan local engine (page 714)</a> as part of your workflow.</p> <p>You have a choice of using the Scan CLI or the Contrast Scan Analyze GitHub action for the scan.</p> <p>The CLI does not support specific branch scanning. It creates separate projects for each repository that you scan. For this reason, using the Contrast Scan Analyze Github action is the recommended option.</p> | <p><a href="#">Scan CLI (page 1293)</a></p> <p><a href="#">Contrast Scan Analyze</a></p> <p><a href="#">Contrast Scan Analyze README</a></p> |

| I want to use GitHub to...                             | Procedure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Related links                                                                         |
|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Scan code in my personal or an alternative branch      | Use the Contrast Scan Analyze GitHub action for the scan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <a href="#">Contrast Scan Analyze</a><br><a href="#">Contrast Scan Analyze README</a> |
| Ingest Contrast findings into GitHub Advanced Security | <ol style="list-style-type: none"><li>Test the application whose information you want to include in a SARIF file with either of these methods:<ul style="list-style-type: none"><li>Deploy the agent on the server deployed in the pipeline itself, where the test suit that should be part of the deployment runs. This action exercises the application and provides information for the SARIF file.</li><li>Deploy the agent and exercise the application on a server before a test run.</li></ul></li><li>Use the <a href="#">sarif</a> API to download the SARIF file from Contrast. You can filter the information by application and other metadata to customize the results.</li><li>To ingest the SARIF file into GitHub Advanced Security, add the following code to your GitHub action file:<pre>- name: Upload SARIF file   uses: github/codeql-action/upload-sarif@v2   with:     sarif_file: results.sarif</pre></li></ol> <p>The Security &gt; Code Scanning tab shows the results.</p> | <a href="#">Uploading a SARIF file to GitHub</a>                                      |

## Integrate Contrast static SCA with GitHub

| I want to use GitHub to...                                 | Procedure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Related links                                       |
|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| Run a static SCA scan against my repo using an action      | Use the Contrast Security SCA GitHub action to scan your code repository for library vulnerabilities. You can also use the GitHub action to fail a build by updating your workflow file.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <a href="#">Contrast Security SCA GitHub action</a> |
| Ingest Contrast SCA findings into GitHub Advanced Security | <ol style="list-style-type: none"><li>Test the application whose information you want to include in a SARIF file with either of these methods:<ul style="list-style-type: none"><li>Deploy the agent on the server deployed in the pipeline itself, where the test suit that should be part of the deployment runs. This action exercises the application and provides information for the SARIF file.</li><li>Deploy the agent and exercise the application on a server before a test run.</li></ul></li><li>Use the <a href="#">sarif</a> API to download the SARIF file from Contrast. You can filter the information by application and other metadata to customize the results.</li><li>To ingest the SARIF file into GitHub Advanced Security, add the following code to your GitHub action file:<pre>- name: Upload SARIF file   uses: github/codeql-action/upload-sarif@v2   with:     sarif_file: results.sarif</pre></li></ol> <p>The Security &gt; Code Scanning tab shows the results.</p> | <a href="#">Uploading a SARIF file to GitHub</a>    |

## Integrate IAST technology (Contrast Assess) with GitHub

| I want to use GitHub to...                                                 | Procedure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Related links                                    |
|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| Export results in a SARIF file and ingest it into GitHub Advanced Security | <ol style="list-style-type: none"> <li>Test the application whose information you want to include in a SARIF file with either of these methods: <ul style="list-style-type: none"> <li>Deploy the agent on the server deployed in the pipeline itself, where the test suit that should be part of the deployment runs. This action exercises the application and provides information for the SARIF file.</li> <li>Deploy the agent and exercise the application on a server before a test run.</li> </ul> </li> <li>Use the <a href="#">sarif</a> API to download the SARIF file from Contrast. You can filter the information by application and other metadata to customize the results.</li> <li>To ingest the SARIF file into GitHub Advanced Security, add the following code to your GitHub action file: <pre> - name: Upload SARIF file   uses: github/codeql-action/upload-sarif@v2   with:     sarif_file: results.sarif </pre> </li> </ol> <p>The Security &gt; Code Scanning tab shows the results.</p> | <a href="#">Uploading a SARIF file to GitHub</a> |
| Send vulnerabilities from Contrast directly to GitHub issues               | Contrast supports the ability to send vulnerabilities to a GitHub repository and report them as issues. <a href="#">Integrate with GitHub (page 1360)</a> explains how to do this.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                  |

### Integration example: Assess and GitHub

The example in this topic uses the Java agent. You can adapt this procedure for other Contrast agents.

#### Before you begin

- Find a GitHub workflow that executes tests.
- Find where mvn is executed with a command similar to the following:

```
run : mvn -B clean install -Dmaven.gitcommitid.skip=true
```

- Add Assess to a test with a command similar to the following:

```
-DargLine="-javaagent:/tmp/contrast.jar --add-opens java.base/sun.net.spi=ALL-UNNAMED"
```

- The easiest method to download and configure an agent is to use the Add New agent wizard in the Contrast web interface for the language you want to use.

#### Steps

- Download the agent with a command similar to the following:

```
curl -L https://download.java.contrastsecurity.com/latest -o contrast.jar
```

The Add New agent wizards in the Contrast web interface display the latest commands for downloading Contrast agents.

- Configure the agent with this environment variable as a [GitHub action secret](#) in the GitHub env workflow:



#### NOTE

The value of the environment variable is security sensitive, therefore configuring it as a secret is recommended.

```
env:
  # Setting an environment variable with the value of a configuration
```

```
variable update test
  CONTRAST__ASSESS__ENABLED: true
  CONTRAST__PROTECT__ENABLED: false
  CONTRAST__API__TOKEN: <token-value>
```

You can retrieve the token value from the Contrast web interface under **Organization settings > Agent keys** or by using the [Contrast agent configuration editor \(page 113\)](#).

If you are using an older agent, configure these environment variables as GitHub action secrets:

```
env:
  # Setting an environment variable with the value of a configuration
  variable update test
  CONTRAST__API__URL: https://<yourURL>/Contrast
  CONTRAST__ASSESS__ENABLED: true
  CONTRAST__PROTECT__ENABLED: false
  CONTRAST__API__API_KEY: ${ secrets.CONTRAST__API__API_KEY }
  CONTRAST__API__SERVICE_KEY: ${ secrets.CONTRAST__API__SERVICE_KEY }
  CONTRAST__API__USER_NAME: ${ secrets.CONTRAST__API__USER_NAME }
```

## GitHub Actions

Contrast provides several GitHub actions that simplify a variety of analysis tasks. For example, you might find some of these GitHub Actions useful:

| GitHub Action                               | Description                                                                                                                                                             |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Contrast Verify                             | This GitHub Action verifies an application that uses Contrast by determining whether the application violates a Job Outcome Policy or threshold of open vulnerabilities |
| Contrast Security SCA                       | This GitHub Action lets you use Contrast to detect vulnerable dependencies in your code.                                                                                |
| Contrast Security EKS Build Deploy          | This GitHub Action builds and deploys a java application to the Amazon Elastic Kubernetes Service (EKS) with a Contrast Security Java Agent.                            |
| Contrast Scan Analyze                       | This GitHub Action lets you use Contrast Scan to find vulnerabilities in your code.                                                                                     |
| Contrast Security AKS Build Deploy          | This GitHub Action builds and deploys a Java application to the Azure Kubernetes Service (AKS) with a Contrast Java agent.                                              |
| Contrast Security Azure Spring Cloud Deploy | This GitHub Action deploys a Java application with a Contrast Java agent to the Azure Spring Cloud PaaS environment.                                                    |

The GitHub Marketplace contains the most current [GitHub Actions for Contrast](#).

## Gradle plugin

The Contrast Gradle plugin is used to integrate the *Contrast.jar* with your build. It's capable of authenticating to Contrast, downloading the latest Java agent and verifying your build.



### NOTE

- [Gradle](#) is a build tool that utilizes `build.gradle` files to configure your applications. It's used to build, package, and test various types of applications.

## Clone a sample web application

The easiest way to set up a project is to clone our sample Gradle-based web application. This application has been migrated from Maven to Gradle and relies on MongoDB.



1. Install and set up the database path.

```
git clone https://github.com/Contrast-Security-OSS/Contrast-Sample-Gradle-Application
brew install mongodb
sudo mkdir -p /data/db
brew services start mongodb
```

2. An application is ready to run. Open the *Contrast-Sample-Gradle-Application/build.gradle* file. Scroll to find the `contrastConfiguration` extension. You can find all of the values in your [personal keys \(page 638\)](#) except `appName` and `serverName`.

```
contrastConfiguration {
    username = "username"
    apiKey = "apiKey"
    serviceKey = "serviceKey"
    apiUrl = "apiUrl"
    orgUuid = "orgUuid"
    appName = "editLATER"
    serverName = "editLATER"
}
```

3. Install the Contrast JAR file by calling the `contrastInstall` task. This installs the Contrast JAR in the project's build directory.

```
cd path/to/Contrast-Sample-Gradle-Application
gradle build -x test contrastInstall
```

4. Run the application with the Java agent. The server starts.

```
cd path/to/Contrast-Sample-Gradle-Application/build
java -Dcontrast.agent.java.standalone_app_name=mytestapp
-Dcontrast.server=mytestserver -jar libs/Contrast-Sample-Gradle-Application-0.0.1-SNAPSHOT.jar
```

5. Check that the application is running at `localhost:8080` and that the application shows up in Contrast.
6. In Contrast, verify that the application with the `appname` specified in the command above shows up.
7. In the *Contrast-Sample-Gradle-Application* project's *build.gradle*, edit the `contrastConfiguration` to specify the `appName` and `serverName` specified as options with the Java agent in the previous step.

```
contrastConfiguration {
    username = "alreadySetup"
    apiKey = "alreadySetup"
    serviceKey = "alreadySetup"
    apiUrl = "alreadySetup"
    orgUuid = "alreadySetup"
    appName = "mytestapp"
    serverName = "mytestserver"
}
```

8. Run the verification task at any time to check for vulnerabilities.

```
gradle build contrastVerify -x test
```

## Use the plugin

The plugin code can be viewed in our [GitHub repository](#). Here you can review the two tasks added by the plugin, `contrastInstall` and `contrastVerify`, and how they work.

The latest version of the plugin can be found on the [Gradle plugin webpage](#).

| Task                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>contrastInstall</code> | Installs a Contrast Java agent to your local project. The plugin edits the <code>org.gradle.jvmargs</code> property in the <code>gradle.properties</code> file to launch the JVM with the Contrast agent. An application version, by which the vulnerabilities are filtered in the <code>contrastVerify</code> task, is generated during this task. The plugin generates the application version in the following order: <ul style="list-style-type: none"><li>• If your build is running in TravisCI, Contrast uses <code>appName-\$TRAVIS_BUILD_NUMBER</code>.</li><li>• If your build is running in CircleCI, Contrast uses <code>appName-\$CIRCLE_BUILD_NUM</code>.</li><li>• If your build is running in neither TravisCI nor CircleCI, Contrast generates one in the format <code>appName-yyyyMMddHHmm</code>. (Where <code>yyyyMMddHHmm</code> is the time of the build generation.)</li></ul> |
| <code>contrastVerify</code>  | Checks for new vulnerabilities in your web application.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## Contrast Security IntelliJ plugin

Use the [Contrast IDE](#) (Integrated Development Environment) plugin to integrate security vulnerabilities associated with projects ([Scan \(page 32\)](#)) and applications ([Assess \(page 27\)](#)). The Contrast plugin provides thorough information about vulnerabilities visible in projects and applications on a near real-time basis. The plugin offers filters based on severity, status, and discovery date to customize the vulnerability data to view.

The key features include a vulnerability report to view vulnerabilities associated with applications, provide a tree view on the list of the vulnerabilities related to the current file open in the IDE with visual indicators based on criticality, provide in-depth details about each vulnerability, automate the collection of vulnerabilities for applications and projects based on a schedule.

### Before you begin

- Make sure you have the supported system requirements:
  - CPU: Quad-core
  - RAM: 16 GB
  - Storage: SSD, 128 GB
  - Monitor: 1080p
- Make sure you have the supported software requirements:
  - Operating systems: Ubuntu 22.04.5 LTS or Windows 11
  - JRE: 17.0.12
  - JVM Heap Size: `-Xms 2g -Xmx 4g`
- Use IntelliJ Community Edition 2024.3 and 2024.2

## Install Java Development Kit (JDK)

### Linux

1. Install [JDK 17.0.13](#) from the Oracle website.
2. Download the appropriate **tar.gz** file for your system (for example, **jdk-17.0.13\_linux-x64\_bin.tar.gz**).
3. Open a terminal and go to the directory where you downloaded the **tar.gz** file.
4. Extract the contents using the command (example):

```
tar -xvzf jdk-17.0.12_linux-x64_bin.tar.gz
```

5. Move the extracted JDK to the `/usr/lib/jvm/` directory:

```
sudo mv jdk-17.0.12 /usr/lib/jvm/
```

6. Set the **JAVA\_HOME** environment variable and update the **PATH**.
7. Edit `.bashrc` or `.profile` file (depending on the shell):

```
nano ~/.bashrc
```

8. Add the following lines at the end of the file:

```
export JAVA_HOME=/usr/lib/jvm/jdk-17.0.12
export PATH=$JAVA_HOME/bin:$PATH
```

9. Apply changes by reloading **.bashrc**.

```
source ~/.bashrc
```

10. Run the following command to verify that Java is correctly installed:

```
java -version
```

11. Continue by configuring the heap size.

## Windows

1. Install **JDK 17.0.13** from the Oracle website.
2. Download the appropriate **tar.gz** file for your system (for example, **jdk-17.0.13\_windows-x64\_bin.tar.gz**)
3. Go to the directory where you downloaded the **tar.gz** file.
4. Set the environment variables:
  - Add **JAVA\_HOME**
  - Select **Win + S**
  - Type **Environment Variables**
  - Select **Edit the system environment variables**
  - In the system properties window, click **Environment Variables**
  - Under system variables, select **New**:

```
Variable name: JAVA_HOME
Variable value: Path to your JDK installation (e.g., C:\Program
Files\Java\jdk17).
```

5. Locate the **Path** variable under **System Variables**.
6. Select **New** and add:

```
%JAVA_HOME%\bin
```

7. Select **OK**.
8. Verify the configuration and open a new command prompt:

```
java -version
```

9. Continue by configuring the heap size.

## macOS

1. Install **JDK 17.0.13** from the Oracle website.
2. Download the appropriate **tar.gz** file for your system (for example, **jdk-17.0.13\_macos-x64\_bin.tar.gz**).
3. Go to the directory where you downloaded the **tar.gz** file.
4. Extract the contents using the command (example):

```
tar -xvzf jdk-17.0.13_macos-x64_bin.tar.gz
```

5. Move the extracted folder to the JDK directory:

```
sudo mv jdk-17.0.13 /Library/Java/JavaVirtualMachines/
```

6. Set the **JAVA\_HOME** environment variable. Determine the JDK Path - the extracted JDK is now located at: **/Library/Java/JavaVirtualMachines/jdk-17.0.13/Contents/Home**.

7. Open the shell configuration file:

```
nano ~/.zshrc
```

8. Add the following lines to set the **JAVA\_HOME** and update the **PATH**:

```
export JAVA_HOME=/Library/Java/JavaVirtualMachines/jdk-17.0.13/Contents/
Home
export PATH=$JAVA_HOME/bin:$PATH
```

9. Save the changes.
10. Select **Ctrl+O** to save in nano.
11. Select **Ctrl+X** to exit.
12. Apply the changes:

```
source ~/.zshrc
```

13. Verify the configuration and open a new command prompt:

```
java -version
```

14. Continue by configuring the heap size.

## Configure the Heap Size

1. Open **IntelliJ IDEA**.
2. Go to **Help > Edit Custom VM Options**.
3. Add or update the following lines:

```
-Xms1024m    # Initial heap size (1 GB)
-Xmx4096m    # Maximum heap size (4 GB)
```

4. Save the file and restart **IntelliJ IDEA**.

## Install the Contrast IntelliJ plugin

Select one of these options.

### Install the Contrast IntelliJ plugin via JetBrains Marketplace

1. Open **IntelliJ IDE** and go to **File > Settings > Plugins**.
2. Under marketplace search for **Contrast** then select the install button.
3. After installation select **Apply** and then **OK**.

### Install the Contrast IntelliJ plugin via manual installation

1. Download the plugin's `.zip` file and download it to your machine.
2. Launch **IntelliJ IDEA** on your system.
3. Go to **Plugin Settings**:
  - Go to **File > Settings**
  - In the *Settings/Preferences* dialog, select **Plugins**
4. Install the plugin from the disk:
  - Click the gear icon in the top-right corner of the plugins window
  - Select **Install Plugin from Disk** from the drop-down menu
5. In the window, go to the location of the `.zip` file and select it.  
IntelliJ IDEA will verify and install the plugin. If prompted, confirm the installation.
6. Restart IntelliJ IDEA:
  - After the installation, a prompt may appear asking you to restart IntelliJ IDEA
  - Click **Restart IDE** to complete the installation process

## 7. Verify Installation:

- Once IntelliJ IDEA restarts, go back to **Plugins** under Settings/Preferences
- Ensure the plugin is listed under **Installed Plugins** and is enabled

## Configure the Contrast IntelliJ plugin

1. In IntelliJ IDEA, find the Contrast plugin and select the **Settings** icon (⚙️).
2. Enter:
  - **Contrast URL:** The URL of your Contrast instance. For example, `https://app.contrastsecurity.com`.
  - **Username:** the username or e-mail address that you use for logging into Contrast.
  - **API Key, Service Key, and Organization ID:** Copy these values from your user profile in the Contrast web interface.  
To find these values:
    1. In the Contrast web interface, select your name in the upper right of the page.
    2. Select **User settings**.
    3. Copy the values for the API Key, Service Key, and Organization ID.



### IMPORTANT

Do not use the Agent keys (found under **user menu > Organization settings > Agent keys**). The access rights for the Agent keys are more limited than the API keys found under User Settings. The Agent keys won't work with the Contrast IntelliJ plugin.

3. Select **OK**.

## Contrast Jenkins integration

**Jenkins** is a continuous integration (CI) tool that automates the process of building, testing, deploying, and running applications.

With the Contrast plugin for Jenkins, you can add application security gates to this pipeline. These gates contain criteria that can fail the Jenkins job for a vulnerable application with a build result like "Failure" or "Unstable".



### TIP

You can view the plugin source code in the [Jenkins Github repository](#).

Use these versions to ensure compatibility:

| Jenkins | Contrast-Jenkins plugin | Contrast |
|---------|-------------------------|----------|
| 2.60.3  | 3.4                     | 3.7.6    |
| 2.60.3  | 3.7                     | 3.7.10   |
| 2.60.3  | 3.8                     | 3.8.0    |

## Install and use Jenkins plugin

1. [Define a connection \(page 1370\)](#) between Contrast and Jenkins.

2. Depending on your situation, decide how you will use Jenkins:
  - If you are using freestyle jobs, you can define vulnerability security controls at a [system level \(page 1371\)](#) or as a [post-build action step \(page 1371\)](#).
  - Define vulnerability security controls for [pipeline steps \(page 1372\)](#).
  - Optionally, a Contrast Organization Administrator define a [job outcome policy \(page 1374\)](#).
3. [Run a build \(page 1378\)](#).

## See also

- [Connect with Jenkins \(page 1370\)](#)
- [Define security controls \(page 1374\)](#)
- [Define a job outcome policy \(page 1374\)](#)
- [Run a build \(page 1378\)](#)

## Connect

### Before you begin

- All Contrast Security integrations require an [organization admin role \(page 1555\)](#) in order to set up the connection.
- [Install Jenkins](#).
- Have already setup a [Jenkins pipeline](#).

### Define a connection

To define a connection to Contrast in Jenkins:

1. Select **Manage Jenkins** in the left sidebar of your Jenkins dashboard.
2. Select **Manage Plugins** under **System Configuration**.
3. Check to enable the **Contrast Continuous Application Security** plugin under the **Installed** tab.
4. Select **Manage Jenkins** again.
5. Select **Configure System** to find the **Contrast Connections** section.
6. Enter your **Contrast username**. Your username is the email address you use for your account in Contrast.
7. Enter the:
  - **Contrast API key**,
  - **Contrast service key**,
  - **Contrast URL** , and
  - **Organization ID**.You can find these in [your profile \(page 638\)](#) under **User settings > Profile > Your keys**.
8. Select a **Result of a vulnerable build** to choose how you want Contrast to mark your Jenkins job when your application is too vulnerable:
  - **Failure**
  - **Unstable**
  - **Success**
  - **Not\_built**
  - **Aborted**
9. Check the box next to **Apply this vulnerable build result to the job when Jenkins encounters an error with Contrast** if you want the Jenkins job to automatically fail whenever your Jenkins instance can't find your application.
10. You can define the criteria that the Contrast plugin will use to determine whether an application is too vulnerable at the Jenkins system level. Check the box next to **Allow global Contrast Vulnerability Threshold Conditions to be overridden in a Job configuration** if you want job

level controls to override system level controls. Leave the box unchecked if you want to enforce consistency of criteria across all Jenkins jobs in your instance.

**NOTE**

If you are using a [job outcome policy \(page 1374\)](#) to set security controls, those policies will override any policies set at the job level or system level.

11. Click **Test Contrast connection** to make sure that the plugin can authenticate to Contrast and retrieve information about your applications' vulnerabilities.
  - A success message displays when plugin is authenticated.
  - If unsuccessful, check that the URL you received from Jira and the one you posted in Contrast are matching.

**See also**

- [Define security controls \(page 1374\)](#)
- [Define a job outcome policy \(page 1374\)](#)
- [Run a build \(page 1378\)](#)

**Define security controls at a system level**

After you [define a connection \(page 1370\)](#) in Jenkins, define if you are using freestyle jobs, you may want to set Contrast vulnerability security controls at a system level. Alternatively, you can [set security controls at a job level \(page 1371\)](#), or if you use a [job outcome policy \(page 1374\)](#) those security controls will take precedence.

1. Under **Contrast Connections > Contrast Vulnerability Security Controls**, select a **Connection** you have previously created, from the dropdown.
2. Set the **Number of Allowed Vulnerabilities**. This number is exclusive; if you set it to "5", Jenkins will fail if there are six or more vulnerabilities. This field is required.
3. Choose a **Vulnerability Severity** from the options in the dropdown. (These are the same [vulnerability severity options \(page 1323\)](#) in Contrast.) The plugin sets a filter in the API call for all vulnerabilities greater than or equal to this field. This field is not required, but selecting it will narrow your results. So if the number is set to "5" and the severity to **High**, Jenkins will fail if there are six or more critical vulnerabilities.
4. Choose a **Vulnerability Type** (rule name) from the dropdown. The plugin checks for the number of vulnerabilities with the rule type selected and compares it to the number of allowed vulnerabilities for that rule. This field is not required, but selecting it will narrow your results. You can choose one severity and one rule type per security control.
5. Choose from the list of **Vulnerability Statuses**. Statuses are not required but can be helpful. For example, select **Confirmed** and **Suspicious** only to return vulnerabilities with an open status. Leave this blank if you do not want to filter vulnerabilities by status.  
You can add multiple vulnerability security controls, but the plugin will fail the job on the first bad condition and set the build result on the first violated vulnerability security control.

**Define security controls as a post-build action step**

After you have set security controls at the [system level \(page 1371\)](#) in Jenkins, you can also add security controls at a job level for freestyle jobs that are not part of a Jenkins Pipeline. To do this:

1. When defining a job in Jenkins, find the **Post-Build Actions** section.
2. Select a **Connection** you have previously created, from the dropdown.
3. Choose your application. This field is required.
  - If your application has been instrumented, select your application from the **Choose your application** dropdown.

- If your application has not yet been instrumented, indicate your application using the **Application Name** and **Application Language** fields. You must provide the same application name in Jenkins that you will use when you do instrument your application. Contrast will use that same name and language during the post-build action step after the application has been instrumented.
4. If the connection is configured to [allow the system-level vulnerability security controls to be overridden \(page 1371\)](#), you can override that setting by checking the box next to **Override Vulnerability Security Controls at the Jenkins system level**.  
If you do this, you will also need to indicate the **Number of Allowed Vulnerabilities**, **Vulnerability Severity**, **Vulnerability Type**, and **Vulnerability Statuses** for this job.
  5. Select how you want to query vulnerabilities by selecting an option under **Query vulnerabilities by**. That way, only those vulnerabilities found from that job will be considered. By default, the plugin uses the first option: `appVersionTag, format: applicationId-buildNumber`.

## Define vulnerability security controls for pipelines in Jenkins

You can use the `contrastAgent` pipeline step to download the Contrast agent, then instrument and exercise your application. You can use the `contrastVerification` pipeline step to verify your application and set parameters for a security control.

## Download with `contrastAgent`

A pipeline step with the name `contrastAgent` downloads the latest Contrast agent.

| Parameter                    | Required                                               | Description                                                                                                                         | Examples                   |
|------------------------------|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| <code>profile</code>         | Required                                               | Contrast connection profile used to communicate with Contrast                                                                       | <code>MyConnection</code>  |
| <code>outputDirectory</code> | Required                                               | This defines where to put the downloaded agent.                                                                                     | <code>env.WORKSPACE</code> |
| <code>agentType</code>       | Required if <code>applicationId</code> is not defined. | Type of agent used to instrument the application (not case sensitive)<br><br>Options are: Java, .NET, .NET_Core, Node, Ruby, Python | Java                       |

Here is an example of how to add a pipeline step with the name `contrastAgent` :

```

node{
  stage('Download Latest Contrast Agent'){
    contrastAgent profile:'MyConnection', outputDirectory: env.WORKSPACE,
    agentType: 'Java'
  }
}

```

## Verify application with `contrastVerification`

You can use a pipeline step with the name `contrastVerification` to verify whether an application is vulnerable.

| Parameter            | Required | Description                                                                           | Examples            |
|----------------------|----------|---------------------------------------------------------------------------------------|---------------------|
| <code>profile</code> | Required | Use <code>profile</code> to specify the connection used to communicate with Contrast. | Contrast Connection |



| Parameter       | Required                                                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Examples                             |
|-----------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| queryBy         | Required                                                                              | <p>Use <code>queryBy</code> to filter build-related vulnerabilities. For options 1, 2 and 4, this value must match the <code>contrast.override.appversion</code> parameter that was passed to the Contrast agent when running your application.</p> <p>Enter the option number for how you want to query vulnerabilities (defaults to 1):</p> <ol style="list-style-type: none"> <li>1. <code>appVersionTag</code>,<br/>format: <code>applicationId-\${BUILD_NUMBER}</code></li> <li>2. <code>appVersionTag</code>,<br/>format: <code>applicationId-\${JOB_NAME}-\${BUILD_NUMBER}</code></li> <li>3. <code>startDate</code> (This is the build timestamp. It only looks at vulnerabilities discovered after the build starts.)</li> <li>4. <code>APPVERSIONTAG</code> (This is the job parameter or environment variable. Select this option if you want to specify your own text, then export <code>APPVERSIONTAG</code> as an environment property within your Jenkins job. Both <code>JOB_NAME</code> and <code>BUILD_NUMBER</code> are already available as Jenkins environment properties.)</li> </ol> | 1                                    |
| applicationId   | Required, if <code>applicationName</code> and <code>agentType</code> are not defined. | The ID of the application or application module you are trying to verify                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | cb3ea678-38c8-4487-ba94-692a117e7966 |
| applicationName | Required, if <code>applicationId</code> is not defined                                | The name of the application you are trying to verify (not case sensitive)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | MyApp                                |
| count           | Optional                                                                              | The total number of allowed vulnerabilities, defaults to 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 10                                   |
| rule            | Optional                                                                              | Defaults to <b>All</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | xss                                  |
| severity        | Optional                                                                              | Defaults to <b>All</b> . Other options are <b>Critical</b> , <b>High</b> , <b>Medium</b> and <b>Low</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>High</b>                          |
| appVersionTag   | Optional                                                                              | The value that was passed to the <code>contrast.override.appversion</code> parameter of the Contrast agent                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | v1.2.3                               |

Here are some examples of how to add a pipeline step with the name `contrastVerification`:

- **Use `queryBy` `startDate`:**

```
contrastVerification applicationId: '1e6ad9c6-89d4-4f06-bdf6-92c569ec89de', count: 1, profile: 'new-profile', queryBy: 3, rule: 'cache-controls-missing', severity: 'High'
```

- **Use `queryBy` custom `appVersionTag` parameter:**

```
contrastVerification applicationId: '1e6ad9c6-89d4-4f06-bdf6-92c569ec89de', count: 1, profile: 'new-profile', queryBy: 4, appVersionTag: 'v1.2.3' rule: 'cache-controls-missing', severity: 'High'
```

- **Use `applicationName` and `AgentType` to define the application:**

```
contrastVerification applicationName: 'MyApp', agentType: 'Java', count: 1, profile: 'new-profile', queryBy: 3, rule: 'cache-controls-missing', severity: 'High'
```

- **Verify an application with a preset or overridden vulnerability security control.**

If you know that the vulnerability security control has been preset in [Contrast \(page 1374\)](#), then you only need to define the profile and either the `applicationId` or (`applicationName` and `agentType`):

```
contrastVerification applicationId: '35ae7b89-1c76-414b-b317-c444ce27608b', profile: 'ContrastConnection'
```

## Jenkins security controls

You can define security controls for Jenkins:

- [At a system level \(page 1371\)](#)
- [As a post-build action step \(page 1371\)](#)
- [For pipelines \(page 1372\)](#)

## Define a job outcome policy

Job outcome policies (supported in the Contrast Jenkins integration version 3.3 and later) assign build outcomes to Jenkins jobs that use the Contrast plugin. These policies mark jobs with a build outcome status such as **Failure**, **Unstable**, or **Success** based on criteria you set.

## Before you begin

You must be an Organization Administrator to define a job outcome policy in Contrast.

## Define a policy

To define a job outcome policy:

1. Under [organization settings \(page 1440\)](#), select **Integrations** in the left navigation.
2. In the **Jenkins** row, select **Add job outcome policy**.

### Define Jenkins job outcome policy

Job outcome policies assign a build outcome to Jenkins jobs for the applications you choose and vulnerability properties you define. [Learn more](#)

Name \*

Name this job outcome policy

Applications

Application names

All applications (823) ×

#### Vulnerability properties

Environments

All Environments (3) ×

Vulnerability rules and severities ⓘ

All Rules

Number of allowed vulnerabilities ⓘ

- vulnerabilities

+ Add another rule

Vulnerability statuses

Reported × Confirmed × Suspicious ×

Vulnerability first seen

From

Application onboarding

Until

Contrast step runs in Jenkins

☐ Apply the Query vulnerabilities by selection from the plugin when filtering vulnerabilities.

#### Policy outcome

If the policy is violated, assign a job outcome of:

☐ Failure

☒ Unstable

☐ Success

ⓘ For applications with conflicting job outcome policies, the policy with the most severe outcome will apply.

☒ Enable this job outcome policy

3. Define a name for the job outcome policy (required).
4. Under **Applications**, indicate the applications to which the policy should apply. You can identify applications by their name, importance level, or tag. If you select by application name, you can select individual or [merged applications \(page 653\)](#).
5. Under **Vulnerability properties**, define a limit of which vulnerabilities, in which environments will be included in the policy. Use the **Environment**, **Vulnerability status** and **Vulnerability first seen** to filter the vulnerabilities that you want to include in this policy. Use the **Vulnerability rules and severities** to set a threshold for how many of those rules (at a particular severity) will trigger the outcome status change.
  - **Environment(s)**: Select the environment where you want to apply the policy. For example, to block vulnerabilities from moving from test (QA) to production, select **QA**. (However, if you do that, vulnerabilities in the development environment are not considered. Select **Development** to also include those vulnerabilities. Or select **All environments** if you want vulnerabilities from all environments to be included.)
  - **Vulnerability statuses**: Select which statuses will be included. [Statuses \(page 1319\)](#) are determined by Contrast.

**TIP**

In most cases, you should only select open statuses like **Reported**, **Confirmed**, and **Suspicious** (rather than closed statuses like **Not a problem**, **Remediated** or **Fixed**). That way, Jenkins jobs won't fail or turn unstable due to vulnerabilities that developers have already remediated.

- **Vulnerability first seen:** Set a time range for the vulnerabilities you'd like to include in this policy according to when they were first seen.

Use **From** and **Until** fields to set the beginning and end of the time range. Select the beginning of the time range to be: the **Job start time**, a predetermined period of time before the Contrast step runs, or the day of **Application onboarding**. Select the end of the time range to be a predetermined number of days before the Contrast step runs, or until the Contrast step runs in Jenkins, or choose an option for a specific amount of time. You can also select **Custom** to choose a specific date for either field.

If vulnerabilities were first found outside of this time range, they will not be included in the policy.

**TIP**

To incentivize developers to remediate vulnerabilities within a time period (for example, a week), define the policy so that only vulnerabilities found more than 7 days ago would be considered for policy violation. To do this, set **From** to **Application onboarding** and **Until** to **Last 7 days**.

- **Vulnerability rules and severities:** Use this section to set a threshold for the number, type and severity of vulnerabilities you want the policy to allow.  
For each rule, select the **Severity** or **Assess rule type**, and then the **Number of allowed vulnerabilities**. Select **Add another rule** to add multiple rules.  
The **Number of allowed vulnerabilities** determines how many vulnerabilities of this severity will be permitted without affecting this build. If you set it to "0", then a single vulnerability will change the build outcome status. If you set it to "10", then the build outcome status won't change until 11 vulnerabilities of that type are found. If you leave the **Number of allowed vulnerabilities** blank for a specific rule type or severity, it will allow *all vulnerabilities* of that rule type or severity.  
For example, if you set this to **All rules** and 1 vulnerability, any single vulnerability would trigger the policy. You could also limit this policy to 5 critical vulnerability rules and 2 cross-site-scripting vulnerability by adding another rule.
- Check the box next to **Apply the "Query vulnerabilities by" selection from the plugin when filtering vulnerabilities**. You can define how to query vulnerabilities in a Jenkins job either using the Contrast Assess [post build step \(page 1371\)](#) or [pipeline step \(page 1372\)](#). For example, you can use the `AppVersionTag`, or the date when the vulnerability was last seen. If this checkbox is checked, then the query is included when the job outcome policy is evaluated.

This example shows possible rules and settings for a job outcome policy that will change the outcome status in Jenkins if these conditions are met.

## Vulnerability properties

### Environments

QA ×

### Vulnerability rules ?

All rules ▾

Critical ▾

SQL Injection ▾

### Number of allowed vulnerabilities ?

3 vulnerabilities

0 vulnerabilities ×

- vulnerabilities ×

+ Add another rule

### Vulnerability statuses

Reported × Confirmed × Suspicious ×

### Vulnerability first seen

From

Application onboarding ▾

Until

The Contrast step runs i... ▾

With this example, the following vulnerabilities will be considered for policy violation:

- All vulnerabilities found on a server designated as a QA environment.
- All vulnerabilities that have a status of **Reported**, **Confirmed** or **Suspicious**.
- Any vulnerability that was first discovered between application onboarding and when the Contrast step runs in Jenkins.

The policy will be violated and the outcome status will change, if at least ONE of these occur:

- There is at least 1 **Critical** vulnerability.
- There are at least a combined total of 4 **High**, **Medium**, **Low** or **Note** severity vulnerabilities of any rule type except SQL injection.



### NOTE

Vulnerabilities are only counted once, with precedence given to the most specific setting (for example, a particular rule type) to the least specific (**All rules**). If vulnerability limits are set for both a rule type and its severity level, the vulnerabilities will be included in the rule type count, but not in the severity's vulnerability count. So in this example, **Critical** vulnerabilities are counted under severity, but **High**, **Medium**, **Low** and **Note** severities are combined under **All rules**.

6. Under **Policy outcome**, select the outcome of the policy. Contrast marks jobs that match the selected criteria as **Failure**, **Unstable**, or **Success**. For applications with multiple job outcome policies, the most severe outcome from all violating policies will apply.
7. At any point, you can use uncheck the box next to **Enable this job outcome policy** to pause Contrast from enforcing policies on Jenkins jobs without having to delete the individual policy.

## Run a build

To run a build for the first time:

1. In Jenkins, select the job or project you want to run.
2. In the menu on the left, select **Build Now**.
3. To see more details, you can view the log output.
4. If you are using a freestyle job, you can view data from the task. Select the run and, in the left menu, select **Vulnerability Report**.



### IMPORTANT

You may also see a chart in the job or project overview, however the chart is not visible if you used a Contrast pipeline step, or if at least one of the applications selected is being overridden by a job outcome policy.

## Integrate with Jira

Integrate Jira with Contrast to automatically generate tickets, synchronize comments and push notifications for your applications.

Before you begin, you must have:

- Jira Cloud or Jira 8.
- Jira account credentials. For Jira Cloud, this is username and API key. For on-premises Jira installations, this is username and password.
- Permission to create issues in the target project.
- A running Jira instance accessible via HTTP to Contrast.
- A project to associate with an application that is already instrumented in Contrast.

### See also

- [Connect with Jira \(page 1378\)](#)
- [Configure Jira for Assess \(page 1379\)](#)
- [Configure Jira for Serverless \(page 1381\)](#)
- [Manage Jira credentials \(page 1382\)](#)

## Connect to Jira

To integrate Jira with Contrast:

### Set up Contrast for Jira

1. In Contrast, go to the **user menu > Organization settings > Integrations**.
2. Select **Connect** for the Jira integration.
3. In the **Setup Contrast with Jira** section, add a name for the Jira integration, the username and the API key (or password for Jira that is on-premises only). Add the URL for the Jira instance, and be sure that Contrast can access the URL.
  - Enter a **name** for the Jira integration.
  - Add the **URL** for the Jira instance.
  - Select **Assess** or **Serverless**.



### NOTE

Contrast saves the username, API key or password, and the URL for Jira as a set of credentials for this integration.

4. Select **Test connection**. The test may take a few moments, if you have many Jira projects. The test confirms that Contrast can reach the specific Jira instance and the user can log in.
5. After testing the connection, configure [Jira for Assess \(page 1379\)](#) or [Jira for Serverless \(page 1381\)](#).

## See also

- [Configure Jira for Assess \(page 1379\)](#)
- [Configure Jira for Serverless \(page 1381\)](#)
- [Manage Jira credentials \(page 1382\)](#)

## Configure Jira for Assess

After testing your Jira connection, you can configure Jira to create tickets based on triggers you've set.

## Before you begin

- Successfully [connected with Jira \(page 1378\)](#)

## Steps

1. After Contrast connects to Jira, select **Applications** to add the Contrast applications that will trigger Jira tickets for security issues. You can also trigger Jira tickets only for applications with specific importance levels in Contrast. Select **Application importance** and add the application levels you want to use as a filter for Jira tickets.

The screenshot shows the 'Jira Connection' configuration dialog within the 'Organization Settings' section. The dialog is titled 'Jira Connection' and has a close button (X) in the top right corner. It contains several fields and options for configuring the Jira integration.

- Connection Name\***: A text input field with the value 'howDoesThiswork'.
- Credentials Name**: A dropdown menu showing 'https://mycompany.atlassian.net-user1' with a 'Manage credentials' link next to it.
- Integration Type**: Three radio buttons: 'Assess' (selected), 'Serverless', and 'Applications'.
- Applications**: A dropdown menu showing 'All Applications (95)'.
- Application Importance**: A radio button option that is currently unselected.
- Project Name**: A dropdown menu showing 'FAKEBUG'.
- Default Epic**: A dropdown menu showing 'No default epic'.
- Default Assignee**: A dropdown menu showing 'Unassigned'.
- Default Issue Type**: A dropdown menu showing 'Task'.
- Default Priority based on vulnerability severity**: A table with five rows:
 

| Severity | Priority |
|----------|----------|
| Critical | Critical |
| High     | Critical |
| Medium   | Major    |
| Low      | Standard |
| Note     | Standard |
- Additional Jira Fields**: A dropdown menu showing 'Labels'.
- Default Value**: A text input field with the value 'sensitive-data-masking'.
- Checkboxes**:
  - ☐ Allow exclusion of sensitive information from issue titles and additional fields when creating tickets
  - ☐ Enable two-way integration
  - ☐ Automatically create tickets for new vulnerabilities discovered
  - ☐ Allow sending tags as labels when creating tickets.
- Buttons**: 'Delete Configuration', 'Cancel', 'Connected' (with a green checkmark), and 'Save'.

2. Use the **Project name**, **Default epic**, **Default assignee** and **Default issue type** fields to set custom values for Jira tickets that Contrast creates. You can also map vulnerability severity levels in Contrast to Jira priority values to help teams refine security tickets. If you want to prefill additional Jira fields, select **Add Jira field**. Use the dropdowns to select the fields you want to add and the default value for the field.

**NOTE**

Changing the **Project name** or **Default issue type** also changes the related Jira fields and values available to you. Contrast will keep any selected values that also apply to the new project or issue type.

3. Select the **Allow exclusion of sensitive information from issue titles and additional fields when creating tickets** option to enable the ability to mask the sensitive information being sent to Jira.
4. Select the option to **Enable two-way integration**:
  - If you want to change the vulnerability status in Contrast, whenever an issue closes or reopens in Jira. In Contrast, use the Vulnerability status dropdowns to configure how a Jira ticket status update will change the vulnerability resolution status.

**NOTE**

If you choose **Not a problem** as a status, Contrast requires you to enter a **Reason** in the dropdown. The default selection in the dropdown is **Other**.

- If you want to synchronize comments added to the Vulnerability **Activity tab** ([page 1307](#)) to the Jira issue and, the other way around, if a comment is added to the Jira issue it appears in the **Activity tab** under the Vulnerability.

- If you want to show the session metadata associated with the vulnerability in the Jira ticket.

This generates a URL visible below the checkbox, which your Jira administrator must use to [register and configure a webhook in Jira](#). Use the *Comment...* actions to synchronize the comments between the **Activity tab** and the Jira issue.

After you save the two-way integration, Contrast automatically tracks any status changes, added comments, or session metadata on related Jira tickets. You will see these as comments in the **Activity tab** for the vulnerability. Each comment includes the name of the Jira integration and a link to the ticket.

**NOTE**

Atlassian has deprecated the ability to register webhooks with non-https URLs. Therefore, Contrast on-premise users need to [configure HTTPS](#) ([page 1485](#)) before attempting to enable Jira two-way integration.

5. If you want a new Jira ticket made when Contrast discovers a vulnerability, select the option to **Automatically create tickets for new vulnerabilities discovered**. Then select which **Severity levels** or **Rules** should trigger new Jira tickets.

If Contrast creates a single Jira ticket for multiple vulnerabilities, the ticket status applies to all vulnerabilities associated with the ticket. If Contrast creates multiple tickets for a single vulnerability, all Jira tickets must close before Contrast can close the vulnerability.

**NOTE**

Automation options are not retroactive and will not generate Jira tickets for past vulnerabilities.

6. If you want to send tags as part of the ticket information that Contrast sends to Jira, select the option to **Allow sending tags as labels when creating tickets**.  
When you add tags to vulnerabilities and turn on this setting, Contrast sends tags to Jira as labels.



7. Select **Save** and begin using your Jira integration. To remove the integration select **Delete configuration**.

## Configure Jira for Serverless

After testing your Jira connection, you can configure Jira to choose a subset of severities and result categories from which the integration should create a Jira ticket.

### Before you begin

- Make sure you are [connected with Jira \(page 1378\)](#) and have AWS accounts in Contrast

### Steps

1. After Contrast connects to Jira, select **Add configuration** to configure the AWS accounts from which results will have Jira tickets created.

The screenshot shows the Contrast web interface. The top navigation bar includes the Contrast logo, tabs for Applications, Scans, Servers, Libraries, and Vulnerabilities, a search bar, and user profile icons. The left sidebar lists various settings categories: Organization, Groups, Users, Security, Agent, Single Sign-On, Integrations (highlighted), Servers, Applications, Notifications, Report Settings, and Score Settings. The main content area is titled 'Organization Settings' and features a 'Jira Connection' modal form. The form includes fields for 'Connection Name \*' (placeholder: 'Name this Jira integration') and 'Credentials Name \*' (placeholder: 'robOwens', with a 'Manage credentials' link). Below these are radio buttons for 'Assess' and 'Serverless' (selected). An 'Accounts' section shows 'All Accounts (0)'. There are dropdowns for 'Project Name', 'Default Epic', 'Default Assignee', and 'Default Issue Type'. A note states 'Jira will automatically create tickets for new vulnerabilities discovered'. A 'Results' section has checkboxes for 'Critical' and 'High'. At the bottom right of the modal are 'Cancel', 'Connected' (with a green checkmark), and 'Save' buttons.

2. Enter the following details:
  - **Connection Name:** Choose a name for the Jira integration you are creating
  - **Credentials Name:** Enter the desired credentials to be used for authentication
3. Click the **Manage Credentials** link above the *Credentials Name* field to edit or create new credentials.
4. Enter the following details:
  - Credentials Name: the name you entered in the previous step
  - URL: Provide the URL for your Jira instance
  - Username
5. Enter the **API Key**. To authenticate calls from Contrast, you need to provide an API Key for Jira.
  - Click the information icon next to the API Key field name and click the *Get Started* link.
  - Click Create API Token.
  - Enter a name.
  - Click Create.
  - Click Copy to copy the API token to your clipboard.

- Go back to Contrast and paste the API token into the API Key field.
- 6. Click **Test Connection** to test the connection.
- 7. Click **Save** or **Done**.
- 8. Select the **Serverless** option to begin creating Jira tickets for vulnerabilities related to specific applications or accounts.
- 9. Enter the desired **Accounts** for which Jira tickets should be created.
- 10. Choose a Jira **Project** in which Contrast should create tickets.
- 11. Set the **Default Epic**. Specify the Epic under which the new tickets should be created (if applicable).
- 12. Set the **Default Assignee**. Specify the person who should be assigned to the tickets.
- 13. Set the **Default Issue Type**. Choose the default issue type for the created tickets (for example, Task / Story / Bug).

**NOTE**

Changing the **Project** or **Default issue type** also changes the related Jira fields and values available to you. Contrast will keep any selected values that also apply to the new project or issue type.

- 14. Choose the type of **Results** for which Contrast should create tickets.
  - Permissions
  - Exploits
  - Dependencies (CVEs)
  - Severity (Note, Low, Medium, High, Critical)
- 15. After configuring the Default Issue Type, you need to provide additional Jira fields.
  - Select **Add Jira field**.
  - Add the Reporter, T-Shirt Size, and Work Type fields
- 16. Map the Contrast severity levels to the corresponding Jira severity levels (for example, Critical, Major, Standard) as needed.
- 17. Select **Save** and begin using your Jira integration. To remove the integration select **Delete configuration**.

Watch the following video for a demonstration of the integration steps.

<https://player.vimeo.com/video/827314961?h=f049a72b04>

Watch the following video for detecting a new vulnerability.

<https://player.vimeo.com/video/827318792?h=78a2e50f7f>

## Manage Jira credentials

Contrast saves the most recent credentials for a Jira integration to help you set up new connections faster. The username, API key or password, and Jira URL values you enter in your first configuration are the default credentials for the next Jira integration. Contrast will pre-populate the next Jira configuration with the default credentials, but you can modify these values. You can also manage saved sets of Jira credentials to update all affected configurations.

To create or edit a single configuration with credentials that are different from your default set:

1. Go to the **user menu > Organization Settings > Integrations**.
2. Select **Show configurations** to see the list of existing Jira integrations. Select the one you want to update.
3. Select **Manage credentials** to see the Jira connection configuration details.

4. In the **URL** field, use the dropdown to choose a set of saved credentials, or manually update the **URL**, **username**, and **API key** or **password**.
5. Once you've updated the fields, select **Test connection** to be sure the changes work.
6. Select **Save**.

**NOTE**

If you're using new credentials, you must choose to override the existing set of credentials under the given name, or save the new values as a new credential set under a different name.

To edit multiple Jira configurations at the same time:

1. In Contrast, go to the **user menu > Organization settings > Integrations**.
2. Select **Manage credentials** in the Jira Integration.
3. In the **Manage Jira credentials** form, select a set of saved credentials in the dropdown.
4. Edit the username, API key or password, or Jira URL.
5. Select **Rename** if you want to use a different name for the edited credentials.

**NOTE**

Any updates to a set of credentials will affect all configurations using that set.

6. Select **Test connection** to be sure the integration works.
7. Select **Save**.

**NOTE**

Any updates to a set of credentials will change all configurations that use this set.

To delete credentials:

1. In Contrast, go to the **user menu > Organization settings > Integrations**.
2. Select the **Manage credentials** option and then select **Delete credential**.
3. Optionally, select **Show configurations** to see the list of existing Jira configurations.
4. Select one of two methods for deletion of the credentials and configuration:
  - Select the delete icon at the end of the row
  - Select the configuration name and then select the **Delete Configuration** option at the bottom of the form
5. Click **Delete** in the confirmation window.

**See also**

- [Jira integration \(page 1378\)](#)
- [Connect to Jira \(page 1378\)](#)
- [Configure Jira for Assess \(page 1379\)](#)
- [Configure Jira for Serverless \(page 1379\)](#)

**Two-way integration with Jira**

You can use a two-way integration with Jira if you want to change the vulnerability status in Contrast every time an issue closes or reopens in Jira. When you select the option to enable two-way integration,

this generates a URL that appears below the checkbox, which your Jira administrator must use to [register a webhook in Jira](#).

In Contrast, use the Vulnerability status dropdowns to configure how a Jira ticket status update will also change vulnerability resolution status.



#### NOTE

If you choose **Not a problem** as a status, Contrast requires you to enter a **Reason** in the dropdown. The default selection in the dropdown is **Other**.

After you save the two-way integration, Contrast automatically tracks any status changes on related Jira tickets. You will see these as comments in the **Activity** tab for the vulnerability. Each comment includes the name of the Jira integration and a link to the ticket.



#### NOTE

Atlassian has deprecated the ability to register webhooks with non-https URLs. Therefore, Contrast on-premise users need to [configure HTTPS \(page 1485\)](#) before attempting to enable Jira two-way integration.

## Contrast Maven plugin

[Maven](#) is a build tool that builds, packages, and tests your Java applications.

The Contrast Maven plugin can integrate Contrast Assess and Scan into your project's Maven build.

Use the [Contrast Maven Plugin Reference Documentation](#) for more details on:

- [Goals](#)
- [Usage](#)

### Goals

- **Scan:** The scan goal analyzes the Maven project's artifact with Contrast Scan to find vulnerabilities using static analysis.
- **Install:** The install goal includes the Contrast Java agent in integration testing to provide Contrast Assess runtime security analysis. For this goal to succeed, you need the [Organization Edit role \(page 1555\)](#).
- **Verify:** The verify goal verifies that none of the vulnerabilities found by Contrast Assess during integration testing violate the project's security policy (fails the build when violations are detected).

### See also

- [Contrast Scan \(page 672\)](#)
- [Install the Java agent \(page 125\)](#)

## Integrate with Microsoft Teams

Use the Microsoft Teams integration to receive notifications from Contrast in your configured Microsoft Teams instance.

To use this integration, configure a Power Automate instant cloud flow using Microsoft Teams.



### NOTE

As of January 31, 2025, Microsoft is changing the way you create webhook integrations with Microsoft Teams. This procedure describes the new method for integrating Contrast with Microsoft Teams.

### Before you begin

- A Microsoft Power Automate account is required.
- Turn on the **New designer** setting in the MS Teams environment for Contrast Security. This setting is required to see the Attachments adaptive card option.
- If you want to receive notifications in a private channel, ensure you configure correct permissions in MS Teams.  
Sending notifications to a public channel has no requirements to change any permissions within the MS Teams environment

### Create an instant cloud flow in Microsoft Teams

1. Sign in to Power Automate.
2. Select **Create > Instant cloud flow**.
3. Enter a flow name (for example, Contrast MS Teams Integration).
4. Select this trigger: **When a Teams webhook request is received**.  
This setting triggers your flow when a Teams channel receives a webhook request.
5. Select **Create**.

### Configure the Instant cloud flow trigger

1. Select the tile for **When a Teams webhook request is received** to see the left panel.
2. In Who Can Trigger the Flow, select **Anyone**.
3. Select the **Add** icon (+) under **When a Teams webhook request is received** to add an action.
4. Select **Post card in a chat or channel**.  
This option sends information to a Teams channel in a visually appealing format.
5. In Post in, select **Flow bot**.
6. In Team, select a team where you want to post the card.
7. In Channel, select the channel where you want to post the card.
8. In Adaptive Card, select the thunderbolt icon (⚡) and select **Attachments Adaptive Card**.
9. Select **Save**.
10. in the Parameters tab for the flow, copy the HTTP URL.  
You need this URL to configure the Contrast integration.

### Configure the Contrast integration

1. In Contrast, under the **user menu**, go to **Organization settings > Integrations**.

2. In the Microsoft Teams row, select **Connect**.
3. Enter a name for the integration.
4. Paste the webhook URL copied from Microsoft Teams.
5. Select an application to enable notifications.
6. Select **Save**.

**NOTE**

Contrast disconnects this integration if it fails to return a successful response after five attempts.

## Integrate with PagerDuty

Integrate with PagerDuty incident management to receive attack notifications from Contrast.

To connect PagerDuty:

1. In the **user menu**, go to **Organization Settings > Integrations**.
2. Select **Connect** in the PagerDuty row.
3. In the window, enter a **Name** for the integration. This name will be displayed in notifications from Contrast.
4. In the **Message Severity** dropdown, choose the behavior of the alert. The default selection is "Critical." For more information about message severity, see the [PagerDuty documentation](#).
5. Enter an **Integration key**. To find your integration key to enter in this field, follow the steps in the [PagerDuty documentation](#).
6. In **Applications**, select the applications in your portfolio that you want Contrast to automatically generate incidents for within PagerDuty. The default selection is "All Applications."
7. Once you complete all of the fields, select **Test connection**. This process may take a few minutes, depending on the number of your PagerDuty projects. The test verifies that Contrast can reach the PagerDuty instance and that a message can be sent.

Manage notifications from your PagerDuty integration in [organization notifications \(page 1457\)](#).

**IMPORTANT**

Contrast will disconnect this integration if it fails to return a successful response after 5 attempts.

## Integrate with Solutions Business Manager

Integrate with Solutions Business Manager to receive notifications from Contrast.

Before you start, you must have:

- Solutions Business Manager account credentials (username and password)
- A running Solutions Business Manager instance accessible via HTTP to Contrast
- A project to associate the application instrumented by Contrast

To connect Solutions Business Manager:

1. Go to **Organization settings > Integrations** in the **user menu**.
2. Click **Connect** in the Solutions Business Manager row.
3. In the **Connect with Serena** page, enter a name for the bugtracker entry. It will be displayed when sending findings to bugtrackers.
4. Enter a username for the account connected to the Solutions Business Manager instance.
5. Enter the password for the username specified.
6. In the **Host** field, enter the URL to the Solutions Business Manager instance.
7. Select the application you would like to map to the Solutions Business Manager instance.
8. Enter the **Solutions Business Manager Project ID** to associate with this application.
9. Select **Test** to verify communication. This ensures that Contrast can communicate and authenticate with the instance, as well as verify the existence of the specified project.

## Integrate with ServiceNow

Integrate ServiceNow with Contrast to automatically generate incidents in ServiceNow.

Before you start, you must have:

- ServiceNow URL
- ServiceNow Username
- ServiceNow Password

### Connect to ServiceNow

To integrate ServiceNow with Contrast:

1. In Contrast, go to the **user menu > Organization settings > Integrations** page.
2. Select **Manage Credentials** for the ServiceNow integration.
3. Add the URL, username, and password for ServiceNow.

The screenshot shows the 'Integrations' page for ServiceNow. It features a header with the ServiceNow logo and the text 'Service Now Incidents Integration.' To the right of the header are two buttons: 'Manage Credentials' and 'Configure Applications'. Below the header, there are three input fields: 'URL' (containing 'http://service-now-url.com'), 'Username' (containing 'username'), and 'Password' (masked with dots). At the bottom right of the form are 'Save' and 'Cancel' buttons.

4. Select **Save**.
5. Select **Configure Applications**.
6. Either enable the integration for all Assess applications or select specific application names from the dropdown list.

The screenshot shows the 'Integrations' page for ServiceNow, specifically the 'Configure Applications' step. It features a header with the ServiceNow logo and the text 'Service Now Incidents Integration.' To the right of the header are two buttons: 'Manage Credentials' and 'Configure Applications'. Below the header, there is a toggle switch labeled 'Enable for all Assess Applications'. Underneath the toggle is a section titled 'Assess Applications' which contains a list of three application names: 'AppName1', 'AppName2', and 'AppName3'. At the bottom right of the form are 'Save' and 'Cancel' buttons.

7. Select **Save**.

## Retry mechanism

If an event fails, it will be stored and retried every night at midnight GMT, increasing the retry count by one to a maximum of three for up to 72 hours. After the third unsuccessful retry, the event will be discarded.

If a `create_vulnerability` event fails and is stored, any update or delete action relating to the failed event is stored and replayed in chronological order to help maintain the correct state.

## Integrate with Slack

With the Slack integration, you can receive [notifications \(page 1457\)](#) from Contrast in your configured Slack instance using a format similar to in-app notifications.

To connect Slack:

1. In Slack, go to your team's **Build** settings.
2. Add a new **Incoming webhooks** custom integration.
3. Choose the appropriate channel to which to send messages.
4. Copy the **Webhook URL**.
5. In Contrast, in the **user menu**, go to **Organization settings > Integrations**.
6. Select **Connect** in the Slack row.
7. Name the integration and paste the URL.
8. Selection the application for which you want to enable notifications.
9. Select **Save**.

To test the integration:

1. Go to **Organization settings > Notifications**.
2. In the dropdown under **Integrations**, select the Slack integration name.
3. For each **Subscription** (event type) you want to be notified of, click the toggle in the **Integrations** column.
4. Cause an event type to occur, and confirm that you get a notification in the Slack channel you specified.



### IMPORTANT

Contrast will disconnect this integration if it fails to return a successful response after 5 attempts.

## Integrate Splunk with Contrast

The Contrast Security App for Splunk provides actionable and timely application threat intelligence across your entire application portfolio. Contrast Security instrumented applications self-report these details about an attack:

- The attacker's IP address
- Authenticated username
- Method of attack
- Affected applications and servers
- Attack frequency and volume



- Level of compromise

## Before you begin

Ensure you have the following software:

- Splunk Enterprise or Splunk CloudPlatform, versions: 9.3, 9.2, 9.1, 9.0, 8.2, 8.1, 8.0
- Contrast Security App for Splunk 2.0.1 or later
- Applications instrumented with a Contrast agent

## Step1: Install Contrast Security App

For more guidance installing Splunk applications, visit their [documentation](#).

### • Install the app

1. In Splunk, select **Apps**.
2. Search for Contrast Security App for Splunk.
3. Select **Install**.  
After installation, you should see the Contrast Security App in the Apps dropdown.

### • Install the app from a file

1. Log in to [Splunkbase](#).
2. Search for the Contrast Security App.
3. Select download and save the file to a convenient location.
4. In Splunk, select **Apps**.
5. Select **Manage**.
6. Select **Install app from file**.
7. Select the app you downloaded.  
Optionally, select **Upgrade app** if you installed the Contrast Security app previously.
8. Select **Upload**.

## Step 2: Set up a syslog receiver in Splunk

Contrast agents stream SIEM events as UDP syslog events in CEF format.

1. In Splunk, select **Settings > Data Input**.
2. Add a new UDP listener.
3. Reuse port 514 or chose a different port.
4. For the source type, specify `contrast_events`.
5. Select **Save**.

| UDP                   |                 |                   |                |
|-----------------------|-----------------|-------------------|----------------|
| Data inputs » UDP     |                 |                   |                |
| <div></div>           |                 |                   |                |
| <div>New</div>        |                 |                   |                |
| Showing 1-1 of 1 item |                 |                   |                |
| Results per page 25   |                 |                   |                |
| UDP port              | Source type     | Status            | Actions        |
| 8514                  | contrast_events | Enabled   Disable | Clone   Delete |

## Step 3: Set up Contrast agents

- **Setup for a single server in the Contrast web interface**

1. In the header, select **Servers**.
2. Select a server that has Protect turned on.
3. Select the **Settings** icon (⚙️) in the top right of the page.
4. In Server settings, select **Enable output of Protect events to syslog**.
5. Specify the settings for the syslog output:
  - Fully Qualified Domain name for the Splunk server where you want to send messages,
  - The UDP port
  - Syslog facility (the process that created the message)
  - The syslog message severity levels
6. Select **Save**.

- **Setup for all new servers in the Contrast web interface**

1. From the user menu, select **Organization settings**.
2. Select **Servers**.
3. Select **Enable output of Protect events to syslog**.
4. Specify the settings for the syslog output:
  - Fully Qualified Domain name for the Splunk server where you want to send messages,
  - The UDP port
  - Syslog facility (the process that created the message)
  - The syslog message severity levels
5. Select **Save**.

- **Setup with agent configuration files**

Specify the syslog settings in the agent configuration YAML file, as shown in this example:

```
agent:
  syslog:
    enable: true
    ip: splunk.mycompany.org
    port: 8514
    facility: 12
    # Set the log level of Exploited attacks. Value options are `ALERT`,
    # `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
    severity_exploited: CRITICAL

    # Set the log level of Blocked attacks. Value options are `ALERT`,
    # `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
    severity_blocked: WARNING

    # Set the log level of Probed attacks. Value options are `ALERT`,
    # `CRITICAL`, `ERROR`, `WARNING`, `NOTICE`, `INFO`, and `DEBUG`.
    severity_probed: NOTICE
```

## Step 4: View Contrast data in Splunk

Splunk provides three dashboards where you can see Contrast data.

- In Splunk, under Apps, find **Contrast Security for Splunk**.
- Select **Dashboards**.
- Select a dashboard:

- **Attack Dashboard:** This dashboard shows a summary of attacks that Contrast blocked in a specified time frame, identifies which applications are targeted for attacks, the type of attacks and when they occurred., and the most frequently targeted URIs.
- **Attacks by Applications:** For the specified applications, this dashboard shows the number of attacks , the different types of attacks detected and blocked, the distribution of different attack types in a specified time frame, and the top 10 most attacked URIs.
- **Attacks Geographical Distribution:** This dashboard shows a geographical view of attacks that Contrast Security detected and blocked.

## See also

These topics provide details for agent-specific syslog settings in agent configuration files:

[Configure Java \(page 151\)](#)

[Configure .NET Core \(page 297\)](#)

[Configure .NET Framework \(page 230\)](#)

[Configure Node.js \(page 357\)](#)

[Configure Python \(page 450\)](#)

[Configure PHP \(page 399\)](#)

[Configure Go \(page 570\)](#)

[Configure Ruby \(page 511\)](#)

## Integrate Contrast Security ADR with Splunk

The Contrast Security ADR integration with Splunk enables [ADR \(page 617\)](#) to send incident details to your SIEM (Security Information and Event Management), SOAR (Security orchestration, automation and response), and XDR (Extended Detection and Response) environments, contextualizing incidents with other threat detection and response solutions.

### How it works

When configured, the **Contrast Security ADR for Splunk** app sends detected attack events from the Contrast Security platform to a Splunk HTTP Event Collector.

The [Contrast Security ADR for Splunk](#) app on [splunkbase.com](https://splunkbase.com) enables Splunk to:

- Parse and normalize the data received over the HTTP Event Collector
- Display Contrast Security ADR dashboards, reports, and searches in Splunk
- (On request) Call the Contrast Security ADR REST APIs for contextual data to help investigate incidents
- Provide runbooks to assist SOC Analysts in resolving AppSec-related security incidents

### Before you begin

Before you start, you must have:

- Splunk Enterprise 9.2. See the [installation guide](#) for information.
- Splunk CIM (Common Information Model) 5.x and later
- Applications instrumented with a Contrast agent

## Step1: Install the Contrast ADR app in Splunk

### Install from the Marketplace

1. In Splunk Enterprise, select **Apps** and select **Find more apps**.
2. Search for **Contrast Security ADR for Splunk 1.0**.
3. Check the requirements.
4. Select **Install**.

After installation, you should see the **Contrast Security ADR for Splunk** app in the apps dropdown.

### Install from a file

1. In Splunk Enterprise, select **Apps** and select **Find more apps**.
2. Search for **Contrast Security ADR for Splunk 1.0**.
3. Select download and save the file to a convenient location.
4. Select **Manage**.
5. Select **Install app from file**.
6. Select the app you downloaded.  
Optionally, select **Upgrade app** if you previously installed the Contrast Security ADR app.
7. Select **Upload**.

After installation, you should see the **Contrast Security ADR for Splunk** app in the apps dropdown.

## Step 2: Set up Splunk CIM

1. In Splunk Enterprise, select **Apps** and select **Find more apps**.
2. Search for **Splunk Common Information Model (CIM)**.
3. Select **Install**.
4. Enter your Splunk.com mail and password credentials.
5. Select the **Accept** and **Login** buttons.

After installation, you should see the app in the apps dropdown.

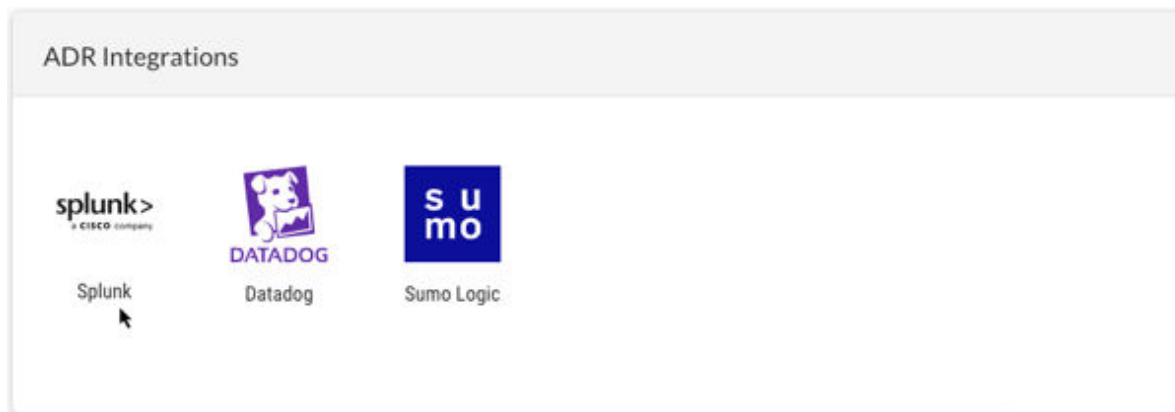
## Step 3: Set up an HTTP Event Collector input in Splunk

1. In **Splunk Enterprise**, go to **Settings > Data Input > HTTP Event Collector**.
2. Enter a **Name** to help identify the token receiving data over HTTP. Remember this name.
3. Select the **New Token** button at the top of the page.
4. Enter the fields and select **Next**.
5. Choose **Select source type** and specify `contrast:adr` for the source type.
6. Select the preferred index to store the data, such as `contrast`. If an index does not exist, create an index following [these steps](#).
7. Select the **Review** button.
8. Select the **Submit** button.
9. Copy the token value on the success page. This will be needed for the integration.

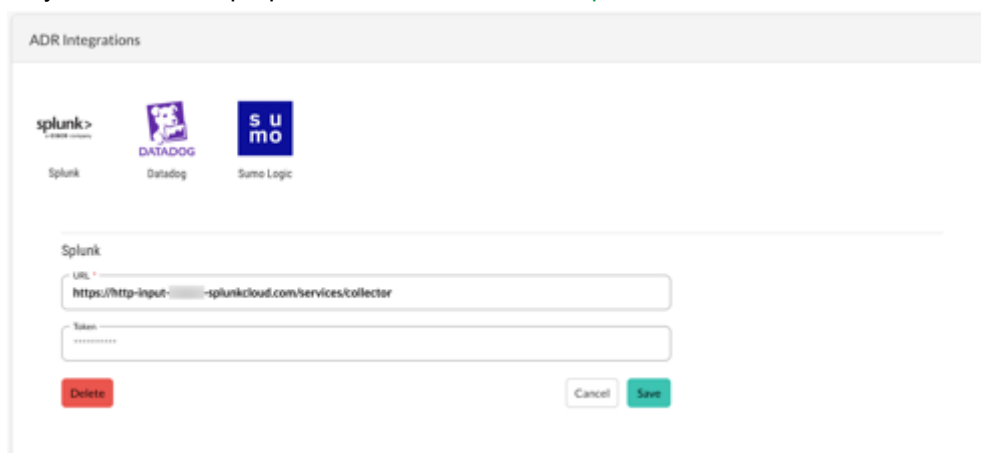
## Step 4: Configure Contrast Security ADR to send attack events to Splunk

Configure the integration in Contrast to send attack events to the Splunk app.

1. In Contrast, go to the **user menu** and select **Organization settings > Integrations**.
2. Select the **Splunk** option under the ADR Integrations section.



- Under the Splunk fields, enter the URL and token information for the destination HTTP Event Collector as configured in [Step 3 \(page 1392\)](#). Note that the URL in the screen example is shown only for illustration purposes; refer to the [official Splunk Documentation](#) for more information.



## Step 5: Set up macros to search for events

Macros are used to keep track of the index where Contrast Security ADR events are stored. The macro will be used for CIM mapping and correlation searches.

- In **Splunk Enterprise**, go to **Settings > Advanced Search**.
- Select **Search macros**.
- Select **Add new**.
- Search for the `contrast_search` macro.
- Select the macro name to edit it.
- Call the index name as the index provided in the HEC input as configured in [Step 3 \(page 1392\)](#).
- Select **Save** to update the macro in the index where Contrast Webhook data is stored.

To validate the macro:

- In **Splunk Enterprise**, select **Contrast Security ADR for Splunk 1.0** from the apps menu.
  - Select **Search**.
  - In the search box, type `contrast_search`.
  - Set the time range input to **All Time**.
  - Select **Search**.
- You should be able to see the Contrast ADR events once the search is complete.

## Step 6: Set up CIM data models

Set up an Intrusion Detection Macro to recognize the Contrast ADR events.

1. In **Splunk Enterprise**, go to **Settings > Advanced Search > Macros**.
2. Select the **Splunk Common Information Model (CIM)** app.
3. Search for `cim_Intrusion_Detection_indexes` and select to edit.
4. Edit the definition as `eventtype=contrast_adr`.
5. Select **Save**.

## Step 7: Set up API details

1. In **Splunk Enterprise**, select **Contrast Security ADR for Splunk 1.0** from the apps menu.
2. Go to the **Setup > Setup Configurations** page.
3. Specify the settings in each field:
  - **Hostname:** The host domain of your Contrast platform. For example, <https://cs001.contrastsecurity.com>.
  - **Username:** The [username \(page 638\)](#) in Contrast
  - **Organization UUID:** The [organization ID \(page 638\)](#) in Contrast
  - **API Key:** The [API key \(page 638\)](#) in Contrast
  - **Service Key:** The [service key \(page 638\)](#) in Contrast
  - **Enrichment Excluded Fields:** Fields to exclude from the API response
  - **Max Retries:** Maximum number of retries to be performed in connection errors
4. Select **Submit**.

## View Contrast ADR data in Splunk

Splunk provides three dashboards where you can see Contrast data.

1. In **Splunk**, under **Apps**, find **Contrast ADR for Splunk**.
2. Select **Dashboards**.
3. Select a dashboard:
  - **Attack Dashboard:** This dashboard shows a summary of attacks that Contrast blocked in a specified time frame, identifies which applications are targeted for attacks, the type of attacks and when they occurred, and the most frequently targeted URIs.
  - **Attacks by Applications:** This dashboard shows the number of attacks, the different types of attacks detected and blocked, the distribution of different attack types in a specified time frame, and the top 10 most attacked URIs for the specified applications.
  - **Attacks Geographical Distribution:** This dashboard shows a geographical view of attacks that Contrast Security detected and blocked.

## See also

- [Attack events \(page 618\)](#)
- [Attacks \(page 624\)](#)

## Integrate with Splunk on-call (formerly VictorOps)

Set up an integration with VictorOps incident management to receive attack notifications from Contrast.

To connect VictorOps:

1. In the **user menu**, go to **Organization settings > Integrations**.
2. Select **Connect** in the VictorOps row.
3. Enter a **Name** for the integration. This is displayed in notifications from Contrast.
4. Use the dropdown to choose the **Message type** of the alert. The default selection is "Critical." For more information about message types, see the VictorOps documentation on [incident fields](#).
5. Enter the **URL** for the connection. You can generate the URL in VictorOps through a REST API endpoint. To get a URL or more information, see the VictorOps documentation on [REST endpoint](#).

6. Select **Test connection**. This process may take a few minutes, depending on the number of your VictorOps projects. The test verifies that Contrast can reach the VictorOps instance and that the specified user can log in.
7. Once a connection is made, click in the multiselect field to choose the **Applications** for which you want to send notifications. The default selection is "All Applications."

**IMPORTANT**

Contrast will disconnect this integration if it fails to return a successful response after 5 attempts.

## Contrast Visual Studio plugin

Use the Visual Studio plugin to see vulnerability information for instrumented applications from the Visual Studio IDE.

The plugin directs you to a line of code inside Visual Studio, and you can view related details in the Contrast application. This way developers can get application security feedback at the time of development for faster remediation.

The plugin supports Visual Studio versions 2017 (15.0 and later), 2019, and 2022.

To install, configure and use the Visual Studio plugin:

1. In Visual Studio, select **Extensions**.
2. In the new window, select **Online** from the left navigation panel.
3. Search for "Contrast", and select **Download**.
4. After you finish the download, restart the IDE.
5. In Visual Studio, go to **Tools > Options**.
6. In the search, enter "Contrast Security" and select **Contrast Security - Connection**.
7. In the **Contrast Connection** form, add the **Contrast URL**, **Username**, **Service key**, **API key** and **Organization ID** in the appropriate fields. You can find these in your [profile \(page 638\)](#).

**NOTE**

The API key must belong to the organization you want to access or you'll get authorization errors. After many failed attempts, this will lock your account.

8. Select **Add**. Visual Studio automatically tests the connection as it attempts to retrieve the organization from Contrast.
9. Select the organization in the **Organizations** field, and select **OK**.
10. In Visual Studio, go to **View > Other Windows > Contrast Security Integration**. You can also search for "Contrast Security Integration". This view shows a list of all the vulnerabilities from Contrast.
11. To filter the list, click the **Filter** icon at the top-left corner of the page.
12. In the window that appears, choose from multiple filters, including servers, applications, severity levels, states and last detected dates.
13. If you can't see your vulnerabilities list, select **Refresh**. To clear all selected filters, click the Clear icon. This also applies for Server and Application lists.

**NOTE**

If you can't see your vulnerabilities even after refreshing the list, you must filter your vulnerabilities. You must repeat this process after selecting a different organization in the **Connection** settings so that filters and vulnerabilities are refreshed correctly.

14. Under the **Actions** column, you can click the magnifying glass icon to see more information about the vulnerability. Use the icon to go to the **Vulnerability** page in Contrast.

## Contrast Visual Studio Code plugin

Use the Visual Studio Code plugin to see vulnerability information for instrumented applications from Visual Studio Code environments when Contrast discovers security problems during functional tests.

The plugin shows you an overview of all vulnerabilities found in the application, as well as details for each vulnerability, like the HTTP request that exposed the vulnerability to Contrast.

The plugin supports Visual Studio Code versions 1.42.1 and later.

**NOTE**

Integrations are to be used with [Contrast Assess \(page 27\)](#).

To install, configure and use the Visual Studio Code plugin:

1. In Visual Studio Code, go to the **Extensions** view and search "Contrast Security".
2. Select **Install**. After installation, restart Visual Studio Code.
3. To authenticate to your Contrast account, select the **Settings** icon in the **Contrast Security** view.
4. Select **Workspace** and enter your **API key**, **Organization ID**, **Contrast URL**, and **Authorization header**. You can find these values in your [profile \(page 638\)](#).
5. Select **Test Contrast connection** to validate your credentials. You will see a message that confirms either a successful connection or invalid credentials.
6. Select the **Refresh** icon to update vulnerability information. Under **Contrast Security**, you can see vulnerabilities grouped by **Severity** and ordered by **Status**. Select a vulnerability to view more details like **How to Fix**, **HTTP Information**, **Details**, and **Overview**.  
You can also see when the vulnerability was last detected and the current status. Vulnerability details display in the code editor under **Output**.



**TIP**

With the plugin, you can filter vulnerabilities by:

- Vulnerability metadata:
  - Application name
  - Status (such as Reported, Not a Problem, Remediated)
  - Environment (development, test, or production)
  - Tags (custom labels applied to vulnerabilities)
  - Detection date (specifically, First and Last detected)
- Session metadata:
  - Committer
  - Commit hash
  - Branch name
  - Git tag
  - Repository
  - Test run
  - Version
  - Build number

For example, you can choose to display only those vulnerabilities found on a specific feature branch (Branch Name) and committed directly by you (Committer), filtering out vulnerabilities introduced by a different developer on a separate feature branch.

Someone else can choose to filter vulnerabilities so that they only see results from a specific build (Build Number) that was blocked by their security team. They can immediately pinpoint the subset of vulnerabilities that need to be resolved before deploying the merged feature branch.

## Contrast Visual Studio for Mac plugin

Use the Visual Studio for Mac plugin to see vulnerability information for instrumented applications from the Visual Studio for Mac IDE.

The plugin directs you to the line of code and you can view more details in the Contrast Security pad. This way, developers can get application security feedback at the time of development for faster remediation.

The plugin supports Visual Studio for Mac versions 8.3.0 and later.

To install, configure and use the Visual Studio for Mac plugin:

1. From the [Contrast distribution repository](#), download the Visual Studio for Mac plugin file (.mpack).
2. In Visual Studio for Mac, go to **Visual Studio > Extensions**.
3. Click **Install from file...** and select the downloaded .mpack file. Allow the plugin to install, and restart Visual Studio for Mac.
4. Select **View > Pads > Contrast**. Then select **Configure** and add your **Contrast URL**, **Username**, **Service key**, **API key** and **Organization ID** in the given fields. You can find these in your [profile \(page 638\)](#).
5. Select **Test connection** to test your connection with Contrast. If the connection is successful, select **Save**.

6. Once the plugin is installed, you can return to **View > Pads > Contrast**, select the magnifying glass icon and then select an application. This will load vulnerabilities that Contrast has found for the application. Select **Refresh** if you don't see the vulnerabilities list. Under each section, vulnerabilities display in order by severity, then by status.

You can select a vulnerability to see general or more detailed information. The **General Information** section includes severity, application, status, and history. The **Details** section includes information pulled from Contrast, such as details, notes, and activity for that vulnerability.

To clear all selected filters, select the broom icon. You can also view **Server** and **Application** lists in this way.

## Integrate Wiz with Contrast

Integrate Contrast with Wiz to send an application's runtime security information to a Wiz deployment.

Polling for Assess vulnerabilities occurs once every 24 hours.

### Before you begin

- This integration is supported for hosted customers only.
- Create a service account in Wiz and copy the Client ID and Client secret as described in [Turn on the Contrast integration in Wiz \(page 1398\)](#).
- These cloud providers and instance types are supported:
  - AWS - ARN  
[Access instance metadata for an EC2 instance - Amazon Elastic Compute Cloud](#)
  - Azure - resourceId  
[Azure Instance Metadata Service for virtual machines - Azure Virtual Machines](#)
- Verify that you are using the minimum supported Contrast agent version:
  - Java 6.8.0
  - .NET Framework 51.0.3
  - .NET Core 4.2.19
  - Node.js 5.12.0
  - PHP 1.35.0
  - Python 8.5.0
  - Go 6.9.0

### Turn on the Contrast integration in Wiz

1. In the Wiz user interface, go to **Settings > integrations**.
2. Select **Add Integration**.
3. Search for **Contrast**.
4. Select the settings you want and select Add Integration.
5. Copy the Service Account Token data for the Contrast configuration.

### Connect to Wiz

1. In Contrast, go to the user menu and select **Organization settings > Integrations**.
2. Under Platform integrations, select **Wiz**.
3. In the Credentials tab, specify Wiz credentials:

These credentials connect Contrast with Wiz:

  - a. Enter these details:
    - **Client ID:** The Client ID generated when you create a Wiz service account.
    - **Client secret:** The Client secret generated when you create a Wiz service account.

- **Token URL:** Locate the Token URL in the settings page for the Wiz service account.
  - **Tenant Data Center:** Locate your Tenant Data Center value in the Data Center and Regions tab in the **User Avatar** (upper-right-hand corner) > **Tenant Info** page.
  - b. Select **Test connection** to verify the credentials are correct.
  - c. Select **Save**.
4. Configure integration settings.
- These settings determine the type of information Contrast sends to Wiz.
- a. In the Configuration tab, select any of these options:
    - **Assess (IAST):** This option sends vulnerability information from Contrast Assess.
    - **Protect (RASP):** This option sends attack information from Contrast Protect.  
*This option is reserved for future use.*
  - b. Select **Save**.
  - c. Verify that the configuration shows these details:
    - **Created at:** The date you created the integration configuration.
    - **Category:** Application Security
    - **ID:** The Client ID
    - **Behavior:** Pull, Enrich
    - **Status:** Active

# Administration

Users with different [roles and permissions \(page 1552\)](#) have different levels of access in Contrast. This allows different individuals and teams in your business to best use Contrast for their responsibilities:

- [Rules and policy administration: \(page 1400\)](#) RulesAdmins can create and edit policies. Editors can add applications and manage some content details like scores and notifications.
- [Organization administration: \(page 1435\)](#) Organization Administrators can configure settings for a particular organization.
- [System administration: \(page 1467\)](#) For on-premises customers, SuperAdmins can install, configure and maintain Contrast at a system level. ServerAdmins and System Administrators can also help with this responsibility.

## Rules and policy administration

Maintaining your data in Contrast requires different roles and permissions depending on what you'd like to do.

As a RulesAdmin, select **Policy management** in the **user menu**.

| Rule                                                                                     | Severity | Description                                                                                                                                            | Development | QA  | Production |
|------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----|------------|
| Anti-Caching Controls Missing<br>.NET Framework, .NET Core, Go, Java, Node, Python, Ruby | NOTE     | Verifies that caching controls are used to protect application content.                                                                                | 168         | 168 | 180        |
| Application Disables "secure" Flag on Cookies<br>Java                                    | MEDIUM   | Verifies that cookies have the 'secure' flag.                                                                                                          | 71          | 71  | 71         |
| Arbitrary Server Side Forwards<br>.NET Framework, Java                                   | HIGH     | Verifies that no untrusted data is used to build a path used in forwards.                                                                              | 146         | 146 | 146        |
| Authorization Rules Misordered<br>.NET Framework                                         | MEDIUM   | Verifies that the application's authorization rules do not include an allow all user rule before a deny rule.                                          | 75          | 75  | 75         |
| Authorization Rules Missing Deny Rule<br>.NET Framework                                  | MEDIUM   | Verifies that the application's authorization rules include a deny rule.                                                                               | 75          | 75  | 75         |
| Cache Control Header Disabled<br>.NET Framework                                          | MEDIUM   | Verifies that the application does not disable the cache control header which helps prevent disclosure of sensitive information via the browser cache. | 75          | 75  | 75         |
| Cookie Has No "secure" Flag<br>.NET Framework, .NET Core                                 | MEDIUM   | Verifies that cookies have the 'secure' flag.                                                                                                          | 77          | 77  | 77         |
| Cross-Site Request Forgery<br>Java                                                       | HIGH     | Verifies that tokens are used to prevent forgeable HTTP traffic                                                                                        | 71          | 71  | 71         |
| Cross-Site Scripting<br>All application languages                                        | MEDIUM   | Verifies that no untrusted data is used in generated HTML pages                                                                                        | 181         | 181 | 181        |
| Detailed Error Messages Displayed<br>.NET Framework                                      | MEDIUM   | Verifies that the application does not inadvertently reveal sensitive or technical information to an attacker via detailed error messages.             | 75          | 75  | 75         |
| Event Validation Disabled<br>.NET Framework                                              | MEDIUM   | Verifies that the application does not disable ASP.NET event validation.                                                                               | 75          | 75  | 75         |
| Expired Session IDs Not Regenerated<br>.NET Framework                                    | LOW      | Verifies that the application generates new session IDs rather than allowing attackers to use expired session IDs                                      | 75          | 75  | 75         |
| Expression Language Injection<br>Java                                                    | HIGH     | Verifies that untrusted data is not used in the evaluation of JSP Expression Language.                                                                 | 71          | 71  | 71         |
| Forms Auth Protection Mode<br>.NET Framework                                             | MEDIUM   | Verifies that the application is using both encryption and validation for forms authentication.                                                        | 75          | 75  | 75         |
| Forms Authentication Cross-App Redirect<br>.NET Framework                                | MEDIUM   | Verifies that the application does not allow for cross-app redirects for authentication which can expose the forms authentication ticket in the URL.   | 75          | 75  | 75         |
| Forms Authentication SSL<br>.NET Framework                                               | MEDIUM   | Verifies that forms authentication requests must be submitted over SSL.                                                                                | 75          | 75  | 75         |

Here you can manage:

- [Assess rules \(page 1401\)](#)
- [Security controls \(page 1402\)](#)
- [Vulnerability policy \(page 1406\)](#)

- [Set Protect rules \(page 1413\)](#)
- [CVE shields \(page 1416\)](#)
- [Virtual patches \(page 1420\)](#)
- [Log enhancers \(page 1422\)](#)
- [Block or allow IP addresses \(page 1431\)](#)
- [Edit IP source names \(page 1432\)](#)
- [Application exclusions \(page 1424\)](#)
- [Compliance policy \(page 1429\)](#)
- [Library policy \(page 1433\)](#)
- [Sensitive data \(page 1434\)](#)

A user with RulesAdmin permissions can also:

- [Instrument an application \(page 51\)](#)
- [Enable Protect \(page 1437\)](#)
- [Approve or deny pending vulnerability status changes \(page 1322\)](#)
- [Enable notifications \(page 1435\)](#)
- [Set default scoring \(page 1459\)](#)

## Set Assess rules

To view a list of all rules applied, select **Applications > Your application name > Policy > Assess** or under the user menu, select **Policy management > Assess rules**. Each rule is listed with a severity and description, as well as an indicator of which environments it applies to.

You can also [set the default Assess rules for an organization \(page 1402\)](#).

## Before you begin

- Ensure that you have an Organization Administrator or RulesAdmin role.
- Log in and select the correct organization.

## Steps

Apply Assess rules and settings:

1. To apply Assess rules to particular environments for applications:
  - a. When viewing the list of rules under **Applications**, use the toggles to turn each rule on or off for each environment. You can also use the checkboxes in the left column to select multiple rules, then select **Change Mode** to apply them. In the window that appears, toggle the rules on or off for each environment and select **Done**.
  - b. Alternatively, under **Policy management > Assess rules**, select a rule to see a list of applications that are associated with that rule. Use the toggles to turn rules on or off for each application.
2. To update settings for individual Assess rules:
  - a. Under **Policy management**, select the name of rule to show a list of applications associated with the rule.
  - b. To select one or more applications, select the check box next to each application. To select all applications, select the **Application** check box.
  - c. Select the **settings** icon (⚙️) in the top right.
  - d. In the window that appears, select the **Likelihood**, **Impact** and **Confidence Level** of the vulnerabilities for which this rule is intended.
  - e. Optionally, select the checkbox to **Override** to enable this option to update these fields after the configuration is saved.

- f. In the **Risk Description** field, enter additional information regarding potential consequences of exposure to this vulnerability. You can also provide a **Recommendation**
- g. In the **References** field, enter a link to an external reference related to the specific vulnerability to provide more context for the rule.
- h. Select **Save**.

## Set Assess rules for organizations

When you add and configure an agent for an application or create a new organization, Contrast applies a set of default Assess rules.

Use this procedure to change the default settings for Assess rules at an organization level. These settings apply to any new application that you add to a Contrast organization. These changes have no affect on existing applications in the organization.

### Before you begin

- Ensure that you have an Organization Administrator or Organization RulesAdmin role.
- Log in and select the correct organization.

### Steps

1. Under the user menu, select **Policy management**.
2. Select **Configure the default policy**.

3. Select **All** as the filter.

4. For each Assess rule, use the toggles to turn each rule on or off for each environment.

| Rule                                                       | Severity | Description                                                             | Development | QA | Production |
|------------------------------------------------------------|----------|-------------------------------------------------------------------------|-------------|----|------------|
| Anti-Caching Controls Missing<br>All application languages | NOTE     | Verifies that caching controls are used to protect application content. |             |    |            |

## Security controls

A security control is a method in your code that ensures the data passing through it is safe to use in your application. Contrast trusts information that is passed through built-in security controls it knows about. Contrast monitors many methods from third-party libraries to determine whether a data flow is safe.

In some cases, your organization may choose to build its own security controls which are not known to Contrast. For these cases, create security controls that teach Contrast to account for your custom method. Adding custom security controls results in Contrast reporting more accurate results.

## Types of security controls

- **Input validators:** Validators are methods that ensure only properly formed and formatted data is accepted as input before it's passed to other parts of the application. They are designed to allow the input field to accept or reject specific characters.  
Input validation is the primary method of preventing SQLi, XSS, and other input-validation related attacks.
- **Regex validators:** Regex validators compare a specified regex pattern in an input string to validate whether it's safe. If a string matches the regular expression specified in a security control, Contrast suppresses related vulnerabilities. Regex validators are applied on an application-specific basis.
- **Sanitizers:** Instead of validating input, sanitizers render input safe before it's passed to other parts of the application, like databases. For example, a sanitizer might take a single quote that could be used in a potential injection attack and change it to double quotes.

## When to use security controls

Create security controls when Contrast does not have visibility into methods, classes, or libraries that your application is using to protect it from input validation issues (sanitizers, input validators, and regex validators).

If you know about the validators or sanitizers that your applications use, you can add them manually or move a suggested security control that Contrast detects automatically to the list of security controls that you apply to your applications.

After you add and enable security controls, they suppress input vulnerabilities in Assess that the security control is designed to mitigate. It is very important that you apply your security control to the proper vulnerability rule.

## Effects of using security controls

Security controls affect any vulnerability and detection for specified rules. Input validators and sanitizers are usually designed for or are applicable to a specific type of data, a particular field, page, or specific application. Enabling a security control for all rules can result in false negatives findings.

Use security controls carefully. You might need to apply a security control to specific rules only. For example, if a validator or sanitizer protects your application from XSS, it may not be effective against SQL injection. If you apply a security control to all rules, Contrast would likely suppress aSQLi vulnerability which would results in false negative finding.

A security control should be good enough to assure you that is it protecting your application against a wide range of attacks.

## Roles for security controls management

Only users assigned an organizational role of RulesAdmin or higher can view or modify security controls.

## Supported languages

Security controls for input validators and sanitizers apply to Java, .NET Framework, and .NET Core languages only.

Security controls for regex validators apply to the Java language only.

## Security control example

Assume that you have a method called `DoLegacySecurity()` inside a class called `com.Acme.OldSecurity` that is being reported for using insecure cryptographic algorithms. You create a security control and specify this method signature:

```
com.Acme.OldSecurity.DoLegacySecurity(java.lang.String*)
```

**Policy Management**

ASSESS

Assess Rules

Security Controls

Vulnerability Management

PROTECT

Protect Rules

CVE Shields

Virtual Patches

Log Enhancers

IP Management

GENERAL

Application Exclusions

Compliance Policy

Library Policy

Sensitive Data

**Add Security Control**

Name

Insecure cryptographic algorithm

Language

Java

Type

Input Validator

API

com.Acme.OldSecurity.DoLegacySecurity(java.lang.String\*)

Applicable rules

Unvalidated Redirect

Cancel Add

In this example, `Java.lang.String*` is the marked parameter to be validated.

When creating the security control, you are careful to not include any trailing parameter definitions or extra characters.

Contrast matches this method signature against the stack trace for any vulnerabilities it finds and suppresses them.

## Add, edit or delete security controls

### Before you begin

- Security controls for input validators and sanitizers apply to Java, .NET Framework, and .NET Core languages only.
- Security controls for regex validators apply to the Java language only.

### Steps

1. Select **User Menu > Policy Management**, select **Security controls**.  
The Security Controls grid shows a list existing security controls, if there are any.
2. Select the name of an existing security control to edit, or select **Add security control** to create one.
3. In the panel that opens, specify this information:
  - **Name**
  - **Language**: Select Java , .NET Framework, or .NET Core.
  - **Type**: Select one of these methods:
    - **Input validator** accepts user input and take corrective action if unsafe data is received.
    - **Sanitizer** cleans the data that is passed in, making it safe for consumption by any interpreter. Many sanitizers prevent one type of attack, but not another.
    - **Regex validator** compares a specified regex pattern in an input string to validate whether it's safe.
  - For **input validators or sanitizers**, specify the API to use.  
When specifying the API for input validators and sanitizers, consider these conventions:




- **Java:**  
Java must include a method name and parameters. Use fully qualified types, intended to target only `java.lang.String` parameters (not boolean, int, long, short double, float, and so forth).
  - **.NET Framework and .NET Core:**
    - Include a return type (or void), method name and parameters. Use fully qualified types, intended to target only `System.String` parameters.
    - Verify that no white space exists between the parameters.
    - Mark the parameters that are going to be validated or sanitized with an asterisk ( \* ).
  - For **Regex validators**, specify this information:
    - **Regex pattern:** Specify the regex pattern you want to compare with an input string. The [Regular expression references \(page 1405\)](#) provides examples of patterns you can use.
    - **Application:** Specify the applications where you want to apply the regex validator.
  - **Applicable vulnerability rules:** Choose **All**, or select one or more individual vulnerabilities.
4. Select **Save** to create a new security control. If you are editing an existing security control, you also have the option to delete the security control from this panel with the **Delete** icon.
  5. At the bottom of the table, you will see **Suggestions** for potential security controls that Contrast detects, along with their class and method. (You can hide the section by clicking on the caret in the header row.)

If a security control is automatically discovered for the first time, a notification is sent to all users with at least View permissions for the corresponding applications.

Hover over the API to see where this suggestion was discovered, and optionally, select the name of the application to see the vulnerabilities in context of that application.

Use the **plus** icon ( + ) at the end of the suggestion row, to add the suggestion as a new security control and include it in the table above. You can edit the Name, API and Type fields inline before adding it. After you add the security control, select the name and verify that the security control is applied to the correct application rules.

Use the **Delete** icon (  ) to delete the suggestion. Contrast doesn't repeat suggestions, so once you delete it, an API is never suggested again. There is no way to view historical suggestions or get them back.



#### NOTE

Servers may require restart. Contrast provides a list of servers affected by your selection.

## Create security controls for specific vulnerabilities

You can also create security controls in the context of a particular vulnerability with a tag event.

If Contrast has captured runtime data flow for a vulnerability, you can select **Vulnerabilities > Vulnerability name > Details** to see more information about that vulnerability. Potential security controls that are detected trigger a tag event and this is shown as a low severity (green) event. Expand the event and you can select **Add a security control**.

Also, if you mark a vulnerability as **Not A Problem** with the reason "Goes through an internal security control," you can define that security control at that time.

## Regular expression reference

Use this table, and the examples below, for reference when [creating application exclusions \(page 1424\)](#):

| Effect                                     | Pattern               | Example pattern        | Example match                        |
|--------------------------------------------|-----------------------|------------------------|--------------------------------------|
| Start of a string                          | <code>^</code>        | <code>^w+</code>       | Start of a string                    |
| End of a string                            | <code>\$</code>       | <code>w+\$</code>      | End of a string                      |
| Case-insensitive match of following string | <code>(?i)</code>     | <code>(?i)%0a</code>   | <code>%0a</code> or <code>%0A</code> |
| A single character of: a, b or c           | <code>[abc]</code>    | <code>[abc]+</code>    | a bb ccc                             |
| A character except: a, b or c              | <code>[^abc]</code>   | <code>[^abc]+</code>   | Anythingbutabc.                      |
| A character in the range: a-z              | <code>[a-z]</code>    | <code>[a-z]+</code>    | Only a-z                             |
| A character not in the range: a-z          | <code>[^a-z]</code>   | <code>[^a-z]+</code>   | Anythingbuta-z.                      |
| A character in the range of: a-z or A-Z    | <code>[a-zA-Z]</code> | <code>[a-zA-Z]+</code> | abc123DEF                            |
| Any single character                       | <code>.</code>        | <code>.+</code>        | abc                                  |
| Any whitespace character                   | <code>\s</code>       | <code>\s</code>        | anywhitespacecharacter               |
| Any non-whitespace character               | <code>\S</code>       | <code>\S+</code>       | any non-whitespace                   |
| Any digit                                  | <code>\d</code>       | <code>\d</code>        | not 1 not 2                          |
| Any non-digit                              | <code>\D</code>       | <code>\D+</code>       | not 1 not 2                          |
| Zero or one of a                           | <code>a?</code>       | <code>ba?</code>       | ba b a                               |
| Zero or more of a                          | <code>a*</code>       | <code>ba*</code>       | a ba baa aaa ba b                    |
| One or more of a                           | <code>a+</code>       | <code>a+</code>        | a aa aaa aaaa bab baab               |
| Exactly 3 of a                             | <code>a{3}</code>     | <code>a{3}</code>      | a aa aaa aaaa                        |
| 3 or more of a                             | <code>a{3,}</code>    | <code>a{3,}</code>     | a aa aaa aaaa aaaaaa                 |
| Between 3 and 6 of a                       | <code>a{3,6}</code>   | <code>a{3,6}</code>    | a aa aaa aaaa aaaaaa aaaa            |
| Period (dot) is a literal character        | <code>.</code>        | <code>a.b</code>       | string.string                        |

## Vulnerability management policies

Vulnerability policies let administrators with Organization RulesAdmin or Organization Administrator roles define a set of criteria that, when triggered, either changes the status of a vulnerability or flags it for review. The criteria that define the policy includes vulnerability rules, severity, application, and route.

- If you are using organization users and groups, you need an Organization RulesAdmin or Organization Administrator role.
- If you are using role-based access control, you need a role with the Organization Administrator role.

Vulnerability policies result in a more accurate view of which vulnerabilities need attention and which are considered remediated and closed. You have the option of setting vulnerability behavior, auto-verification policies, violation policies, and time to remediate settings.

You can set [in-app notifications \(page 1457\)](#) when vulnerabilities violate these policies. Administrators are notified of violations in-app and by email.

## Vulnerability behavior

The vulnerability behavior settings let you determine if administrator approval is required when users try to close vulnerabilities. You can also choose to display a custom label for the reason that's different from Other when users change a vulnerability status to Not a Problem.

## Types of Auto-verification policies

[Auto-verification \(page 1408\)](#) policies automatically change the status of a vulnerability that meets specific criteria to **Remediated - Auto-verified**. These policies are useful when you want a more accurate view of vulnerabilities that need attention instead of relying on manually changing the status of vulnerabilities after they are fixed and verified.

An auto-verification policy can be session-based, route-based, or time-based:

- **Session-based auto-verification (recommended):** A combination of metadata values that you set in the agent configuration file define a session. You control when a session ends by calling a Contrast API at the end of a test run.

You need an automated test suite for this type of auto-verification.

- **Route-based auto-verification:** A combination of metadata values that you set in the agent configuration file define a session. Use this type of auto-verification if you cannot use session-based auto-verification.

You need an automated test suite for this type of auto-verification.

- **Time-based auto-verification:** Use this method of auto-verification if you have high confidence that your application will exercise all routes within a specified time period.

You can use automated or manual testing with this type of auto-verification.

## Auto-verification behavior

- Contrast marks a vulnerability as **Remediated - Auto-Verified** if Contrast does not discover it on the same route across two different sessions. If two sessions report the exact same session metadata values, Contrast views the two sessions as a single session.

Depending on the defined values, each agent run could be part of a single session or every agent run could have its own session. If you are integrating Contrast into a CI/CD pipeline, ensure that you send at least one session metadata key-value pair that is unique each time you deploy a new version of the application. For example, configure the agent to send the Commit Hash, Build Number, or Version metadata because these values are likely to change for each application deployment. When you use route-based auto-verification, Contrast evaluates vulnerabilities associated with the route immediately after the route is exercised. Alternatively, when you use session-based auto-verification, Contrast waits to evaluate all routes exercised during the session until after calling the Session End API.

Contrast closes vulnerabilities only if the vulnerable parameter that the application reads during the observation of an exercised route vulnerability is not reported again. If the route is exercised, but Contrast does not see the particular parameters that are identified in the vulnerability as being a source of tainted data, then the vulnerability remains open.

- If a vulnerability that Contrast previously marked as **Remediated - Auto-Verified** reappears when the same route is exercised, its status changes to **Reported**. Contrast updates the details in the Activity tab on the vulnerability details page.
- If a vulnerability that Contrast previously marked as **Remediated - Auto-Verified** reappears when the same route is exercised after you disable or delete an auto-verification policy, the vulnerability status changes to **Reported**. Contrast updates the details in the Activity tab on the vulnerability details page.

## Session metadata for session-based and route-based auto-verification

For session-based or route-based vulnerability policies, [add session metadata \(page 658\)](#) to the agent configuration files:

- Providing unique session metadata allows Contrast to create a baseline of findings that lets it verify whether a vulnerability was remediated based on route comparisons.
- Using the Test Run session metadata field is a good way to ensure that Contrast is tracking routes and vulnerabilities across an entire test run even if you restart the agent and the application multiple times during the run.

Contrast creates a unique session ID for every unique metadata key-value pair. Using session metadata in this manner combines multiple test runs into a single test session. This action is useful in situations where different code paths on the same route are tested.

- Using the Commit Hash, Build Number, or Version metadata is useful because these values are likely to change for each application deployment.

## Violation policies

[Violation policies \(page 1412\)](#) trigger a violation notice when a vulnerability matches a set of specific criteria. If triggered, you see the vulnerability in red text in the vulnerabilities list. Use the vulnerabilities filter to view only vulnerabilities with policy violations.

|          |                                                                         |                                                                                                                                                 |    |
|----------|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|----|
| CRITICAL | SQL Injection from "orderBy" Parameter on "/ggtmtnOUDb/okTheZlhlv" page | <b>Attention</b><br>This vulnerability is in violation of the following policies set by your administrator<br>All must be remediated in 28 days | 14 |
|----------|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|----|

## Policy triggers

These trigger types activate a vulnerability policy:

- **Session-based (recommended):** Triggers an auto-verification policy when a vulnerability is seen, or not seen, on a specific route during a session. When you use this trigger, use the Contrast API to end the session. This feature lets you define when a session ends so that you can get immediate results from a test run.
- **Route-based:** Triggers an auto-verification policy when a vulnerability is seen, or not seen, on a specific route. This trigger is available for technologies where Contrast can identify routes.
- **Time:** Triggers a violation or auto-verification policy after a specified number of days.

## Environments

For optimal results, configure the vulnerability policies to apply to the environments where you are using test automation. If you are running the same application on multiple servers, ensure that each server is configured for the Development, QA, or Production environment.

## Multiple policy actions

If multiple policies affect the same vulnerability, these rules determine how Contrast applies the policies:

- Auto-verification policies take precedence over violation policies. For example, if an auto-verification deadline applies first, the vulnerability is closed and never flagged.
- Between two time-based triggers, the action with the closest deadline applies first. For example, if a violation deadline applies first, the vulnerability is flagged and then auto-verified when the later deadline applies.

## Time to remediate

The time to remediate settings let you specify the default filter for the Average time to remediate section in the [Contrast dashboard \(page 636\)](#).



The Contrast dashboard presents data on the Average Time to Remediate (ATTR) vulnerabilities at your organization. When generating these metrics, you can choose to filter on the date a vulnerability was first seen, last seen, or closed, depending on your organizations program goals.

Based on the selected time frame, Contrast finds vulnerabilities that are closed and have a date that falls within the filter range. Contrast calculates the ATTR by looking at the difference between the first seen and closed dates on the selected vulnerabilities, and averaging them.

## Set auto-verification vulnerability policies

[Auto-verification policies for vulnerabilities \(page 1406\)](#) automatically change the status of a vulnerability that meets specific criteria to **Remediated - Auto-verified**. These policies can be session-based, route-based or time-based.

When you add a policy, it is turned on, by default. You can turn a policy off or on in the Enabled column in the Auto-verification tab.

| Auto-Verification        |                     | Violation    |                |              |                                                                                     |
|--------------------------|---------------------|--------------|----------------|--------------|-------------------------------------------------------------------------------------|
| Find Policy              |                     |              |                |              | + Add Policy                                                                        |
| Policy                   | Vulnerability Rules | Applications | Description    | Environments | Enabled                                                                             |
| test                     | Note                | All          |                | All          |  |
| Simon Test<br>Time-Based | All                 | WebGoat7     | 7 day duration | All          |  |

## Before you begin

- Use Contrast version: 3.7.2 and later.
- Verify you are using the minimum version of supported agents:
  - .NET Framework 20.4.1
  - .NET Core 1.0
  - Java 3.7.3.14895
  - Node.js 2.11.0
  - Python 3.4.0
  - Ruby 3.8.4
- Verify that you are using a [supported framework](#). (page 1411)
- If you plan to use session-based or route-based auto-verification, [configure unique session metadata](#) (page 658) (for example, Commit Hash, Build Number, or Version) in the agent configuration files.

## Set an auto-verification policy

1. From the user menu, select **Policy management**.
2. Select **Vulnerability management**.
3. In Vulnerability policy, select the **Auto-verification** tab.
4. Select **Add policy**.
5. In **Name**, enter a name for the policy.
6. In **Vulnerability rules**, select one or more severity levels or Assess rules that you want to associate with the policy.
7. In **Applications**, select one or more importance levels or applications that you want to associate with the policy.  
To find specific levels or applications, select the Applications box and start typing.
8. In **Environments**, select one or more server environment where the policy is applied: All environments, Development, QA, or Production.
9. Under **Trigger**, select the type of trigger you want to use for the policy (select one or both types of triggers):
  - To set a time-based trigger, select **Mark any vulnerability as “Verified – Auto-Remediated” after** and select the number of days after which the vulnerability policy is marked as auto-verified.  
This trigger is useful if you are confident that vulnerabilities will be fixed and routes will be exercised within the selected time frame. If Contrast finds the vulnerabilities again, it reopens them.

**TIP**

Use time-based auto-verification along with session-based or route-based auto-verification to find situations where routes change drastically from build to build. For example:

- Major code refactoring where you add new routes and remove old routes.
- A route is no longer exercised because it is no longer valid.

- To set a trigger for session-based or route-based auto-verification:
  - a. Select **Auto-verify based on session or route**.  
Session or route-based auto-verification take precedence over a time-based trigger.
  - b. Select **ONE** of these options (you can't use both options at the same time):
    - **Session-based auto-verification (recommended)**: This type of auto-verification policy lets you define when a session ends so that you can get immediate results from a test run, including making pass/fail decisions for your builds. Session-based auto-verification is the preferred method for auto-verification. When you select this option, you end sessions by adding calling the Contrast API at the end of a test run.
    - **Route-based auto-verification**: If you can't use session-based auto-verification, consider using route-based auto-verification. In this case, the session metadata that you configure for your agent define the session.  
Route-based triggers only work for certain technologies with identifiable routes.

10. Select **Save**.

### Configure a test run for session-based auto-verification

Session-based auto-verification, the recommended auto-verification method, requires you to make calls to the Contrast `SBAVRouteSession` API at the end of a test run. The following examples show different approaches for closing sessions.

To find your authorization header and API key, log in to the Contrast web interface and under the user menu, select **User settings**.

- End the session defined by a session ID and application ID. Use commands similar to the following example:

```
curl --location --request POST 'https://<HOST>/Contrast/api/ng/organizations/<ORG-UUID>/agent-sessions/sbav' \
--header 'Authorization: <Your-Auth-Header-Value>' \
--header 'API-Key: <API-KEY>' \
--header 'Content-Type: application/json' \
--data-raw '{
  "sessionId": "0",
  "appId": "5b4960b3-a111-4f2a-bf24-7367be7c8302"
}'
```

- End the session defined by a session ID, the application name, and the application language. Use commands similar to the following example:

```
curl --location --request POST 'https://<HOST>/Contrast/api/ng/organizations/<ORG-UUID>/agent-sessions/sbav' \
--header 'Authorization: <Your-Auth-Header-Value>' \
--header 'API-Key: <API-KEY>' \
--header 'Content-Type: application/json' \
--data-raw '{
  "sessionId": "0",
  "appName": "FakeRubyApp",
  "language": "ruby"
}'
```

```
"appLanguage": "JAVA"
}'
```

- End the session defined by metadata key-value pairs configured for the application and the application ID. Use commands similar to the following example:

```
curl --location --request POST 'https://<HOST>/Contrast/api/ng/
organizations/<ORG-UUID>/agent-sessions/sbav' \
--header 'Authorization: <Your-Auth-Header-Value>' \
--header 'API-Key: <API-KEY>' \
--header 'Content-Type: application/json' \
--data-raw '{
  "appId": "abc",
  "metadata": [
    { "label": "developer", "value": "carlos" },
    { "label": "repo", "value": "ts" }
  ]
}'
```

- End the session defined by these metadata key-value pairs configured for the application with application name and language. Use commands similar to the following example:

```
curl --location --request POST 'https://<HOST>/Contrast/api/ng/
organizations/<ORG-UUID>/agent-sessions/sbav' \
--header 'Authorization: <Your-Auth-Header-Value>' \
--header 'API-Key: <API-KEY>' \
--header 'Content-Type: application/json' \
--data-raw '{
  "appName": "FakeJavaApp",
  "appLanguage": "JAVA",
  "metadata": [
    { "label": "developer", "value": "carlos" },
    { "label": "repo", "value": "ts" }
  ]
}'
```

## Update a vulnerability policy

1. From the user menu, select **Policy management**.
2. Select **Vulnerability management**.
3. In Vulnerability policy, select the **Auto-verification** tab.
4. Select the policy.
5. Update the values, as needed.
6. Select **Update**.

## Auto-verification supported frameworks

These frameworks support auto-verification policies:

- **Java:** Jersey 2, Spring MVC 4, Struts 1, Struts 2, Servlets (beta)
- **.NET Framework:** ASP.NET MVC (versions 4 and 5), WebForms, WebAPI and WCF
- **.NET Core:** ASP.NET Core MVC (versions 2.1, 2.2, 3.0 and 3.1) and ASP.NET Core Razor Pages (versions 2.1, 2.2, 3.0, and 3.1)
- **Node.js:** Express, Hapi 17+, Koa, and Kraken
- **Python:** Django, Pyramid, and Flask
- **Ruby:** Rails and Sinatra



## Set violation vulnerability policies

Violation policies mark a vulnerability as being in violation of a policy. When this policy is triggered, the vulnerability is displayed in red text in the Vulnerabilities list.

When you add a policy, it is turned on, by default. You can turn a policy off or on in the Enabled column in the Violation tab.

| Auto-Verification                                 |                     | Violation    |                 |              |                                     |                              |
|---------------------------------------------------|---------------------|--------------|-----------------|--------------|-------------------------------------|------------------------------|
| <input type="text" value="Find Policy"/>          |                     |              |                 |              |                                     | <a href="#">+ Add Policy</a> |
| Policy                                            | Vulnerability Rules | Applications | Description     | Environments | Enabled                             |                              |
| All must be remediated in 28 days<br>Time-Based   | All                 | All          | 28 day duration | All          | <input checked="" type="checkbox"/> |                              |
| All High must be remediated in o...<br>Time-Based | Critical High       | All          | 7 day duration  | All          | <input type="checkbox"/>            |                              |

## Before you begin

- An Organization Rules Admin or Organization Admin role is required.

## Steps

1. From the user menu, select **Policy management**.
2. Select **Vulnerability management**.
3. Select the **Violation** tab.
4. To add a policy:
  - a. Select **Add policy**.
  - b. In Name, enter a name for the policy.
  - c. In Vulnerability rules, select the vulnerability severity levels or Assess rules that you want to associate with the policy.
  - d. In Applications, select the application importance levels or applications that you want to associate with the policy.
  - e. In Environment, select the environments for the servers hosting the applications where you want to apply the policy.
  - f. Under Trigger, select **Flag any existing vulnerability after** and select the number of days.
  - g. Select **Save**.
5. To update a policy:
  - a. On the Violations tab, select a policy.
  - b. Change any of the policy values.
  - c. Select **Update**.

## Protect rules

Apply Protect rules to monitor or block specific kinds of attacks in application environments. Every rule represents a type of attack that exploits vulnerabilities in either custom code or open-source libraries, such as SQL injection or cross site scripting.

Contrast includes many Protect rules you can use to monitor or block attacks, like these:



- **Command injection:** Carefully crafted inputs can execute tainted operating system level commands.
- **Cross-site scripting:** A web application vulnerability that can allow users to run arbitrary JavaScript in other user's browsers.
- **Expression language injection:** A vulnerability type for many frameworks and custom code that happens when an application mistakenly evaluates user inputs as expression languages like OGNL, SpEL, or JSP EL.
- **Method tampering:** An attack against authentication or authorization systems that have implicit "allow all" settings in their security configuration.
- **Path traversal / Local file include:** A vulnerability that allows users to control which files an application opens and reads.
- **SQL and NoSQL injection:** Carefully crafted inputs to the application that alter SQL or NoSQL queries in order to steal data or execute code.
- **Unsafe file upload:** A vulnerability in the upload process that allows malicious files to bypass upload protections and perform malicious actions. This rule affects files with commonly-used extensions including (but not limited to): SVG, ASP, ASPX, \*SH, JAR, and JAVA. In Monitor mode, this rule reports potentially unsafe file uploads to Contrast. In Block mode, Contrast blocks uploads of these files.
- **Untrusted deserialization:** A web application vulnerability that allows users to pass arbitrary objects to a deserializer and execute remote code.
- **XML external entity processing:** A vulnerability in XML processing that allows users to read, write, and potentially, execute remote code to a file.

## Set Protect rules

You can set [Protect rules \(page 1412\)](#) that monitor or block attacks in your application environments.

When you add new applications, Contrast applies a set of default Protect rules to them. You can change the modes for an organization's [default Protect rules \(page 1415\)](#).

## Before you begin

- Ensure that Contrast (hosted customers) or a SuperAdmin (on-premises customers) [granted Protect permissions \(page 1508\)](#) for the organization.

## Steps

1. Select **Applications** in the header.
2. Select an application name and select **Policy**.
3. Select **Protect**.

Overview

Vulnerabilities

Attacks

Libraries

Route Coverage

Flow Map

Policy

ASSESS

PROTECT

EXCLUSIONS

All (11) Find Rule

Change Mode

| <input type="checkbox"/> Rule               | Type/Description                                                                                                                                                                                                            | Development ? | QA ?    | Production ? |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------|--------------|
| <input type="checkbox"/> Padding Oracle     | Protect Rule / A padding oracle attack can be used to decrypt cipher text. Monitor mode only.                                                                                                                               | MONITOR       | MONITOR | MONITOR      |
| <input type="checkbox"/> Unsafe File Upload | Protect Rule / A vulnerability in the upload process that allows malicious files to bypass upload protections and perform malicious actions. Consequences can range from complete system takeover to web server defacement. | OFF           | OFF     | OFF          |

4. To find a specific rule, enter the rule name in the search box.
5. For each rule, set the mode for each environment:
  - a. Select the dropdown for each environment.
  - b. Select one of these modes:
    - **Off:** This mode disables the rule.

- **Monitor:** The agent identifies and reports attacks.
- **Block:** The agent identifies, reports and blocks attacks.



### IMPORTANT

If an attack matches a rule and the mode for that rule is set to **Block**, the Java, .NET Framework, and .NET Core agents throw an `AttackBlockedException`.

To ensure the application doesn't crash, edit the application to handle the `AttackBlockedException`.

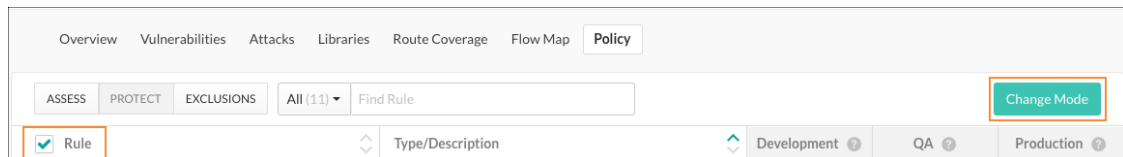
- **Block at perimeter:** The agent blocks a possible attack before the application can process it. This option is not available for all rules.
  - **Monitor at perimeter:** The agent attempts to identify and report a possible attack before the application can process it. This option is not available for all rules.
- If you block or monitor at the perimeter, the agent doesn't verify the attack at the *sink*. This action can lead to false positive results.



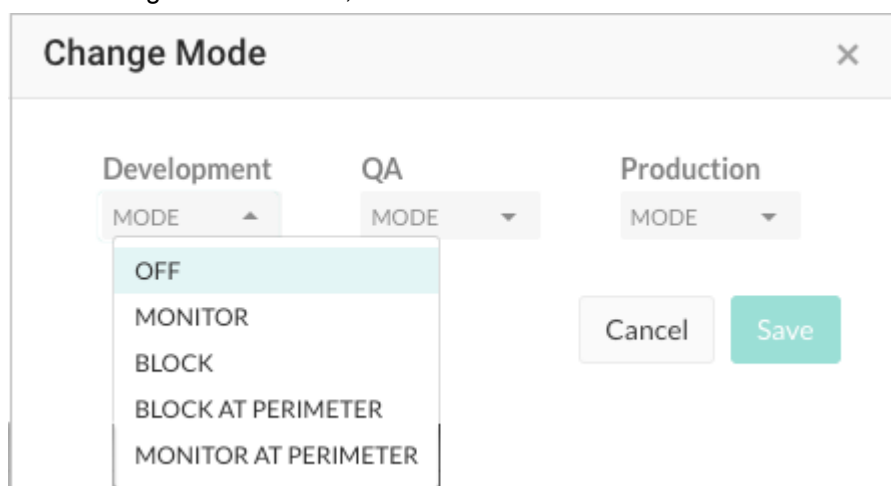
### TIP

You can test policies by setting a different mode for a Protect rule in each environment. This action lets you see how various options work in pre-production and won't disrupt production defenses.

- To apply settings to multiple rules, use one of these methods:
  - Select the checkbox next to each rule that you want to change and select **Change Mode**.
  - To change settings for all rules, select the **Rules** checkbox and select **Change Mode**.



- In the Change Mode window, set the mode for each environment and select **Save**.



- To set Protect rules for all applications in the organization that use a specific rule: This step requires an Organization RulesAdmin role.
  - Select **user menu > Policy management > Protect rules**.
  - To filter the list of rules, use the dropdown to filter the rules by language or the search field to find a rule by name.

- c. Select a rule name to manage settings for all applications that currently use the rule.

**Policy Management**

ASSESS

Assess Rules

Security Controls

Vulnerability Management

PROTECT

Protect Rules

CVE Shields

Virtual Patches

Log Enhancers

IP Management

GENERAL

Application Exclusions

Compliance Policy

Library Policy

Sensitive Data

PROTECT RULES

OFF MONITOR/MONITOR AT PERIMETER BLOCK BLOCK AT PERIMETER

.NET Framework (15) Find Rule [Configure the default policy](#) for new applications in your organization.

| Rule                                                                            | Description                                                                                                                                               | Development | QA | Production |
|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----|------------|
| <b>Command Injection</b><br>.NET Framework, .NET Core, Java, Node, Python, Ruby | Carefully crafted inputs can execute tainted commands.                                                                                                    | 4 9         | 1  |            |
| <b>Chained Commands - Command Injection</b><br>.NET Framework, .NET Core, Node  | Detects chained commands as potential attacks since command chaining is often used by attackers to invoke sensitive system commands.                      | 3 1         |    |            |
| <b>Command Backdoors - Command Injection</b><br>.NET Framework, .NET Core, Node | Detects when user input is executed as a system command or is passed as a command parameter to common shell programs (e.g. /bin/sh -c "some user input"). | 4           |    |            |
| <b>Dangerous Paths - Command Injection</b><br>.NET Framework, .NET Core, Node   | Detects dangerous paths as part of system commands as attackers often try to get access to sensitive paths or files.                                      | 4           |    |            |

- d. Use the dropdown to set the Protect mode for each environment.

**Policy Management**

ASSESS

Assess Rules

Security Controls

Vulnerability Management

PROTECT

Protect Rules

CVE Shields

Virtual Patches

Log Enhancers

**Command Injection**  
Carefully crafted inputs can execute tainted commands.

All (14) Find Application [Change Mode](#)

| Application                            | Importance | Development | QA    | Production |
|----------------------------------------|------------|-------------|-------|------------|
| <input type="checkbox"/> bugfindy      | Medium     | BLOCK       | BLOCK | BLOCK      |
| <input type="checkbox"/> DonetCoreApp1 | Medium     | OFF         | BLOCK | BLOCK      |
| <input type="checkbox"/> DonetCoreApp2 | Medium     | BLOCK       | BLOCK | BLOCK      |

## Set Protect rules for organizations

When you add and configure an agent for an application or create a new organization, Contrast applies a set of default Protect rules.



### NOTE

Starting in August 2021, new organizations include an optimized set of Protect rules. This configuration is designed to provide the highest value to users, including enhanced performance.

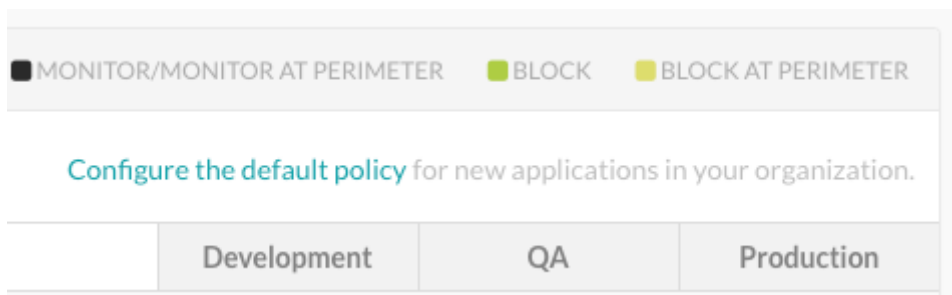
Use this procedure to change the default settings for Protect rules at an organization level. Changing these settings affects new application that you add to a Contrast organization. These changes have no effect on existing applications in the organization.

## Before you begin

- If you are using users and groups, ensure that you have an Organization Administrator or Organization RulesAdmin role.
- If you are using role-based access groups, Actions and permissions lists the actions that are required.
- Ensure that you have an Organization Administrator or Organization RulesAdmin role.
- Log in and select the correct organization.

## Steps

1. Under the user menu, select **Policy management**.
2. Select **Protect rules**.
3. Select **Configure the default policy**.



4. For each rule, select the dropdown for the environment where the application is hosted (Development, QA, and Production).
5. Select one of the following modes:
  - **Off**: This mode disables the rule.
  - **Monitor**: The agent identifies and monitors attacks.
  - **Block**: The agent identifies, reports, and blocks attacks.
  - **Block at perimeter**: The agent blocks a possible attack before the application can process it. This option is not available for all rules.
  - **Monitor at perimeter**: The agent attempts to identify and report a possible attack before the application can process it. This option is not available for all rules.

## CVE shields

Common Vulnerabilities and Exposures (CVE) provide a standardized identifier for a given vulnerability or exposure. They also provide a baseline for evaluating the coverage of your tools.

Contrast provides several CVE shields to help protect your applications that contain CVEs. CVE shields are useful for legacy applications that use vulnerable libraries that are difficult to update.

You only need CVE shields when the vulnerability isn't a common attack class like SQL injection or untrusted deserialization. In some cases, Contrast creates a CVE shield to get more data that is specific to a particular threat, even if there's an existing Protect rule that prevents the attack from occurring. This action helps provide more context into exploitation. It helps organizations map ongoing attacks to trends in the overall security ecosystem.

[View CVE shields \(page 1416\)](#)

[Set modes for CVE shields \(page 1418\)](#)

## View CVE shields

The CVE shields list displays the following information:

## Policy management

ASSESS

Assess Rules

Security Controls

Vulnerability Management

PROTECT

Protect Rules

**CVE Shields**

Virtual Patches

Log Enhancers

IP Management

GENERAL

Application Exclusions

CVE SHIELDS

OFF MONITOR/MONITOR AT PERIMETER BLOCK

Find CVE Shield

| CVE Shield (ID)                                                                                    | Description                                                                                                                                      | Development | QA | Production |
|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----|------------|
| Apache Tomcat Arbitrary Code Execution<br><a href="#">CVE-2017-12617</a> BETA                      | A remote code execution vulnerability in Tomcat 7.0.0 through 7.0.81, 8.0.0.RC1 through 8.0.46, 8.5.0 through 8.5.22, and 9.0.0.M1 through 9.0.0 | 1           |    |            |
| Apache Tomcat VirtualDirContext File Browsing Vulnerability<br><a href="#">CVE-2017-12616</a> BETA | A flaw in VirtualDirContext in Tomcat 7.0.0 through 7.0.80, allows an attacker to view sourcecode and other files on the system.                 | 1           |    |            |

- The CVE shields that Contrast provides for specific CVEs.
- A description of the CVE.
- The environments in which the servers hosting an application are running.
- The mode configured for the CVE shield:
  - **Off:** This mode disables the CVE shield entirely.
  - **Monitor:** In this mode, the CVE shield identifies and reports attacks.
  - **Monitor at perimeter:** In this mode, the CVE shield tries to identify and report a possible attack before the application can process it. This option is not available for all CVE shields.
  - **Block:** In this mode, the CVE shield identifies, reports, and blocks attacks.
- The applications, if any, that contain a specific CVE.  
The CVE shield defends this vulnerability against attack.

## Steps

1. From the user menu, select **Policy management**.
2. Under Protect, select **CVE shields**.
3. To find a specific CVE, enter a full or partial name in the search box.
4. To view details about a specific CVE, click the link below the CVE name.

CONTRAST

Applications Servers Libraries Vulnerabilities Attacks

Policy management

ASSESS

Assess Rules

Security Controls

Vulnerability Management

PROTECT

Protect Rules

**CVE Shields**

Virtual Patches

Log Enhancers

CVE SHIELDS

Find CVE Shield

| CVE Shield (ID)                                                                                    | Description                                                                                                                                      | Development | QA | Production |
|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----|------------|
| Apache Tomcat Arbitrary Code Execution<br><a href="#">CVE-2017-12617</a> BETA                      | A remote code execution vulnerability in Tomcat 7.0.0 through 7.0.81, 8.0.0.RC1 through 8.0.46, 8.5.0 through 8.5.22, and 9.0.0.M1 through 9.0.0 | 1           |    |            |
| Apache Tomcat VirtualDirContext File Browsing Vulnerability<br><a href="#">CVE-2017-12616</a> BETA | A flaw in VirtualDirContext in Tomcat 7.0.0 through 7.0.80, allows an attacker to view sourcecode and other files on the system.                 | 1           |    |            |

**CVE-2017-12617** MEDIUM (CVSS 6.8)

When running Apache Tomcat versions 9.0.0.M1 to 9.0.0, 8.5.0 to 8.5.22, 8.0.0.RC1 to 8.0.46 and 7.0.0 to 7.0.81 with HTTP PUTs enabled (e.g. via setting the readonly initialisation parameter of the Default servlet to false) it was possible to upload a JSP file to the server via a specially crafted request. This JSP could then be requested and any code it contained would be executed by the server.

|                         |         |
|-------------------------|---------|
| Confidentiality Impact  | Partial |
| Integrity Impact        | Partial |
| Availability Impact     | Partial |
| Authentication Required | None    |
| Access Vector           | Network |
| Access Complexity       | Medium  |

Done

- To view which applications contain a CVE, in one of the environment columns, hover over the number. The tooltip lists the applications that the CVE shield is defending. The number indicates the number of applications that contain the CVE. The mode indicates how the CVE shield is configured.

**Policy management**

ASSESS

Assess Rules

Security Controls

Vulnerability Management

PROTECT

Protect Rules

**CVE Shields**

Virtual Patches

Log Enhancers

IP Management

**CVE SHIELDS** OFF MONITOR/MONITOR AT PERIMETER BLOCK

Find CVE Shield

| CVE Shield (ID)                                                                                 | Description                                                                                                                                      | Development                                      | QA | Production |
|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|----|------------|
| Apache Tomcat Arbitrary Code Execution<br>CVE-2017-12617 <span>BETA</span>                      | A remote code execution vulnerability in Tomcat 7.0.0 through 7.0.81, 8.0.0.RC1 through 8.0.46, 8.5.0 through 8.5.22, and 9.0.0.M1 through 9.0.0 | 1<br>Applications Monitoring<br>VikasWebGoatApp3 |    |            |
| Apache Tomcat VirtualDirContext File Browsing Vulnerability<br>CVE-2017-12616 <span>BETA</span> | A flaw in VirtualDirContext in Tomcat 7.0.0 through 7.0.80, allows an attacker to view sourcecode and other files on the system.                 | 1                                                |    |            |

## Set modes for CVE shields

Instead of detecting categories of attacks, CVE shields defend specific CVEs in applications from attacks.

Set one of the following modes for applications hosted on servers running in a Development, QA, or Production environment:

- Off:** This mode disables the CVE shield entirely.
- Monitor:** In this mode, the CVE shield identifies and reports attacks.
- Monitor at perimeter:** In this mode, the CVE shield tries to identify and report a possible attack before the application can process it. This option is not available for all CVE shields.
- Block:** In this mode, the CVE shield identifies, reports, and blocks attacks.

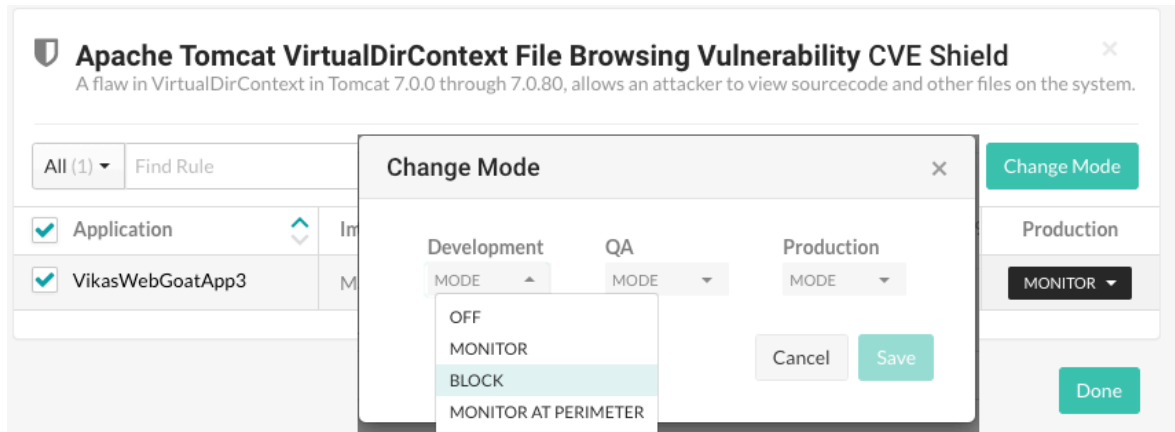
## Before you begin

- Required:** Check that you have Organization or Rules Admin permissions.
- Check that [settings \(page 1197\)](#) for servers hosting your applications are configured to use the correct environments.

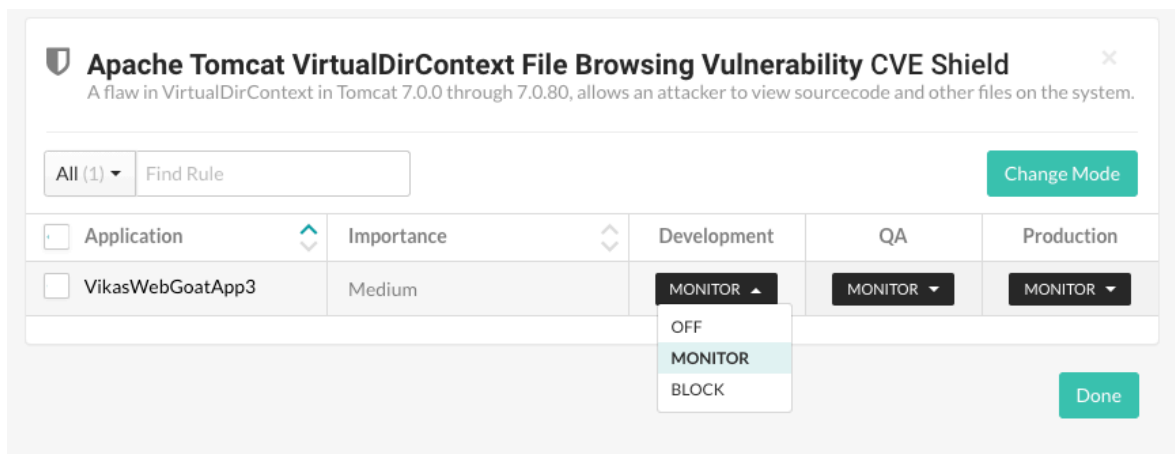
## Steps

To view CVE Shields.

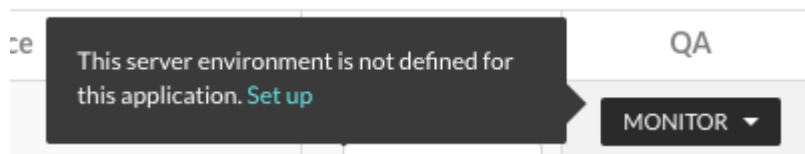
- From the user menu, select **Policy management**.
- Select **CVE shields**, and select the name of a CVE shield.  
To find a specific CVE shield, enter a partial or full name in the search box.
- To set the mode for all or multiple applications:



- a. To select all applications, select the **Application** checkbox. To select multiple applications, select the checkbox for each application.
  - b. Click **Change mode**.
  - c. In the Change Mode window, select the CVE shield mode for the selected applications in a one or more environments.
  - d. Click **Done**.
4. To set the mode for a single application:



- a. At the end of the row for an application, select the menu in an environment column. If an environment is not defined for the server hosting the application, when you hover on that environment, a tooltip appears. To configure the server for that environment, click **Set up** and select the settings icon (⚙️) at the end of the server row.



- b. Select a CVE shield mode for the application in the selected environment.
- c. Select **Done**.

## Set modes for CVE shields for organizations

When you add and configure an agent for an application in a Contrast organization, Contrast applies a set of default CVE shields.

**NOTE**

Starting in August 2021, new organizations include an optimized set of CVE shields. This configuration is designed to provide the highest value to users, including enhanced performance.

Use this procedure to change the default settings for CVE shields at an organization level. These settings apply to any new application that you add to a Contrast organization. These changes have no effect on existing applications in the organization.

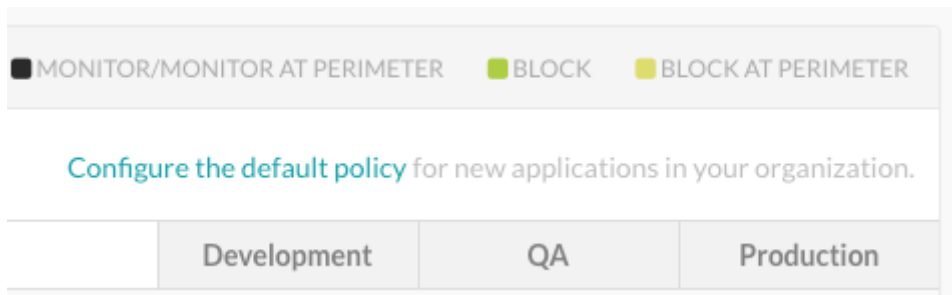
**Before you begin**

- Ensure that you have an Organization Administrator or Organization RulesAdmin role.
- Log in to or select the correct organization.

**Steps**

To change modes for CVE shields:

1. Under the user menu, select **Policy management**.
2. Select **CVE shields**.
3. Select **Configure the default policy**.



4. For each CVE shield, select the dropdown for the environment where the application is hosted (Development, QA, and Production).
5. Select one of the following modes:
  - **Off:** This mode disables the CVE shield entirely.
  - **Monitor:** In this mode, the CVE shield identifies and reports attacks.
  - **Monitor at perimeter:** In this mode, the CVE shield tries to identify and report a possible attack before the application can process it. This option is not available for all CVE shields.
  - **Block** In this mode, the CVE shield identifies, reports, and blocks attacks.

**Manage virtual patches**

Virtual patches are custom, short-term rules that block HTTP requests matching specific criteria (for example, URL, parameter keys or values, and so forth) before an application can process them.

Organization Administrators and RulesAdmins can view and manage virtual patches.

To add a virtual patch:

1. In the **user menu**, under **Policy management**, select **Virtual patches**.
2. Find virtual patches by using the language filters or the search field above the grid.



| VIRTUAL PATCHES            |                    |                                                      |                                     |                                     |                                     |   |
|----------------------------|--------------------|------------------------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|---|
| All (4) ▾                  | Find Virtual Patch |                                                      | + Add Virtual Patch                 |                                     |                                     |   |
| All (4)                    |                    | Description                                          | Development                         | QA                                  | Production                          |   |
| Java (4)                   | ⌵                  | Anertix on E                                         |                                     |                                     |                                     |   |
| .NET Framework (0)         |                    | Autogenerated patch for Anertix on ErikTomcatEclipse | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 🗑 |
| .NET Core (0)              |                    |                                                      |                                     |                                     |                                     |   |
| Node (0)                   |                    | Blocks Klein for Acct Name                           | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 🗑 |
| Ruby (0)                   |                    |                                                      |                                     |                                     |                                     |   |
| spring cmd injection       |                    | spring cmd injection                                 | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 🗑 |
| Java                       |                    |                                                      |                                     |                                     |                                     |   |
| struts-content-type-header |                    | Struts2 S2-045 Remote Command Execution Patch        | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 🗑 |
| Java                       |                    |                                                      |                                     |                                     |                                     |   |

- Click on the name of a patch to edit the rule configuration, or select **Add virtual patch** to add a new one.  
You can also select the **Delete** icon to delete a rule or use the toggles in the grid to enable or disable each environment.
- In the window that appears, add a **Name** and **Description**.

Add Virtual Patch

Name

Description

Apply To <sup>?</sup>

☒ Applications
☐ Application language
☐ Application technology

All applications (155)

Conditions <sup>?</sup>

User Agent matches Value

User Agent matches Value

+ Add Condition

Cancel

Add

- Under **Apply to**, use the radio button to choose whether the rule applies to specific **Applications**, an **Application language** or an **Application technology**. After clicking the appropriate button, use the multiselect field that appears to further refine your choice.
- Under **Conditions**, use the dropdowns to select the conditions under which the patch should apply to the applications. Select **Add another condition** in a separate row, if necessary.  
When you select how the virtual patch value is applied, select one of the following options:
  - Equals
  - Contains
  - Matches (using Perl-Compatible Regular Expressions - PCRE)

- Does not equal
- Does not contain
- Does not match (using Perl-Compatible Regular Expressions - PCRE)

Both the **Matches** and **Does not match** options support the use of Perl-Compatible Regular Expressions (PCRE). If you select **Matches** or **Does not match** option, you can define a regular expression that matches a value in the selected field of the HTTP request.

If the expression matches, or does not match as specified, the virtual patch is applied and the mitigation action specified in the patch configuration is taken.



#### NOTE

Regular expressions can be very powerful, but they can also be complex and difficult to create correctly. If you're not familiar with PCRE expressions, ask for assistance from a security expert or [Contrast Security](#) to ensure that your Virtual Patches are configured correctly and effectively.

As a starting point, look at [Regular expression reference \(page 1405\)](#). This reference provides some examples of what is possible with PCREs.

7. Select **Add** to save the configuration.

## Add or edit log enhancers

Log enhancers are instrumentation instructions that allow the Contrast agent to log additional parameters and data in the application, without requiring any source code changes.

By using these deep security instrumentation techniques, a user can specify the API and parameter to log, and the Contrast agent adds this information to the *security.log* file as part of RASP logging.



#### NOTE

Starting in August 2021, new organizations include an optimized set of log enhancers. This configuration is designed to provide the highest value to users, including enhanced performance.

To add, edit or delete a log enhancer:

1. Under [policy management \(page 1400\)](#), select **Log enhancers**.
2. Filter by language, or use the search to find the existing log enhancer you want to edit and select the name, or select **Add log enhancer**. Use the toggles in the grid row to enable or disable the rule in each environment.

| LOG ENHANCERS                                               |                                                                                 |                                     |                          |                                     |  |  |
|-------------------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------------|--------------------------|-------------------------------------|--|--|
| All (18) ▾ Find Log Enhancer                                |                                                                                 | + Add Log Enhancer                  |                          |                                     |  |  |
| Log Enhancer                                                | Description                                                                     | Development                         | QA                       | Production                          |  |  |
| Apache SSL HostName Verifier Changed<br><small>Java</small> | The SSL hostname verifier changed after the SSLSocketFactory object was created | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |  |  |
| ESAPI Default Login<br><small>Java</small>                  | ESAPI login using current request                                               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |  |  |
| ESAPI Exception<br><small>Java</small>                      | ESAPI threw a runtime security exception                                        | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |  |  |
| ESAPI Exception with cause<br><small>Java</small>           | ESAPI threw a runtime security exception                                        | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |  |  |

- In the window that appears, enter a **Name** and **Description**.

### ⚙️ Add Log Enhancer

Name

Description

Log Level

Info ▾

Log Type

Security ▾

API to Log

Language

Java ▾

API

Format

Cancel

Add

- Enter a **Log level** (page 1559) and **Log type**.
- Under **API to log**, enter:
  - Language**
  - API:** Use the structure `<class_name>.<method_name>(<argument_types>)`. For example:
 

```
public boolean com.acme.Authenticator.authenticate(String user, String password)
```
  - Format:** Enter the log description, including relevant data from the function call. You can include any of the following placeholders in your message:
    - `{O}`: Print the string representation of the object on which this call is made. If the method is static, this may be null or empty.
    - `{Pn}`: Print the given parameter at index `n`. Note that `n` starts at 1.
    - `{P1}`: Print the first parameter into the message.
    - `{R}`: Print the return value of the function.
- Select **Add** to save the rule.

## Application exclusions

Exclusions are used to suppress events. You might want to suppress events if you are using an external security control outside of the scope of Contrast's agent instrumentation. For example:

- As an administrator, you need to change the HTML that shows up on your web page, even though this qualifies as a cross-site scripting (XSS) vulnerability. In this case, you can create an exclusion that prevents these changes from being reported.
- You use an edge device to place the correct headers on outbound HTTP responses to stop clickjacking attacks. However, the issue might be appropriately reported because the application never provided the required protection.
- When you test beta rules, you can use exclusions to suppress false positives.

If you are using Java, Node.js, .NET, Python, Go, or Ruby agents, you can [add an application exclusion \(page 1424\)](#) under policy management, or from the list of attack events.

To view a list of existing exclusions, go to **Applications > Your application name > Policy > Exclusions** or **user menu > Policy management > Application exclusions**.

To add application exclusions for a specific application, go to **Applications > Your application name > Policy > Exclusions** or **Attacks > Attack Events**.

## Add application exclusions

Java, .NET Framework, .NET Core, Node.js, Python, Go, and Ruby agents let you use an [application exclusion \(page 1424\)](#) to exclude certain applications, or parts of them, from security analysis.

Currently, PHP agents do not support application exclusions.

## Before you begin

- Access control requirement:
  - **Users and groups:** Organization RulesAdmin or Organization Admin role.
  - **Role-based access control (preview feature):** Role that includes the Edit application action.
- Java and .NET agents support code exclusions.
- Java, .NET, Node.js, Python, Ruby, and Go agents support input exclusions.
- Java, .NET, Node.js, Python, and Ruby agents support URL exclusions.
- Java and .NET Core agents support queue/topic (message queue) exclusions.

## Steps

1. Select **Applications** in the header and select the name of your application. Exclusions only apply to the application for which they were created.
2. Select the **Policy** tab and then, select **Exclusions**.
3. Select **Add Exclusion**.



### TIP

You can also create an exclusion from an existing attack event. When viewing the list of attack events, **Attacks > Attack events**, select the triangle in the far right column, then select **Add exclusion**. Selecting this button pre-populates the exclusion fields based on the details of this specific event.

Once created, this exclusion is visible in the list of exclusions.

4. In Add Exclusions, enter a **Name** for this exclusion (something you'll remember easily).

5. Select the **Exclusion type**.

Input, URL and Queue/topic-based exclusion definitions accept a subset of Perl Compatible Regular Expressions (PCRE) which includes these values:

```
. * for 0 or more of any character
.+ for 1 or more of any character
.? for 0 or 1 of any character
. for 1 of any character
\. for an escaped literal of . for usage Example: somefile\.jsp
```

Use these [examples \(page 1429\)](#) to guide you.

Select one of these options:

- **Code:** Enter the method signatures you want to be suppressed. For example, if you have a method called `doLegacySecurity()` inside a class called `com.Acme.OldSecurity` that is being reported for using insecure cryptographic algorithms, you can ignore it by entering:

```
Com.Acme.OldSecurity.DoLegacySecurity
```

Be sure to include the entire method signature without a trailing parameter definition or any other extra characters. Contrast matches this method signature against the stack trace for any vulnerabilities found. Contrast suppresses any method signatures containing a match.

- **Input:** Enter an input type and an input name. Any findings using this input will be suppressed. [Input exclusions \(page 1426\)](#) provides details and examples on using these exclusions.
  - For **Parameter**, **Header** and **Cookie**: You must specify the name of the particular input for which you wish to suppress findings. You can use wildcard `*` to suppress all findings from the selected input type.
  - **QueryString** and **Body**: These will suppress findings from the entire QueryString and Body, respectively. The QueryString and Body may only be excluded in conjunction with the URL exclusion pattern defined below.

For the **Input** exclusion type, under Applied URLs, choose how to apply URLs:

- **All URLs:** Findings using the specified input type and name will be suppressed regardless of their origin.
- **These URLs:** Specify a set of paths to which to apply the exclusion. You can use [regex \(page 1405\)](#) and [wildcard expressions. \(page 1429\)](#)



### IMPORTANT

Do not include protocol schemes (`http://` or `https://`) or hostnames; only use path names beginning with `/`.

Slash followed by dot-wildcard `/*` is an acceptable substitute for listing all URLs.

Designate URLs that should be ignored by certain rules.

- **URL:** Designate URLs that should be ignored by certain rules. List the URL paths to be excluded, one per line. You can use [regex \(page 1405\)](#) and [wildcard expressions \(page 1429\)](#).
- **Queue/topic:** Specify a message queue or topic that should be ignored by certain rules. A message queue has one consumer while a topic has multiple consumers. Currently, this option is supported by Java only.

For the Queue/topic exclusion type, under Applied queues, choose how to apply the queues or topic names:

- **All queues/topics:** Findings from all queues and topics are suppressed.
- **These queues:** Specify a list of queue or topic names to be excluded. You can specify queue names or use [regex. \(page 1405\)](#) and [wildcard expressions \(page 1429\)](#).

6. Under **Applicable rules**, specify the scope of rules affected by the exclusion. All rules is the default, or you can click in the box to select multiple options:

- **All rules** applies the exclusion to all vulnerabilities found in both Assess and Protect mode.
  - Under Assess, **All Assess rules** applies to all vulnerabilities found when Assess is enabled.
  - Under Protect, **All Protect rules** applies to all attack events when Protect is enabled.
  - Under the Assess section or the Protect section, selecting individual rules lets you further narrow the focus. Exclusions are only applied to vulnerabilities that the selected rules find.  
If you select **Input** as the exclusion type, you can only select rules that are not triggered by user input.
  - Under Assess and Protect, select individual rules found in both Assess and Protect mode.
7. Select the box next to **Suppress all events that match this exclusion** if you want Contrast to suppress historical events that have already been reported.
  8. Select **Add**.  
The exclusion is added to the list of exclusions. Any inputs that match the criteria you entered won't be processed with the rules you've applied.  
You can view this list either at **Applications > Your application name > Policy > Exclusions** or in the **user menu > Policy management > Application exclusions**. From the list, you can use the toggles to enable or disable the exclusion for Assess or Protect.

## Input exclusions

One type of an application exclusion is an input exclusion. These exclusions let you exclude specific inputs from a Contrast agent's analysis. This exclusion type can be useful if you know certain inputs are safe and do not require monitoring, thereby reducing noise in your security reports.

### Types of input exclusions

Contrast supports exclusions that use these types of inputs:

- **Parameter:** Excludes specific parameters accessed through request methods, including parameters from the post body or query string itself.
- **Header:** Excludes specific HTTP headers.
- **Query String:** Excludes the entire query string.
- **Body:** Excludes the entire request body.
- **Cookie:** Excludes specific cookies.

### Parameter Input exclusions

An input exclusion with an input type of parameter checks for any parameters in the request, like those from the query string or form body, that match the specified parameter, as long as the application retrieves it using that parameter name (for example, `request.getParameter("foo")`).

#### Example:

**Add exclusion** (\*\*Terracotta Bank) ×  
Use an application exclusion to suppress events when you use security controls outside of Contrast agent's scope. [Learn more](#)

Exclusion name

Parameter exclusiong

Exclusion type

Input

Input type


Parameter

Input name ?

foo

If you specify `foo` as the parameter to exclude, the following table shows examples of how Contrast handles the HTTP request.

| HTTP request                                                                                                        | If excluded...                                                             | If included...                                                         |
|---------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------|
| GET /someRequest?<br><br>foo=excludedValue&bar=includedValue                                                        | Contrast excludes this parameter from monitoring:<br><br>foo=excludedValue | Contrast continues to monitor this parameter:<br><br>bar=includedValue |
| POST /someRequest<br><br>Content-Type: application/x-www-form-urlencoded<br><br>foo=excludedValue&bar=includedValue | Contrast excludes this parameter from monitoring:<br><br>foo=excludedValue | Contrast continues to monitor this parameter:<br><br>bar=includedValue |



**NOTE**  
For a POST request, the exclusion only works for a body format of `application/x-www-form-urlencoded` body.

## Header input exclusions

Headers are specific HTTP headers that the application retrieves from the request (for example, `request.getHeader("User-Agent")`).

### Example:

Add exclusion (\*\*Terracotta Bank) ×  
Use an application exclusion to suppress events when you use security controls outside of Contrast agent's scope. [Learn more](#)

Exclusion name

Exclusion type

Input type

Input name ?

If you specify `User-Agent` as a header to exclude, the following table shows examples of how Contrast handles HTTP requests.

| HTTP request                                                                          | If excluded...                                                                      | If included...                                                             |
|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| GET /someRequest<br><br>User-Agent: excludedUser<br><br>AgentAccept: application/json | Contrast excludes this header from monitoring:<br><br>User-Agent: excludedUserAgent | Contrast continues to monitor this header:<br><br>Accept: application/json |

## Query string input exclusions

The query string exclusion applies to the entire query string, not individual parameters. This exclusion is useful when the application retrieves and parses the entire query string (for example, acting on the result of `request.getQueryString()`).

### Example:

**Add exclusion** (\*\*Terracotta Bank) ×  
Use an application exclusion to suppress events when you use security controls outside of Contrast agent's scope. [Learn more](#)

Exclusion name

Query exclusion

Exclusion type

Input

Input type

Query String

Applied URLs

☒ All URLs

☐ These URLs

Based on specified URLs, the following table shows examples of how Contrast handles HTTP requests.

| HTTP request                                             | If excluded...                                            | If included...                                        |
|----------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------|
| GET /someRequest?<br>foo=excludedValue&bar=excludedValue | Contrast excludes the entire query string from monitoring | Contrast continues to monitor the entire query string |

## Body input exclusions

The body input exclusion applies to the entire body of the request. This type of exclusion is useful when the body contains data that the application parses (for example, acting on the result of `request.getBody()`)

### Example:

**Add exclusion** (\*\*Terracotta Bank) ×  
Use an application exclusion to suppress events when you use security controls outside of Contrast agent's scope. [Learn more](#)

Exclusion name

Body exclusion

Exclusion type

Input

Input type

Body

Applied URLs

☒ All URLs

☐ These URLs

Based on specified URLs, the following table shows examples of how Contrast handles HTTP requests.

| HTTP request                                                                                                         | If excluded...                                            | If included...                                        |
|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------|
| POST /someRequest<br><br>Content-Type: application/json<br><br>{ "foo": "excludedValue", "bar":<br>"excludedValue" } | Contrast excludes the entire request body from monitoring | Contrast continues to monitor the entire request body |

## Cookie input exclusions

Cookie input exclusions are useful when you want to suppress findings related to specified cookies.

### Example:



Add exclusion (\*\*Terracotta Bank)
×

Use an application exclusion to suppress events when you use security controls outside of Contrast agent's scope. [Learn more](#)

Exclusion name

Exclusion type

Input type

Input name ?

If you specify `sessionID` as the cookie to exclude, the following table shows examples of how Contrast handles HTTP requests.

| HTTP request                                                     | If excluded...                                 | If included...                             |
|------------------------------------------------------------------|------------------------------------------------|--------------------------------------------|
| GET /someRequest                                                 | Contrast excludes this cookie from monitoring: | Contrast continues to monitor this cookie: |
| Cookie:<br>sessionID=excludedValue;<br>otherCookie=includedValue | sessionID=excludedValue                        | otherCookie=includedValue                  |

## Wildcard expressions

When specifying Input, URL, or Queue/topic exclusions for applications, you can build wildcard expressions using:

- `.*` to mean 0 or more of any character
- `.+` to mean 1 or more of any character
- `.?` to mean 0 or 1 of any character
- `.` to mean 1 of any character
- `\.` for an escaped literal of `.` for usage

Example: `somefile\.jsp`

## Wildcard expression examples

| Desired effect                                                                        | Regular expression           | Example                                                                                                               |
|---------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Exclude all subpaths                                                                  | <code>/myapp/.+</code>       | Excludes all paths with the initial URL of <code>/myapp/</code>                                                       |
| Exclude one character from subpath                                                    | <code>/.yapp</code>          | Excludes all subpaths that are 5 characters and end in <code>yapp</code> (like <code>myapp</code> )                   |
| Exclude one subpath explicitly                                                        | <code>/myapp/thispath</code> | Excludes only <code>/myapp/thispath</code>                                                                            |
| Exclude path ending                                                                   | <code>/*.ignore</code>       | Excludes all paths ending in <code>ignore</code>                                                                      |
| Exclude paths containing                                                              | <code>/*.value.*</code>      | Excludes all paths containing <code>value</code>                                                                      |
| Exclude path containing                                                               | <code>/.?value.*</code>      | Excludes all paths either starting with <code>value</code> or paths that have one character before <code>value</code> |
| Exclude paths where a period (dot) is used as a literal character and not a wildcard. | <code>/myapp\.js</code>      | Excludes only <code>myapp.js</code><br><br>You can use up to three instances of this expression.                      |

## Set compliance policy

You can define compliance policies for application compliance within your organization. If any designated applications violate this policy, Contrast marks them so you can quickly find them and fix them. (Administrators are also notified of violations by email.)

To set compliance policy:

1. Under [policy management \(page 1400\)](#), select **Compliance policy**.
2. You will see a list of existing compliance policies if there are any. You can enable or disable policies using the toggles, or delete them with the **Delete** icon.

3. Select the name of any policy to edit, or select **Add policy** at the top of the grid to create a new compliance policy.
4. In the panel that opens enter:
  - **Name:** Choose a name for the policy.
  - **Policy criteria:** The default is **All rules**, or you can type ahead and select vulnerabilities by severity level(s), security standards or Assess rules.
  - **Applications:** The default is All applications or you can type ahead and select applications by level(s) of importance and/or individual name.
5. Select **Add** or **Save**.

**NOTE**

For default policies, the **Name** and **Policy criteria** fields are locked, and you cannot delete them. However, you can modify application selections for default policies.

**TIP**

Enabled policies can be used to filter applications by compliance policy. To do this select Applications. In the Applications page, click the Advanced link to filter application by Compliance Policy.

**NOTE**

If an applicable vulnerability isn't remediated, or applicable Security Standards and Assess Rules are being violated, Contrast flags the corresponding applications in the Applications page. Hover over the warning icon in the Applications grid or go to the application's details page for a link to the violated policy.

## IP management

Manage IP policy in your organization with denylists, allowlists (trusted hosts), and source names:

**NOTE**

For denylists and allowlists, Contrast checks the `Client Address` and the `X-Forwarded-For` request headers to see if the IP addresses match the list entries.

- **IP denylist:** Sets rules that let Contrast Protect block all IP addresses in this list  
Using a denylist is appropriate for immediate triage until you can put a more permanent Protect policy in place or conduct an investigation.
- **IP allowlist:** Marks trusted hosts conducting internal vulnerability scans as safe. Contrast doesn't show data for IP addresses in this list.

Entries in this list don't override entries in IP denylists

Contrast Assess features remain unaffected and continue to function as normal.

Contrast Protect ignores all IP addresses (or ranges) that match entries in this list. It does not monitor or block any attacks from IP addresses in the list.

- **Source name:** Labels attack events caused by known sources, such as pen testers, based on one or more IP addresses or subnet masks.

When you view attacks in the **Attacks > Monitor** and **Attack Details** pages, Contrast displays the source name instead of the attacker's IP information. Displaying this value allows you to quickly identify and differentiate expected events from attack events that need your attention.

## See also

- [Block or allow IPs \(page 1431\)](#)
- [Manage source names \(page 1432\)](#)

## Deny or allow IP addresses

Use IP denylists or IP allowlists to [manage IP addresses \(page 1430\)](#) in your organization.

### Before you begin

- If you are using users and groups, the organization role of Admin or RulesAdmin role is required.
- You must have the organization role of Admin or RulesAdmin role.
- You can use Classless Inter Domain Routing (CIDR) notation to specify a subnet mask.

### Steps

1. From the user menu, select **Policy Management > IP Management**.
2. Manage denylists:
  - a. Select the **IP denylist** tab.
  - b. To edit a denylist, select a denylist name, change the displayed information, and select **Save**.
  - c. To add an IP address to a denylist, select **Add IP to denylist**, specify the details, and select **Add**.

**Add IP to denylist**

Name  
test

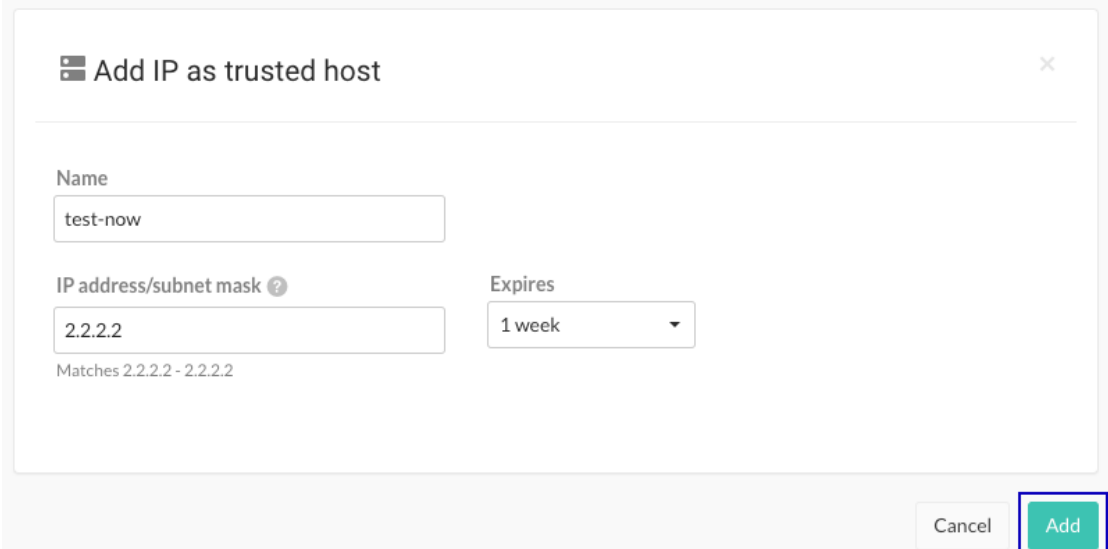
IP address/subnet mask ?  
1.1.1.1  
Matches 1.1.1.1 - 1.1.1.1

Expires  
1 week

Cancel Add

3. Manage allowlists:
  - a. Select the **IP allowlist** tab.
  - b. To edit an allowlist, select the allowlist name, change the displayed information, and select **Save**.

- c. To add an trusted host to an allowlist, select **Add trusted host**, specify the details, and select **Add**:



**Add IP as trusted host**

Name  
test-now

IP address/subnet mask ?  
2.2.2.2  
Matches 2.2.2.2 - 2.2.2.2

Expires  
1 week

Cancel Add

## Manage source names

Use source names to quickly identify non-threatening, internal traffic and testing, while monitoring attack events in your organization.

You can label one or more IP addresses and subnet masks with a source name of your choice. When the source name is saved, you can see the name (rather than user IP information) by selecting **Attacks > Monitor** or looking on the **Attacks details** page. This can make it easier to identify the named attacker as a known source when assessing attack events.

To create source names:

1. Go to the **user menu > Policy management > IP management > Source names**.
2. Select **Add source name**.
3. Enter the **Name** you want to use to identify one or more IP addresses.
4. Add the **IP address/Subnet mask** to identify with this source name. Use the link to **Add** more IP addresses or subnet masks to the group, if necessary.
5. Use the dropdowns to select the **Start** and **End** dates and times for the source name. You may choose to create a custom time span that starts on a past date; in this case, the source name applies retroactively to any attack events.
6. Once the fields are completed, select **Add** to save the source name.  
Once a source name is added in your organization, the source name appears for attacks that match the criteria on the **Monitor** and **Attack** details pages. This will help you [monitor attacks \(page 628\)](#).  
If the data reported for an attack event matches more than one source name, Contrast applies the name that you updated most recently.
7. To edit a source name later, select the source name. In the **Edit source name** form that opens, make changes and select **Save**.
8. To delete a source name, either select the **Delete** icon in the **Source names grid**, or below the **Edit source names** form. Once the name is deleted, all references to the name are replaced with the IP information.

## Set library policy



### IMPORTANT

License policy is available to Contrast SCA customers only. Contact your Organization Administrator to enable SCA.

Contrast can flag libraries that don't meet your organization's criteria to ensure your applications are secure.

If a library is restricted or used in an application that's below a specific version, it's marked as a policy violation by Contrast. You can also tell Contrast to automatically grade any library that violates the policy with the letter "F" to flag it in the Contrast interface. (Administrators are notified of violations in both the product and by email.)



### NOTE

Library versions include any major, minor, and patch versions.

To set a library policy:

1. In the user menu, select **Policy Management > Library Policy**.
2. Check the box to **Restrict libraries** and choose which libraries you want to exclude from your portfolio. You can select multiple.
3. Check the box to **Enable version requirements** and choose one or multiple libraries that must be within your given number of versions.
4. Click the **Add another requirement** link to create version requirements for additional library groupings.
5. Check the **Restrict licenses** box to set a policy on open-source licenses that you want to restrict. If an open-source license is restricted, then any libraries that use the restricted license will be marked as a policy violation.  
The license policy lists open-source licenses in SPDX format, listed by short identifier and followed by the full name. Any license type that you want to restrict must be selected. Contrast includes any 'or later' licenses it identifies in your portfolio. For example, if you restrict by GPL-3.0-only, any licenses that are GPL-3.0-or-later will be included in that restriction.
6. Check the box next to **Fail libraries in violation of policy**, to automatically assign a failing score to any library that violates a set policy.  
If a library fails to comply with a set policy, the name, a warning icon and the library score are highlighted in red in the **Libraries** page. Hover over the icon or go to the library's **Overview** page for more information about the violation.  
If you choose to automatically fail libraries, Organization Administrators will be notified when [adjusting score settings \(page 1459\)](#).

## Sensitive data masking

Sensitive data masking limits risk to your organization and helps meet compliance requirements.

Data masking protects sensitive data in your applications by redacting it in vulnerability and attack reports that are sent to Contrast, syslog or security log.

Contrast offers several categories of sensitive data, or data types, that are comprised of specific keywords that the agent automatically identifies and redacts in reports. A user with at least RulesAdmin permissions can [manage sensitive data \(page 1434\)](#).

Contrast agents mask sensitive data in query parameters, request headers, cookies and body. Your agent identifies sensitive data by searching for specific keywords used in the input name. If the agent finds a match, it redacts the value for that input, and replaces it with a placeholder with the format `contrast-redacted-{datatype}`, where `datatype` is the category of sensitive data to which the keyword belongs.

Contrast agents do **not** mask individual fields in request bodies with a content type other than `application/x-www-form-urlencoded`; however, you can configure the agent to mask the entire request body. Contrast agents also do not mask data that appears in the data flow portion of a vulnerability report, if using Assess, or in the vector of an attack event, if using Protect.



## NOTE

Contrast agents make a “best effort” attempt to avoid printing sensitive data in Contrast log statements; however, it’s possible that sensitive data could appear in the Contrast log, if the log level is set to DEBUG or lower. Whenever possible, you should avoid setting production systems to log at DEBUG or lower. If a system that deals with sensitive data is set to log at DEBUG or lower, you should take steps to ensure that those logs are not being sent to an external system to avoid leaking any sensitive data.

For example, this HTTP request sent by an agent as part of a vulnerability report shows two inputs that the agent identified as sensitive, as well as the placeholders it used to mask the values of the input before sending the report to Contrast, syslog server or security log.

```
PUT /employee/5 HTTP/1.1
Host: yourdomain.com
Content-Type: application/x-www-form-urlencoded
Content-Length: 30
apikey: contrast-redacted-authentication-info

ssn=contrast-redacted-government-id&department=sales
```

In this case, the header value is masked because "apikey" matches a keyword in the "Authentication Info" data type, and the form parameter is redacted because "ssn" matches a keyword in the "Government ID" data type for your Contrast organization. (Keyword matches are case insensitive.)

## Manage sensitive data types

[Sensitive data masking \(page 1433\)](#) limits risk to your organization and helps meet compliance requirements.

1. Under policy management, select **Sensitive data**.
2. Here you can see an alphabetical list of sensitive data types. Use the search field to find a particular type by name or keyword.
3. Select the checkbox next to **Mask entire body** to enable redaction of the entire HTTP request body. This setting applies to all applications in your organization.
4. To mask sensitive data in attack values, select the checkbox next to **Mask sensitive data in attack values**.

Masking sensitive data in attack values can decrease your ability to evaluate the impact of an attack event. Contrast agents do not normally mask this type of data

5. Critical data types and keywords determined by Contrast apply to all applications in your organization by default, and can't be edited or disabled. For data types that Contrast has not determined to be critical, you may use the toggle in the grid to enable or disable them for the organization.
6. To add custom keywords, select the name of the data type in the list. In the Custom keywords box at the bottom of the page, enter one or more custom keywords and select **Add**. Custom keywords apply to all applications in your organization.
7. Select **Save**.

## Add and edit notifications as a RulesAdmin

Notification defaults are set by an Organization Administrator, but as a RulesAdmin you can enable or disable existing notifications or create new ones.

1. Under [organization settings \(page 1440\)](#), select **Notifications**.
2. Use the toggles to enable or disable existing notifications.
3. To create a new notification, select **Create notification**.
4. In the window that appears, enter:
  - Name
  - Frequency
  - Description
  - Applications
  - Application tags
  - Users
5. Select **Save**.

## Organization administration

If you have Organization Administrator permissions you can do everything a [RulesAdmin \(page 1400\)](#) or [Editor \(page 633\)](#) can do, plus, at an organization level you can:

- [Configure organization settings \(page 1440\)](#)
- [Enable Assess \(page 1435\)](#)
- [Enable Protect \(page 1437\)](#)



### NOTE

Organization Administrators have the highest organization level permissions. Other [organization roles \(page 1555\)](#) also have capabilities that span across their organization.

If [configured at a system level \(page 1506\)](#), users can fill the Organization Administrator role across multiple organizations.

## Enable Assess

You can use configuration files, variables, or the Contrast web interface to configure the Assess setting. This procedure describes how to enable Assess in the Contrast web interface. [YAML configuration \(page 112\)](#) and [Environment variables \(page 115\)](#) describe how to use methods outside of the web interface to configure agent settings.

## Before you begin

- Although you can see the types of vulnerabilities that Contrast discovers without an Assess license, you won't be able to retrieve any details unless you apply licenses to applications.

## Steps

- Log in to Contrast.
- Select **Servers** in the header.
- Either scroll or use the search at the top of the page to find the servers associated with the applications you want to analyze with Assess.
- To manage the Assess setting for specific servers in the Contrast web interface, use either of these methods:
  - In the Servers list, select the setting in the Assess column.
  - In the Servers list, select a server name to open its detailed view and use the Assess setting there.



### NOTE

- If you use only the Contrast web interface to turn Assess on or off, the Assess setting is green if ON and gray if OFF. You can change this setting in the Contrast web interface.



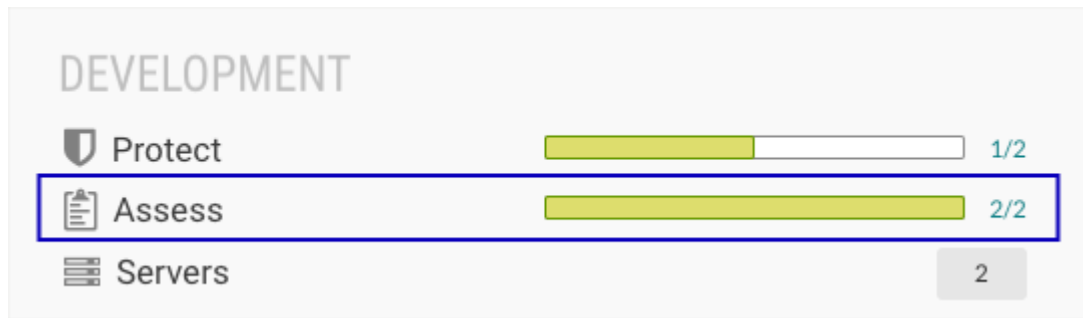
- If you used a method external to the Contrast web interface to configure the setting for Assess (for example, an agent configuration file), the setting is green but disabled if ON and grey but disabled if OFF. You cannot change this setting in the Contrast web interface.




- If the setting in the Contrast web interface is disabled, hover over the setting to see where it is configured. The [order of precedence \(page 111\)](#) determines which setting Contrast uses as the effective configuration.


- To determine if an application is using Assess on each server associated with it, go to the Applications page:
  - Select **Applications** in the header.
  - Select an application.
  - In the Overview tab, under each environment, if at least one server has Assess turned on, the bar next to the Assess setting indicates the Assess status for all servers associated with the application. A green bar represents the number of servers that have Assess turned on. A white bar represents the number of servers that have Assess turned off.

















If no servers have Assess turned on, you see an OFF icon (  ).

- d. To see if the application is configured to use Assess for each server associated with it, select a section of the Assess setting bar to open a filtered view of the Servers list.

**Servers** All (4751)  ↓ SORT BY LAST SEEN

| Server ▼                                                                                                         | Last Seen    | Environment ▼ | Applications  | Assess                                                                              | Protect                                                                             |
|------------------------------------------------------------------------------------------------------------------|--------------|---------------|---------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| ip-172-5.0.0.216                | 4 hours ago  | Development   | PF:1681275975 |  |  |
| ip-172-5.0.0.216                | 4 hours ago  | Development   | PF:1681275940 |  |  |
| ip-172-5.0.0                    | 9 hours ago  | Development   | PF:1681269945 |  |  |
| UMAHESWARI-C02DD09CMD6R 4.13.1  | 20 hours ago | Development   | application   |  |  |

6. To set a default Assess setting for new servers, from the user menu, select **Organization settings > Servers** and use the Assess setting there.
7. If the application you want to analyze with Assess is unlicensed, add a license to it:
  - a. Select **Applications** in the header.
  - b. Select **Unlicensed** next to the application name
  - c. In the Apply License window, select **Apply license**.
  - d. Restart the application server to ensure the Contrast agent instruments your application with Assess capabilities. Once that's complete, Contrast begins to receive vulnerability analytics. The application no longer has **Unlicensed** next to it, which means there is an Assess license assigned to it.



## NOTE

Organization Administrators can configure a default setting that applies Assess licenses automatically to new applications rather than applying licenses manually for every application.

1. Under [organization settings \(page 1440\)](#), select **Organization**.
2. In Licenses, under Assess, select **Automatically apply licenses to new applications**.

## Enable Protect

Enabling Protect for users lets them access and see Protect data. Enabling Protect for servers lets applications use Protect to monitor and block attacks.


**NOTE**

If you enable Protect on servers with existing applications, restart the applications to have Protect take effect.

## Before you begin

- Go to **Organization settings > Users** and verify that you have permissions to access Protect data and settings.
  - For hosted customers, Contrast grants Protect permissions to organizations and user roles in the organization.
  - For on-premises customers, SuperAdmin, ServerAdmin, or System Administrator roles are required to [grant Protect permissions for one or more organizations. \(page 1508\)](#)  
These roles can also configure which user roles have access to Protect data.
- Ensure that you have [licenses \(page 1443\)](#) that you can apply to servers.
- To enable Protect for users, an Organization Administrator role is required.

## Let users access Protect data

1. Log in to Contrast.
2. Enable users to see and use Protect data:
  - a. In the user menu, select **Organization Settings**.
  - b. Select **Users**.
  - c. For each user who needs access to Protect data, turn on the Protect setting (  )
  - d. To have the new setting take effect, tell users to log out of the Contrast web interface and log in again.

## Enable Protect for servers

You can use configuration files, variables, or the Contrast web interface to configure the Protect setting. This procedure describes how to enable Protect in the Contrast web interface. [YAML configuration \(page 112\)](#) and [Environment variables \(page 115\)](#) describe how to use methods outside of the web interface to configure agent settings.

1. To configure a default Protect setting for new servers in selected environments:

If you use a method outside the Contrast web interface to configure the Protect setting for a specific server, that configuration overrides this default setting.


  - a. From the user menu, select **Organization settings**.
  - b. Select **Servers (page 1453)**.
  - c. Select an environment.
  - d. Under Protect, turn on the Protect setting.



Protect

**NOTE**

To automatically [allocate licenses \(page 1443\)](#), an Organization Administrator or RulesAdmins role is required. This option is useful if you don't want to enable Protect for servers, one at a time.

2. Enable Protect for specific servers:
  - a. Select **Servers** in the header.
  - b. To enable Protect in the Contrast web interface, turn on the Protect setting (  ). Use either of these methods:
    - In the Servers list, turn on the setting in the **Protect** column.
    - In the Servers list, select a server name and in the Overview tab, turn on the Protect setting.



#### NOTE

- If you use only the Contrast web interface to turn Protect on or off, the Protect setting for a specific server is green if ON and gray if OFF. You can change this setting in the Contrast web interface.

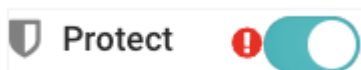


- If you used a method external to the Contrast web interface to configure the setting for Protect (for example, an agent configuration file), the setting is green but disabled if ON and gray but disabled if OFF. You cannot change this setting in the Contrast web interface.

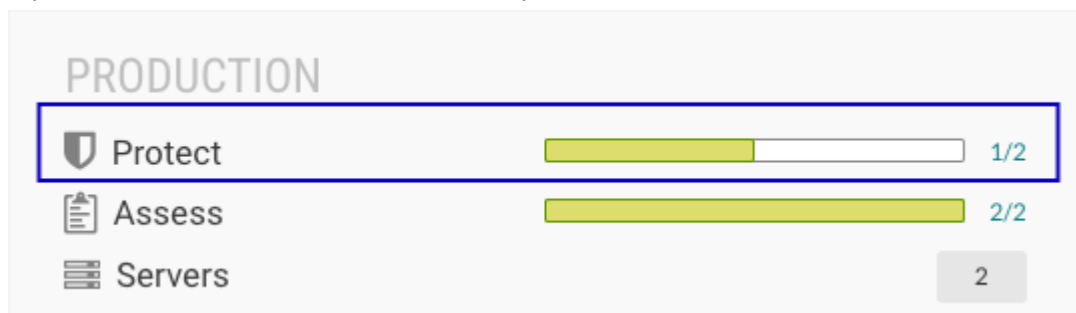


- If the setting in the Contrast web interface is disabled, hover over the setting to see where it is configured. The [order of precedence \(page 111\)](#) determines which setting Contrast uses as the effective configuration.

3. To verify that Protect is turned on for a specific server, in the Servers tab, select the server, select **Overview** and verify the Protect setting is green.
  - If one or more applications associated with the server are not configured to use Protect, a warning icon displays next to the Protect setting.

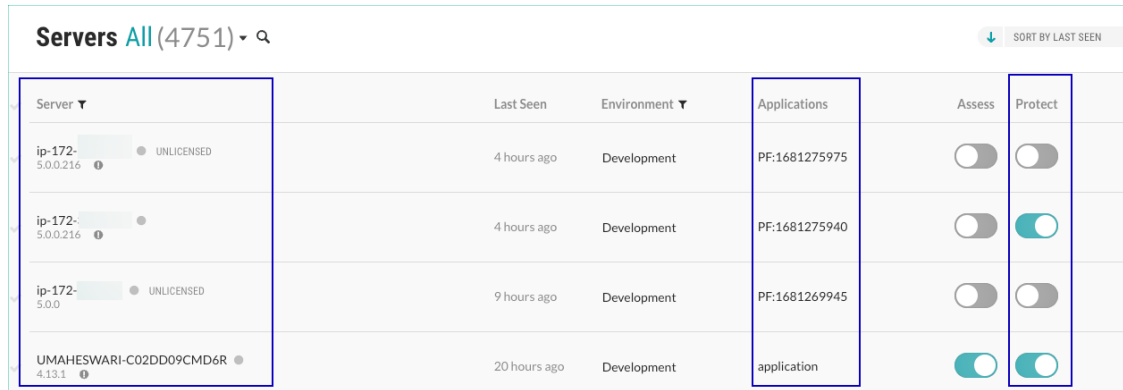










4. To determine if an application is using Protect on each server associated with it, go to the Applications page:
  - a. Select **Applications** in the header.
  - b. Select an application.
  - c. In the Overview tab, under each environment, if at least one server has Protect turned on, the bar next to the Protect setting indicates the Protect status for all servers associated with the application. A green bar represents the number of servers that are protected. A white bar represents the number servers that are not protected.



If no servers have Protect turned on, you see an Off icon (  ).

- d. To see if the application is configured to use Protect for each server associated with it, select a section of the Protect setting bar to open a filtered view of the Servers list.



| Server                         | Last Seen    | Environment | Applications  | Assess                                                                              | Protect                                                                             |
|--------------------------------|--------------|-------------|---------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| ip-172-5.0.0.216 UNLICENSED    | 4 hours ago  | Development | PF:1681275975 |  |  |
| ip-172-5.0.0.216               | 4 hours ago  | Development | PF:1681275940 |  |  |
| ip-172-5.0.0.0 UNLICENSED      | 9 hours ago  | Development | PF:1681269945 |  |  |
| UMAHESWARI-C02DD09CMD6R 4.13.1 | 20 hours ago | Development | application   |  |  |

## License behavior

Contrast applies Protect licenses automatically to servers when these conditions exist:

- Protect is turned on for an organization.
- Automatic application of Protect licenses is turned on for an organization and Protect is NOT enabled by a method external to the Contrast web interface (for example, an agent configuration file).  
If Protect is enabled with a method external to the Contrast web interface, that effective configuration overrides the automatic licensing option in the Contrast web interface.
- A server exists in one or more environments where automatic licensing is turned on.

If you also use the Protect setting in an agent configuration file, it overrides the license behavior in the following ways:

- **Protect is turned on in the agent configuration file**
  - If Protect licenses are available when the application starts, you might notice the server is licensed for a very brief period of time. Contrast removes the license automatically as soon as the agent registers the application.
  - If **no** Protect licenses are available when the application starts, Contrast tries to apply a license to the server every time the agent communicates with Contrast.
- **Protect is turned off in the agent configuration file**
  - If Protect licenses are available when the application starts, Contrast tries to apply a license to the server. When an agent registers an application with Contrast, it removes the license applied to the server.
  - If **no** Protect licenses are available when the application starts, Contrast doesn't apply a license to the server.

## Configure organization settings

If you have Organization Administrator permissions you can configure settings for your organizations.

## Steps

1. If you have multiple organizations, select the name of the organization you want to configure in the **user menu**.
2. Select **Organization settings** in the **user menu**.  
The organization settings are:
  - Organization ([general information \(page 1442\)](#), [licenses \(page 1443\)](#), and [usage analytics \(page 1449\)](#))
  - [Users, groups and permissions \(page 1445\)](#) including [API only users \(page 1447\)](#).
  - Security ([passwords \(page 1450\)](#), [multi-factor authentication \(page 1450\)](#), [IP range \(page 1450\)](#), [email domain restrictions \(page 1450\)](#))
  - Agent (view the [agent keys \(page 109\)](#) that you use to configure agents to communicate with Contrast)
  - [Single sign-on \(SSO\) \(page 1451\)](#)

If you're not using SSO, protect your system by configuring [multi-factor authentication \(page 1450\)](#) as required. Contrast supports configurations that use both SSO and multi-factor authentication.

- [Integrations \(page 1331\)](#)
- [Servers \(page 1453\)](#)
- [Applications \(page 1455\)](#)
- [Notifications \(page 1457\)](#)
- [Score Settings \(page 1459\)](#)

## Configure general organization information

1. Under [organization settings \(page 1440\)](#), select **Organization** in the left navigation.
2. In the top right corner you can see the UUID for this organization. (This is helpful in [bulk adding users \(page 1504\)](#).)
3. This panel also shows general information about the organization like:
  - Organization name
  - Default time and date formats for the organization
  - Default language settings for the organization such as Japanese (if enabled by a superadmin), or English



### NOTE

Individual user settings override most general organization settings (time and date formats, for example) with the exception of language settings. User language settings override organization language settings for things specific to the user, such as user notifications or emails. However, user language settings will not override organization language settings for things specific to the organization, such as organization-level notifications.

4. Select **Edit** to change any of the information on this panel.
5. Make changes and select **Save**.

## Manage AI settings at an organization level

An administrator can control whether AI guidance is available for providing additional information and suggestions for vulnerabilities.



### LEGAL DISCLAIMER

When you use [Contrast AI] Intelligent Remediation Guidance, you submit data to the Anthropic services made available through the technical environment referred to as Amazon Bedrock that is hosted and managed by Amazon Web Services, Inc. ("Services"). Both the submission of data to the Services and the output generated by the Services will be subject to the [terms of service of Anthropic](#). Use of Contrast AI is entirely at your own risk.

## Before you begin

- If you are using role-based access control, you need a role with the Manage organization action.
- If you are using organization groups and users, you need the Organization Admin role.

## Steps

1. Under organization settings, select **General**.
2. Under AI settings, select **Intelligent Remediation guidance** to turn this feature on or off.
3. Optional: Select **Show legal disclaimer for everyone** if you want users to see the legal disclaimer when they use Contrast AI guidance.

### See also:

[Contrast AI guidance \(page 1306\)](#)

## Allocate licenses for organizations, applications, and servers

### Before you begin

- An Organization Administrator role is required.
- If your organization has consumed all allocated Assess licenses, hosted customers are asked to [contact Support](#).
- For on-premises customers, the SuperAdmin can [make more licenses available at a system level \(page 1533\)](#).

## Steps

1. See an overview of license usage in an organization:
  - a. From the user menu, select **Organization settings**.
  - b. Select **Organization**.
  - c. Under **Licensing**, view information about Assess and Protect licenses:
    - Available and used Assess (application) licenses, as well as how many applications are unlicensed.
    - Available and used Protect (server) licenses as well as how many servers are unlicensed. If you are using more licenses than you purchased, the available licenses section of the license bar is replaced with the number of additional licenses in use.
2. (Optional) Under **Licensing**, automatically apply licenses to new applications or servers:
  - a. For Assess licenses, turn on **Automatically apply licenses to new applications**.



AUTOMATICALLY APPLY LICENSES TO NEW APPLICATIONS

- b. For Protect licenses, turn on **Automatically apply licenses to new servers**.  
Select the server environments.



AUTOMATICALLY APPLY LICENSES TO NEW SERVERS

Select which environment(s) to automatically apply licenses:



Development



QA



Production

If you use a method external to the Contrast web interface for Protect settings (for example, an agent configuration file), Contrast considers that configuration to be the effective configuration. An effective configuration takes precedence over the automatic licensing setting in the Contrast web interface:

- If an agent's effective configuration has Protect turned OFF and the automatic licensing setting is turned ON, Contrast ignores the setting in the Contrast web interface. It doesn't apply a license to the server automatically.

- If an agent's effective configuration has Protect turned ON and the automatic licensing setting is turned OFF, Contrast ignores the setting in the Contrast web interface. It applies a license to the server automatically.
  - If an agent doesn't report an effective configuration, the automatic licensing setting in the Contrast web interface applies to all new servers.
3. If needed, apply Assess licenses to individual applications:
    - a. Select **Applications** in the header.  
In the applications list, applications that are unlicensed show **Unlicensed** after their name. You cannot view vulnerability data for the application if it is unlicensed.
    - b. To apply a license to an unlicensed application, select **Unlicensed**.
    - c. In the Apply License window, select **Apply License**.
  4. If needed, remove Assess licenses from applications by [deleting the application \(page 656\)](#).  
Licenses applied to applications permanently count towards the number of maximum allowable applications. Deleting a licensed application has no effect on the number of licenses you are allowed to apply to applications
  5. If needed, add or remove Protect licenses from individual servers:
    - a. Select **Servers** in the header.
    - b. Turn the Protect setting on or off for the server.
      - If you use only the Contrast web interface to turn Protect on or off, the Protect setting for a specific server is green if ON and gray if OFF. You can change this setting in the Contrast web interface.



- If you used a method external to the Contrast web interface to configure the setting for Protect (for example, an agent configuration file), the setting is green but disabled if ON and gray but disabled if OFF. You cannot change this setting in the Contrast web interface.



- If the setting in the Contrast web interface is disabled, hover over the setting to see where it is configured. The [order of precedence \(page 111\)](#) determines which setting Contrast uses as the effective configuration.
- c. Restart applications associated with the server.

## Configure agent keys

Agent keys let agents communicate with Contrast. Contrast supports the ability to configure multiple agent keys with different authentication credentials instead of sharing one key across an organization.

The benefits of having multiple agent keys include:

- **Enhanced security:** Each team or service can manage its own credentials, reducing the risk of a single point of failure.
- **Operational flexibility:** Teams can delete keys, add keys, or manage access without impacting other teams or services within the organization.
- **Granular control:** By assigning specific agent keys to different contexts, organizations can better control and monitor agent access and activity.

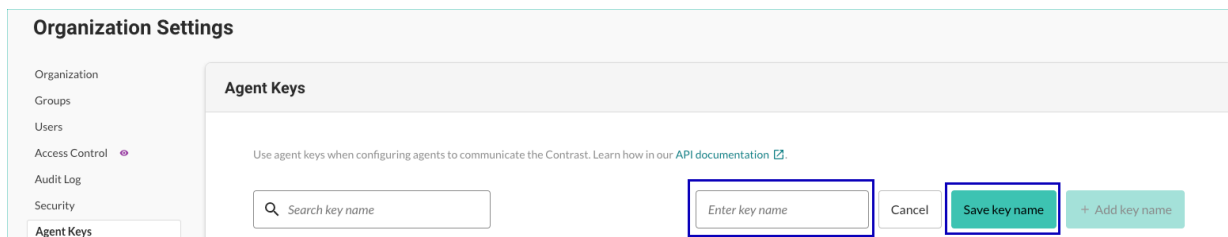
## Before you begin



- To add or delete agent keys, you need these actions or roles:
  - If you are using role-based access control, you need a role with the Manage organization action.
  - If you are using organization users and groups, you need the Organization Admin role.
- To view agent keys, you need these actions or roles:
  - If you are using role-based access control, you need a role with the Manage organization rules or Edit organization action.
  - If you are using organization users and groups, you need the Rules Admin or Edit role.

## Add an agent key

1. Under the user menu in the Contrast web interface, select **Organization settings**.
2. Select **Agent keys**.
3. Select **Add key name**.
4. Enter a key name at the top of the list.
5. Select **Save key name**.  
Contrast displays the keys for the new key name.



The screenshot shows the 'Organization Settings' page in the Contrast web interface. The left sidebar contains a menu with 'Organization', 'Groups', 'Users', 'Access Control' (selected), 'Audit Log', 'Security', and 'Agent Keys'. The main content area is titled 'Agent Keys' and includes a sub-header 'Use agent keys when configuring agents to communicate the Contrast. Learn how in our [API documentation](#).' Below this is a search bar labeled 'Search key name'. To the right of the search bar are three buttons: 'Enter key name' (highlighted with a blue box), 'Cancel', and 'Save key name' (highlighted with a green box). To the right of the 'Save key name' button is a '+ Add key name' button.

## Delete an agent key

When you delete an agent key, any active agent using it will be unable to authenticate and will shut itself down.

1. Under the user menu in the Contrast web interface, select **Organization settings**.
2. Select **Agent keys**.
3. Locate the agent key name you want to delete.
4. Select the **Delete** icon (🗑️) at the end of the row.
5. When prompted to do so, confirm you want to delete the key name by selecting **Delete**.

## Manage users, groups and permissions at an organization level

If [allowed at a system level \(page 1503\)](#), an Organization Administrator can manage user permissions for the organization by:

- [Adding a user or editing user settings \(page 1445\)](#)
- Managing organization permissions with [access groups \(page 1446\)](#)

## Add or edit a user at an organization level

If you add users within an organization, you can assign them to access groups for the applications within that organization. For most Contrast installations, the [default \(page 1503\)](#) is to set roles and permissions at an organization level, however if you have users who need to access multiple organizations, [add those users at a system level \(page 1503\)](#).

To add users:

1. Log in to Contrast with Organization Administrator permissions.
2. Select **Organization settings** in the **user menu**.

3. Select **Users** in the left navigation.
4. Select a user name from the list of users to edit their entry, or select **Add user** to add a new user.
5. For each user you can enter:
  - **Organization role:** Select one of the default [organization roles \(page 1555\)](#) that apply to all applications in this organization or [create a custom access group \(page 1446\)](#).
  - **Application access groups:** Select one of the default [application roles \(page 1553\)](#) that apply to all applications in this organization or create a custom access group to grant specific permissions to certain applications.
  - **Access permissions:** You can allow users access to the API, to the Contrast web interface and to Protect data. (Protect permissions can also [be granted at a system level \(page 1508\)](#).)

**TIP**

If you assign someone an administrator role, be sure to grant them both API and Contrast web interface access.

6. Select **Add** or **Save**.

### Add, edit, or delete an organization access group

Use organization access groups to assign users permissions and capabilities by [role \(page 1552\)](#).

Contrast provides default access groups that you can use instead of creating your own:

- **View:** Members of this group have read-only access to the Contrast interface to see scores, libraries, vulnerabilities and comments.
- **Edit:** Members of this group can remediate findings, add tags, manage vulnerabilities, edit attributes, merge applications, add or delete applications, and create servers.
- **Rules Admin:** Members of this group can edit rules and policies in the application, enable Protect, manage notifications and scoring.
- **Admin:** Members of this group can configure and manage settings for the organization.

### Before you begin

An Organization Administrator role is required.

### Steps

1. Under [organization settings \(page 1440\)](#), select **Groups**.
2. Select an existing group to edit, or select **Add group** to create a new group.

**TIP**

To find groups you can use the quick filter dropdown or the search field in the top left, or use the up/down arrows at the top of each column to sort.

The default groups that Contrast provides, indicated with a lock icon, have fixed applications and roles, and can't be deleted. You can only add or remove users from these default groups.

3. Fill out the form with:
  - **Group name:** Choose something that reflects the purpose, permissions and capabilities you will assign to this group.
  - **Application access:** Select the application name here to associate this group with the application. You can also set a group name when you are setting up a new application.

- **Role:** Select the application role you want the members of this group to have within the corresponding application.
  - Select **Add access** to add more applications and roles.
4. Next to **Members**, on the right, type ahead to select one or more users to assign to the group.
  5. When you are finished, select **Add** to create the new group.

**NOTE**

If users are assigned to two groups with conflicting roles for all applications or organizations, the role that provides the most restrictive access applies.

6. To delete a group, select **User menu > Organization settings > Groups**. Find the group you want to delete and select the Delete icon in that row.  
Once this is confirmed, the group is removed and any access provided by that group is revoked from all users assigned to the group.

**TIP**

To assign a user a role for all applications in the organization, assign them both an organization role and an application role from the default role groups. (For example, set both the organization and application roles to "Administrator" and they will have administrator permissions for all applications in your organization.)

To give a user access to a particular application, create an access group for that application and add the user to that group. Users not assigned to any application access groups won't have access. A user can have various roles across applications within a single organization.

Most Contrast customers use single organization deployments. Groups created at an organization level impact the roles and permissions across that particular organization. Organization access groups can also be created [at a system level \(page 1506\)](#) to allow users access to more than one organization

## Create an API only user

Create an API Only user account that you can use for all plugins or integrations.

**NOTE**

This procedure is for on-premises customers only.

If you are a hosted customer use this [Create an API only user \(page 1595\)](#) procedure.

**Best practice:** Add a user account that's only purpose is for use with plugins and integrations. Doing so avoids a situation where a user leaves and you delete that user's account. The deletion of that account would result in breaking the plugins and integrations that you use.

An API only account does not receive email notifications, even if the notification settings are turned on.

## Before you begin

- An Organization Admin role is required.
- API Only users can access Contrast's REST API but cannot log in to the Contrast web interface.
- If you configured your organization to use SAML-based single sign-on (SSO), you can still create an API only user.

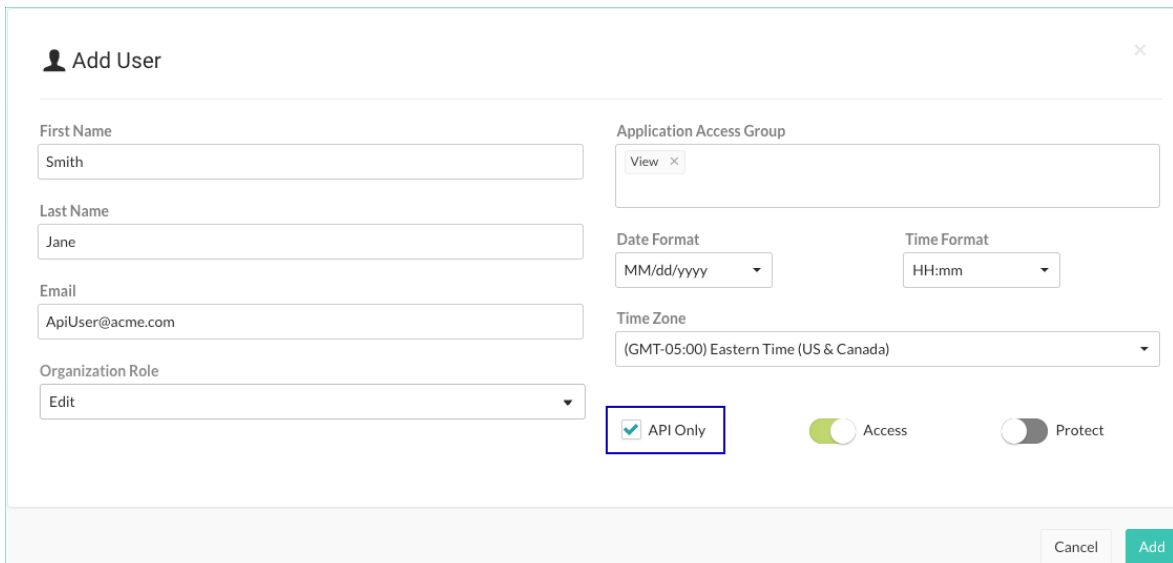
## Steps

To create an API only user:

1. From the user menu, select **Organization settings**.
2. Select **Users**.
3. Select **Add User**.

 + Add User

4. Enter the user name , email address, and time zone information.
5. Select the **Role**.  
**Best practice:** Select **Edit** (page 1555) for the Organization role to give the user the least permissive role.  
It is not recommended to give API only users Admin permissions.
6. Select an Application access group.  
**Best practice:** Select **View** (page 1553) or **Edit** (page 1553) for the Application access group.  
Depending on the API endpoints you want to call, and if you are trying to GET (read) or POST (write), the API only user might require the higher Edit permission instead of View.
7. Select the **API only** checkbox.



### NOTE

Selecting the API only checkbox overrides the Access option, if it's enabled. API only users have no access to the Contrast web interface.

8. In **Organization Settings > Users**, verify that you can see with new user with the **API Only** label next to the name.

| USERS ?                        |          |                   |            |                                     |                          |                          |  |  |
|--------------------------------|----------|-------------------|------------|-------------------------------------|--------------------------|--------------------------|--|--|
| All (1) sm                     |          |                   |            |                                     |                          |                          |  |  |
| Name (Username)                | Status   | Organization Role | Last Login | UI Access                           | Serverless               | Protect                  |  |  |
| Smith Jane<br>ApiUser@acme.com | API Only | ✓                 | Edit       | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |  |  |

9. If you are using access groups to restrict access to specific applications, add the API only user to the [groups \(page 1446\)](#) for the applications that you want the API user to access. Verify access by looking at **Permissions** in the user profile.
10. To use the API only user account, get the connection strings:
  - a. From the user menu, select **Organization settings**.
  - b. Select **Users**.
  - c. Hover over the API only label next to the user's name and copy the displayed Service key. The Service key is unique to each user. All other API keys are shared across all users.
  - d. Create the Authorization header with a command similar to this example:

```
echo -n '[email address of the API only account:Service Key]' |
base64
```

## Manage usage analytics

Contrast collects usage data to understand how to build a better product. Confidential customer data is not tracked, and all user data is anonymized for analytics performed on aggregate information.

As an Organization Administrator, you can enable or disable usage data collection for the organization:

1. Under [organization settings \(page 1440\)](#), select **Organization**.
2. Under **General settings**, use the toggle to disable or enable **Product usage analytics**. It is enabled by default.

Diagnostics are also [managed at a system level \(page 1532\)](#).

## Restricted edit role

If you want to restrict users from deleting vulnerabilities and archiving applications, use the Restricted edit role setting. When selected, this setting applies to all users with the Organization edit or Application edit role.



### NOTE

This setting is available for on-premises customers only.

## Steps

1. From the user menu, select **Organization settings**.
2. Select **Organization**.
3. Under General settings, select **Restricted edit role**.  
When selected, all users with the Organization edit or Application edit role cannot delete vulnerabilities or archive applications.

## Set a password policy at an organization level

As long as it is [allowed at a system level \(page 1528\)](#), as an Organization Administrator, you can regulate passwords within your organization by creating a password policy.

1. Under [organization settings \(page 1440\)](#), select **Security**.
2. Enter the following settings for your policy:
  - Password Strength: This can be **Weak**, **Medium**, **Strong**, **Complex** or **Custom**. If you choose **Custom**, enter the minimum required number of **Uppercase letters**, **Lowercase letters**, **Numbers** and **Symbols**.
  - Enter the number of characters required in the **Minimum length** field.
  - Use the dropdown to choose the length of time allowed before **Password expiration**.
  - Enter the number of login attempts allowed before **Login logout**.
  - Choose the length of time allowed before **Inactive account expiration**.
  - Check the box to **Restrict password reuse**, and use the dropdown to choose the number of times each password may be reused.
  - Check the box to **Restrict password reset**, and use the dropdown to choose the number of hours during which a user can reset their password after their reset request is sent.
  - Use the dropdowns to select the amount of time that may pass before **Idle timeout** and **Session timeout**.
3. Select **Save**.

## Restrict email domains

Restrict which email address domains can receive Contrast information.

1. Under organization settings, select **Security**.
2. Under **Email domains**, enter comma delimited email domain names that should be allowed to receive information from Contrast. For example, `yourbusiness.com`.
3. Select **Save**.

## Set IP range

Restrict which IP addresses can access your Contrast account. This affects both browser and API access.

1. Under [organization settings \(page 1440\)](#), select **Security**.
2. Enter the IP address for which you want to allow access. Select **Add IP address** to enter additional addresses. You can also specify a range of IP addresses by using Classless Inter Domain Routing (CIDR) notation `10.0.0.0/24`.
3. Select **Save**.

## Enable multi-factor authentication at an organization level



### NOTE

For on-premises customers, set multi-factor authentication [at a system level \(page 1514\)](#).

If a user belongs to multiple organizations, their default organization determines their multi-factor authentication settings.

## Before you begin



### NOTE

- If you configure SSO in Contrast and also want to use multi-factor authentication, configure it using your identity provider (IdP), instead of Contrast. With SSO configured, Contrast passes the responsibility of authenticating users to the IdP.
- If you're not using SSO, protect your system by requiring [multi-factor authentication \(page 1450\)](#) as a required setting.

## Steps

1. Under [organization settings \(page 1440\)](#), select **Security** in the left navigation.
2. Toggle the MFA setting to green.
3. Specify whether to require MFA for users in the organization.  
Multi-factor authentication is enabled and users can [choose how they want to receive multi-factor authentication notices. \(page 637\)](#)

## Configure single sign-on (SSO) at an organization level

For on-premises customers, single sign-on can be [configured at a system level \(page 1524\)](#). For hosted customers, Contrast Security configures authentication; however, a user may be granted permissions to set up SSO for their organization.



### NOTE

- If users are identified with a user ID rather than an email address, those accounts don't automatically transfer over to the SSO configuration and must be recreated.
- If you configure SSO in Contrast and also want to use multi-factor authentication, configure it by using your identity provider (IdP), instead of Contrast. With SSO configured, Contrast passes the responsibility of authenticating users to the IdP.
- If you're not using SSO, protect your system by requiring [multi-factor authentication \(page 1450\)](#) as a required setting.

1. From the user menu, under Organization settings, select **Single-sign-on** and select **Get started**. To change an existing configuration, select **Edit** at the bottom of the screen.
2. In the left navigation, under Administration, select **Single-sign-on**.
3. You may receive a warning window regarding the implications of changing authentication. Read it carefully before proceeding.
4. Use the displayed information at the top of the screen to set up Contrast with your IdP.

Organization

Groups

Users

Access Control

Security

Agent

Single Sign-On

Integrations

Servers

Applications

Notifications

Score Settings

SINGLE SIGN-ON

What you'll need: [Copy Metadata URL](#)

[Revert to Contrast-Managed Authentication](#)

|                                              |                                              |                  |
|----------------------------------------------|----------------------------------------------|------------------|
| Entity ID *                                  | Metadata URL                                 | Attributes       |
| https://mycompany.com/Contrast/saml/metadata | https://mycompany.com/Contrast/saml/metadata | None required    |
| Version                                      | NameID Format                                | Consumer Binding |
| 2.0                                          | Email Address                                | HTTP-POST        |
| Assertion Consumer URL                       |                                              |                  |
| https://mycompany.com/Contrast/saml/SSO      |                                              |                  |

What we need:

Identity Provider \*

My/Company Okta

☒ I have access to the metadata URL

IdP Metadata URL \*

https://mycompany.okta.com/app/sso/saml/metadata

Accepted Domain(s) (New Users) \*

mycompany.com

+ Add domain

Default Organization Role (New Users) \*

View

Default Application Access Group \*

View

Default Organization User Access Group \*

ADMIN UAG

☒ Enable user provisioning

☐ Add users to their Contrast groups upon SSO login

☐ Remove users from their Contrast groups upon SSO login

Cancel Save

5. Provide a name for your IdP as well as the associated metadata to connect to Contrast.
6. If you want to automatically create new user accounts when someone make a SAML request to log in to Contrast, select the **Enable user provisioning** checkbox at the bottom of the screen.
  - a. Add the **Accepted domains** that must be used to trigger user provisioning (for example, contrastsecurity.com)
  - b. Specify roles and groups:
    - **On-premises customers:** Use the dropdowns to choose the **Default organization role** and **Default application access group** for the new users.  
The value displayed for the Default User Access group does not apply to your configuration.
    - **Hosted customers:** If role-based access control is turned on, use the dropdown to select a **Default User access group** for the new users.  
The values displayed in the Default organization role and Default application access group do not apply to your configuration. If you are using the legacy access control, follow the instructions for on-premises customers.
7. If you want to add users who are members of a SAML group that matches the name of a Contrast group, select **Add users to their Contrast groups upon SSO login**.
8. If you want to remove users who are members of a SAML group that *does not* match the name of a Contrast group, select **Remove users from their Contrast groups upon SSO login**.
9. Select **Save**.
10. Open a **new** browser window, private browsing session or incognito window, and attempt the SSO login with your account. If you're unsuccessful, go back to the browser in which you're still logged in, disable SSO for the organization, select **Revert to Contrast-managed authentication** and confirm the change.

## See also

- [Configuring user and group provisioning with Okta](#)
- [Configuring ADFS to automatically add users to groups](#)



## Set server defaults at an organization level

Server settings provide default configurations to new servers (and their agents) that you add to Contrast. You can customize these configurations and set specific defaults for each environment.

### Steps

1. Under [organization settings \(page 1440\)](#), select **Servers**.
2. Use the dropdown to choose the environment in which you want to apply the default (Development, QA, or Production). Check the box next to **Set as default environment** if you want to specify a default environment for future server configuration.
3. Use the dropdown to choose the **Log Level**. The default [log level \(page 1492\)](#) selection is **ERROR**.
4. Under **Automatic server cleanup**, enter the length of time that you would like servers to be offline before they are automatically cleaned up. The default value is 30 days.  
A background task runs every five minutes to check if there is an organization with automatic server cleanup enabled.  
If there are one or more servers with no activity received within the configured time frame, Contrast disables the servers automatically. They are no longer visible under **Servers** in the Contrast web interface.  
Contrast keeps Information on vulnerabilities and attacks related to these servers even after they're disabled. Protect licenses from disabled servers return to the pool of licenses.
5. Under **Assess**, specify these settings:
  - a. Select which stack traces should be captured (all, some or none).
  - b. To optimize analysis performance, select **Enable sampling for higher performance**.
    - If Contrast sees the same URL being called multiple times, it analyzes the URL based on the the number of times specified in the Baseline setting.
    - Afterwards, if Contrast continues to see the same URL, it only checks it based on the Frequency setting.
    - Contrast retains samples for the number of seconds specified for the Window setting. After the time specified for the Window setting elapses, Contrast analyzes the URL again, according to the Baseline setting.Configure these settings:
  - **Baseline:** The number of times that Contrast analyzes URLs to complete sampling. The default setting is **5**.
  - **Frequency:** The number of times that Contrast analyzes URLs after the Baseline is achieved. The default setting is **10**.
  - **Window:** The number of seconds that Contrast retains samples before reverting to the Baseline. The default setting is **180**.
6. Under **Protect**, specify these settings:
  - a. To enable Protect, turn on the Protect toggle.



### IMPORTANT

Turning Protect on selects the setting to apply Protect licenses to new servers automatically.

Administrators receive emails each time a server is licensed. As servers go up and down frequently, you may want to setup an email filter for any unwanted traffic.

In this section, the license bar shows the number of purchased Protect licenses in use. If you are using more licenses than you purchased, the license bar also shows the number of additional licenses in use.

- b. To turn on bot blocking, select **Enable bot blocking**.  
Bot blocking blocks traffic from scrapers, attack tools and other unwanted automation.  
To view blocked bot activity, under **Attacks > Attack Events**, use the **Automated** filter option.

**NOTE**

You can configure bot blocking in the [YAML files \(page 112\)](#) for Java, .NET Framework, .NET Core, Ruby, and Python.

- c. To send Protect events to syslog, select **Enable output of Protect events to syslog**.  
Configure these settings:
- Enter the **IP Address** and **Port** in the given fields. Use the dropdown to choose the **Facility**.
  - Click on the event severity badges, and use the dropdown to choose a message **Severity** level for each one. The defaults are:
    - **1 - Alert** for Exploited
    - **4 - Warning** for Blocked
    - **5 - Notice** for Probe
7. To retain library details, turn on **Retain Library Data**. When enabled, Contrast retains library details for the last server being deleted from Contrast during server cleanup.
8. To send agent data to Contrast, turn on **Agent diagnostics** toggle. Contrast uses this data to improve rules, performance, and to prioritize product improvements.
9. To remove routes that are seen only on servers that are no longer active, turn on **Enhanced server cleanup**. [Configure enhanced server cleanup \(page 1454\)](#) provides details about this setting.

## Configure enhanced server cleanup

The Enhanced server cleanup setting lets you remove routes from the historical routes dataset if those routes are only seen on servers that are no longer active. This feature is an alternative to [route expiration \(page 666\)](#) policies.

Enhanced server cleanup is useful primarily if you have ephemeral servers and prefer to manage Assess results as unique, point-in-time scans of the application. For example, it could be beneficial if you use one server for one test run of a Contrast agent-instrumented application and don't expect to test run that application again for weeks or months.

If, as a user of Assess and Application Vulnerability Monitoring (AVM), you continuously instrument your applications, use a route expiration policy instead. It allows for more flexibility and control over when stale routes are cleaned up, regardless of the status of the server the route was reported on. Route expiration is also a better choice for if you have long-running servers, as they are more likely to host multiple versions of the same application.

### Additional benefits

The benefits of using this setting include:

- Remove routes that may no longer be seen in current builds of the application
- An improvement in route coverage percentage
- An improvement in vulnerability burn down metrics
- Less data in the Route Coverage tab

### How enhanced server cleanup works

When you set a server cleanup policy and turn on enhanced server cleanup, Contrast:

- Removes all servers except the last active server  
Contrast keeps the most recently active server for each application, even if all servers for an application are offline.

- Remove routes that may no longer be seen in current builds of the application
- Removes routes that are associated with no servers when the server is removed
- Marks vulnerabilities that are associated with no servers as **Verified- Auto-remediated** when the server is removed
- Updates the total count of routes and the denominator in route coverage
- Updates total count of vulnerabilities based on the auto-verified status

### Before you begin

- The enhanced server cleanup setting affects all server environments.
- Use the Contrast web interface or the [Contrast API](#) to configure this setting.

### Steps

1. From the user menu, select **Organization settings**.
2. Select **Servers**.
3. Under Automatic server cleanup, set the server cleanup policy by entering the length of time that you would like servers to be offline before they are automatically cleaned up.  
Any Protect licenses assigned to removed servers are returned to the pool of available Protect licenses.
4. Select **Enhanced server cleanup**.
5. Select **Save**.

**Retain Library Data** ☐ **!** Applies to all server environments.  
Libraries will still be visible for applications on deleted servers

**Agent Diagnostics** ☐ **!** Applies to all server environments.  
Send Contrast agent data to improve rules, performance and to prioritize product improvements.

**Enhanced Server Cleanup** ☒ **!** Applies to all server environments.  
Enhances automatic server cleanup to remove routes and mark vulnerabilities as auto-remediated when those routes or vulnerabilities were only seen on servers that are being cleaned up.

**Save**

### Set application defaults at an organization level

Use this procedure to choose default settings for applications at an organization level.

### Before you begin

- If using groups and users, an Organization Admin role is required.
- An Organization Admin role is required.

### Steps

1. Under [Organization settings \(page 1440\)](#), select **Applications**.
2. Use the dropdown to choose an **Importance** level for applications. Your options are **Critical**, **High**, **Medium**, **Low**, **Unimportant**. The default selection is Medium.
3. Under Policy, select the remediation and [compliance policies \(page 1429\)](#) you would like to automatically apply to applications.  
You can still add applications to policies that aren't included in your default settings at a later time.

4. Under Application onboarding, select either or both of these settings:
  - Do not onboard applications that are missing application metadata
  - Do not onboard applications that are missing session metadataDepending on the settings you select, Contrast fails to add applications that are missing required metadata. These settings help you to enforce the metadata configuration in the agent's configuration file.
5. Under Session metadata, to set the default [session metadata filtering \(page 656\)](#) to the most recent session, select **Filter application details by most recent session**. This selected filter affects the application's Vulnerabilities and Route coverage tabs.
6. Under Behavior, select **Automatically apply licenses to new applications** if you want licenses to be applied automatically. A status bar shows you how many licenses have been used out of the total number available. Select the license link to understand the breakdown of your organization's licenses.
7. Use the Application metadata section to [configure application metadata \(page 1456\)](#) that should be provided for each of the applications in your organization.
8. Select **Save**.

### Create requests for application metadata

You can configure requests for application metadata that is collected whenever you add a new application to Contrast.

When you [install and configure an agent \(page 51\)](#), you are prompted to enter metadata for the fields you create and to add the information in the agent configuration file. The metadata is then displayed in the **Applications** list, where you can also use it to filter applications, and the application's **Details** page in the Contrast web interface.



#### NOTE

The following agent versions support application metadata fields:

- Java 3.5.6.591 and later
- .NET 18.10.35 and later
- Node 1.35.0
- Python 1.2.0
- Ruby 2.0.8



#### IMPORTANT

The data supplied for application metadata is required for Agent configuration and YAML file download. The downloads will be disabled without the data.

### Steps

1. Under organization settings, select **Applications**.
2. Under Application metadata, for each field enter:
  - **Field type:** Freeform, Numeric or Point of contact. The type of field determines the type of validation.

- **Name:** Enter a label for this field.  
To ensure compatibility with the Contrast APIs, use lower camel-case formatting for application metadata names. For example, use `businessID`, not `BusinessID` or `Business ID`.
  - **Value condition:** Use the checkbox to indicate whether the metadata value provided should be **Required** or **Unique**.
3. Select **Add field** to complete as many rows as needed.
  4. As you provide information for each field, you will see the formatted property that you can copy and paste into your agent configuration files. Add the information for each key=value pair to the agent configuration file.
  5. To prevent reporting of data for applications that don't include all required fields, select **Restrict applications missing required fields**. This option applies to new and existing applications in the organization.  
When you select this option, the Contrast web interface displays a warning message if an application is missing a required field in the agent configuration file. The Contrast web interface displays the application, however, the agent reports no data for it, including exercised routes and vulnerabilities.  
If you choose not to restrict applications, any application missing a required field is successfully added and the agent reports data. Contrast displays a warning message that one or more fields are missing.

## Manage notifications at an organization level

Notifications alert users in specific situations, such as the discovery of a vulnerability or an attack on an application. Organization Administrators can [set default settings \(page 1458\)](#) for Contrast notifications for all users in their organization. Individual users can [choose how they want to receive these notifications \(page 639\)](#).

There are two primary channels available for notifications:

- **In Contrast:** Notifications are available directly in the Contrast application. Select the **Notification** icon in the top right header to view your notifications.
- **Email:** A System Administrator can [configure Contrast \(page 1536\)](#) to communicate with an appropriate SMTP system to receive notifications by email.



### NOTE

For some features that require user notifications, Contrast automatically notifies the affected users when a Contrast administrator enables the feature. (You can't control these notifications in the **Notifications** page.) Contrast requires user and administrator notifications for features including [vulnerability status approval \(page 1460\)](#) and other **Policy Management** settings.

## Set administrative notifications

Administrators automatically receive the following notifications for high-level events in their organization in the Contrast application and by email.

- **Application licensed:** A new application was [licensed \(page 1443\)](#) in Contrast.
- **Application license expiring:** The license for an active application is expiring. (Contrast sends this notification two months, one month and one week prior to the expiration date).
- **Licenses expiring:** Existing license(s) with no associated applications is expiring. (Contrast sends this notification two months, one month and one week prior to the expiration date).

- **Remediation policy violation:** A vulnerability is in violation of an existing [remediation policy](#). (page 1406)
- **Library policy violation:** A library is in violation of an existing [library policy](#) (page 1433).
- **Compliance policy violation:** An application is in violation of an existing [compliance policy](#) (page 1429).

Administrator and RulesAdmin users at the application and the organization level must receive policy violation notifications. You can [manage your notifications](#) (page 639) to minimize the number of notifications or consolidate them into a single email.

You can also receive notifications soliciting approval when a user requests to close certain vulnerabilities. This must be [configured](#) (page 1460) by an Organization Administrator.

## Set default user notifications

As an Organization Administrator, you can define default notification settings for all users in your organization both for integrations and for email and in-app notifications in Contrast. Individual users can [choose how they receive those notifications](#) (page 639).

### Steps

1. Under [organization settings](#) (page 1440), select **Notifications**.
2. Use the toggles to enable or disable the subscriptions listed on the left:
  - **Active attack:** There is an active attack on an application with Protect enabled.
  - **New vulnerability:** Contrast has detected a new vulnerability. Click in the field to enable notifications for specific severity levels; the default selection is **All**.
  - **Vulnerable library:** Contrast detected a new vulnerable library or a new CVE in a library.
  - **Server Messages:** Receive messages about reliability issues for servers.
  - **Server offline:** Contrast can't reach a server.
  - **New comment:** A team member commented on a finding.
  - **New asset:** A new asset to which the user has access was onboarded. Click in the field to set this notification for **Application** or **Server**; the default selection is **All**.
  - **Nearing expiration:** An application license is about to expire.
  - **Policy violations:** A vulnerability is in violation of a compliance, policy, or remediation policy. To receive daily email digests of violation notifications, select **Aggregate policy violation emails into separate daily email digests** and select the type of policy notifications you want to include in the email.
  - **Scan failed:** A Contrast scan failed. The notification specifies the name of the Scan project that contains the failed scan.
  - **Email digest:** A daily summary of Contrast activities. (Email only)

### Enable subscription notifications for integrations

To enable subscriptions for a particular integration, select **Add integration** to add an integration or select an existing integration from the dropdown at the top of the Integrations column.

### Create custom notifications

As an Organization Administrator, you can set notification defaults, or create custom notifications.

To create a custom notification:

Select **Organization settings > Notifications > Create notification** at the top of the **Custom notifications** list. In the window that appears, fill out the following form fields.

1. Use the radio buttons to choose **Vulnerability** or **Attack**.
2. Choose a **Name** for the notification.

3. Use the dropdown to set the notification **Interval** as *Daily*, *Weekly*, or *On Event*.
4. Enter a **Description** for the notification's purpose.
5. Click in the multiselect field to choose the **Applications** for which this notification applies.
6. Choose the **Application Tags** for which this notification applies.
7. Choose which organization **Users** should receive the notifications.
8. Use the dropdowns to choose your **Conditions**.

Click the **Add Condition** link to add a row.

Contrast supports these conditions for custom notifications:

| Notification types | Condition                         | Description                                                                                                                                                                                   |
|--------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Category           | Is or Is Not                      | Categories are high-level groupings of rule types such as Authentication, Injection, Cryptography, etc. There are 11 categories within Contrast rule types.                                   |
| Impact             | Is, Is Lower Than, Is Higher Than | Impact is measured in High, Medium and Low ratings based on how a rule type affects a given organization. Every rule type has a default impact configuration setting which can be customized. |
| Likelihood         | Is, Is Lower Than, Is Higher Than | Likelihood is measured in High, Medium and Low ratings based on how frequent a rule type may occur. Every rule type has a default likelihood configuration setting that can be customized.    |
| URL                | Is, Contains, Starts With         | A specific URL from an application.                                                                                                                                                           |
| Class              | Is, Contains, Starts With         | A specific Java or .NET class.                                                                                                                                                                |
| Method             | Is, Contains, Starts With         | A specific Java or .NET method.                                                                                                                                                               |



### IMPORTANT

If you choose multiple conditions, Contrast uses AND logic for the notifications. Contrast generates the notifications when all selected conditions apply to the situation.

## Customize score settings at an organization level

Contrast designates an [application score \(page 1557\)](#), which can optionally depend on a [library score \(page 1216\)](#). To customize score settings at an organization level:

1. Under [organization settings \(page 1440\)](#), select **Score settings**.
2. Under **Overall score**, choose how applications in this organization are scored:
  - **Default score** is the average of your application's library score and its custom code score.
  - **Custom code-only score** ignores library score when calculating the overall application score. If you select this option, you can click to select specific languages, or apply it to all languages.
3. Under **Library score**, choose how libraries in this application are scored:
  - **Default score** uses an algorithm that includes vulnerabilities, as well as the age and versioning of a library.
  - **Vulnerability-only score** bases scoring solely on vulnerabilities present in the library.
4. Select **Save**.



### TIP

A RulesAdmin can configure policy settings in **Policy Management** so that any library in violation automatically receives a failing score (F). Once these settings are chosen, you'll see an alert message in Score Settings. Clicking the policy link in the alert navigates you to Library Policy, where administrators may view and revise these settings.



## Require vulnerability approval

As an Organization Administrator, you can [require administrative approval when closing vulnerabilities \(page 1406\)](#) in your organization. You must be an Organization RulesAdmin with RulesAdmin permissions for the target application in order to [approve or deny vulnerability closures \(page 1322\)](#).

To configure this requirement:

1. In the **user menu**, select **Policy management > Vulnerability management > Vulnerability behavior**.
2. Select the box next to **Require administrator approval when closing vulnerabilities**.
3. Choose the statuses and severities of vulnerabilities that should automatically go into a **Pending** state when a user moves to close them.
4. When a user requests to close any qualifying vulnerabilities, Contrast sends an in-app notification to all Organization Administrators saying that a review is needed.  
Each vulnerability status will remain **Pending** until an Organization Administrator submits a review of the closure. To qualify for administrative approval, *both* a status and severity must be selected. If a reviewer denies the closure of a vulnerability, they must provide a reason for denial. Once confirmed, the reviewer's feedback appears in the vulnerability's **Activity** tab.  
If you disable the feature, any pending closures are automatically approved.



### NOTE

While in a **Pending** state, the vulnerability's previous status still applies for the purpose of organizational reports and statistics.

## View audit log (hosted customers) ☹

Contrast captures activity about user sessions including changes to settings or licenses, actions on vulnerabilities, and much more.

### Before you begin

- This feature is supported for hosted customers only. On-premises customers should visit [View audit log \(page 1462\)](#).
- If you are using [role-based access control \(page 1565\)](#), the View audit logs action is required. Role-based access control is part of the Contrast pre-release customer testing program. If you want access to this feature, contact your Contrast representative.
- If you are using [users and groups \(page 1445\)](#) for access control, an Organization Admin role is required.

### Steps

1. From the user menu, select **Organization settings**.
2. Select **Audit log**.
3. Search for a message or specify a date range.  
You can search for text or a specific date.



**Organization Settings**

Organization

Groups

Users

Access Control

**Audit Log**

Security

Agent Keys

Last week

| GENERATED ON        | MESSAGE                                              |
|---------------------|------------------------------------------------------|
| 2024/16/10 10:55 AM | auto-test-user@ cations [ ] .vulne 271b6}. Justifica |

## Audit log details

The audit log contains these details:

|                       |                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alerts                | Creating<br>Deleting<br>Updating                                                                                                                                                                                                                                                                                                                                                               |
| Applications          | Applying a license<br>Archiving<br>Changing Assess rule configurations<br>Changing organization settings<br>Enabling/disabling a rule<br>Merging/unmerging<br>Restoring<br>Resetting                                                                                                                                                                                                           |
| Attacks               | Adding notes to events<br>Creating/Editing/Deleting notes<br>Suppressing                                                                                                                                                                                                                                                                                                                       |
| Bugtrackers           | Creating<br>Updating                                                                                                                                                                                                                                                                                                                                                                           |
| Email                 | Adding domains<br>Sharing libraries                                                                                                                                                                                                                                                                                                                                                            |
| Groups                | Creating/Updating/Modifying membership of organization groups                                                                                                                                                                                                                                                                                                                                  |
| IP ranges             | Adding<br>Removing                                                                                                                                                                                                                                                                                                                                                                             |
| Keys                  | Rotating API and Agent service keys                                                                                                                                                                                                                                                                                                                                                            |
| Notification settings | Updating for an organization or user                                                                                                                                                                                                                                                                                                                                                           |
| Patches               | Creating/Updating/Toggling/Deleting virtual patches                                                                                                                                                                                                                                                                                                                                            |
| Policies              | Changing cleanup settings<br>Changing library restrictions<br>Changing password<br>Changing scoring<br>Changing timeouts<br>Creating/Deleting/Disabling/Enabling/Updating compliance policies<br>Creating/Deleting/Updating/Enabling organization remediation policies<br>Creating/Deleting/Updating/Enabling security controls<br>Creating/Deleting/Updating/Enabling rule exclusion policies |

|                                                                                                                         |                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reports                                                                                                                 | <p>Creating reports</p> <p>Vulnerability trend reports</p> <p>Downloading the PDF file for the Aggregated Vulnerability report</p>                                                                                                                   |
| <p>Role-based access control</p> <p>Role-based access control is a preview feature and not turned on for all users.</p> | <p>Creating/Updating/Deleting users</p> <p>Creating/Updating/Deleting resource groups</p> <p>Creating/Updating/Deleting roles: Includes updates to built-in roles.</p> <p>Creating/Updating/Deleting user access groups</p>                          |
| Scan                                                                                                                    | <p>Creating/Deleting scan projects</p> <p>Running a scan</p> <p>Changing the status of a vulnerability</p>                                                                                                                                           |
| Servers                                                                                                                 | <p>Changing defaults</p> <p>Creating notifications</p> <p>Deleting/Disabling/Updating/Removing licenses</p> <p>Enabling/Disabling Protect</p>                                                                                                        |
| SuperAdmin                                                                                                              | <p>Creating</p> <p>Impersonating a user</p> <p>Updating</p>                                                                                                                                                                                          |
| Traces                                                                                                                  | <p>Adding/Editing/Deleting notes</p> <p>Auto-remediation</p> <p>Sharing/Deleting/Merging/Marking status of a trace (or bulk traces)</p> <p>Updating severities</p>                                                                                   |
| Users                                                                                                                   | <p>Adding</p> <p>Activating</p> <p>Changing access</p> <p>Creating/creation via provisioning/in bulk</p> <p>Deleting</p> <p>Granting/Revoking Protect</p> <p>Importing into an organization</p> <p>Underprivileged user attempts</p> <p>Updating</p> |
| Webhooks                                                                                                                | <p>Creating</p>                                                                                                                                                                                                                                      |

## View audit log

Contrast captures activity about user sessions including changes to settings or licenses, actions on vulnerabilities, and much more.

This view is for on-premises customers. If you are a hosted customer, visit [View audit log \(hosted customers\) \(page 1460\)](#).

## Steps

1. Under the **User Menu**, select **Organization Settings > Security**.
2. Select **View Audit Log** on the upper-right of the page.

Contrast captures activity about all user sessions. [View Audit Log](#)



- Use the search fields to look for a specific log by date or name.

**Organization Settings**

- Organization
- Groups
- Users
- Security**
- API
- Single Sign-On
- Integrations
- Servers
- Applications
- Notifications
- Report Settings
- Score Settings

**Audit Log**

Contrast captures activity about all user sessions including changes to settings or licenses, actions on vulnerabilities, and much more

Find Audit Log
Start Date
End Date
Search

40 of 57595 events

| Generated On     | Message                                                                                                                                |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| 01/20/2022 14:51 | User i@contrastsecurity.com updated their account: [language=ja] differs from [language=en]                                            |
| 01/20/2022 14:46 | - User i@contrastsecurity.com successfully logged in from [99. .31].                                                                   |
| 01/20/2022 14:06 | - @contrastsecurity.com at [99. .31] was logged out due to inactivity.                                                                 |
| 01/20/2022 13:35 | User updated their account: [language=en] differs from [language=ja]                                                                   |
| 01/20/2022 13:29 | - User successfully logged in from [75. .150].                                                                                         |
| 01/20/2022 12:38 | - @contrastsecurity.com at [75. .4] was logged out due to inactivity.                                                                  |
| 01/20/2022 12:37 | t@contrastsecurity.com impersonating @contrastsecurity.com - User t@contrastsecurity.com successfully logged in from [109. .37].       |
| 01/20/2022 12:37 | - User @contrastsecurity.com successfully logged in from [73. .16].                                                                    |
| 01/20/2022 12:08 | - User @contrastsecurity.com successfully logged in from [75. .4].                                                                     |
| 01/20/2022 11:43 | - User @contrastsecurity.com successfully logged in from [73. .16].                                                                    |
| 01/20/2022 10:47 | Remediation Policy 'test' disabled by @contrastsecurity.com                                                                            |
| 01/20/2022 10:47 | Remediation Policy 'test' enabled by @contrastsecurity.com                                                                             |
| 01/20/2022 10:36 | @contrastsecurity.com - @contrastsecurity.com - User @contrastsecurity.com successfully logged in from [109. .37].                     |
| 01/20/2022 10:26 | - @contrastsecurity.com at [73. .16] was logged out due to inactivity.                                                                 |
| 01/20/2022 10:13 | - User @contrastsecurity.com successfully logged in from [75. .4].                                                                     |
| 01/20/2022 10:12 | - User @contrastsecurity.com successfully logged in from [75. .4].                                                                     |
| 01/20/2022 09:52 | @contrastsecurity.com impersonating @contrastsecurity.com] User i@contrastsecurity.com is now impersonating user @contrastsecurity.com |
| 01/20/2022 09:51 | @contrastsecurity.com impersonating @contrastsecurity.com] User @contrastsecurity.com is now impersonating user @contrastsecurity.com  |
| 01/20/2022 09:48 | @contrastsecurity.com @contrastsecurity.com - User @contrastsecurity.com successfully logged in from [109. .37].                       |
| 01/20/2022 09:47 | @contrastsecurity.com @contrastsecurity.com - User @contrastsecurity.com successfully logged in from [109. .37].                       |
| 01/20/2022 08:45 | - User @contrastsecurity.com successfully logged in from [31. .58].                                                                    |
| 01/20/2022 08:36 | i@contrastsecurity.com impersonating @contrastsecurity.com] User @contrastsecurity.com is now impersonating user @contrastsecurity.com |
| 01/20/2022 07:45 | Server 'PLogan-1' is offline                                                                                                           |
| 01/20/2022 07:40 | - User @contrastsecurity.com successfully logged in from [31. .58].                                                                    |

## Audit log details

The audit log contains these details:

|        |                                  |
|--------|----------------------------------|
| Alerts | Creating<br>Deleting<br>Updating |
|--------|----------------------------------|

|                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Applications                                                                                                     | <ul style="list-style-type: none"> <li>Applying a license</li> <li>Archiving</li> <li>Changing Assess rule configurations</li> <li>Changing organization settings</li> <li>Enabling/disabling a rule</li> <li>Merging/unmerging</li> <li>Restoring</li> <li>Resetting</li> </ul>                                                                                                                                                                                                                 |
| Attacks                                                                                                          | <ul style="list-style-type: none"> <li>Adding notes to events</li> <li>Creating/Editing/Deleting notes</li> <li>Suppressing</li> </ul>                                                                                                                                                                                                                                                                                                                                                           |
| Bugtrackers                                                                                                      | <ul style="list-style-type: none"> <li>Creating</li> <li>Updating</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Email                                                                                                            | <ul style="list-style-type: none"> <li>Adding domains</li> <li>Sharing libraries</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                      |
| Groups                                                                                                           | Creating/Updating/Modifying membership of organization groups                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| IP ranges                                                                                                        | <ul style="list-style-type: none"> <li>Adding</li> <li>Removing</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Keys                                                                                                             | Rotating API and Agent service keys                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Notification settings                                                                                            | Updating for an organization or user                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Patches                                                                                                          | Creating/Updating/Toggling/Deleting virtual patches                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Policies                                                                                                         | <ul style="list-style-type: none"> <li>Changing cleanup settings</li> <li>Changing library restrictions</li> <li>Changing password</li> <li>Changing scoring</li> <li>Changing timeouts</li> <li>Creating/Deleting/Disabling/Enabling/Updating compliance policies</li> <li>Creating/Deleting/Updating/Enabling organization remediation policies</li> <li>Creating/Deleting/Updating/Enabling security controls</li> <li>Creating/Deleting/Updating/Enabling rule exclusion policies</li> </ul> |
| Reports                                                                                                          | <ul style="list-style-type: none"> <li>Creating reports</li> <li>Vulnerability trend reports</li> <li>Downloading the PDF file for the Aggregated Vulnerability report</li> </ul>                                                                                                                                                                                                                                                                                                                |
| Role-based access control<br><br>Role-based access control is a preview feature and not turned on for all users. | <ul style="list-style-type: none"> <li>Creating/Updating/Deleting users</li> <li>Creating/Updating/Deleting resource groups</li> <li>Creating/Updating/Deleting roles: Includes updates to built-in roles.</li> <li>Creating/Updating/Deleting user access groups</li> </ul>                                                                                                                                                                                                                     |
| Scan                                                                                                             | <ul style="list-style-type: none"> <li>Creating/Deleting scan projects</li> <li>Running a scan</li> <li>Changing the status of a vulnerability</li> </ul>                                                                                                                                                                                                                                                                                                                                        |
| Servers                                                                                                          | <ul style="list-style-type: none"> <li>Changing defaults</li> <li>Creating notifications</li> <li>Deleting/Disabling/Updating/Removing licenses</li> <li>Enabling/Disabling Protect</li> </ul>                                                                                                                                                                                                                                                                                                   |

|            |                                                                                                                                                                                                               |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SuperAdmin | Creating<br>Impersonating a user<br>Updating                                                                                                                                                                  |
| Traces     | Adding/Editing/Deleting notes<br>Auto-remediation<br>Sharing/Deleting/Merging/Marking status of a trace (or bulk traces)<br>Updating severities                                                               |
| Users      | Adding<br>Activating<br>Changing access<br>Creating/creation via provisioning/in bulk<br>Deleting<br>Granting/Revoking Protect<br>Importing into an organization<br>Underprivileged user attempts<br>Updating |
| Webhooks   | Creating                                                                                                                                                                                                      |

## Impersonation

Impersonation lets someone with a [system role \(page 1557\)](#) access an organization as an existing user to troubleshoot issues.

Contrast turns off impersonation for organizations after 24 hours, automatically.

For hosted customers, if the impersonation setting is not visible for your organization, contact [Contrast Support](#). On-premises customers can manage and use impersonation, as needed.

## Impersonation access

By default, the impersonation setting is enabled for all organizations. Organization Admins manage whether you can impersonate another user in an organization.

To change access to impersonation:

- SuperAdmins can turn on or turn off the **Can enable impersonation** setting for a specific organization by [editing the organization \(page 1501\)](#).  
This setting affects whether Organization Admins can see the Impersonation setting for an organization.
- Organization Admins can manage impersonation use by [editing an organization's Security settings. \(page 1466\)](#)

When you turn on impersonation:

- If you have a SuperAdmin role, you can use [impersonation \(page 1512\)](#) by selecting **Impersonate** for an organization on the Organizations page.  
You can impersonate the first Organization Admin for the organization.
- If you have a SuperAdmin role, you can select a user to impersonate on the Users page.
- If you have a SuperAdmin role, you can use [impersonation \(page 1512\)](#) by selecting **Impersonate** for an organization on the Organizations page.  
You can impersonate the first Organization Admin for the organization. You must have access to the organization.

## Audit log

The Contrast audit log shows impersonation activity including:

- When impersonation is turned on or off
- The organization where impersonation occurred
- The server key associated with an impersonation status change
- Rejected impersonation attempts

## Enable impersonation

Use this procedure to turn on [impersonation \(page 1465\)](#) for an organization.

### Before you begin

- Verify that the setting to enable impersonation is visible under **Organization settings > Security**.  
If the setting is not visible:
  - **Hosted customers:** Contact [Contrast Support](#).
  - **On-premises customers:** Ask a SuperAdmin to [edit the organization \(page 1501\)](#) and turn on the **Can enable impersonation** setting.

### Steps

1. From the user menu, select **Organization settings**.
2. Select **Security**.
3. Under Impersonation, select the setting to enable it and select **Save**.

**Impersonation**

Enabling impersonation lets a SuperAdmin impersonate a user in the organization for support and troubleshooting actions. This access expires in 24 hours.

☒ ENABLED Click Save to enable impersonation for this organization

Save

# System Administration

Only on-premises customers require system administration. System administration is handled by Contrast Security for hosted customers.

See an overview of how to [get started on-premises \(page 1467\)](#) or decide how to [manage your system administration \(page 1500\)](#).

## Get started on-premises

As an on-premises customer, you can set up your own instance of Contrast without a connection to the internet. You only need to set this up once per organization.



### IMPORTANT

If you are able to use Contrast as a hosted solution, you don't have to complete the additional installation and maintenance of the Contrast application on-premises.

Contrast hosted is SOC-2 Type II compliant and continuously receives feature updates. To connect to Contrast hosted, use the credentials provided by your administrator to log in and continue to [install an agent \(page 51\)](#).

For on-premises customers, to use Assess, Protect or both, you must complete at least two installations:

- [Install Contrast \(page 1472\)](#)
- [Install an agent for each application server \(page 51\)](#)

The Contrast installation contains all embedded components that make up the system configuration, including a Tomcat servlet container, MySQL database instance, and an AdoptOpenJDK Hotspot Java Virtual Machine. All of these components are embedded within the installation binary and deployed to a single server as part of the Contrast architecture.

Before installing the Contrast application, verify that your environment complies with the:

- [System requirements \(page 1468\)](#)
- [Sizing recommendations \(page 1469\)](#)

After installation, you can further configure:

- [Tomcat \(page 1484\)](#)
- [JRE \(page 1485\)](#)
- [HTTPS \(page 1485\)](#)
- [Contrast settings \(page 1530\)](#)

For the long term, make sure you have a plan to:

- [Manage system administration \(page 1500\)](#)
- [Configure settings \(page 1530\)](#)
- [Maintain the Contrast system \(page 1537\)](#)

## Contrast installation

Options for installing and deploying Contrast in an on-premises environments include:

- [Install with the Contrast installer \(page 1472\)](#)
- Use a [distributed MySQL database \(page 1476\)](#)
- [Deploy with a WAR file. \(page 1475\)](#)
- Deploy in a [distributed environment \(page 1479\)](#)

### Next steps

- Review the [Contrast system requirements. \(page 1468\)](#)
- Review the [Contrast sizing recommendations \(page 1469\)](#).
- Download the Contrast installer from the [Contrast Hub](#) or with [curl commands \(page 1470\)](#).

## Contrast system requirements

The following table lists the system requirements for installing the Contrast application.

Before you install Contrast:

- [Download the Contrast Installer \(page 1471\)](#) from the [Contrast Hub](#) or by using [curl commands \(page 1470\)](#).
- Review the [sizing recommendations. \(page 1469\)](#)

| Requirement      | Recommended                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Minimum                                                                                                                                  | Notes                                                                                      |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| OS Architecture  | 64-bit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 64-bit                                                                                                                                   | Due to memory requirements, the Contrast application can only run on 64-bit architectures. |
| Operating system | <ul style="list-style-type: none"><li>• RHEL 8</li><li>• RHEL/CentOS 7</li><li>• Microsoft Windows 2019</li><li>• Ubuntu 18.04 LTS or higher (up to 20.04 LTS)</li></ul>                                                                                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"><li>• RHEL/CentOS 7</li><li>• Microsoft Windows 2012 R2 or higher</li><li>• Ubuntu 16.04 LTS</li></ul> | Support for CentOS 6 ended on December 1, 2020.                                            |
| Java             | Java is bundled with the installer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                          |                                                                                            |
| MySQL            | <ul style="list-style-type: none"><li>• For on-premises customers using Contrast versions 3.8.11 or prior, MySQL 5.7.23 is bundled with the installer.</li><li>• Beginning with Contrast 3.9.0, MySQL 8.0 is bundled with the Linux on-premises installer.</li><li>• Beginning with Contrast 3.9.3, MySQL 8.0 is bundled with the Windows on-premises installer.</li><li>• Beginning with Contrast 3.12.1, MySQL 8.4 is bundled with the Linux and Windows on-premises installer.</li></ul> <p>If you experience issues, <a href="#">contact Support</a>.</p> |                                                                                                                                          |                                                                                            |



### IMPORTANT

- For on-premises customers using MySQL 8.0 or later (which has binary logging enabled by default), the system variable `log_bin_trust_function_creators` must be set to **ON** so that Contrast can create stored procedures. For more details, see [MySQL documentation](#).
- For on-premises customers using MySQL 8.0 or later, the system variable `local_infile` must be set to **ON** so that Contrast can accept CSV files to help the import of SCA data. For more details, see [Security Considerations for LOAD DATA LOCAL](#).



## MySQL and Java requirements for distributed installations

Use these requirements if you are deploying Contrast as a distributed application or are using your own MySQL database. For all other on-premises installations, use the MySQL and Java software included in the Contrast installer.

If you experience issues, [contact Support](#)

| Requirement | Recommended                                                                                                                                                                                                          | Minimum                                                                                                                         |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Java        | 17.0.0 - 17.0.x<br><br>Contrast displays a message if you try to use a version outside of this range.                                                                                                                | 17.0.0                                                                                                                          |
| MySQL       | <ul style="list-style-type: none"><li>• 8.4 (Contrast 3.12.1 or later)</li><li>• 8.0.36 (Contrast 3.11.0 or later)</li><li>• 8.0.30 (Contrast 3.9.1 or later)</li><li>• 5.7.23 (Contrast 3.9.0 or earlier)</li></ul> | <ul style="list-style-type: none"><li>• 8.0.27 (Contrast 3.9.1 or later)</li><li>• 5.7.23 (Contrast 3.9.0 or earlier)</li></ul> |

## SuperAdmin account

To ensure that connections for integrations work correctly, create a SuperAdmin account that is different from the default account that Contrast Security created. Continuing to use the default SuperAdmin account can result in connection errors.

## Distributed configuration for large number of agents

If you plan to use more than 100 connected agents, use a [distributed configuration \(page 1479\)](#).

Without a distributed configuration for this situation, you are likely to experience performance issues.

## Sizing recommendations for the Contrast application

The CPU and memory resources for Contrast can vary based on the number of agents connected and application traffic communicating back to the Contrast application. The recommendations on this page apply to the application service.

Additional factors that impact performance include:

- **Web traffic from consumers of Contrast reporting data.**

Contrast is a highly transactional system that presents calculated and real-time data sets back to consumers of the data. The more users interface with the system, the greater the demand for computing and memory.

- **Large amounts of data maintained in the application over extended periods of time.**

You can proactively purge data over time or choose to keep the data. With any transactional system, the larger the data set to query against, the greater the computing requirements.

- **More than 100 connected agents**

If you plan to use more than 100 connected agents, use a [distributed configuration \(page 1479\)](#).

Without a distributed configuration for this situation, you are likely to experience performance issues.

Use these guidelines to choose the appropriate mix of resources to scale the requirements to your workload:

- **Small workload:** A small workload is about three to 30 agents communicating to Contrast, and about five to 25 web traffic end users who access the system multiple times a day and actively use alerts, reports and integrations.

The greater the number of connected agents, the greater the memory requirements are for Contrast to handle in-flight traces. Storage depends on the life of trace data and the preservation of log files by system administrators.

| vCPUs    | Clock speed        | RAM            | Storage          |
|----------|--------------------|----------------|------------------|
| ~4 to ~8 | 2.5 GHz to 3.3 GHz | 16 GB to 24 GB | 100 GB to 200 GB |

- **Large workload:** A large workload is about 30 to 100 agents communicating to Contrast, and more than 25 web traffic users for full-scale enterprise deployments. End users access the system multiple times of day, and actively engage in Contrast features such as alerts, reports and integrations. The greater the number of connected agents and end users, the greater the memory requirements for Contrast to handle in-flight traces. Storage depends on the life of trace data and the preservation of log files by system administrators.

| vCPUs     | Clock speed        | RAM            | Storage          |
|-----------|--------------------|----------------|------------------|
| ~8 to ~16 | 2.5 GHz to 3.3 GHz | 24 GB to 48 GB | 200 GB to 500 GB |



### IMPORTANT

Regardless of your workload size, allocate at least 16 GB of RAM to the Contrast application.



### TIP

Follow the large workload guidelines if you are using the Contrast REST API architecture for automation or data extraction purposes and for continuous integration of agents with large automated regression suites.

## Download Contrast software with curl commands

When your license is provisioned, a good way to download the Contrast installer and licenses is to use curl commands. If you're unsure about who holds access for your company, [contact Support](#).

You can also download other software files using curl commands.

Alternatively, you can download installers and license files from the [Contrast Hub](#).



### NOTE

Starting with Contrast 3.9.10, the installer doesn't include the library and CVE data. For an air-gapped installation, you need to download this data manually. If you have internet access, you can configure your system to [upgrade this data automatically \(page 1498\)](#).

## Steps for downloading installation files

1. To download the latest version of the Linux Contrast installer, use this command:

```
curl -L https://hub.contrastsecurity.com/h/api/artifacts/installer/sh/nocache -u <ContrastHubUsername> -o "contrast-latest-nocache.sh"
```

Replace <ContrastHubUsername> with the username for your Contrast Hub account. After you enter the command, you are prompted to enter the password.

2. To download the latest version of the Windows Contrast installer, use this command:

```
curl -L https://hub.contrastsecurity.com/h/api/artifacts/installer/exe/nocache -u <ContrastHubUsername> -o "contrast-latest-nocache.exe"
```

Replace `<ContrastHubUsername>` with the username for your Contrast Hub account. After you enter the command, you are prompted to enter the password.

3. **Air-gapped installations:** To download the library and CVE data, use this command:

```
curl -JLO https://hub.contrastsecurity.com/h/api/artifacts/ardy_export  
-u <ContrastHubUsername>
```

Replace `<ContrastHubUsername>` with the username for your Contrast Hub account. After you enter the command, you are prompted to enter the password.

4. To download the latest Contrast WAR file, use this command:

```
curl -JLO https://hub.contrastsecurity.com/h/api/artifacts/war -u  
<ContrastHubUsername>
```

Replace `<ContrastHubUsername>` with the username for your Contrast Hub account.

The WAR file is useful if you have an existing Tomcat server and you want to install Contrast on that server.

5. To download the license file, use this command:

```
curl --request GET --url https://hub.contrastsecurity.com/h/rest/  
customer/license/text -u <ContrastHubUsername> > license.lic
```

Replace `<ContrastHubUsername>` with the username for your Contrast Hub account. After you enter the command, you are prompted to enter the password.

6. After you download the files, [install Contrast \(page 1472\)](#).

## Additional software downloads

You can use this curl command to download additional Contrast software:

```
curl -JLO https://hub.contrastsecurity.com/h/api/artifacts/<OtherSoftware>  
-u <ContrastHubUsername>
```

Replace `<Other Software>` with any of the these values:

- For the .NET Framework agent, use `dotnet`
- For the .NET Core agent, use `dotnet_core`
- For the .NET Core installer for IIS, use `dotnetcore_installer_for_iis`

## Download the Contrast installer

When your license is provisioned, you get access to a [Contrast Hub](#) account where you can download installers and licenses. If you're unsure about who holds access for your company, [contact Support](#).

Alternatively, you can use [curl commands \(page 1470\)](#) instead of the Contrast Hub to download installers and licenses.



### NOTE

Starting with Contrast 3.9.10, the installer doesn't include the library and CVE data. For an air-gapped installation, you need to download this data manually. If you have internet access, you can configure your system to [upgrade this data automatically \(page 1498\)](#).

## Steps

1. Log in to the Contrast Hub with the credentials provided to you.
2. Download the Contrast installer for your operating system.
  - a. Select **Downloads** in the header.
  - b. Select **Installers**
  - c. Select the file to download:



### TeamServer

| Installers        |         |              |                                              |           |                                                  |
|-------------------|---------|--------------|----------------------------------------------|-----------|--------------------------------------------------|
| Version           | OS      | Release Date | File Name                                    | File Size |                                                  |
| 3.8.11.1683721903 | linux   | 01/11/2022   | Contrast-3.8.11.1683721903-NO-CACHE.sh       | 869.91 MB | <a href="#">Download</a> <a href="#">MD5 Sum</a> |
| 3.8.11.1683721903 | windows | 01/11/2022   | Contrast-3.8.11.1683721903--NO-CACHE-x64.exe | 874.14 MB | <a href="#">Download</a> <a href="#">MD5 Sum</a> |

- **Linux installer:** Contrast<version>-NO-CACHE.sh
  - **Windows installer:** Contrast<version>-NO-CACHE-x64.exe
3. **Air-gapped installations:** [Download the library and CVE data \(page 1497\)](#).  
If you have internet access, you don't have to download the data; you can configure your system to [upgrade library and CVE data automatically \(page 1498\)](#) after installation.
  4. Download the license file.  
The license file is configured with a [SuperAdmin \(page 1557\)](#) account and a regular user account. You'll need the license to complete the installation of the Contrast application.
    - a. Select **Home** in the header.
    - b. Select **Licenses**.
    - c. Select the license file to download.
  5. After you download the files, [install Contrast. \(page 1472\)](#)

## Install Contrast on-premises



### IMPORTANT

These installation instructions are for on-premises use only.

If you are using the hosted version of Contrast, you can [instrument your applications \(page 51\)](#) without installing Contrast. Get started by [installing an agent \(page 51\)](#).

Contrast updates the library data approximately every 24 hours. If you have internet access, your Contrast installation pulls the data from a Contrast database hosted on the cloud. If you don't have internet access (air-gapped installations), you can download the data manually.

## Before you begin

- [Download the Contrast Installer \(page 1471\)](#) from the [Contrast Hub](#) or by using [curl commands. \(page 1470\)](#)

- If you don't have internet access (air-gapped installations), [download the library data manually \(page 1497\)](#).
- Review the [system requirements \(page 1468\)](#) and [sizing recommendations \(page 1469\)](#).

## Steps

1. Preconfigure your base operating system with a shared library for running MySQL. Additionally, the system package `fontconfig` is required on Linux to install fonts. Run the command for your operating system:

- **RHEL 8:**

```
[contrast@myserver ~]# dnf install -y ncurses-compat-libs libaio fontconfig
```

- **CentOS or RHEL 7:**

```
[contrast@myserver ~]# yum install -y libaio fontconfig
```


- **Ubuntu or Debian:**

```
[contrast@myserver ~]# apt-get install -y libaio1 libaio-dev fontconfig
```

- **Windows:** MySQL requires [Microsoft Visual C++ 2015-2022 Redistributable Update..](#)

2. Run the installer as a privileged user.
  - On Windows, right-click on the installer and select **Run As Administrator**.
  - On Linux, use the `sudo` command to start the installer.
3. Respond to installer questions according to your situation. (For example, you can [create a MySQL backup \(page 1539\)](#) or [configure the JRE \(page 1485\)](#)).

You can further configure Contrast after startup. You can customize installer behavior using these command line arguments when you run the installation script:

| Command line argument          | Description                                                                                                                                                                                                                                                                                              |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-h -help</code>          | Shows help for common command line arguments.                                                                                                                                                                                                                                                            |
| <code>-c</code>                | Forces the installation to run in Console mode.                                                                                                                                                                                                                                                          |
| <code>-q</code>                | Executes the installer in Unattended mode.                                                                                                                                                                                                                                                               |
| <code>-g</code>                | Forces the installation to run in GUI mode. (Windows only).                                                                                                                                                                                                                                              |
| <code>-console</code>          | If the installer is executed in Unattended mode and the <code>-console</code> argument is passed on Windows, a second console shows the output of the installer.                                                                                                                                         |
| <code>-overwrite</code>        | Forces the installer to overwrite all files in Unattended mode regardless of the overwrite policy specified in the installer.                                                                                                                                                                            |
|                                | <div><b>CAUTION</b><br/>This can cause your configuration to be overwritten back to default values.</div>                                                                                                             |
| <code>-dir</code>              | Only valid in Unattended mode; specifies the directory where Contrast should be installed.                                                                                                                                                                                                               |
| <code>-Dinstall4j.debug</code> | By default, the installer catches all exceptions, creates a crash log and informs the user about the location of that log file. This might be inconvenient when debugging an installer; so, this system property switches off the default mechanism, and exceptions are printed to <code>stderr</code> . |

| Command line argument                                                                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-Dinstall4j.keepLog=true</code><br><code>-Dinstall4j.alternativeLogfile=[path]</code> | <p>The installer creates a log file prefixed <code>i4j_log</code> for all installations and uninstallation in your temp directory. This log file can be helpful for debugging purposes. If your installer contains an <b>Install files</b> action and terminates successfully, the log file is copied to <code>[installation dir]/install4j/installation.log</code>. Otherwise, the file is deleted after the installer or uninstaller terminates by default.</p> <p>When using the <code>-Dinstall4j.keepLog=true</code> option, the log file won't be deleted. With the <code>-Dinstall4j.alternativeLogfile=[path]</code> option, the log file is copied to the file specified with <code>[path]</code>. This should be an absolute path name. Neither option has any effect if the log file has already been copied to the installation directory.</p> |
| <code>-varfile (filename)</code>                                                            | Specifies a variable-file to be used. When installing in Unattended mode, this allows you to provide customizations to the default values set by the installer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <code>--skip-preflight</code>                                                               | Skips preflight checks (current user is root, dependencies present). If using this parameter, it must be the first parameter passed on the command line.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |



### NOTE

If you're using a distributed setup for the Contrast application, you should use a distributed MySQL instance during setup.



### IMPORTANT

Client agents use the Contrast URL to communicate back to the application. Contrast makes the best attempt to determine the hostname and pre-populate this value; but, if the provided hostname isn't resolvable by clients on the network, they won't be able to communicate back to the server.

Please set this value to a Contrast host or load balancer that's reachable by your agent hosts.

- Installation completes and the Contrast application performs its initial configuration. To confirm it has finished, you can visit the URL you specified above.



### NOTE

If you're [upgrading your version of Contrast \(page 1495\)](#), any required update tasks are included at this point.

- The first time the Contrast application starts after installation, there are [only two users that can log in \(page 1482\)](#) to the user interface: the default SuperAdmin and the default Organization Administrator. Go to `http://<ContrastServer>:8080/Contrast` (where `<ContrastServer>` is either the IP address or hostname setup during installation), log in as both users and change the password for each.



### IMPORTANT

To keep your application secure, either disable these default logins and create new ones, or at very least change the default passwords.

- Once Contrast is installed, the next step is to [configure system settings \(page 1530\)](#) (for example, allocate licenses, set up authentication, and allow users to receive notifications and run reports).

To ensure your library data is current, configure your system to [upgrade library data automatically \(page 1498\)](#). If you don't have internet access (air-gapped installations), [update library data manually \(page 1497\)](#).

## Additional options

After you install Contrast, you have options for expanding your installation:

- Use a [distributed MySQL database \(page 1476\)](#)
- Deploy with a [WAR file \(page 1475\)](#)
- Deploy in a [distributed environment \(page 1479\)](#)

## Deploy Contrast with a WAR file

Using this procedure lets you manage the different components of the Contrast installation separately. After using this method to deploy Contrast, you can upgrade your configuration by replacing the existing WAR file with a new one.

## Before you begin

- [Install Contrast. \(page 1472\)](#)

## Steps

1. Create a compressed file that contains the following files from the directory where you installed Contrast (for example, `/usr/local/contrast`):

- `data/agents/`
- `data/conf/`
- `data/esapi/`
- `data/.contrast`
- `data/.initialized`
- `data/cache/`
- `data/contrast.lic`
- `webapp/Contrast.war`

**Example:** This example shows how to create a TAR file that contains the Contrast files:

```
$ cd /usr/local/contrast
$ tar -czvf ~/ctdc.tar.gz data/agents data/conf data/contrast.lic data/
esapi/ data/cache/ data/.initialized data/.contrast webapp/Contrast.war
```

2. Install Tomcat and Java:

- Use the same version of Tomcat that is included in the Contrast installer.
- [A supported version of Java \(page 1468\)](#)

3. Set up the `contrast-data` directory.

The volume where you create this directory must be large enough for log files, caches and ActiveMQ persistence. For best performance, use a separate volume to handle growth without impacting your overall system.

- a. Create the `contrast-data` directory with a command similar to the following:

```
$ mkdir /opt/contrast-data
```

This example creates the directory in the `/opt` directory, but you can create it in any location.

- b. Unarchive the compressed file you created in step 1 into the `contrast-data` directory.
- c. Check the contents of the directory using a command similar to the following:

```
ls /opt/contrast-data/conf
```

You should see files named `general.properties` and `database.properties` among several others.

- d. To ensure there are no access issues, change the owner and group for the `contrast-data` directory with a command similar to the following:

```
$ chown -R tomcat7:tomcat7 /opt/contrast-data
```

4. To complete the configuration, in the `JAVA_OPTS` environment variable, set the location of `contrast.home` and `contrast.data.dir` to the location where you unarchived the compressed file.

This example shows one way to set the `JAVA_OPTS` variable. Use the documentation for your environment to determine the best way to set this variable.

```
-XX:+UseTLAB
-XX:+UseCompressedOops
-XX:+UseConcMarkSweepGC
-XX:+UseParNewGC
-XX:CMSFullGCsBeforeCompaction=1
-XX:+CMSParallelRemarkEnabled
-XX:+PrintVMOptions
-XX:+PrintCommandLineFlags
-Xmx4g
-Xms4g
-server
-XX:MaxPermSize=768m
-Dcontrast.data.dir=/opt/contrast-data
-Dcontrast.home=/opt/contrast-data
-XX:+HeapDumpOnOutOfMemoryError
-Xloggc:/opt/contrast-data/gc.out
```

5. Place the `Contrast.war` file in the Tomcat `webapps` directory.  
Create a symbolic link, copy, or move the `Contrast.war` file from the location where you unarchived the compressed file to the Tomcat `webapps` directory.
  - This example shows how to create a symbolic link to the file in a Ubuntu environment:

```
$ sudo ln -s /opt/contrast-data/webapp/Contrast.war /var/lib/tomcat7/webapps/Contrast.war
```

- This example shows how to copy the file in a Ubuntu environment:

```
$ cp /opt/contrast-data/webapp/Contrast.war /var/lib/tomcat7/webapps/Contrast.war
```

## Create a distributed MySQL environment

You can use an external MySQL database (an open-source database that runs on both Windows and Linux) with your existing on-premises installation. For example, this is necessary if you are using a [distributed deployment of Contrast \(page 1479\)](#).



**TIP**

Work with your Operations and/or Database team to ensure a secure and durable installation.

You can use a [snippet of Ansible](#) that you can use to install the MySQL on Ubuntu 14.04.

You can also [download the gpg keyfile](#) from MySQL. Contrast changes the bind address to "\*", but recommends binding your MySQL server to the IP of your application server. Create a user and grants that offer access to only the Contrast schema and limited to the host IP address or subnet.

## Steps

In the following steps, replace `<jdbc.host>`, `<jdbc.port>`, `<jdbc.user>`, `<jdbc.pass>`, and `<jdbc.schema>` with your host, port, user, password, and schema.

1. Install and configure a [supported version \(page 1468\)](#) of MySQL on the database server host.
2. Create a maintenance window for Contrast downtime.
3. [Back up the embedded MySQL database \(page 1539\)](#).
4. Connect to MySQL.

- **Windows:**

```
mysql -h <jdbc.host> -P <jdbc.port> -u <jdbc.user> -p <jdbc.schema>
```

- **Linux:**

```
./mysql -h <jdbc.host> -P <jdbc.port> -u <jdbc.user> -p <jdbc.schema>
```

5. Create the Contrast database with this command:

```
create database <jdbc.schema>;
```

6. Create a MySQL user with this command:

```
CREATE USER '<jdbc.user>'@'%' IDENTIFIED BY '<jdbc.pass>';
```

7. Grant permissions for the Contrast user with this command:

```
GRANT ALL PRIVILEGES ON *.* to '<jdbc.user>'@'%' ;.
```

8. Exit from MySQL.

9. Restore the MySQL backup. Replace `<backup_location>` with your backup location and `<backup_filename>` with your backup filename.

- **Windows:**

```
mysql -h <jdbc.host> -P <jdbc.port> -u <jdbc.user> -p <jdbc.schema> <  
<backup_location>/<backup_filename>
```

- **Linux:**

```
./mysql -h <jdbc.host> -P <jdbc.port> -u <jdbc.user> -p <jdbc.schema>  
< <backup_location>/<backup_filename>
```

10. Update the configuration in the [encrypted properties editor \(page 1537\)](#). Edit the encrypted file `$CONTRAST_HOME/data/conf/database.properties`. Look for `database.type`; if it doesn't exist, create a new property. Set this value to `distributed` and modify the database connection values to point to the distributed database you want to use.

```
user@ubuntu:/opt/contrast/bin$ ./edit-properties -e ../data/esapi/  
-f ../data/conf/database.properties
```

```

jdbc.type : MYSQL
database.prod.dir : /opt/contrast/data/db
jdbc.debug : false
jdbc.pass : pass
jdbc.schema : contrast
jdbc.host : ubuntu
database.bk.time : 6:39:14
jdbc.port : 3306
database.bk.enabled : false
database.enabled : true
jdbc.url : jdbc:mysql://
ubuntu:3306/contrast
jdbc.user : contrast
database.bk.dir : /opt/contrast/data/
backups/db
jdbc.dialect :
com.aspectsecurity.contrast.teamserver.persistence.CustomMySQL5Dialect
jdbc.driver : com.mysql.jdbc.Driver

```

```

Enter the name of the property to edit [q to Quit]: database.type
Create new Property [database.type](y/N): y
Enter a value for the property: distributed

```

```

jdbc.type : MYSQL
database.prod.dir : /opt/contrast/data/db
jdbc.debug : false
jdbc.pass : pass
jdbc.schema : contrast
jdbc.host : ubuntu
database.bk.time : 6:39:14
jdbc.port : 3306
database.bk.enabled : false
database.enabled : true
database.type : distributed
jdbc.url : jdbc:mysql://
ubuntu:3306/contrast
jdbc.user : contrast
database.bk.dir : /opt/contrast/data/
backups/db
jdbc.dialect :
com.aspectsecurity.contrast.teamserver.persistence.CustomMySQL5Dialect
jdbc.driver : com.mysql.jdbc.Driver

```

```

Enter the name of the property to edit [q to Quit]:

```



## NOTE

If you're converting from a default embedded database configuration to a distributed configuration, `database.bk.enabled` also needs to be set to `false`. It's your responsibility to configure your own backups when running a distributed database configuration with Contrast.

11. If your on-premises installation is on a Windows system, remove the `contrast-server` service dependency on MySQL.

Before you restart Contrast, remove the `contrast-server` service dependency on the MySQL service with the following command:

```
sc config contrast-server depend= ""
```

## 12. Restart Contrast (page 1483).

### Distributed deployment of Contrast

A distributed configuration of Contrast deploys the database and application server to separate servers. Use a distributed configuration if you:

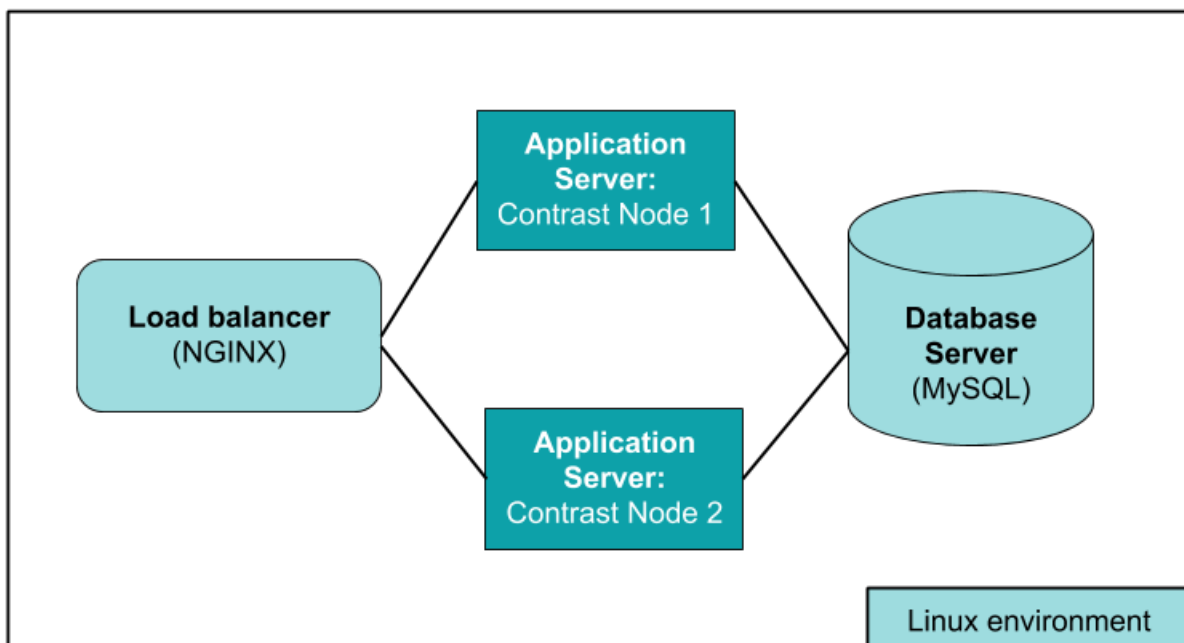
- Plan to use more than 100 connected agents  
Without a distributed configuration for this situation, you are likely to experience performance issues.
- Want to use load-balancing for better performance and scalability
- Require additional administration and management

### Distributed configuration example

This example shows a configuration for installing Contrast in a Linux environment at `/usr/local/contrast`. Your organization may use different environments or have different guidelines on where to install third-party software.

The example shows a configuration using these servers:

- A load-balancer
- A database server
- Two application servers running the Contrast application.  
You can more servers, as needed.



### Before you begin

- Distributed deployment requires an understanding of your environment and the loads it can easily handle.  
To determine whether it's best to use a distributed deployment of Contrast or a dedicated instance, [contact Support](#).
- If you are **already using Contrast**, use your existing instance as **Application Server 1** and be sure it uses a distributed database configuration. Before you continue, you should:

- If you don't already have one, [create a distributed MySQL environment \(page 1476\)](#).
- Determine the version of Contrast running on **Application Server 1** by looking at the contents of the `$CONTRAST_HOME/VERSION` file.
- If the installer you plan to use to create **Application Server 2** is using a higher version of Contrast than **Application Server 1**, you must first [upgrade \(page 1495\)](#) **Application Server 1** to the same version.
- If you are **new to Contrast**, you should:
  - Install and configure MySQL on the database server, as described in steps 1 through 8 in [Create a distributed MySQL environment \(page 1476\)](#).
  - [Install Contrast \(page 1472\)](#) on **Application Server 1** with a distributed database configuration. For example:

```
Choose a MySQL database configuration.
Default [1, Enter], Distributed [2]2
Host
[localhost]
<enter hostname of MySQL server>

Port
[13306]
<enter port to be used to access MySQL server - usually 3306>

Credentials
Username
<enter name of MySQL user that was created for Contrast>

Password
<enter password for MySQL user>
```

## Set up distributed servers

1. Copy the following files from **Application Server 1** to a temporary location on **Application Server 2**:
  - `$CONTRAST_HOME/data/conf/server.properties`
  - The associated Server KeyStore file if you [configured \(page 1485\)](#) **Application Server 1** for HTTPS.
2. If you configured [Single Sign On \(SSO\) \(page 1524\)](#) on **Application Server 1**, complete these steps:
  - a. Run the [encrypted properties editor \(page 1537\)](#) against `$CONTRAST_HOME/data/conf/saml.properties` to retrieve the configured values. Enter `q` at the prompt (you aren't changing any values). For example:

```
$ bin/edit-properties -e data/esapi/ -f data/conf/saml.properties

authenticator.saml.keystore.default.key      : some_alias
authenticator.saml.secret.url                :
authenticator.saml.keystore.path             : /path/to/
samlKeystore.jks                             :
authenticator.saml.keystore.password          : changeit
authenticator.saml.keystore.passwordMap      :
some_alias=changeit

Enter the name of the property to edit [q to Quit]: q
```

- b. Create a new file named `saml.properties.cleartext` containing the values you retrieved above, but formatted with an `=` replacing the `:`, for example:

```
authenticator.saml.keystore.default.key=some_alias
authenticator.saml.secret.url=
authenticator.saml.keystore.path=/path/to/samlKeystore.jks
authenticator.saml.keystore.password=changeit
authenticator.saml.keystore.passwordMap=some_alias=changeit
```

- c. Copy the associated SAML KeyStore from **Application Server 1** to a temporary location on **Application Server 2**.
3. [Install Contrast \(page 1472\)](#) on **Application Server 2** with the same distributed configuration that you used for **Application Server 1**.
4. When the installation has completed, [stop \(page 1481\)](#) the Contrast Server on this Application Server.
5. Place the `server.properties` file, the associated Server Keystore, the `saml.properties.cleartext` file and the associated SAML KeyStore (where applicable) in the same directories on **Application Server 2** (usually `$CONTRAST_HOME/data/conf/`).
6. [Start \(page 1481\)](#) the Contrast Server on **Application Server 2**.
7. Test the [default users \(page 1482\)](#) created by the application to be sure they work with both Contrast **Application Servers (1 and 2)**.
8. Set up a load balancer (like NGINX) on the fourth server. If you choose NGINX, use the [basic installation instructions](#).



#### NOTE

Contrast requires sticky or persistent sessions for better performance. For example, with an NGINX load balancer, use the Ip Hash method to guarantee that requests from the same address get to the same server if it's available.

9. Once you set up the server, you must configure Contrast to point to your load balancer. To do this, edit the `/data/conf/general.properties` file on each node. Change the `teamserver.url` value in the YAML config file to that of the load balancer and restart the Contrast application server.

If you are doing health checks for the load balancer, use this URL:

```
<CONTRAST_SERVER>/Contrast/api/public/ng/information
```

where `<CONTRAST_SERVER>` is the host name of the Contrast application server.



#### IMPORTANT

Agents use the Contrast URL to communicate back to the application. Contrast attempts to determine the hostname and pre-populate this value. If clients on the network can't resolve the hostname you provide, they won't communicate back to the server. Please set this value to a Contrast host or load balancer that the agent hosts can reach.

When installation is complete, Contrast begins an initial configuration. It can take two to three minutes to fully start up.

10. To check configuration progress, watch `server.log` and `contrast.log`. When the server successfully starts, you will see something like this in `server.log`:

```
260916 20.18.25,837 {} {} {} INFO (Server.java:303) Contrast TeamServer
Ready -
```

## Run Contrast

To run Contrast:

- **Windows:** In Windows, Contrast is installed as a system service. You can start and stop the service through the Windows Service Manager application.

- **Linux:** The Contrast daemon is registered as an `init.d` daemon. To start and stop the server use:

```
/etc/init.d/contrast-server <start|stop|restart|status>
```

Or

```
service contrast-server <start|stop|restart|status>
```

To start the Contrast server independently of the parent shell, execute:

```
nohup /path/to/installation/contrast/bin/contrast-server start >/dev/null  
2>1
```

At this point, it's helpful to tail the server logs:

```
$ tail -f $CONTRAST_HOME/logs/server.log
```

And then the application logs:

```
$ tail -f $CONTRAST_HOME/logs/contrast.log
```

If Contrast starts successfully, you will see this message in the `server.log`:

```
190116 21.22.15,703 {} {} {} INFO (ConnectionTester.java:50) Received code  
200 from TeamServer  
190116 21.22.15,707 {} {} {} INFO (ConnectionTester.java:60) Server start  
has been verified  
190116 21.22.15,709 {} {} {} INFO (Server.java:319) Contrast TeamServer  
Ready - Took 208323ms
```

## Default and SuperAdmin credentials

As the system administrator who installs Contrast, you can manage the following sets of credentials:

- **Contrast Hub credentials:** New customers receive an email with the username and a link to set the password. You will need these credentials to [download the installer \(page 1472\)](#) and to log in to [Contrast Hub](#).
  - **Username:** Contrast provides the username in the format `example@domain.com`. It is the same username as the Default Organization Administrator.
  - **Password:** Create this password when you select the link in the activation email.
- **Default SuperAdmin credentials:** These credentials are included in the license. They are used for managing the Contrast application in the [role of SuperAdmin \(page 1557\)](#).
  - **Username:** Contrast provides the username in the format `contrast_superadmin@domain.com`, where `domain` is the name of your company's email domain.
  - **Password:** The default password is: `default1!`.
- **Default Organization Administrator credentials:** The Organization Administrator can use these credentials to log in to Contrast after [installation \(page 1472\)](#) and set up and maintain the organization.
  - **Username:** Contrast provides the username in the format `example@domain.com`. It is the same username as the Default Organization Administrator.
  - **Password:** The default password is: `default1!`.



### IMPORTANT

Be sure to change the supplied default passwords as soon as you have successfully logged in. You can reset the SuperAdmin password [in Contrast \(page 637\)](#) or by using command line on [Windows \(page 1530\)](#) or [Linux \(page 1529\)](#).

## Restart Contrast

To restart Contrast:

1. Use the following command(s):

- **Windows:**

```
net stop "Contrast Server"
```

Once the service is completely shut down:

```
net start "Contrast Server"
```

- **Linux:**

```
sudo service contrast-server restart
```

2. At this point, it's helpful to tail the server logs:

```
$ tail -f $CONTRAST_HOME/logs/server.log
```

3. And then the application logs:

```
$ tail -f $CONTRAST_HOME/data/logs/contrast.log
```

4. If Contrast starts successfully, you will see this message in the server.log:

```
190116 21.22.15,703 {} {} {} INFO (ConnectionTester.java:50) Received  
code 200 from TeamServer  
190116 21.22.15,707 {} {} {} INFO (ConnectionTester.java:60) Server  
start has been verified  
190116 21.22.15,709 {} {} {} INFO (Server.java:319) Contrast TeamServer  
Ready - Took 208323ms
```

## Uninstall Contrast

Each installation comes with a script for safely uninstalling Contrast plus all embedded components such as Java, Tomcat and MySQL. The script is packaged within the root directory of the Contrast installation. On Unix, the file is an executable script labeled *uninstall*. On Windows, a command file is packaged in the installation directory called *uninstall.cmd*.

Before uninstalling:

- [Create a backup of MySQL \(page 1539\)](#) using the database backup tool provided with Contrast.
- Shut down Contrast using either the Windows or Unix service script.

To remove Contrast from your servers using **Windows**:

1. Open the Windows Explorer.
2. Navigate to the Contrast installation directory.
3. Click on the file *uninstall.exe* and run. Run the uninstall with the same privileges you ran the installation (as an administrator).
4. Follow the prompts to perform uninstallation.

To remove Contrast from your servers using **Unix**:

1. Open a Linux console.
2. Change directory (*cd*) to the Contrast installation directory.
3. Execute the command *uninstall*.
4. Follow the prompts to perform uninstallation.

**NOTE**

You'll delete the vast majority of files when performing an uninstallation. However, an administrator may need to delete a few remaining files manually, such as:

- The *Contrast HOME* directory
- The *Contrast DATA* directory
- The *Contrast LOGS* directory
- The *Contrast MYSQL* directory

## Post-installation

After you install Contrast, you have options that might help you improve your Contrast environment.

### Post-installation tasks

Consider these post-installation options:

- [Configure Tomcat \(page 1484\)](#)
- [Configure the Java Runtime Environment \(page 1485\)](#)
- [Configure HTTPS \(page 1485\)](#)
- [Configure HTTP headers \(page 1488\)](#)
- [Customize MySQL \(page 1489\)](#)
- [Configure reporting storage \(page 1491\)](#)
- [Configure logs \(page 1493\)](#)
- [Use Redis as a shared cache \(page 1494\)](#)

### Configure Tomcat

During [installation \(page 1472\)](#), you set some values for the memory used by the embedded Tomcat server on which Contrast runs.

As you add more applications or find more vulnerabilities, you may notice a degradation in performance which can indicate you have reached the maximum amount of memory allowed for this server.

To increase memory settings:

1. Stop the Contrast server by running the `contrast-server stop` command.
2. When the server is stopped and *Contrast/logs/contrast-stdout.log* ends with `[MysqldResource] shutdown complete`, it is safe to change memory settings.
3. In the Contrast bin directory, *c:/Program Files/Contrast/bin* or the default */opt/Contrast/bin*, open a file named *contrast-server.vmoptions*. It should look something like this:

```
-XX:+UseG1GC
-XX:+UseStringDeduplication
-XX:+PrintVMOptions
-XX:+PrintCommandLineFlags
-XX:+UseContainerSupport
-XX:InitialRAMPercentage=50.0
-XX:MaxRAMPercentage=50.0
-XX:MinRAMPercentage=50.0
-Dcontrast.data.dir=/opt/contrast-data
-Dcontrast.home=/opt/contrast-data
-XX:+HeapDumpOnOutOfMemoryError
```



```
-Xloggc:/opt/contrast-data/gc.out  
-server
```

4. You can update the values for:

- **Xms**: the amount of memory allocated to the server on start
- **Xmx**: the maximum amount of memory the server can use
- **MaxPermSize**

These values can change depending on the memory available on the machine hosting Contrast.

5. Save the file and start Contrast back up using the `contrast-server start` command.

**TIP**

See [JVM documentation](#) for help with tuning.

## Configure the Java Runtime Environment (JRE)

During [installation \(page 1472\)](#), you are given the option to use either an embedded JRE or a pre-installed JRE.

The minimum supported version is Java 17.

To configure the JRE:

1. Open `$CONTRAST_HOME/install4j/pref_jre.cfg` with a text editor.
2. Add the complete path to the Java version you would like to use. For example:

```
C:\Program Files\Java\jre17
```

## Configure HTTPS

By default, HTTP is used for connections between Contrast and the agents. You may need to add or replace HTTP with HTTPS for both Contrast and agent traffic, which you can do with Tomcat's built-in connector functionality. There are two ways to do this:

- **Contrast HTTPS connector:** Configure Contrast to listen to HTTPS connections on a port that you specify by adding a certificate to a Java KeyStore.
- **Reverse proxy method:** Use a standard web server, such as Apache HTTPD or NGINX, in front of the Contrast server configured to reverse proxy requests using Contrast's AJP connector.

You can customize the configuration further as described in [How-To Modify Supported TLS Versions and Ciphers on On-Premise Contrast Server](#).

**IMPORTANT**

In the following procedures, it is important that you use only a single password throughout. If any of the CA-provided files are password protected, you must either remove that password (your CA can help you with this) or ensure that you use the same password for the resulting JKS KeyStore file.

## Use the Contrast HTTPS connector

Use these procedures to create a Java KeyStore (JKS), with a signed certificate, that your on-premises Contrast application server will use at runtime.



### NOTE

It is also possible to use the HTTPS connector with a self-signed certificate.

## Certificate Signing Request (CSR) is required

For this situation, create the KeyStore first and then use that as the basis for the CSR.



### IMPORTANT

The CA provides you with files that you must import into the same KeyStore from which you generated the CSR.

1. Use the Java keytool command to create a Java KeyStore (JKS) (for example, `contrast.jks`) containing a private and public key for a certificate with an alias of `contrast-server`.

```
keytool -genkeypair -alias contrast-server -keyalg RSA -keystore contrast.jks
```



### NOTE

When you create the KeyStore, depending on the Java version you're using, the first prompt might ask "What is your first and last name?". Enter the Common Name (the FQDN for which the certificate will be issued). For example, use a name like `mydomain.com` instead of your first and last name.

2. Generate a Certificate Signing Request (CSR) (`contrast.csr`). You can add DNS or IP fields as needed to include these as Subject Alternative Names on the certificate.

```
keytool -certreq -alias contrast-server -file contrast.csr -keystore contrast.jks -ext san=dns:your_hostname.your_company.com,ip:10.0.0.1
```

3. Send the resulting CSR file to your CA. The CA will provide you with either multiple PEM files or a single PCKS #7 file.
4. Import the files into the Java KeyStore. Use these instructions depending on the file type you receive.
  - **Multiple PEM files:** These files have extensions of `.CRT` or `.PEM` (PEM files open as readable text). One file contains the certificate, while the others contain the root and possibly one or more intermediate certificates.

The certificates must be imported into the KeyStore in a top-down order, with the server certificate itself being imported last. The server certificate should have the same alias used when the KeyStore was created. For example, if you were provided with `root.cer`, `inter.cer` and `server.cer`, you should import them as:

```
keytool -import -trustcacerts -alias root -file root.cer -keystore contrast.jks
keytool -import -trustcacerts -alias intermediate -file inter.cer -keystore contrast.jks
keytool -import -trustcacerts -alias contrast-server -file server.cer -keystore contrast.jks
```

- **Single PKCS #7 file:** This file has an extension of .P7B, .CER or possibly .CRT. This file contains the server certificate bundled with all necessary root and intermediate certificates. The server certificate should have the same alias used when the KeyStore was created. For example, for a file `certificate.p7b`, import it as:

```
keytool -import -trustcacerts -alias contrast-server -file certificate.p7b -keystore contrast.jks
```

5. Once KeyStore setup is complete, open the `<YourPath>/data/conf/server.properties` file in your text editor, where `<YourPath>` is the path where Contrast is installed. Replace `<port>`, `<full path to>`, and `<password>` with your port, JKS file path, and password.

```
https.enabled=true
https.port=<port>
https.keystore.file=<full path to>/contrast.jks
https.keystore.pass=<password>
https.keystore.alias=contrast-server
```



### IMPORTANT

If using Windows, the full path to the JKS file must be escaped. For example:

```
https.keystore.file=C:\\Program\\ Files\\Contrast\\data\\
\\conf\\ssl\\contrast-server.jks
```

You may find it useful to set the `http.enabled` and `ajp.enabled` options to `false` to ensure that only connections made over HTTPS are allowed to the Contrast server.

6. Open the `<YourPath>/data/conf/general.properties` file, and change the value of the `teamserver.url` property to reflect your change. Agents must be updated manually the first time after you make this change. Future updates to the agent will be automatic.
7. **Optional:** [Modify supported TLS versions and cipher suites.](#)
8. Restart the Contrast server service, and ensure that it's now listening on the HTTPS port you configured.

### No CSR is required

For this situation, create a new KeyStore from the files the CA provides you. If you have an existing KeyStore, delete or rename it before you create the new one.

1. Use one of these methods to create the KeyStore:
  - If you have `server.crt`, `priv.key` and `inter.crt` files: Convert the files to a PKCS #12 and create a KeyStore with these commands.

```
openssl pkcs12 -export -out cert.pfx -inkey priv.key -in server.crt
-certfile inter.crt -name "contrast-server"
keytool -importkeystore -srckeystore cert.pfx -srcstoretype pkcs12
-destkeystore contrast.jks -deststoretype jks
```

- If you have a PKCS #12 file: Create a KeyStore with this command.

```
keytool -importkeystore -srckeystore cert.pfx -srcstoretype pkcs12  
-destkeystore contrast.jks -srcalias <sourcealias> -destalias contrast-  
server -deststoretype jks
```

2. Once KeyStore setup is complete, open the <YourPath>/data/conf/server.properties file in your text editor, where <YourPath> is the path where Contrast is installed.

Replace <port>, <full path to>, and <password> with your port, JKS file path, and password.

```
https.enabled=true  
https.port=<port>  
https.keystore.file=<full path to>/contrast.jks  
https.keystore.pass=<password>  
https.keystore.alias=contrast-server
```

3. Open the <YourPath>/data/conf/general.properties file, and change the value of the teamserver.url property to reflect your change. Agents must be updated manually the first time after you make this change. Future updates to the agent will be automatic.
4. **Optional:** [Modify supported TLS versions and cipher suites](#).
5. Restart the Contrast server service, and ensure that it's now listening on the HTTPS port you configured.

## Use the reverse proxy method

To use Apache JServ Protocol (AJP) with the reverse proxy method:

1. Ensure that the Contrast server is configured to listen for connections using the AJP protocol. Open the CONTRAST\_HOME/data/conf/server.properties file in your text editor and verify that the following options are set:

```
ajp.enabled=true  
ajp.port=8009  
ajp.secretRequired=true|false  
ajp.secret=somesecret
```

Choose the `ajp.port` setting to reflect the port on which you'd like the server to listen for incoming connections. If you want the AJP connector to be the only way to access the server, disable the `http.enabled` and `https.enabled` options.

If the `secretRequired` is configured to `true`, the `ajp.secret` setting should have a non-null, non-zero length value. Request workers are required to have the secret keyword; otherwise, the requests are rejected. The workers must provide a matching value, or the request will be rejected regardless of the setting of `secretRequired`.

2. After updating the `server.properties` file, restart the Contrast server service for the changes to take effect.
3. To configure the front-end server, refer to your server's documentation for instructions on how to configure it to use AJP. (For example, see [Apache](#) or [NGINX](#) AJP documentation.)

## Configure HTTP headers

Use this procedure to configure HTTP headers if you are using the Tomcat software that Contrast provides.

When an HTTP header is enabled, it controls whether a document from an HTTP response can be loaded inside a navigable child (for example, `<iframe>`).

The `'X-Frame-Options'` header in the HTML standard provides details about HTTP header configuration.

## Steps

1. Open the `<YourPath>/data/conf/server.properties` file in your text editor, where `<YourPath>` is the path where Contrast is installed..
2. Specify one of these values for the `servlet.response.xframe.options` property:
  - `SAMEORIGIN`: Same-origin embedding is allowed.
  - `DENY`: Embedding is disallowed.
  - No value: The header is omitted. Embedding is allowed.



### NOTE

If the `servlet.response.xframe.options` property is missing, a default value of `SAMEORIGIN` is used.

3. After you update the `server.properties` file, restart the Contrast server service for the changes to take effect.

## Customize MySQL



### NOTE


This procedure applies to the embedded MySQL database, not a distributed configuration.

To match the needs of your environment, you might need to change the default settings that Contrast specifies for the MySQL database. For example, after an upgrade, you might need to adjust the value for the `innodb_buffer_pool_size` setting.'

To change the default MySQL settings, use the `my_extra.cnf` options file. The Contrast installer includes this file as part of the on-premises installation.

Contrast loads its default options file first and then, applies custom settings that you specify in the `my_extra.cnf` file.

## Steps

1. Find the `$CONTRAST_HOME/data/conf/my_extra.cnf` file.
2. Add or change  [MySQL settings](#), as needed.
3. [Restart Contrast. \(page 1481\)](#) or, if you're using Microsoft Windows, restart the MySQL service.

## Set up a proxy configuration

Setting up a proxy configuration for your on-premises installation lets you integrate Contrast with tools that exist inside your network (and don't require a proxy) and outside of your network (which require web proxy access).

### Set up methods

You can use either of these methods to set up a proxy configuration:

- JVM arguments in the `contrast-server.vmoptions` file.

- The proxy settings in the Contrast Web interface.  
JVM arguments in the options file override settings in the Contrast web interface.

## Steps

- **Use JVM arguments (preferred method)**

1. In the Contrast bin directory, `c:\Program Files/Contrast/bin` or the default directory `/opt/Contrast/bin`, open `contrast-server.voptions`.
2. Add these JVM arguments to the file (for security purposes, `https` arguments are preferred):
  - `https.proxyHost` or `http.proxyHost`  
The host name of the proxy server. Use this argument for communication with externally-hosted software.
  - `https.proxyPort` or `http.proxyPort`  
The port number on which the proxy server listens for traffic.
  - `http.nonProxyHosts`  
A list of hosts, separated by a vertical bar (`|`), which you connect to directly, bypassing the proxy server. This argument works for both `https` and `http` configurations.  
Use this argument to exclude on-premise hosts that are deployed in the same network as your Contrast installation.  
For example, if you have an on-premises Jira installation as well as an integration for MS Teams in the cloud, you can use the `http.nonProxyHosts` argument to exclude the Jira integration from using the proxy server, as shown in the following example:

```
-Dhttps.proxyHost=89.148.22.17  
-Dhttps.proxyPort=3128  
-Dhttp.nonProxyHosts=jira.mycompany.com|*.internal.mycompany.com
```

In this example, the proxy host is 89.148.22.17, listening for traffic on port 3128.  
This configuration bypasses the proxy server when communicating with the host for `jira.mycompany.com` as well as hosts matching `*.internal.mycompany.com`.

- **Use the Contrast web interface:**

1. In the user menu, select **SuperAdmin**.
2. Select **System settings**.
3. Under Internet settings, select **Proxy**.



4. Specify the proxy host name, the port number, the username for the proxy server, and the password for the proxy server.

The screenshot shows the Contrast Security web interface. The top navigation bar includes links for Organizations, Applications, Servers, Vulnerabilities, Users, and Groups. A search bar and a user profile dropdown are also present. The left sidebar lists various settings categories: General Settings, Licensing, Policy, Security, Agent, Authentication, Mail, and Score Settings. The main content area is titled 'INTERNET SETTINGS' and contains three sections: Proxy, Contrast Hub, and Diagnostics. The Proxy section is highlighted with a blue box and includes a toggle switch, a description 'Connect your internet bound traffic', and four input fields: Proxy Host (89.148.22.17), Proxy Port (3128), Username (myusername), and Password (masked). The Contrast Hub section has a toggle switch and a description. The Diagnostics section has a toggle switch, a 'Last Connected' timestamp of 10/17/2022, and a description. A 'Test Connection' button and a 'Save' button are located at the bottom right of the settings area.

5. Select **Save**.

## Configure reporting storage for the system

As SuperAdmin, you can configure reporting storage options by adding the following properties to the `contrast/data/conf/general.properties` file:

- **reporting.storage.mode:** The default value option is `DB`.  
The available value options are `DB` and `FILE_SYS`.  
If you don't specify a value, Contrast uses the default value of `DB`.
- **reporting.storage.path:** This is required when storage mode is set to `FILE_SYS`.

You can also add the same properties to the `contrast-server.vmoptions` file:

- **-Dreporting.storage.mode**
- **-Dreporting.storage.path**

The recommended setting for `reporting.storage.mode` is `FILE_SYS`. When `DB` is configured, files are stored in the database, adding unnecessary contention on the database.

With the `FILE_SYS` option, you must set up a file-sharing service where all Contrast nodes are able to access the file path. Provide this path as the value for `reporting.storage.path`.

**NOTE**

The path should be an absolute path, such as `/Users/user1/reporting`.

For Windows, be sure to escape the colon or the path will not work. For example, this path will fail:

```
reporting.storage.path=C:\Contrast\data\reports
```

You must use either forward slashes or two backslashes around the colon for it to work, like this:

```
reporting.storage.path=C\\:\\Contrast\\data\\reports
```

If an Attestation report exceeds the [report limits \(page 1324\)](#), an error message displays and the report doesn't generate. If this situation occurs, change the report selections when you generate the report to reduce the amount of information in the report.

## Contrast logs

For the Contrast application, Log4j version 2 is used as the logging framework.

You can [configure logging thresholds \(page 1493\)](#), control log file destinations, and see an overview of each log available in Contrast.

Find these logs under the `$CONTRAST_HOME/logs` directory:

- `server.log`
- `catalina.out`

Other logs, like these, can be found in `$CONTRAST_HOME/data/logs`:

- `contrast.log`
- `ldap_ad.log`
- `migration.log`
- `audit.log`
- `mysql_error.log`

This table shows all of the primary log files in Contrast.

| Log file                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>audit.log</code>           | Logs audit events such as: <ul style="list-style-type: none"><li>• Logging in and out of the application</li><li>• Impersonating another user</li><li>• Switching organizations</li><li>• Accessing the administrator portal</li><li>• Changes to the configuration and settings of Contrast by a SuperAdmin account</li><li>• User account service issues (locked accounts, password changed, etc.)</li><li>• Deleting traces</li><li>• Changes to a license or an expired license notification</li><li>• API Key changes</li></ul> |
| <code>console.log</code>         | Default application event log                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <code>contrast-error.log</code>  | Logs messages printed to <code>stderr</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <code>contrast-stdout.log</code> | Logs messages printed to <code>stdout</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |



| Log file             | Description                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>contrast.log</i>  | Like Tomcat's stdout or console log, <i>contrast.log</i> shows most key events happening inside Contrast to inform or help with debugging. It includes information about: <ul style="list-style-type: none"><li>• applications</li><li>• servers</li><li>• libraries</li><li>• traces</li><li>• users</li><li>• Java stack traces for debugging purposes when a server exception takes place</li></ul> |
| <i>security.log</i>  | Formerly the <i>esapi.log</i> , this log file is used for capturing key events from Contrast, such as the loading of a given property file.                                                                                                                                                                                                                                                            |
| <i>migration.log</i> | Contains a summary of all database migrations that occur against the Contrast application between updates. It references the Contrast version, the migration script that ran and the status of the script.                                                                                                                                                                                             |

## Configure logs at a system level

Contrast collects [multiple log files that log events and messages \(page 1492\)](#).

You can configure the *log4j2.xml* file used to host the Log4j configuration that is packaged in the Contrast application (and optionally apply [Log4j custom levels](#)).



### CAUTION

before making any changes to this file to ensure the formatting is syntactically correct. A server restart is not required *if the changes are entered correctly*.

1. Find the file under `$CONTRAST_HOME/data/conf`.
2. The first parameter of the file below is a monitor interval that refreshes the settings based on the variable defined. By default, Contrast checks every 60 seconds and refreshes the logging configuration.

```
<Configuration monitorInterval="60">
```

3. Edit the file as needed.

**TIP**

Read more about appenders and delivering LogEvents in the [Log4j documentation](#). Contrast predominantly makes use of the [Rolling File Appender](#), which is an *OutputStreamAppender* that writes to the file named in the *fileName* parameter, and rolls the file over according to the *TriggeringPolicy* and the *RolloverPolicy*.

Here is a sample file of the appenders for *contrast.log*. It shows a daily appender with a 1 GB max file size policy and no more than 15 files of rollover. This appender also compresses the file and renames it daily.

```
<RollingFile name="DAILY" fileName="${contrast.logs.dir}/
logs/contrast.log"
            filePattern="${contrast.logs.dir}/logs/
contrast.%d.%i.log.gz" immediateFlush="true">
  <PatternLayout>
    <Pattern>%d{ddMMyy HH:mm:ss,SSS} {%X{session.id}}
{%X{user.name}} {%X{remote.addr}} %-5p (%F:%L) %m%n
    </Pattern>
  </PatternLayout>
  <Policies>
    <TimeBasedTriggeringPolicy/>
    <SizeBasedTriggeringPolicy size="1 GB"/>
  </Policies>
  <DefaultRolloverStrategy max="15"/>
</RollingFile>
```

The logger section of the file defines which Java packages should log to a specific appender and at a given log level.

## Use Redis as a shared cache (on-premises)

You can configure Contrast to use a shared cache on a Redis server.

This topic does not provide details about setting up Redis servers.

## Contrast properties for Redis

Use these properties:

| Property name                    | Description                                                                                                    |
|----------------------------------|----------------------------------------------------------------------------------------------------------------|
| cache.userredis                  | A Boolean value indicating whether Contrast uses Redis for caches.                                             |
| contrast.cache.redis.db.index    | An Integer specifying the database index where Contrast stores cache information.                              |
| contrast.cache.redis.proto       | A string that controls which protocol to use when Contrast connects to the Redis server.                       |
| contrast.cache.redis.host        | A string containing the host name or IP address of the Redis server.                                           |
| contrast.cache.redis.port        | An Integer representing the TCP/IP port that the Redis server uses using to listen for new client connections. |
| contrast.cache.redis.password    | A string containing the password used to authorize client access to the Redis server.                          |
| contrast.cache.redis.client.name | A string that identifies the client.                                                                           |

## Before you begin

- You need this information:

- The host name or IP address for the Redis server
- The listening port for the Redis server
- The password for a user account on the Redis server
- The database index that the cache should target
- Verify that the Redis server is configured to use TLS (REDISS)

## Steps

1. Create a `contrast.properties` file in the `/data/conf/` folder.  
Ensure this file has the correct permissions to let a `contrast_server` user access it.
2. In the property file, add the Contrast properties for Redis.  
At a minimum, configure values for the host name, listening port, and password for the Redis server.

### Property file example:

```
cache.userredis=true
contrast.cache.redis.db.index=0
contrast.cache.redis.proto=rediss
contrast.cache.redis.host=contrast-redis-server.company.com
contrast.cache.redis.port=6379
contrast.cache.redis.password=changeme
contrast.cache.redis.client.name=contrast
```

3. [Restart Contrast \(page 1483\)](#).
4. **To verify the configuration** look in the `/data/logs/contrast.log` file.  
This file contains all the information on the current configuration and interactions with Redis. Key terms to look for include:
  - RedissonCache
  - Redisson
  - CacheConfiguration

## System updates and upgrades

Periodically, Contrast Security provides updates and upgrades for on-premises Contrast software.

### Updates and upgrades

Use these procedures:

- [Upgrade Contrast \(page 1495\)](#)
- [Upgrade agents \(page 1496\)](#)
- [Update IP address \(page 1497\)](#)
- [Update library data \(page 1497\)](#)
- [Upgrade library data automatically \(page 1498\)](#)
- [Update license \(page 1499\)](#)

### Upgrade Contrast

Contrast releases patches and upgrades as part of the embedded on-premises installer file, which you can download from the Contrast Hub.

The installer intelligently determines that a previous version of Contrast exists on a given system. You can choose to run the updater portion of the process, or run an installation in a separate location. If a previous installation exists, you must configure a parallel installation to run on separate ports.

### Before you begin

Back up the `cacerts` file in the `$CONTRAST_INSTALLATION/jre/lib/security` directory.

The upgrade process overwrites this file which can result in login issues. These certificates are used for [LDAP integrations \(page 1524\)](#).

## Steps

1. [Create a MySQL backup \(page 1539\)](#) and store the backup file on a separate file system or drive to avoid any issues with restoration. The installer attempts to create a database backup as part of the upgrade process, but to be safe, do this manually. Also, back up all configuration files located at `$CONTRAST_HOME/data/conf`.
2. Be sure the Contrast application is running when you start the installation process. Agents will continue to send vulnerability and library messages during this time. When the application initiates a shutdown on its own, the agents defer sending messages until it can reach the application.
3. The upgrade process is nearly identical to the original process to [install the Contrast application \(page 1472\)](#); however, you will be asked to choose to update an existing installation or perform a new installation. You should choose to update an existing installation.
4. The upgrade will initially perform a database backup. Depending on the size of your database, this process can take a few seconds to a few minutes. During this operation, the application should be accessible to agents and end users.
5. The update then deploys a new file system under the installation directory. This primarily consists of deploying the Contrast.war file directory to the `$CONTRAST_HOME/webapps` directory. The application won't be accessible while the file system is updated.
6. Once a successful file system update is complete, the application starts up. While the application is starting up, you can follow along in the log files (*migration.log* and *contrast.log*, specifically). Log entries are written for both file system and database updates in a sequential manner.



### NOTE

Configuration files and database components aren't updated until the initial startup step.

7. The first indicator of a successful update is that you can access the Contrast application by either logging in to the Contrast web interface or using an API request.



### TIP

In the **user menu** you will see a link to the Release News for the version you are using.

8. Review the contents of the *migration.log* immediately after the upgrade. This log will reveal any issues experienced as part of the update process.



### NOTE

In the minutes after the upgrade, deployed agents might attempt to update to the latest agent version. These agents won't reflect their own update until each has restarted and established contact with the Contrast application.

## Upgrade agents (on-premises)

You can download most agents from public repositories. To download .NET and .NET Core agents, go to the Contrast Hub.

Copy downloaded agents to sub-directories in the `$CONTRAST_HOME/data/agents` directory in the Contrast application. On-premises installations of Contrast are automatically configured to support this directory.

## Steps

1. Download the latest version of an agent from the appropriate repository:
  - **.NET:** Download from the [Contrast Hub](#).
  - **.NET Core:** Download the .NET Core agent or the .NET Core agent installer for IIS from the [Contrast Hub](#)
  - **Java:** Download from the [Maven](#).
  - **Node.js:** Download from [NPM](#).
  - **Python:** Download from the [PyPi](#) .
  - **Ruby:** Download from [RubyGems](#).
  - **Go:** Install with a [direct download \(page 570\)](#).
2. Copy the agents to the appropriate sub-directory for each agent language in the `$CONTRAST_HOME/data/agents` directory.  
For example, if you download a Java agent, copy it to the `$CONTRAST_HOME/data/agents/java` sub-directory.  
You don't need to restart the Contrast application. Agents reload dynamically and become accessible for download.

## Update your IP address

Whether you moved the installation, or had to change the hostname or IP address of your Contrast application, you must also complete these steps.

1. Log in to Contrast as SuperAdmin.
2. In the top right, select **SuperAdmin > System Settings > General Settings**.
3. In the **General** panel, change the **TeamServer URL** to `IP:port/Contrast`.
4. Select **Save**.
5. [Restart Contrast \(page 1483\)](#) to apply the changes.

## Upgrade SCA library data manually

Starting with Contrast version 3.7.4, you can download SCA library data manually from the Contrast Hub. This method is useful in situations where you don't have internet access (air-gapped installations).

## Before you begin

- A Contrast Hub account is required.
- For optimal performance, plan to download the library data on a monthly basis.
- If you have a [distributed deployment \(page 1479\)](#) with multiple servers, use the procedure in this topic for one instance. You can use the same downloaded library data files on multiple installations.



### IMPORTANT

For on-premises customers using MySQL 8, the system variable `local_infile` must be set to **ON** so that Contrast can accept CSV files. For more details, see [Security Considerations for LOAD DATA LOCAL](#).

## Steps

1. Log in to the [Contrast Hub](#).
2. Select **Downloads**.
3. Select **Library data exports** and download the archive version you want.

The screenshot shows the Contrast Hub interface. At the top, there's a navigation bar with 'CONTRAST HUB', 'Home', and 'Downloads' (which is highlighted). Below this, the 'TeamServer' section is visible. Under 'TeamServer', there are three tabs: 'Installers', 'Wars', and 'Library Data Exports' (which is selected). The 'Library Data Exports' tab displays a table with columns for 'Release Date', 'File Name', and 'File Size'. There are three rows of data, each with 'Archive', 'Download', and 'MD5 Sum' buttons.

| Release Date | File Name                             | File Size | Archive | Download | MD5 Sum |
|--------------|---------------------------------------|-----------|---------|----------|---------|
| 09/14/2021   | Contrast-Data-Export-202109141732.zip | 2.96 GB   | Archive | Download | MD5 Sum |
| 09/13/2021   | Contrast-Data-Export-202109131732.zip | 2.95 GB   | Archive | Download | MD5 Sum |
| 09/12/2021   | Contrast-Data-Export-202109121732.zip | 2.94 GB   | Archive | Download | MD5 Sum |

4. Extract the downloaded ZIP file and place the CSV files in the Contrast *data/libraries* directory. For example:  
**Unix:** `/etc/contrast/data/libraries`  
**Windows:** `C:\ProgramData/contrast/data/libraries`  
Some files may be hidden due to their names, so ensure all extracted files are moved to this directory.
5. [Restart Contrast. \(page 1483\)](#)  
When Contrast restarts, the data is imported in the background. The CSV files are deleted from the folder as each file is imported.
6. Check the *data/logs/contrast.log* file for success messages as each script completes. For example, you may see a message like this:

```
Beginning CSV import from 'C:\Program
Files\Contrast\data\libraries\java.csv' into 'artifacts_java' Import
temporary table 'artifacts_java' completed, time: 36.6886968s
```

## Upgrade SCA library data automatically

Starting with Contrast version 3.6.4, you can configure the Contrast application to update Contrast SCA library data automatically.

Contrast updates the library data approximately every 24 hours; newly added CVEs are updated every 30 minutes and will then be included in the 24-hour schedule. Your Contrast installation pulls the data from a Contrast database hosted on the cloud.

## Before you begin

- Configure your firewall to allow access to this URL:  
`https://ardy.contrastsecurity.com/production`

- A SuperAdmin role is required.

## Steps

1. Log in to the Contrast web interface as a SuperAdmin user.
2. From the user menu, select **System settings**.
3. Select **General settings**.
4. Under Internet settings, turn on **Contrast Hub**.

**Proxy**

Connect your internet bound traffic

**Contrast Hub**

Contrast's content server where you can get the latest releases and licenses

**Diagnostics** Last Connected 03/02/2022

Send Contrast health statistics to enable proactive support and resolve support cases faster

## Update your on-premises Contrast license

You may occasionally need a new license file. There are two ways to update this file:

- As a SuperAdmin, you can log in to the application and update the license in Contrast.
- You can replace the license file on the local file system. (If the license is expired, you must use this method.)

To replace the license **in the Contrast web interface**:

1. Log in as SuperAdmin.
2. Select **Licensing** in the left navigation.
3. Click **Update this license** at the bottom of the panel.
4. Enter your **Contrast Hub credentials** ([page 1482](#)) to download and apply the latest license from the Contrast Hub.
5. If you don't have access to the Contrast Hub, click **Upload license** and paste your license in the field provided.
6. Select **Update**.
7. [Restart Contrast](#) ([page 1483](#)) to apply the new license changes.

To replace the license **in the Contrast file system**:

1. Obtain a new license from the Contrast Hub, your account manager or the technical support team.
2. Rename the new license file *contrast.new.lic*.
3. Stop the Contrast application service.
  - **Windows:** Use the service control panel
  - **Linux:** Execute `sudo service contrast-server stop` or another appropriate command for the distribution configuration. Execute `ps aux | grep contrast` to verify that all Contrast application processes have stopped, and confirm there are no processes listed. If *mysqld* is still running, it may take a few minutes to terminate on its own after stopping the service. If it doesn't terminate, [contact Support](#). **Do not kill the processes.**



### IMPORTANT

Don't move the current *contrast.lic* file. Contrast needs both the old and new license files to upgrade the license.

4. Place the new license file in the `<contrast_home>/data` directory.  
On Linux, confirm that the new license file has the same owner, group and permissions as other files in that directory. (Execute `ls -l` to list the directory contents with permissions and owners.) A backup of the current license called `contrast.lic.bak` will be created in the same directory when the new one is consumed during startup.  
Execute `sudo chown contrast_service:contrast_service contrast.new.lic` to change the owner and group.  
Execute `sudo chmod 644 contrast.new.lic` to change the permissions.
5. Start the Contrast application as normal.
  - **Windows:** Use the service control panel.
  - **Linux:** Execute `sudo service contrast-server start` or another appropriate command for the distribution configuration.
6. The new license takes effect.

To update all instances of the Contrast application, follow the steps for the file system method described above for each application instance that's running.

## Manage system administration

Depending on the size of your organization and how you manage your Contrast installation, you can set up [roles \(page 1557\)](#) to best meet your system administration needs.

For a small organization, a single SuperAdmin can manage all system administration work. If you want to share the responsibilities, you can [designate additional SuperAdmins or ServerAdmins \(page 1506\)](#).

- A **SuperAdmin** is responsible for the system administration of Contrast. This may be assigned to one or more individuals. They have access to the **SuperAdmin** option in the user menu, which allows them to configure organizations, applications, servers, vulnerabilities, users and groups.
- A **ServerAdmin** is identical to a SuperAdmin except without access to users or groups. They have access to the ServerAdmin option in the user menu, which allows them to configure organizations, applications, servers and vulnerabilities.

If you have a separate individual or group of individuals that manages end users and agent licenses, you can [add a system access group \(page 1506\)](#) to designate users as **System Administrators** or **Observers**.

- A **System Administrator** is responsible for maintaining organizations and groups. They have access to the SuperAdmin option in the user menu, which allows them to configure organizations, applications, servers, vulnerabilities, users and groups. They can also impersonate administrators at an organization level.
- A **System Observer** has read-only access to organizations, users, applications, groups and traces. They have read-only access to the **Observer** option in the user menu, which allows them to view organizations, applications, servers, vulnerabilities and users.



### NOTE

If a user is designated as **No Access**, they are blocked from system level access to the designated organization(s).

## Manage multiple organizations

On-premises users deploying in a multi-tenant environment can set up Contrast to support multiple organizations within the same system. During the installation process, a default organization is created. After that, users with SuperAdmin credentials can create additional organizations. To do this:



1. Log in to Contrast as SuperAdmin.
2. In the **user menu** select **SuperAdmin** to view system administration options.
3. Select **Organizations** in the header.
4. Select **Add organization**.
5. Supply valid information for the new organization and designate an Organization Administrator by entering credentials of the user who will fill this role.
6. When a user is granted access to the new organization (either in the above step, or by becoming a member of an [organization access group \(page 1446\)](#)) they can move between organizations by selecting the organization name in the **user menu**.



### IMPORTANT

If you are an Organization Administrator and you want to change settings for a particular organization, you must first switch to that organization in the **user menu**, before selecting **Organization settings**. The active organization will show a green check next to its name in the **user menu**.

## Add/edit an organization

In Contrast, an organization is a group of associated users and applications with a shared business purpose. Contrast uses multi-tenant architecture: each Contrast customer is a tenant, represented as an organization.

### Before you begin

- To create an organization, a [System Administrator \(page 1557\)](#) role is required.
- All organizations require a unique name as well as an [Organization Administrator \(page 1555\)](#) to oversee the organization.

### Steps

- **To add an organization:**
  1. In the **user menu**, select **SuperAdmin**.
  2. Select **Organizations** in the header, then select **Add organization**.
  3. In the Add organization window, specify the details for the organization:

Add Organization

Organization Name

Protect

Enable SCA

License Consumption

☐ Require users to manually apply allocated licenses
 ☒ Automatically apply allocated licenses

☒ Assess (Application licenses)
 ☐ Protect (Server licenses)

Language

English

Date Format

MM/dd/yyyy

Time Format

hh:mm a

Time Zone

(GMT-05:00) Eastern Time

Additional Options

☐ Enable Duplicate Vulnerability Notification
 ☐ Enable Route-Based Auto-Verification
 ☒ Enable Security Standards Report
 ☐ Enable DISA STIG Checklist reporting
 ☐ Allow beta language testing
 ☐ Enable Harmony
 ☐ Enable SAST
 ☐ Enable CloudNative

Agent Diagnostics

Application Library Status

BETA

Admin Email

Admin First Name

Admin Last Name

Require Email Activation

Admin Password

Confirm Admin Password

Cancel

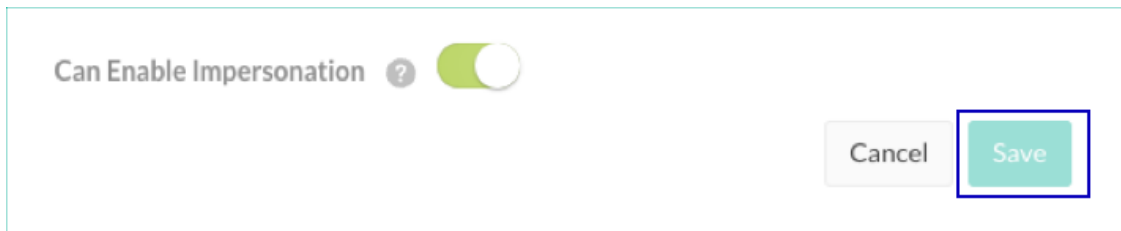
Add

- Enter the new **Organization name**.
  - Use the toggle to enable **Protect**, if appropriate.
  - Use the toggle to **Enable SCA** licensing, if appropriate.
  - Under **License consumption**, use the radio buttons to manually or automatically apply allocated licenses.
  - Select the default **Language** for the organization.
  - Use the dropdowns to choose **Date** and **Time** formats and a **Time zone**.
  - Select additional options for duplicate vulnerability notification, [route-based auto-verification \(page 1408\)](#), [DISA STIG checklist reporting \(page 1325\)](#), [diagnostics \(page 1532\)](#) and any other features.
  - Complete the profile information for the Organization Administrator, including their email, name and password.
  - Only check the box to **Require email activation** if you have a mail server set up with the Contrast application.
4. Select **Add** to create the organization. You may continue to create as many organizations as you need for multi-tenant support.
- **To edit an organization:**
    1. In the **user menu**, select **SuperAdmin**.
    2. Select the name of the organization you want to edit.
    3. Update information as needed and select **Save**. Additional settings in the Edit organization window include:

- **CVSS 3.11:** Contrast is compatible with CVSS 3.1. For on-premises customers, SuperAdmins can enable the scoring by turning on **Enable CVSS 3.1**. Hosted customers must contact [Contrast Support](#) to turn on this setting.



- Hosted customers must contact [Contrast Support](#) to change this setting. If you turn this setting off, Organization Admins cannot manage impersonation for their organizations. Hosted customers must contact [Contrast Support](#) to change this setting.



## Manage users and permissions at a system level

Before setting up Contrast and adding users, be familiar with Contrast settings for :

- **Users:** You can add users [one at a time \(page 1503\)](#), or [bulk add multiple users \(page 1504\)](#). In the **user menu** select **SuperAdmin**, then select **Users** in the header to see all users and their status (who's awaiting activation, active or inactive, or locked out of their account based on a security policy).
- **Authentication:** You can set up Contrast to use its own internal directory, or use an [external directory like LDAP or Active Directory \(page 1530\)](#).
- **Groups and permissions:** Access and permissions are determined by [roles \(page 1552\)](#). Most roles are assigned with [access groups \(page 1506\)](#). SuperAdmin and ServerAdmin roles are [designated differently \(page 1506\)](#). You can also [grant Protect permissions \(page 1508\)](#) at a system level or when [adding a new user \(page 1503\)](#) or [bulk adding users \(page 1504\)](#).

As a SuperAdmin or System Administrator, you can add users at a system or organization level.

Adding a user to a system group provides them access to the System Administration interface or allows them to perform activities across organizations in cross-organization groups.

You can also add users within a single organization with a defined role to determine their application access and privileges.

### Add or edit a user at a system level

System and Organization Administrators can create users individually, in groups, or through [Microsoft Active Directory \(AD\) \(page 1515\)](#) or [LDAP \(page 1519\)](#) integrations.

### Before you begin

- A System Administrator or Organization Administrator role is required.
- All users are required to have a default organization and a default role within that organization. [SuperAdmin and ServerAdmin roles \(page 1506\)](#) are designated differently.
- When adding an individual user, or multiple users at one time, you can also grant Protect permissions for the users.

## Steps

1. Log in as a SuperAdmin or System Administrator.
2. Select **SuperAdmin** in the **user menu**.
3. Select **Users** in the header.
4. Select a **user name** to edit an existing user or select **Add user** to add a new user.
5. Enter the user's **First name**, **Last name** and **Email address**.
6. Select **Require email activations**, if you want to use email activation instead of requiring a password.
7. Select a **System roles (page 1557)** for the user.  
The default role is **None**.
8. Select the **Organization** to which the user belongs.
9. Select the default **Organization role**.
10. Select a custom or default **Application access group**:  
Contrast provides these default groups:
  - **View**: Members of this group have read-only access to the Contrast interface to see scores, libraries, vulnerabilities, and comments.
  - **Edit**: Members of this group can remediate findings, add tags, manage vulnerabilities, edit attributes, merge applications, add or delete applications, and create servers.
  - **Rules Admin**: Members of this group can edit rules and policies in the application, enable Protect, and manage notifications and scoring.
  - **Admin**: Members of this group can configure and manage settings for an organization.
11. Select a **Date format**, **Time format**, and **Time zone**.
12. To let Organization Administrators change user settings at an organizational level, select **Use organization settings**.  
This option is selected by default.  
To create user settings at a system level, clear the this option.:
  - a. Clear **User organization settings**.
  - b. To restrict users to using the API only and not the Contrast web interface, **Select Make user API only**.
  - c. To let the user see and use Assess data, turn on **Access**.
  - d. To let the user see and use Protect data, turn on **Protect**.



### TIP

You can also [grant Protect permissions \(page 1508\)](#) at an organization level.

13. Select **Add** or **Save**.

## Add multiple users to an organization

You can use a CSV file to add multiple users to an organization.

## Before you begin

- For on-premises customers, a SuperAdmin role is required.
- For hosted customers, an Organization Administrator role is required.

## Steps

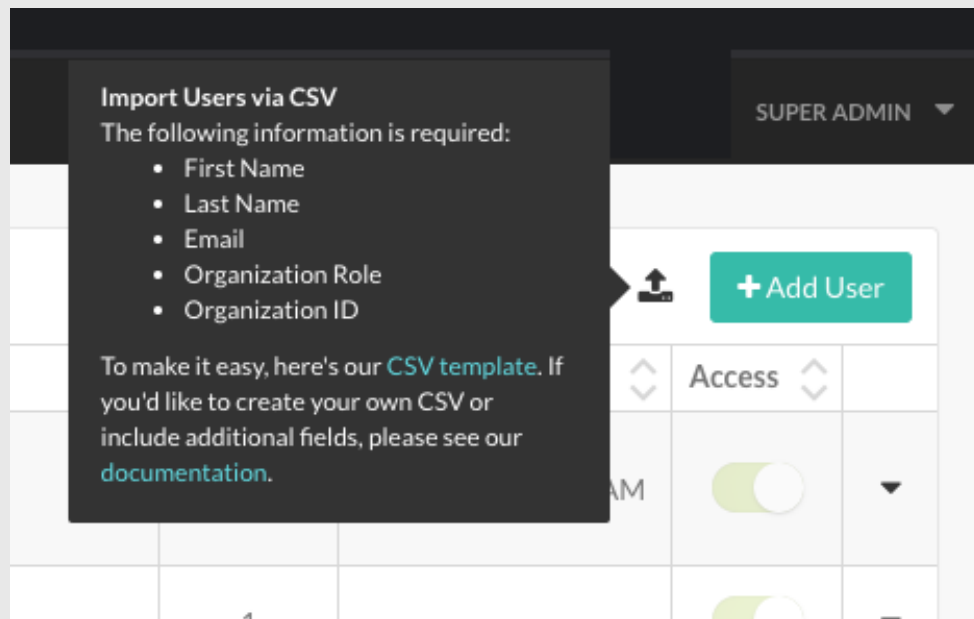
1. Go to the Users list:
  - a. For hosted customers, under the user menu, select **Organization settings** and then, select **Users**.

- b. For on-premises customers, under SuperAdmin, select **Users** in the header.
2. Create a spreadsheet with the recommended information and save it as a CSV file:
  - Include the required fields for each user.
  - Format all field headings and values exactly as shown in the table below.
  - Add a new column for any optional fields.



### TIP

Hover over the **Upload** icon and select the link in the tooltip to download a CSV template to get started.



### CSV fields:

| Field name                   | Required                           | Value                                                                                                                                                                                                                                                          |
|------------------------------|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>First Name</b>            | Required                           | User first name                                                                                                                                                                                                                                                |
| <b>Last Name</b>             | Required                           | User last name                                                                                                                                                                                                                                                 |
| <b>Email or Username</b>     | Required                           | If you are using the Contrast's default internal directory, enter the user's email.<br><br>If you are using an external directory, change <b>Email</b> to <b>Username</b> in the CSV, and enter usernames that match those in your external directory exactly. |
| <b>Organization UUID</b>     | Required for on-premises customers | Get this value from the organization's <a href="#">general information settings (page 1442)</a> .                                                                                                                                                              |
| <b>Organization Role</b>     | Required                           | Values can be View, Edit, Rules_admin or Admin.                                                                                                                                                                                                                |
| <b>Date Format</b>           | Optional                           | The default value is the organization setting, such as MM/dd/YYYY.                                                                                                                                                                                             |
| <b>Time Format</b>           | Optional                           | The default value is the organization setting, such as hh:mm a.                                                                                                                                                                                                |
| <b>Timezone</b>              | Optional                           | The default value is the organization time zone.                                                                                                                                                                                                               |
| <b>Protect</b>               | Optional                           | The default value is Off.                                                                                                                                                                                                                                      |
| <b>Groups</b>                | Optional                           | Values can be View, Edit, Rules Admin, Admin or custom group names. Format multiple group names as GroupA&&GroupB&&GroupC.                                                                                                                                     |
| <b>Language</b>              | Optional                           | The default is the value <a href="#">configured for the organization (page 1442)</a> .                                                                                                                                                                         |
| <b>System Administration</b> | Optional                           | The default value is Off.                                                                                                                                                                                                                                      |
| <b>Email Activation</b>      | Optional                           | If the value is None, the default is Required Password.                                                                                                                                                                                                        |
| <b>Password</b>              | Optional                           | This field is required if the Email Activation field is set to false.                                                                                                                                                                                          |

| Field name | Required | Value                     |
|------------|----------|---------------------------|
| Api Only   | Optional | The default value is Off. |
| Access     | Optional | The default value is On.  |

3. Select the black **upload icon** next to **Add user**, then select the CSV you created.  
Once the spreadsheet upload is in progress, you can leave the page and continue with other tasks in Contrast. If the upload is successful, you'll see a confirmation message that includes the number of users uploaded. If the upload failed, you'll see an error message that includes the source of the error in the spreadsheet.

## Designate SuperAdmins or ServerAdmins

The **SuperAdmin** has the highest level system administration permissions.

A **ServerAdmin** has the same permissions and capabilities as a SuperAdmin, except without access to users and groups.

You must have at least one person as SuperAdmin. If you want to designate more than one user as SuperAdmin, do not share a log in, instead:

1. Log in as SuperAdmin.
2. Select **User menu > SuperAdmin > Users**.
3. Find the user you want to designate as SuperAdmin. (You can search by name, email or organization, or find their name in the grid.)
4. Select the user name to open the **Edit user** window.
5. In the **System Administration** field, select **SuperAdmin** or **ServerAdmin**.
6. Select **Save**.



### TIP

Anyone designated as a SuperAdmin or ServerAdmin will be able to access **SuperAdmin** in the top right **User menu**. Also a small key icon will appear next to their name in the **SuperAdmin > Users** grid. Hover over the key to see the assigned role.

## Add, edit or delete a system access group



### NOTE

System access groups are only available to on-premises customers. You must be a SuperAdmin to add a system access group.

To add a system access group:

1. Select **User menu > SuperAdmin > Groups**.
2. Select an existing group to edit, or select **Add group** to create a new group.

**TIP**

To find groups you can use the quick filter dropdown or the search field in the top left, or use the up/down arrows at the top of each column to sort.

3. Fill out the form with:

- **Group name:** Choose something that reflects the purpose, permissions and capabilities you will assign to this group.
- **Type:** Select **System**.

**TIP**

You can also [add an access group at an organization level \(page 1446\)](#). However, if you add access groups at a system level, you have the option of creating cross-organization groups.

Cross-organization groups might be helpful if you have a security team that supports multiple business units that each have their own organization.

Members of a cross-organization group are able to switch between organizations by selecting the name in the user menu.

- **System access:** Select the organization you want this group to access.
  - **Role:** Select the [system role \(page 1557\)](#) you want the members of this group to have within the corresponding organization.
  - Select **Add system access** to add more organizations and roles.
4. Next to **Members**, on the right, type ahead to select one or more users to assign to the group. Select the X to delete members.

**NOTE**

Users can belong to many groups. They don't have to be created within a particular organization in order to gain access to that organization.

5. When you are finished, select **Add** to create the new group, or select **Save** if you are editing an existing group. The members you added to this group will now have permissions that correspond to their role.



## IMPORTANT

If users are assigned to two groups with conflicting roles for all applications or organizations, the role that provides the most restrictive access applies.

Note that only organization and application level groups are [visible to a user \(page 639\)](#), if you are confused about your access level, it may be that stricter permissions have been imposed at a system level.

However, a role assigned to a specific application overrides a role assigned to all applications, even if the application-specific role is more permissive than the role given to all applications.

If a user is assigned to two custom groups that provide roles for the same application, the role with the least privilege applies.

[System \(page 1557\)](#), [organization \(page 1555\)](#) and [application \(page 1553\)](#) roles are listed in order from most to least permissive.

In the following examples of conflicting role permissions, permissions in Group 2 take precedence.

| Group 1                                  | Group 2 (takes precedence)                        |
|------------------------------------------|---------------------------------------------------|
| Application Editor for all applications  | Application Viewer for all applications           |
| Organization Viewer for all applications | Application Administrator for the Red application |
| RulesAdmin for the Red application       | No Access for the Red application                 |



## TIP

To delete a group, select **User menu > SuperAdmin > Groups**. Find the group you want to delete and select the Delete icon in that row.

Once this is confirmed, the group is removed and any access provided by that group is revoked from all users assigned to the group.

## Grant Protect permissions (on-premises)

For on-premises customers with multiple organizations, you can grant permissions that let all or some user roles in one or more organizations access Protect data.

### Before you begin

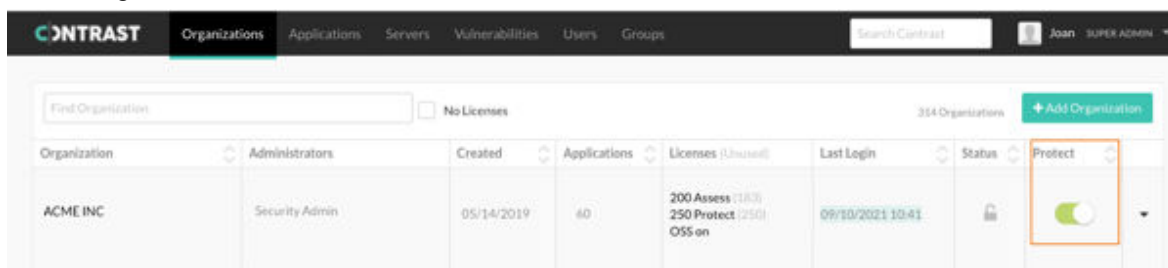
- A SuperAdmin role is required.
- Identify the organizations whose users need access to Protect data.
- Identify which user roles in an organization need access to Protect data.

### Steps

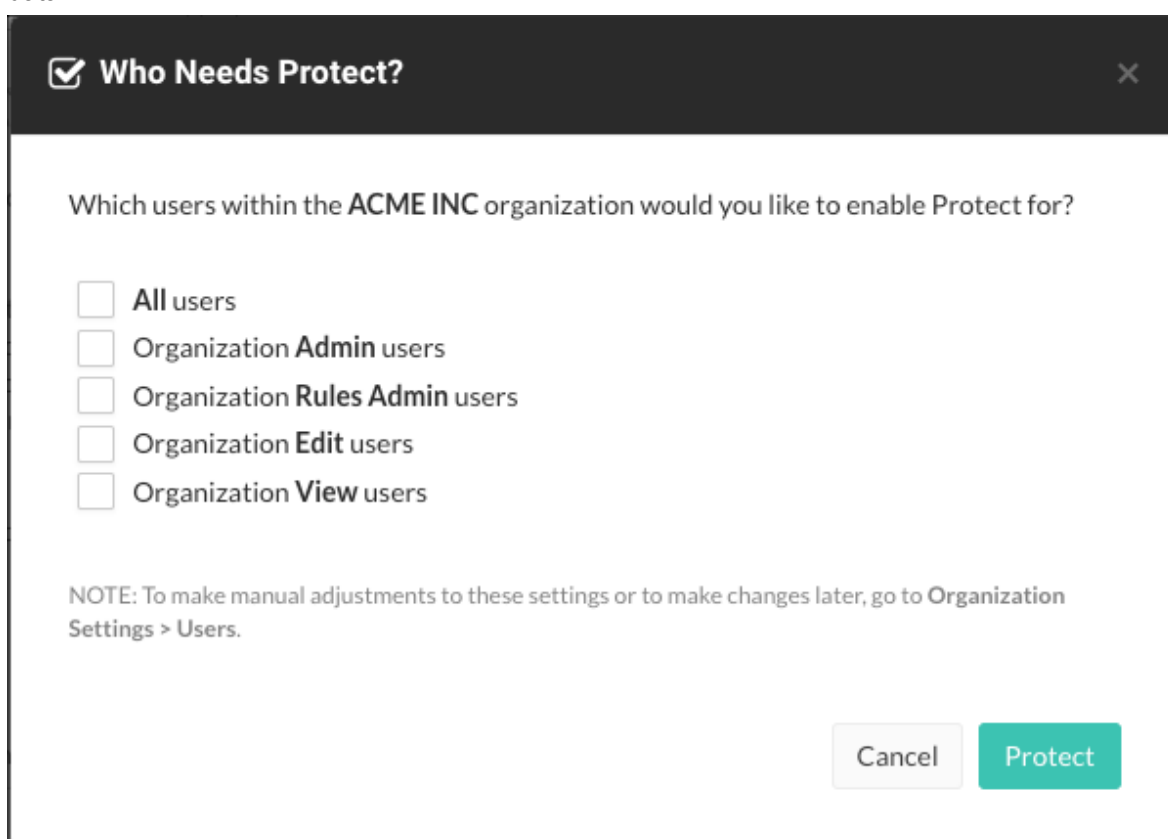
1. Log in as SuperAdmin.
2. Select **SuperAdmin** in the user menu.
3. Select **Organizations** in the header.



- Find the organization for which you want to enable Protect. In the Protect column for that row, turn the setting on.



- In the Who needs Protect window, select the roles that need permission to see and access Protect data.



Select **All users** or specific user roles.

You can also enable or disable Protect access for [individual users](#) (page 1503).

- Select **Protect**.

When you make this change, the users with the selected roles have access to Protect data.

## Automatically add users to groups with SSO

You can automatically add users to groups with single sign-on (SSO).

- Update your SAML configuration in your IDP:

```
<saml2:AttributeStatement
xmlns:saml2="urn:oasis:names:tc:SAML:2.0:assertion">
  <saml2:Attribute Name="contrast_groups"
NameFormat="urn:oasis:names:tc:SAML:2.0:attrname-format:unspecified">
    <saml2:AttributeValue xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/
XMLSchema-instance"
```

```

                                xsi:type="xs:string"
                                >GROUP1</saml2:AttributeValue>
    <saml2:AttributeValue xmlns:xs="http://www.w3.org/2001/XMLSchema"
                                xmlns:xsi="http://www.w3.org/2001/
XMLSchema-instance"
                                xsi:type="xs:string"
                                >GROUP2</saml2:AttributeValue>

    ...
  </saml2:Attribute>
</saml2:AttributeStatement>

```



### IMPORTANT

The attribute values listed under `contrast_groups` must exactly match an existing group name. Contrast won't create new groups based on the values listed under this attribute.

2. Then in Contrast, under [organization settings \(page 1440\)](#), select **Single sign-on** and use the check boxes at the bottom of the form to enable one or both of these:
  - **Add users to their Contrast groups upon SSO login:** Upon login, Contrast adds users to groups listed in the `contrast_groups` attribute in the SAML assertion.
  - **Remove users from their Contrast groups upon SSO login:** Upon login, Contrast removes users from groups not listed in the `contrast_groups` attribute in the SAML assertion.

## References

- User email as NameID

```

<md:NameIDFormat>urn:oasis:names:tc:SAML:1.1:nameid-format:emailAddress</
md:NameIDFormat>

```

- First name and surname

```

<saml2:Attribute Name="http://schemas.xmlsoap.org/ws/2005/05/identity/
claims/givenname"
NameFormat="urn:oasis:names:tc:SAML:2.0:attrname-format:unspecified"
>
    <saml2:AttributeValue xmlns:xs="http://www.w3.org/2001/
XMLSchema"
                                xmlns:xsi="http://www.w3.org/2001/
XMLSchema-instance"
                                xsi:type="xs:string"
                                >Dan</saml2:AttributeValue>
  </saml2:Attribute>

<saml2:Attribute Name=" http://schemas.xmlsoap.org/ws/2005/05/identity/
claims/surname"
NameFormat="urn:oasis:names:tc:SAML:2.0:attrname-format:unspecified"
>
    <saml2:AttributeValue xmlns:xs="http://www.w3.org/2001/
XMLSchema"
                                xmlns:xsi="http://www.w3.org/2001/
XMLSchema-instance"
                                xsi:type="xs:string"

```

```

                                >Dan</saml2:AttributeValue>
    </saml2:Attribute>

```

- User group management

```

<saml2:AttributeStatement
xmlns:saml2="urn:oasis:names:tc:SAML:2.0:assertion">
  <saml2:Attribute Name="contrast_groups"
NameFormat="urn:oasis:names:tc:SAML:2.0:attrname-format:unspecified">
    <saml2:AttributeValue
xmlns:xs="http://www.w3.org/2001/XMLSchema"xmlns:xsi="http://www.w3.org/
2001/XMLSchema-instance"xsi:type="xs:string">GROUP1</saml2:AttributeValue>
    <saml2:AttributeValue
xmlns:xs="http://www.w3.org/2001/XMLSchema"xmlns:xsi="http://www.w3.org/
2001/XMLSchema-instance"xsi:type="xs:string">GROUP2</saml2:AttributeValue>
    ...
  </saml2:Attribute></saml2:AttributeStatement>

```

## See also

[✎Configuring user and group provisioning with Okta](#)

[✎Configuring ADFS to automatically add users to groups](#)

## Default and SuperAdmin credentials

As the system administrator who installs Contrast, you can manage the following sets of credentials:

- **Contrast Hub credentials:** New customers receive an email with the username and a link to set the password. You will need these credentials to [download the installer \(page 1472\)](#) and to log in to [Contrast Hub](#).
  - **Username:** Contrast provides the username in the format *example@domain.com*. It is the same username as the Default Organization Administrator.
  - **Password:** Create this password when you select the link in the activation email.
- **Default SuperAdmin credentials:** These credentials are included in the license. They are used for managing the Contrast application in the [role of SuperAdmin \(page 1557\)](#).
  - **Username:** Contrast provides the username in the format *contrast\_superadmin@domain.com*, where *domain* is the name of your company's email domain.
  - **Password:** The default password is: default1!.
- **Default Organization Administrator credentials:** The Organization Administrator can use these credentials to log in to Contrast after [installation \(page 1472\)](#) and set up and maintain the organization.
  - **Username:** Contrast provides the username in the format *example@domain.com*. It is the same username as the Default Organization Administrator.
  - **Password:** The default password is: default1!.



### IMPORTANT

Be sure to change the supplied default passwords as soon as you have successfully logged in. You can reset the SuperAdmin password [in Contrast \(page 637\)](#) or by using command line on [Windows \(page 1530\)](#) or [Linux \(page 1529\)](#).

## Impersonate users

Impersonating users lets you access organizations as if you have the same role and permissions as the impersonated user. Impersonation is helpful when you need to troubleshoot issues.

If you have a ServerAdmin or System Admin role, you can impersonate the first Organization Admin for an organization by selecting **Impersonate** for an organization on the Organizations page. To use impersonation, you must have access to these organizations.

If you have a ServerAdmin or System Admin role, you can impersonate the first Organization Admin for an organization by selecting **Impersonate** for an organization on the Organizations page. To use impersonation, you must have access to these organizations.

Contrast turns off impersonation automatically after 24 hours.

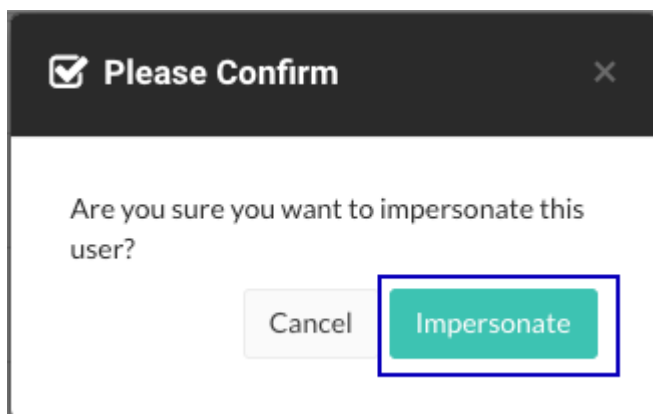
## Before you begin

- The user you choose to impersonate must have an [organization role \(page 1555\)](#).
- If the Impersonation option is not visible for an organization, a SuperAdmin must turn on the [Can enable impersonation \(page 1501\)](#) setting for the organization.
- An Organization Admin must [enable impersonation \(page 1466\)](#) for the organization that you want to access.

## Steps

### • To start impersonation at a user level:

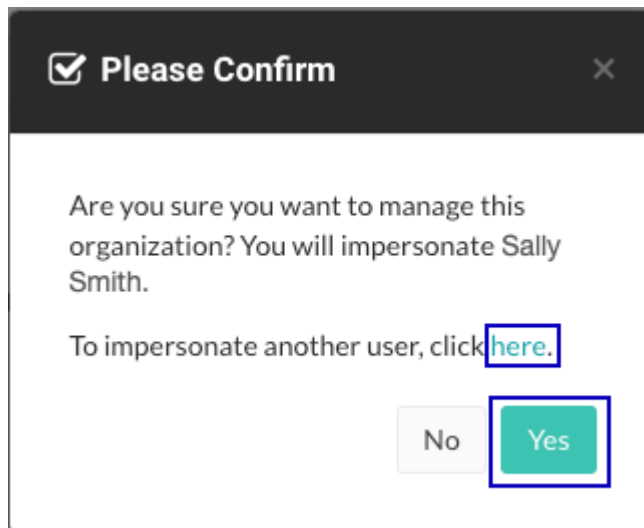
1. Log in to the Contrast web interface as a SuperAdmin.
2. Select **Users**.
3. At the end of the row for the user you want to impersonate, select the triangle ( ▾ ) and select **Impersonate**.
4. In the Please confirm window, select **Impersonate** to confirm that you want to impersonated the selected user.



Contrast opens a session as the impersonated user.

### • To start impersonation at an organization level:

1. Log in to the Contrast web interface as a SuperAdmin, ServerAdmin, or System Administrator.
2. Select **Organizations**, if not already selected.
3. At the end of a row for an organization you want to access, select the triangle ( ▾ ) and select **Impersonate**.
4. In the Please confirm window, select **Yes** to confirm that you want to impersonate the displayed user or select a different user who is an administrator for the organization you want to access.



## Configure authentication



### NOTE

For hosted users, Contrast Security configures authentication. However, an Organization Administrator may be granted the ability to override these settings, including SSO setup.

To request this change contact [Contrast Support](#).

By default, Contrast stores a user directory that includes user's login name, credentials and other details about application authentication. Database credentials are stored (using a one-way hash) in the internal Contrast database. You can set a [password policy \(page 1528\)](#) and [two-step authentication \(page 1514\)](#) for users in Contrast.

Alternatively, you can use an external directory for authentication, in which case, only the username is stored in the Contrast database. Contrast supports:

- [LDAP \(page 1519\)](#)
- [Active Directory \(page 1515\)](#)
- [Single Sign-On \(page 1524\)](#)
- [Trusted HTTPS Proxy \(page 1528\)](#)

Any changes to the authentication settings require that you [restart Contrast \(page 1483\)](#). To change authentication, select **Authentication** under [system settings \(page 1530\)](#).



## IMPORTANT

When you switch between authentication modes, be aware:

- Any users that were created under the previous authentication mode will no longer work, unless the user's email address is the same between the new and old authentication provider.
- After you setup your new authentication mode and restart your server, users can't login to Contrast until their accounts are added to a new or existing organization. For on-premises customers, the SuperAdmin can take care of the Organization Administrator accounts, and then each Organization Administrator is responsible for the users within that organization.



## NOTE

When you use an external authentication provider mode (LDAP or AD), the username field when adding a user functions as a live search that shows users in the proper group.



## TIP

Since roles and permissions are managed by access groups (and not the user directory), it is best practice to create access groups before configuring authentication. You will need at least two unique access groups, one for administrators and one for users.

## Turn on multi-factor authentication at a system level

### Before you begin

- If you configure SSO in Contrast and also want to use multi-factor authentication, configure it using your identity provider (IdP), instead of Contrast. With SSO configured, Contrast passes the responsibility of authenticating users to the IdP.
- For additional protection, organization administrators can set [multi-factor authentication \(page 1450\)](#) as required at the organization level.

### Steps

1. Under [system settings \(page 1530\)](#), select **Security** in the left navigation.
2. Turn the toggle on (green) to enable multi-factor authentication.
3. Select **Allow organization override** to allow Organization Administrators to [choose whether or not to require the feature for users \(page 1450\)](#).

**NOTE**

If a user belongs to multiple organizations, their default organization determines their multi-factor authentication settings.

A user can also [choose how they want to receive multi-factor authentication notices](#). [\(page 637\)](#)

## Configure Microsoft Active Directory

As a [System Administrator \(page 1557\)](#), you can configure Contrast to connect to a Microsoft Active Directory (AD). Use the AD connector to configure this integration. AD has a well-defined structure for directories, resulting in fewer possibilities and a more direct configuration.

**NOTE**

Switching to AD from a different authentication method such as a local database may result in issues if the user ID attribute is inconsistent.

## Access if AD is offline

In the event that your AD service experiences connectivity or configuration issues, use the default SuperAdmin account to log in to Contrast. This feature ensures that you continue to have immediate access to your Contrast account even when AD is offline.

## Steps

1. Start by creating a user in the Active Directory Server that is a dedicated read-only user. The user should have read permission to the directory, including users with permission limited only to the Search Base. You will need this user to set the Search Base when [configuring users for AD \(page 1518\)](#) and when binding to user.
2. Create user groups in the external AD server. You will later use these groups to [assign SuperAdmin privileges \(page 1517\)](#) in Contrast.
3. Under [system settings \(page 1530\)](#), select **Authentication**.
4. Select **Change authentication method** and follow the steps to configure server, groups and advanced settings.
5. Select **Active Directory**.
6. Enter the following information. Some settings may be different for LDAP over SSL (LDAPS) as noted.

#### Under **Connect server**:

- **Protocol:** Enter the protocol that should be used to communicate with the LDAP server. Choose **LDAP** or **LDAPS** from the dropdown. The default is **LDAP**. Additional configuration may be needed for the **LDAPS** option if you are [using a self-signed or privately-signed certificate with AD \(page 1518\)](#).
- **Hostname:** Enter the hostname to connect to when communicating with the LDAP server; either the DNS hostname or IP address of the AD server. In multi-tenant forests, this should be the Global Catalog Server. The default is `localhost`.
- **Port:** Enter the port to connect to when communicating with the LDAP server. For standard (single-tenant, single-domain) directories, this should be port **389 (LDAP)** or **636 (LDAPS)**. In multi-tenant or multi-domain forests, this should be **3268 (LDAP)** or **3269 (LDAPS)**.
- **Search base:** Enter the base DN (a distinguished name that represents the global base level container for your AD environment) to use when communicating with the LDAP server. This is usually your domain or subdomain name. The default is `dc=contrastsecurity,dc=com`. If your login domain is `yourdomain.com`, your base DN would be `dc=yourdomain,dc=com`.

#### Under **Bind to server**.

- **Username:** Enter the full DN of the user who can bind to the directory to perform search functionality. The default is `cn=Directory Manager`.
  - **Password:** The password of the user account that the application should use when connecting to the LDAP server.
7. Select **Test connection** to ensure connectivity to the server. Once connectivity is verified, select **Next**.
  8. [Configure groups. \(page 1517\)](#)
  9. [Configure advanced settings. \(page 1518\)](#)
  10. Once all of the configuration options are set, verify that you are able to log in as both a SuperAdmin and an Organization Administrator using the **Test login** button.



#### NOTE

If the test seems to take an excessive amount of time, it's likely a result of having the wrong setting for the **Follow referrals** option in [Advanced settings \(page 1518\)](#). Once you switch the setting, you should be able to verify login functionality more quickly.



11. Select **Finish** to complete the configuration.

## Configure groups for Active Directory

As part of [Active Directory configuration \(page 1515\)](#), you will need to configure groups.

Contrast doesn't perform Data Access Control using the integrated AD servers. In other words, roles and access to data within the application are handled by the application and Organization Administrators set user roles. However, there is an Access Control check when logging in or creating new users to ensure that the provided user belongs to the correct group in Active Directory (AD).

### Steps

## STEP 3 Configure Groups ?

### Contrast User Group

[Query for Groups](#)

### Contrast SuperAdmin Group

1.

Use the groups that you created on your external AD server to assign users to one of the following Contrast groups.

- **SuperAdmin group:** This group allows users to log in to the Super Administrator interface. Users in this group are authenticated and authorized the first time they log in to Contrast.
- **User group:** This group allows users to be added to an organization and log in to the Contrast web interface. This group is appropriate for all other users.  
To let users log in, [add them \(page 1445\)](#) to the organization manually in the Contrast web interface.



#### NOTE

If you add a user to both groups in your AD instance, Contrast automatically adds them to the SuperAdmin group during configuration.

2. Select **Query for groups** to enable a live search of existing groups as you begin to type within the input fields.



#### NOTE

To create users with AD authentication in Contrast while bypassing the Access Control check, execute the following query in the database.

```
UPDATE teamserver_preferences
SET property_value='true' WHERE
property_name='directory.skip.user_existence.validation'
```

## Configure settings for Active Directory

As part of [Active Directory configuration \(page 1515\)](#), under **Advanced settings** enter:

- **User base DN:** The default is *cn=Users*, the default container for AD. However, if your AD is configured differently, this will be the path to the top-most container where users are stored in the directory.  
For example, if your users are stored in the DN *CN=Engineering,CN=GlobalUsers,DC=intranet,dc=example,dc=com* and your base DN is *DC=intranet,DC=example,DC=com*, the value of the User DN suffix will be *CN=Engineering,DC=GlobalUsers*.
- **User ID attribute:** Enter the user attribute that the user will enter as the username when logging in to the Contrast application. Use the attribute that will be most familiar to the users. The default is **Email address**.
  - **Login ID:** The AD *sAMAccountName* attribute; this is usually the username that you use to log in to Windows.
  - **Email address:** The AD *mail* attribute containing the email address of the user.
  - **User principal:** The AD *userPrincipal* attribute containing the full username.
- **Search within nested groups:** Enable or disable searching within nested groups. The toggle is disabled by default.
- **Follow referrals:** In multi-tenant or multi-domain enterprise forests, LDAP queries may be referred to another server for more details. The toggle is disabled by default.
- **Limit referrals:** Limit to how many referrals should be followed when AD replies with a *Referral* response. The default is "5".

## Use self-signed or privately-signed certificates with Active Directory

If you [configure your AD integration \(page 1515\)](#) to connect to your server using SSL, you may need to import your server's certificate into a new truststore to be used by the Contrast JRE.

1. Acquire the server's certificate from your administrators in PKCS#12 format. If you're using a self-signed certificate, this will be the actual AD server's certificate. If you have a private CA, you need the CA certificate for that server.

2. Once you have the certificate for the server, create a truststore that contains that certificate. Run the following commands as an administrator from a command shell in the directory where Contrast is installed.

```
$ mkdir data/conf/ssl
$ jre/bin/keytool -import -file <path to certificate> -alias <hostname> \
  -keystore data/conf/ssl/truststore.jks
```

3. After you create your truststore containing either your server's or CA certificate, add the following lines into the `bin/contrast-server.vmoptions` file:

```
-Djavax.net.ssl.trustStore=<full path to truststore>
-Djavax.net.ssl.trustStorePassword=<password you set for the trustStore,
if any>
```

4. You should now restart the Contrast server service, and verify that queries against AD will use SSL.

## Configure LDAP

Contrast integrates with many types of Lightweight Directory Access Protocol (LDAP) servers. LDAP is an Internet protocol that web applications can use to look up users or groups listed on an LDAP directory server.

Contrast supports these LDAP server types:

- OpenLDAP
- OpenDS
- ApacheDS
- Fedora Directory Server
- Microsoft Active Directory
- Generic LDAP Servers

Connecting to an LDAP directory server is useful if you manage users and groups in a corporate directory, and you want to delegate the responsibility of managing user access of the application to your corporate directory administrators.



### NOTE

Switching to LDAP from a different authentication method such as a local database may result in issues if the user ID attribute is inconsistent.

A system administrator can configure the LDAP server:



### IMPORTANT

If you configure your LDAP integration to connect to your server using SSL, you may need to take extra steps for [self-signed or privately signed certificates \(page 1524\)](#).

## Access if LDAP is offline

In the event that your LDAP service experiences connectivity or configuration issues, use the default SuperAdmin account to log in to Contrast. This feature ensures that you continue to have immediate access to your Contrast account even when LDAP is offline.

## Steps

1. Start by creating a user in the LDAP Server that is a dedicated read-only user or read-write user (depending on how you configure Contrast to interact with the LDAP directory). The user should be have read permission to the directory, including users with permission limited only to the Search Base. You will need this user to set the Search Base when [configuring users for LDAP \(page 1523\)](#) and when binding to user.
2. Create user groups in the external LDAP server. You will later use these groups to [assign SuperAdmin privileges \(page 1521\)](#) in Contrast.
3. Under [system settings \(page 1530\)](#), select **Authentication**.
4. Select **Change authentication method**.
5. Select **LDAP**.
6. Enter required information under **Connect server** and **Bind server**.

| Option                | Description                                                                                                                                                                                | Default                           |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| <b>Connect server</b> |                                                                                                                                                                                            |                                   |
| <b>Protocol</b>       | The protocol that should be used to communicate with the LDAP server. Choose between <b>LDAP</b> or <b>LDAP with SSL (LDAPS)</b> .                                                         | <b>LDAP</b>                       |
| <b>Hostname</b>       | Enter the hostname to use when communicating with the LDAP server.                                                                                                                         | localhost                         |
| <b>Port</b>           | Enter the port to use when communicating with the LDAP server.                                                                                                                             | <b>389 (LDAP), 636 (LDAPS)</b>    |
| <b>Search base</b>    | Enter the base distinguished name (DN) to use when communicating with the LDAP server. If your login domain is <i>yourdomain.com</i> , your base DN would be <i>dc=yourdomain,dc=com</i> . | <i>dc=contrastsecurity,dc=com</i> |
| <b>Bind to server</b> |                                                                                                                                                                                            |                                   |
| <b>Method</b>         | Select the method to use when connecting to the LDAP server. Options are shown in the next table.                                                                                          | Simple                            |
| <b>Username</b>       | Enter the full DN of the user that should bind to the directory to perform queries and check authentication.                                                                               | N/A                               |

| Option   | Description                                                                  | Default |
|----------|------------------------------------------------------------------------------|---------|
| Password | Enter the password for the bind user specified in the <b>Username</b> field. | N/A     |

There are four supported bind mechanisms that can be used by Contrast. Each has different required fields:

| Method     | Description                                                                                                                         | Required Fields    | Optional Fields |
|------------|-------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------|
| Anonymous  | Administrators provide anonymous, read-only access to the directory.                                                                | None               | N/A             |
| Simple     | This is standard username and password authentication. The username and password are verified as provided by the LDAP server.       | Username, Password | N/A             |
| DIGEST-MD5 | A username and password are provided and hashed using MD5 prior to sending to the server to be authenticated.                       | Username, Password | SASL Realm      |
| CRAM-MD5   | The LDAP server issues a pre-authentication challenge, which is sent with the MD5 hashed username and password to be authenticated. | Username, Password | SASL Realm      |

- Once you configure the connection to the LDAP server, select **Test connection**. Testing the connection ensures that the application can connect to the LDAP server and perform queries.
- [Configure groups for LDAP \(page 1521\)](#).
- [Configure users for LDAP \(page 1523\)](#).
- To verify that the group and user mappings are correctly configured, select **Test login**.
- Once you've successfully logged in as both SuperAdmin and Organization Administrator, select **Finish** to complete the configuration.

## Configure groups for LDAP

As part of the [LDAP configuration \(page 1519\)](#), you will need to configure groups.

Organization Administrators set the [roles and permissions \(page 1552\)](#) for users, and each application handles roles and access to data within that application. When configuring users, you can opt to [add users to an access group on login \(page 1523\)](#). However, even if that is not enabled, Contrast uses the LDAP directory to ensure that the provided user belongs to the correct group.

To configure groups:

- Enter the following values:

| Option                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Default                   |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Group type</b>             | Groups types depend on your server functionality and configuration. Groups are either: <ul style="list-style-type: none"> <li><b>Static:</b> Groups track members through an attribute on the object, such as <code>uniqueMember</code>. The remaining four options in this table only apply to static groups.</li> <li><b>Dynamic:</b> The user object tracks its own membership. Groups are added dynamically to the user object when the user becomes a member of a group.</li> </ul>                    | <b>Static</b>             |
| <b>Group subtree</b>          | Configures whether subtrees of the Base DN should be included when searching for groups in the directory.                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Enabled</b>            |
| <b>Base DN</b>                | This is the distinguished name (DN) where the application can find groups in your LDAP server (like the User Base DN).                                                                                                                                                                                                                                                                                                                                                                                      | <code>ou=Groups</code>    |
| <b>Object class</b>           | If left blank, the application uses the default values of "group," "groupOfUsers," or "groupOfUniqueUsers." This isn't a required field, as it is standard across LDAP deployments.                                                                                                                                                                                                                                                                                                                         | N/A                       |
| <b>Group member attribute</b> | The attribute within a group object in the directory that contains the members of that group. This may differ for your LDAP deployment, so ensure that you are using the correct attribute with your LDAP administrator.<br><br>Each member of the group should be listed as a full distinguished name (DN) not a relative distinguished name (RDN). For example: <code>"cn=smith,ou=Users,cn=support,dc=test,dc=org"</code> .<br><br>If you use an RDN, Contrast does not see that user in the LDAP group. | <code>uniqueMember</code> |

- Use the groups you previously created in your external LDAP server, to assign users to one of the following groups
  - SuperAdmin group:** This group allows users to log in with SuperAdmin permissions.
  - Users group:** This group allows users to be added to an organization and log in to the standard interface. This group is appropriate for all other users.



### IMPORTANT

If a user belongs to both groups, and provisioning is disabled, the user will be created as a SuperAdmin. If provisioning is enabled, the user will be created without SuperAdmin permissions.

3. Select **Query for groups** to enable a live search of existing groups as you begin to type within the input fields.

## Configure users for LDAP

As part of the [LDAP configuration \(page 1519\)](#), you will need to configure users.

To fully integrate with an LDAP directory, Contrast needs information on how to connect to the LDAP server as well as how to find users and groups within the directory.

1. Enter the following information on how you want Contrast to search for users in the directory. The default settings are correct for most LDAP deployments.

**System settings**

General Settings  
Licensing  
Policy  
Security  
API  
**Authentication**  
Mail  
Score Settings  
System Messages

**Set Up Authentication**

Step 4 Configure Users

**Find Users**

Base DN  
ou=People,dc=example,dc=com

Object Class  
inetOrgPerson

First Name Attribute  
givenName

Last Name Attribute  
sn

Email Attribute  
mail

User Subtree ☒

User ID Attribute  
mail

Authentication Strategy ☒ Bind ☐ Compare

Default Organization  
New Org

Default Organization Role (New Users)  
Edit

Default Application Access Group  
Edit

☒ Enable user provisioning  
☐ Add users to their Contrast groups upon login  
☐ Remove users from their Contrast groups upon login

Previous Test Login Finish

| Option                         | Description                                                                                                                                                                                                                                                                                                      | Default        |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Base DN                        | Indicate the container (under the global base DN) where Contrast should start searching for users. In most organizations, this is a single container (for example, <i>ou=Users</i> ), but your LDAP administrator should verify that you're searching the right container.                                       | ou=users       |
| Object Class                   | Indicate the LDAP object class for user objects in the directory.                                                                                                                                                                                                                                                | inetOrgPerson  |
| First Name Attribute           | Indicate the LDAP field that contains a user's first name.                                                                                                                                                                                                                                                       | givenName      |
| Last Name Attribute            | Indicate the LDAP field that contains a user's last name.                                                                                                                                                                                                                                                        | sn             |
| Email Attribute                | Indicate the LDAP field that contains a user's email address.                                                                                                                                                                                                                                                    | mail           |
| <b>User subtree</b>            | If enabled, subtrees of the Base DN are included when searching for users.                                                                                                                                                                                                                                       | <b>Enabled</b> |
| <b>User ID attribute</b>       | Indicate the LDAP field that should be identified as the User ID. This is the username to enter when logging in to contrast.                                                                                                                                                                                     | uid            |
| <b>Authentication strategy</b> | Choose how you want Contrast to authenticate users when they provide their credentials. <b>Bind</b> means the application sends the user's credentials to the server for authentication. <b>Compare</b> means the server hashes the user's credentials and compares them to the value of the password attribute. | <b>Bind</b>    |

| Option                    | Description                                                                                                                                                                      | Default      |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>Password attribute</b> | The LDAP field that contains a user's password.<br><br>If you selected <b>Compare</b> for the authentication strategy, this attribute contains the hashed password for the user. | userPassword |

- To automatically create new user accounts when someone makes an LDAP request to log in, check the box next to **Enable user provisioning**.  
Use the dropdowns to choose the **Default organization**, **Default organization role** and **Default application access group** for the new users.
- Contrast can automatically provision or de-provision users at login time based upon the user's LDAP groups. When this feature is enabled for LDAP-based authentication, users are added to a Contrast access group that maps to a corresponding LDAP group and removed from disallowed Contrast groups. Users can be added to multiple groups, as well as added to groups that give them access to multiple organizations.



### IMPORTANT

For this to work, the Contrast groups must already exist, and the groups from LDAP (for provisioning purposes) must have the same name as the Contrast groups.

- To add users to their groups when they log in to Contrast, check the box next to **Add users to their Contrast groups upon login**. To remove users from their groups when they log in to Contrast, check the box next to **Remove users from their Contrast groups upon login**.

## Use self-signed or privately-signed certificate with LDAP

If you [configure your LDAP integration \(page 1519\)](#) to connect to your server using SSL, you may need to import your server's certificate into a new truststore to be used by the Contrast JRE.

- To begin, acquire the server's certificate from your administrators in PKCS#12 format. If you're using a self-signed certificate, this is the actual LDAP server's certificate. If you have a private certificate (CA), you need the CA certificate for that server.
- Once you have the certificate for the server, import it into the truststore used by the JRE running Contrast. Run the following command as an administrator from a command shell in the directory where Contrast is installed.

```
$ jre/bin/keytool -import -file <path to certificate> -alias <hostname> \
-keystore <ts install>/jre/lib/security/cacerts
```

- You should now restart the Contrast server service, and verify that queries against LDAP now use SSL.

## Configure single sign-on (SSO) at a system level

Single sign-on (SSO) is an authentication service that allows access to multiple applications using one set of credentials. As a System Administrator, you can configure Contrast to use this service with a SAML 2.0 supported provider.



**NOTE**

- For more information, see the [SAML 2.0 specification](#).
- If you're not using SSO, protect your system by configuring [multi-factor authentication \(page 1514\)](#) as a required setting.
- If you configure SSO in Contrast and also want to use multi-factor authentication, configure it using your identity provider (IdP), instead of Contrast. With SSO configured, Contrast passes the responsibility of authenticating users to the IdP.

Authentication happens through an identity provider (IDP). You may use your own generic IDP or one of many popular third-party providers, such as [Okta](#), [OneLogin](#), [Ping Identity](#) or [ADFS](#).

Have your IDP metadata information ready, and then provide your metadata to connect to Contrast via an XML file or a Metadata URL.

For on-premises customers, the SuperAdmin configures SSO at the system level. Hosted customers can configure SSO at an organization level. Multi-tenant hosted instances can have multiple IDPs configured to a single instance of Contrast.

**NOTE**

If users are identified with a user ID rather than an email address, those accounts don't automatically transfer over to the SSO configuration and must be recreated.

## Before you begin

When using SSO, you must configure your `NameID` to pass the user's email.

Optionally, to set the user's first and last name, you must configure their IdP to pass additional attributes via the SAML assertion using:

- **First name:** `http://schemas.xmlsoap.org/ws/2005/05/identity/claims/givenname`
- **Last name:** `http://schemas.xmlsoap.org/ws/2005/05/identity/claims/surname`

If those fields are not present or are blank, the default is to use the `NameID` field. And if user provisioning is enabled, the user's first and last name will auto-populate.

```
1<saml2:Attribute Name="http://schemas.xmlsoap.org/ws/2005/05/identity/claims/givenname"
2
3NameFormat="urn:oasis:names:tc:SAML:2.0:attrname-format:unspecified"
4
5>
6      <saml2:AttributeValue xmlns:xs="http://www.w3.org/2001/XMLSchema"
7
8          xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
9
10             xsi:type="xs:string"
11             >Dan</saml2:AttributeValue>
12    </saml2:Attribute>
```

## Steps

1. Contrast doesn't provide keys for SAML authentication. If you enable SSO without providing private keys, you're only able to perform IDP-initiated logins. You need to generate your own self-signed key using the Java Keytool:

```
keytool -genkeypair -alias some-alias -keypass changeit -keyalg RSA  
-keystore samlKeystore.jks
```

2. Use the [encrypted properties editor \(page 1537\)](#) to modify *saml.properties*, and update the values to the keystore you created in the previous step.

```
authenticator.saml.keystore.path          : /path/to/  
samlKeystore.jks  
authenticator.saml.keystore.default.key   : some-alias  
authenticator.saml.keystore.passwordMap   : some-alias=changeit  
authenticator.saml.keystore.password     : changeit
```

3. Once you make the changes, restart Contrast so that it picks up the new keystore.
4. In the Contrast, under [system authentication \(page 1513\)](#), select **Authentication**, then **Change authentication method**.
5. Select **Single sign-on**.
6. Use the provided information to set up Contrast with your IDP. (You must also provide the **Entity ID** and **Metadata URL** in your IDP configuration.)

## Set Up Authentication

Step 2 Configure Your Identity Provider

Integrate your SAML Identity Provider (IdP) with Contrast to allow authentication of users using one set of credentials.

What you'll need: [Copy Metadata URL](#)

|                                                                                     |                                                                                     |                  |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------|
| Entity ID *                                                                         | Metadata URL                                                                        | Attributes       |
| http://ec2-52-68-234-25.ap-northeast-1.compute.amazonaws.com/Contrast/saml/metadata | http://ec2-52-68-234-25.ap-northeast-1.compute.amazonaws.com/Contrast/saml/metadata | None required    |
| Version                                                                             | NameID Format                                                                       | Consumer Binding |
| 2.0                                                                                 | Email Address                                                                       | HTTP-POST        |
| Assertion Consumer URL                                                              |                                                                                     |                  |
| http://ec2-52-68-234-25.ap-northeast-1.compute.amazonaws.com/Contrast/saml/metadata |                                                                                     |                  |

What we need:

Identity Provider \*

☐ I have access to the metadata URL

IdP Metadata \*

```
<EntityDescriptor xmlns="urn:oasis:names:tc:SAML:2.0:metadata" entityID="http://ec2-52-68-234-25.ap-northeast-1.compute.amazonaws.com/Contrast/saml/metadata">
  <SPSSODescriptor AuthnRequestsSigned="false" WantAssertionsSigned="false"
    protocolSupportEnumeration="urn:oasis:names:tc:SAML:2.0:protocol
urn:oasis:names:tc:SAML:1.1:protocol http://schemas.xmlsoap.org/ws/2003/07/secext">
    <SingleLogoutService Binding="urn:oasis:names:tc:SAML:2.0:bindings:HTTP-POST"
      Location="http://ec2-52-68-234-25.ap-northeast-1.compute.amazonaws.com/Contrast/saml/logout" />
  </SPSSODescriptor>
</EntityDescriptor>
```

Accepted Domain(s) (New Users) \*

[Add domain](#)

Default Organization: Contrast Demo

Default Organization Role (New Users): Edit

Default Application Access Group: Edit

☒ Enable user provisioning

☐ Add users to their Contrast groups upon SSO login

☐ Remove users from their Contrast groups upon SSO login

Cancel Save

- Provide a name for your **Identity provider**.
- Enter your IDP metadata. Select the box if you **have access to the metadata URL**, then enter the URL.
- If you want to automatically create new user accounts when someone make a SAML request to log in to Contrast, check the box next to **Enable user provisioning**.
  - Use the dropdowns to choose the **Default organization role** and **Default application access group** for the new users.
  - Add the **Accepted domains** that must be used to trigger user provisioning (for example, *yourdomain.com*).



### NOTE

You can also [automatically add users to groups \(page 1509\)](#).

- Select **Save**. If an error occurs, you can [check debug logs \(page 1492\)](#) for troubleshooting.
- [Restart Contrast \(page 1483\)](#) to apply the changes.

Once connected, you can return to the **SSO** tab to view and edit your settings. (You must retest and [restart Contrast \(page 1483\)](#) to apply the changes.) To return the organization back to the default configuration, select **Revert to Contrast-managed authentication** and confirm the change.

If SuperAdmin was disabled during installation, you're provided with two sets of metadata: one for the public node and one for the secret node. You need to set up the configuration for both in the Contrast interface.

## See also

- 🔗 [How to troubleshoot problematic SAML integrations](#)
- 🔗 [Configuring user and group provisioning with Okta](#)
- 🔗 [Configuring ADFS to automatically add users to groups](#)

## Enable HTTPS proxy authentication

You can use a trusted proxy for authentication, which authenticates the user and then sends the user's username to Contrast in an HTTP header. (This type of authentication is particularly useful for x509 clients.)

Users must be configured in Contrast before starting their authentication configuration, and use the same email address as their usernames for both configurations, in order to be granted access to Contrast after authentication.

To enable trusted HTTPS proxy authentication:

1. Update the *auth.properties* property file by changing the authentication mode in *~/path\_to\_contrast\_installation/data/conf/auth.properties* to *http\_header*.
2. By default, the HTTP header name is *Contrast-Authentication*. You can also configure this in the *auth.properties* file by updating the value of *auth.http.header.field.name*.
3. After restarting Contrast, each request must include the HTTP header *Contrast-Authentication: username* to log in.



### NOTE

Trusted HTTPS proxy authentication should only be used if all Contrast nodes are accessible exclusively through a trusted proxy. No nodes should be accessible directly; otherwise, an attacker could impersonate any authorized user.

## Set a password policy at a system level

Regulate passwords at a system level by creating a password policy.

1. Under [system settings \(page 1530\)](#), select **Security**.
2. Under **Default password policy**, select the box if you want to **Allow organization override**. This way organization administrators can [set password policy for their organizations \(page 1450\)](#).
3. Enter the following settings for your policy:
  - Set the password strength. This can be **Weak**, **Medium**, **Strong**, **Complex** or **Custom**. If you choose **Custom**, enter the number of minimum **Uppercase letters**, **Lowercase letters**, **Numbers** and **Symbols** required.
  - Enter the number of characters required in the **Minimum length** field.
  - Use the dropdown to choose the length of time allowed before **Password expiration**.
  - Enter the number of login attempts allowed before **Login logout**.
  - Enter the length of time allowed before **Inactive account expiration**.
  - Select the box to **Restrict password reuse**, and use the dropdown to choose the number of times each password may be reused.

- Select the box to **Restrict password reset**, and use the dropdown to choose the number of hours during which a user can reset their password after their reset request is sent.
- Use the dropdowns to select the amount of time that may pass before **Idle timeout** and **Session timeout**.

4. Select **Save**.

## Reset SuperAdmin password on Linux

To change the SuperAdmin password, edit the `contrast-server.voptions` file or use environment variables.

In most cases, editing the `contrast-server.voptions` file is the easiest method to use. If you are using containers for your Contrast application, use environment variables to reset the password.

### Steps

1. Open a command prompt and log in using the Contrast service account created during installation. For example:

```
sudo -su contrast_service
```

2. Shut down the Contrast server with this command:

```
$CONTRAST_INSTALLATION/bin/contrast-server stop
```

3. Are you going to use the `contrast-server.voptions` file to reset the password?

- If **yes**, go to [step 4](#).
- If **no**, go to [step 5](#).

4. To reset the password with the `contrast-server.voptions` file, use this procedure:

- a. Go to the `$CONTRAST_INSTALLATION/bin` directory. On most systems, this directory is `/opt/Contrast/bin`.
- b. Open the `contrast-server.voptions` file in a text editor.
- c. Add the following options to the file (replace `youremaildomain.com` with your email domain):

```
-Dreset.superadmin=true  
-Dsuperadmin.username=contrast_superadmin@<your.email.domain.com>  
-Dsuperadmin.password=<password>
```

5. To reset the password with environment variables instead of the `voptions` file, use this procedure:

- a. Go to the `$CONTRAST_INSTALLATION` directory. On most systems, this directory is `/opt/Contrast`.
- b. Enter the following command:

```
export INSTALL4J_ADD_VM_PARAMS="$INSTALL4J_ADD_VM_PARAMS  
-Dreset.superadmin=true  
-Dsuperadmin.username=contrast_superadmin@<your.email.domain.com>  
-Dsuperadmin.password=<new password>"
```

6. Start the Contrast server with this command:

```
$CONTRAST_INSTALLATION/bin/contrast-server start
```

When the server starts, use the password you specified in step 4 or 5.

7. Shut down the Contrast server with this command:

```
$CONTRAST_INSTALLATION/bin/contrast-server stop
```

8. If you used the `contrast-server.voptions` file, remove the options you added in step 4.
9. Start the Contrast server as you normally would and exit the shell.

If you used environment variables to reset the password, this step clears the password from the `INSTALL4J_ADD_VM_PARAMS` environment variable.

## Reset SuperAdmin password on Windows

To reset the SuperAdmin password in the Contrast application.

1. Stop the Contrast Server service.
2. Launch a command prompt (`cmd.exe`) as an Administrator by right-clicking on **cmd.exe** and selecting **Run As Administrator**.
3. Go to the `Contrast\bin` directory. (On most systems, this is `C:\Program Files\Contrast\bin.`)
4. Use this command to edit the JVM options:

```
notepad contrast-server.vmoptions
```

5. Add the following options to the file. (Replace `youremaildomain.com` with your email domain.)

```
-Dreset.superadmin=true  
-Dsuperadmin.username=contrast_superadmin@<your.email.domain.com>  
-Dsuperadmin.password=<password>
```

6. Save the file and exit Notepad.
7. Use this command to start the Contrast service:

```
net start "Contrast Server"
```

8. Verify you are able to log in with the new password.
9. Enter the following command to stop the Contrast service:

```
net stop "Contrast Server"
```

10. Enter the following command to edit the JVM options:

```
notepad contrast-server.vmoptions
```

11. Remove the options added in step 5.
12. Save the file and exit Notepad.
13. Exit the command prompt.
14. Start the Contrast Server service as normal (from the Services control panel).

## Manage keys

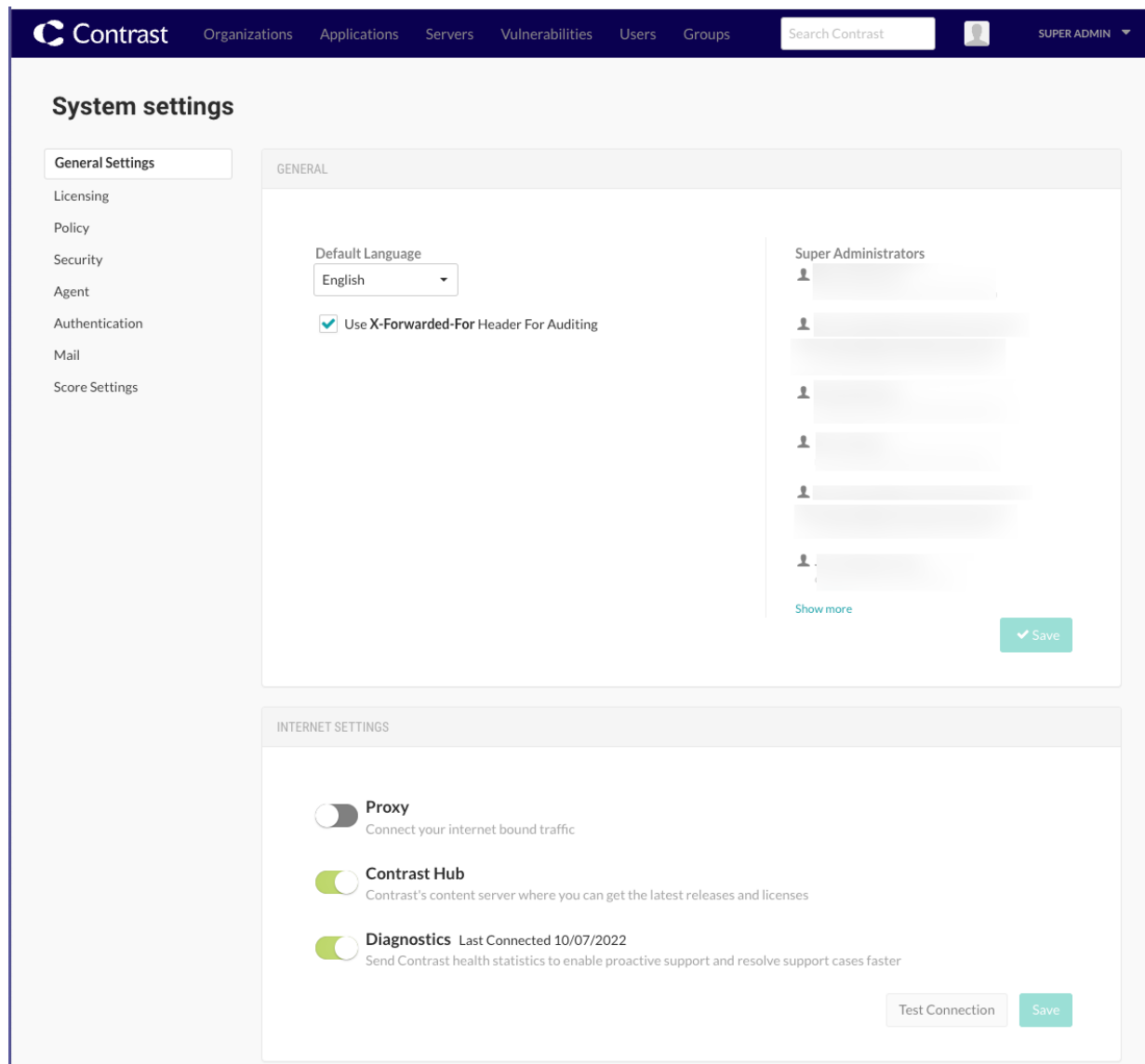
As a System Administrator, you can set policies for the keys across all your organizations to make sure they always meet your security standards.

1. In [system settings \(page 1530\)](#), select **Security**.
2. Under **API keys** choose the number of characters required as well as the minimum number of numerals, upper case characters and lower case characters required in the key. These standards apply when anyone [rotates the API key \(page 109\)](#).
3. Check the box at the top of the form if you want to **Mask invalid IPs on login**.
4. Select **Save**.

## Configure system settings

The System settings page lets you configure standard settings at a system level.

A [distributed deployment \(page 1479\)](#) of Contrast requires a different configuration.



## Steps

1. Log in as SuperAdmin, ServerAdmin or System Administrator.
2. Select **SuperAdmin** in the **user menu**.
3. Select **System settings** in the **user menu**.  
You can access:
  - [General settings \(page 1532\)](#)
  - [Licensing \(page 1533\)](#)
  - [Policy \(page 1536\)](#) (library compliance settings)
  - [Security \(passwords \(page 1528\), two-step authentication \(page 637\) and key management \(page 1530\)\)](#)
  - [Agent keys](#) (these are the same [Agent keys \(page 109\)](#) that you can find in Organization settings).
  - [Authentication \(page 1513\)](#)
  - [Mail \(page 1536\)](#)
  - [Score settings \(page 1459\)](#)

## Additional system settings

Additional system settings include:

- [Configure Tomcat \(page 1484\)](#)
- [Configure Java Runtime Environment \(JRE\) \(page 1485\)](#)
- [Configure HTTPS \(page 1485\)](#)
- [Add organizations \(page 1501\)](#)
- [Configure log levels \(page 1493\)](#)
- [Configure reporting storage \(page 1491\)](#)

## Configure general system settings

General settings is part of [system settings \(page 1530\)](#). Here, you can configure these settings:

- **Default language:** Select the language for your user interface.
- **X-Forwarded-For header:** Check the box if you want to use this header for auditing.
- **Proxy:** Connect your internet bound traffic.
- **Hub:** Integrate with Hub for library and CVE updates.
- **Diagnostics:** Send Contrast health statistics to enable proactive support and resolve support cases faster.
- **Agent diagnostics:** Send Contrast agent data to improve rules, performance and to prioritize product improvements.
- **Heroku settings:** Enter your password and SSO salt for the Heroku integration.

## Manage diagnostics at a system level

Contrast collects diagnostics that measure customer product usage to help provide faster, more proactive support and guide delivery of new functionality.

Contrast periodically sends snapshots of relevant data elements and aggregations to a diagnostics service on Contrast's hosted platform. Data that could be used to identify a customer or organization is obscured using a one-way hash, and is encrypted both in transit and at rest.

Diagnostic data provides aggregated insights, including counts and severity levels of detected vulnerabilities, Mean Time to Resolution (MTTRs), discovered and tested network routes, license utilization, and attack strings and IP addresses. This data is designed for high-level analysis and does not contain sensitive details such as personally identifiable information, source code, customer network identifiers, or specific vulnerability details beyond their general category and severity.

The data is then stored in a Contrast database, where it's made available to approved support and development users for analysis and reporting. Within the database, the data is attributed to customers to provide Customer Support insight into how to better assist Contrast customers.

Diagnostics improve customer support in three main ways:

- Customer Support analyzes diagnostics data for markers and reaches out proactively to customers to prevent problems.
- Data is used to quickly diagnose existing problems and reduce the cycle time for successfully resolving support cases.
- Deployment and usage insights help Contrast product development teams adjust and deliver new functionality that better address customer needs.

As a SuperAdmin, ServerAdmin or System Administrator, you can enable or disable diagnostics for your whole on-premises system:

1. In system settings, select **General settings** from the left navigation.
2. Under **Internet settings**, use the **Diagnostics** setting to disable or enable this feature. Diagnostics are enabled by default.  
Proxy settings apply to [Contrast Hub](#) and diagnostics settings.



**TIP**

You can also use the [REST API](#) to preview the data that will be transmitted to Contrast in these diagnostics.

## Allocate licenses at a system level

Contrast has these types of licenses:

- On-premises customers require a license to [install \(page 1472\)](#) and [upgrade \(page 1495\)](#) Contrast.
- Hosted and on-premises customers require specific licenses for Assess (application licenses), Protect (server licenses), and SCA (library licenses).

Use this procedure to allocate Assess and Protect licenses to organizations.

### Before you begin

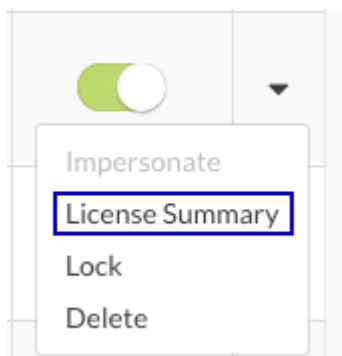
- For on-premises customers, a SuperAdmin or ServerAdmin role is required to allocate Assess and Protect licenses to a particular organization. Contrast Security handles this activity for hosted customers.
- Licenses applied to applications permanently count towards the number of maximum allowable applications. Deleting a licensed application has no effect on the number of licenses you are allowed to apply to applications.

### Steps to allocate licenses

1. Select **SuperAdmin** or **ServerAdmin** in the **user menu**.  
You see a list of organizations. The **Licenses** column shows the total number of Assess and Protect licenses available for each organization, followed by the number of unused licenses in parentheses.
2. You see a list of organizations. The **Licenses** column shows the total number of Assess and Protect licenses available for each organization, followed by the number of unused licenses in parentheses.
  - Select **Assess** or **Protect** in the Licenses column.



- Select the triangle ( ▾ ) at the end of a row and select **License summary**.



3. To add available Assess licenses to an organization:
  - a. Select **Add more licenses** above the Assess license bar.
  - b. In **Assess licenses**, enter the number of licenses you'd like to make available to this organization.
  - c. In **Expiration date**, enter an expiration date for the licenses you are adding.
  - d. Select **Allocate**.

**License summary**

A summary of licenses for the **AZTestOrg** organization.

**10 Assess licenses** [Add more licenses](#)

0/10 [Revoke unused licenses](#)

**Allocate Licenses** ×

[Go back](#)

Allocate licenses to the **AZTestOrg** Organization.

**Assess licenses** **Expiration Date**

450 02/01/2023 ×

999969157 of 999999999 Available

[Cancel](#) [Allocate](#)

4. To remove unused Assess licenses from an organization, select **Revoke unused licenses** below the Assess license bar.
5. To change the number of purchased Protect licenses allocated to an organization:
  - a. Select **Change license allocation** above the Protect license bar.
  - b. In **License allocation**, enter the number of licenses that you want to let the organization use. The default value is the number of purchased licenses. To revoke licenses for the organization, enter a value that's less than the number of purchased licenses. You can revoke more than the number of purchased licenses.
  - c. Select **Save changes**.

### License summary

A summary of licenses for the **AZTestOrg** organization.

10 Assess licenses

0/10

[Add more licenses](#)

10 Protect licenses

0/10

[Revoke unused licenses](#)

[Change license allocation](#)

### License summary

[< Go back](#)

#### Allocate Protect licenses

Change license allocation for the **AZTestOrg** organization.

20 Protect licenses

0/20

License allocation

20

Cancel

Save changes

## Steps for license details and settings

- To view the number of licenses available for each organization, Select **Organizations** in the header,  
The **Licenses** column shows the total number of Assess and Protect licenses available for each organization, followed by the number of unused licenses in parentheses.  
If Assess licenses are nearing expiration, you see a red warning icon. Hover over the icon to see the number of licenses expiring.
- To view the number of available licences as well as the number of applications or servers that are unlicensed, from the user menu, select **System settings > Licensing**.
- To automatically apply licenses to new applications or servers, under Licensing, select the toggle for Assess or Protect licenses. Then, select whether this setting applies to all applications or servers or only new ones.  
SuperAdmins, ServerAdmins and System Administrators also have the option to automatically apply licenses when you [add an organization \(page 1501\)](#).
- In the top right of the Licensing window, you can select **Allow Organization Administrators to override** these settings (this setting defaults to enabled).

## Customize score settings at a system level

Contrasts designates an [application score \(page 1557\)](#), which can optionally depend on a [library score \(page 1216\)](#). To customize score settings at a system level:

1. Under [system settings \(page 1530\)](#), select **Score settings**.
2. Select an option for **Overall score** to determine how applications are scored in Contrast:
  - **Default score** is the average of your application's [library score \(page 1216\)](#) and its custom code score.
  - **Custom code-only score** ignores library score when calculating the overall application score. If you select this option, you can click to select specific languages, or apply it to all languages.
3. Select an option for **Library score** to determine how libraries are scored in Contrast:
  - **Default score** uses an algorithm that includes vulnerabilities as well as the age and versioning of a library.
  - **Vulnerability-only score** bases scoring solely on vulnerabilities present in the library.
4. Select the box next to **Allow organization override** so that an Organization Administrator can [determine score settings at an organization level. \(page 1459\)](#)
5. Select **Save**.



### NOTE

A RulesAdmin can configure policy settings in **Policy Management** so that any library in violation automatically receives a failing score (F). Once these settings are chosen, you'll see an alert message in Score Settings. Clicking the policy link in the alert navigates you to Library Policy, where administrators may view and revise these settings.

## Manage library compliance policy

You can manage library compliance policy at the system level. Library compliance policy allows you to restrict libraries that applications can safely use and set version requirements for specific libraries. Contrast can flag applications that use restricted libraries and flag or fail libraries that violate the compliance policy.

To manage library compliance policy:

1. Open the **user menu** (your name in the top right corner of Contrast) and select **System settings (page 1530)**.
2. Select **Policy**.
3. Set compliance requirements for your policy: libraries that are restricted from use, library version requirements, and whether Contrast should fail libraries that violate the policy.
4. Select **Allow organization override**, if you want Organization Administrators and RulesAdmins to [set compliance policy \(page 1429\)](#) at an organization level.

## Manage email notifications at a system level

System Administrators can enable or disable and configure Contrast to communicate with an appropriate SMTP system to receive these notifications.

Notifications allow Contrast users to receive alerts in specific situations, such as the discovery of a vulnerability or an attack on an application or when a password is reset.

Organization Administrators can [set default settings \(page 1457\)](#) for Contrast notifications at an organization level. Individual users can [adjust their own settings \(page 639\)](#).

To configure notifications at a system level:

1. Under [system settings \(page 1530\)](#), select **Mail** in the left navigation.
2. Configure these settings:
  - **Enable mail:** Use the toggle to enable or disable the feature.
  - **Mail protocol:** Values can be "SMTP" or "SMTPs".
  - **Mail host:** The fully qualified address of the SMTP server.
  - **Mail port:** The likely value is "25".
  - **Use SMTP auth:** Check the box to enable this setting.
  - **Mail user:** A user account for authentication purposes on the SMTP system.
  - **Mail password:** The password for the mail user associated with the SMTP system.
  - **Mail from:** Enter the email address you want system notifications to be sent from.
  - **Enable STARTTLS:** Check the box to enable this setting.
3. Select **Save**.

## Maintain Contrast on-premises

As a system administrator there are some ongoing tasks that are required for maintenance of the system. You may need to:

- [Back up MySQL databases \(page 1539\)](#)
- [Improve performance \(page 35\)](#)
- [Upgrade Contrast \(page 1495\)](#)
- [Upgrade the agents \(page 1496\)](#)
- [Update library data \(page 1497\)](#)
- [Update the Contrast license \(page 1499\)](#)
- [Update the IP address \(page 1497\)](#)
- [Manage SSL \(page 1541\)](#)
- [Use the encrypted properties editor \(page 1537\)](#)

## Use the encrypted properties editor

Contrast includes several configuration files in the `$CONTRAST_HOME/data/conf` directory. By default, Contrast encrypts the configuration files for security, but you can modify some of these files through workflows in Contrast.

For example, these are some of the encrypted properties files for on-premises installations:

| Name                             | Contents                                                                            |
|----------------------------------|-------------------------------------------------------------------------------------|
| <code>ad.properties</code>       | Settings to connect and configure Contrast to authenticate Active Directory groups. |
| <code>ldap.properties</code>     | Settings to connect and configure Contrast to authenticate LDAP groups.             |
| <code>database.properties</code> | Host and connection settings for communication between Contrast and MySQL.          |
| <code>saml.properties</code>     | SAML keystore security settings.                                                    |

Contrast also includes an editing tool to decrypt these files and assist with configuration. This is helpful when you are [running Contrast \(page 1481\)](#) and need to get values from encrypted properties files outside of the application or automatically update a property in the files, such as automatic password rotation.

To edit encrypted properties files:

1. Find the decryption tool in the `$CONTRAST_HOME/bin` directory.
  - **Linux:** the file is a shell script called `edit-properties`.
  - **Windows:** the file is a Windows command file called `edit-properties.exe`.

2. Run the tool from a command prompt. This opens an application that allows you to update the value of an encrypted property:

```
$CONTRAST_HOME/bin/edit-properties -e $CONTRAST_HOME/data/esapi -f
$CONTRAST_HOME/data/conf/ad.properties
```

3. You must provide input details to view or edit encrypted properties files. The basic inputs you need are:

- The path to *ESAPI.properties*.
- The target properties file to edit.

To find this information for the encrypted properties editor, execute `edit-properties` with no arguments:

```
contrast@EOP-TeamServer:~/contrast/bin$ ./edit-properties

usage: property-editor
-c,--comment <text>      The comment for the top of the file
-e,--esapi <path>        The path to the ESAPI.properties file
-f,--targetFile <file>    The properties file to edit
-o,--print-value          Print out the value of the property and exit
-p,--property <name>      The name of the property to set
-v,--value <val>         The value of the property
```

4. This example shows you how to edit an encrypted file. Provide the path to *ESAPI.properties* and the target properties file to edit. You will see the existing values encrypted in the file that you can edit. The usage options above allow you to view or edit a single property.

```
contrast@TeamServer:~/contrast/bin$ ./edit-properties -e ../data/esapi/
-f ../data/conf/ad.properties

ad.userDn                        : cn=Directory Manager
ad.identity.attribute.name       : mail
ad.password                      : NotaRealPassword
ad.nested.groups.enabled         : false
ad.group.users                   :
cn=ContrastUsers,cn=Users,dc=contrastsecurity,dc=com
ad.group.admin                   :
cn=ContrastAdmins,cn=Users,dc=contrastsecurity,dc=com
ad.url                           : ldap://localhost:389
ad.base                          :
dc=contrastsecurity,dc=com
```

5. You can also retrieve or update unencrypted values for a property. To retrieve values, pass another parameter to the properties editor. In this example, the user is looking for details about database properties:

```
$CONTRAST_HOME/bin/edit-properties \
-e $CONTRAST_HOME/data/esapi \
-f $CONTRAST_HOME/data/conf/database.properties \
-p jdbc.username \
-o
```

To update unencrypted values, pass a different set of arguments to the properties editor:

```
$CONTRAST_HOME/bin/edit-properties \
-e $CONTRAST_HOME/data/esapi \
-f $CONTRAST_HOME/data/conf/database.properties \
-p jdbc.username \
-v joe.user \
-c "Updating JDBC Password"
```

**NOTE**

Add comments to indicate edits to encrypted properties files. This is useful for auditors or others who need to track configuration changes.

## MySQL backups

Use these procedures to maintain the MySQL databases that the Contrast installer creates.

These procedures do not apply to a MySQL database that you create for distributed environments.

- [Create an automated MySQL backup \(page 1539\)](#)
- [Backup MySQL manually \(page 1539\)](#)
- [Restore database backups \(page 1540\)](#)
- [Disable automated backups \(page 1540\)](#)

## Backup MySQL manually

You can also use the `backup-db` script included with Contrast to do this.

### Before you begin

- Be sure you have permission to run the `backup-db` script. Typically, you must be the installation owner for a Contrast, root or Windows Administrator account to do this.
- Be sure that Contrast is running and MySQL is available.

### Steps

1. If you have not done so, configure the database backup location. Set a location for `database.bk.dir` by editing the `$CONTRAST_HOME/data/conf/database.properties` file with the [encrypted editor \(page 1537\)](#).
2. Run the backup command for your environment:
  - **Windows:** `$CONTRAST_HOME\bin\backup-db.cmd`
  - **Linux:** `$CONTRAST_HOME/bin/backup-db.sh`

## Create an automated MySQL backup

You can create a backup of the Contrast MySQL database on a regularly scheduled basis. During [installation \(page 1472\)](#), you can select this option and define a time and location for storing database backups.

If you skip this step during installation, you can still configure Contrast later to schedule database backups.

### Steps

1. Find Contrast database settings in `$CONTRAST_HOME/data/conf/database.properties`.
2. [Use the encrypted properties editor \(page 1537\)](#) to identify database settings. The example below shows a Contrast database with backups enabled, scheduled and in a specific location. You can edit these settings, if any options need to change.

```
contrast@TeamServer:~/contrast/bin$ ./edit-properties -e ../data/esapi/
-f ../data/conf/database.properties

database.bk.time           : 4:0:0
database.bk.enabled       : true
```

```
database.bk.dir : /mnt/backups/mysql/  
contrast
```

3. If you want to upgrade Contrast, you should capture any data created or changed since the last scheduled backup.

## Disable automated backups

You can stop automated backups of the Contrast MySQL database. Scheduled backups run through `schtasks` on Windows and `crontab` on Linux.

To disable automated backups:

For **Windows**, use Task Scheduler to disable or delete `ContrastBackup`.

For **Linux**:

1. Switch to the user under which you installed Contrast and run `crontab -l`.
2. This lists the scheduled job. You will see:

```
0 2 * * * /usr/local/contrast/bin/backup-db.sh
```

3. Run `crontab -e` to delete a single backup. Run `crontab -r` to delete all backups.



### CAUTION

The `-e` option allows edits with Vim to delete selected backups. The `-r` option deletes everything: be careful when you use it.

## Restore database backups

Use this procedure to restore the MySQL database that the Contrast installer creates.

This procedure does not apply to MySQL databases that you create for distributed environments.

### Before you begin

Database restoration should be performed by a MySQL Database Administrator.

### Steps

1. Use the [encrypted properties editor \(page 1537\)](#) to identify the MySQL database settings.
2. Shut down Contrast.
3. Start up MySQL individually using the MySQL service packaged with Contrast. Replace `<YourPath>` with the path to your Contrast home.

- **Windows:**

```
"<YourPath>\mysql\bin\mysqld.exe" --defaults-  
file="<YourPath>\data\conf\my.cnf"
```

- **Linux:**

```
sudo -u contrast_service <YourPath>/mysql/bin/mysqld --  
defaults-file=<YourPath>/data/conf/my.cnf --basedir=<YourPath>/mysql  
--datadir=<YourPath>/data/db --plugin-dir=<YourPath>/mysql/lib/plugin  
--lc-messages-dir=<YourPath>/mysql/share --tmpdir=/tmp --lc-  
messages=en_US --log-error=<YourPath>/logs/mysql_error.log --pid-  
file=<YourPath>/data/proc/MysqldResource.pid --port=13306
```



4. Connect to MySQL. Replace <jdbc.host>, <jdbc.port>, <jdbc.user> and <jdbc.schema> with your host, port, user and schema.

- **Windows:**

```
mysql -h <jdbc.host> -P <jdbc.port> -u <jdbc.user> -p <jdbc.schema>
```

- **Linux:**

```
./mysql -h <jdbc.host> -P <jdbc.port> -u <jdbc.user> -p <jdbc.schema>
```

5. Drop the Contrast database with `drop database <jdbc.schema>;`.
6. Create the Contrast database with `create database <jdbc.schema>;`.
7. Grant permissions to the Contrast user with `GRANT ALL PRIVILEGES ON *.* to 'contrast'@'%' ;`.
8. Exit from MySQL.
9. Restore the MySQL backup. Replace <backup\_location> with your backup location and <backup\_filename> with your backup filename.

- **Windows:**

```
mysql -h <jdbc.host> -P <jdbc.port> -u <jdbc.user> -p <jdbc.schema> <  
<backup_location>/<backup_filename>
```

- **Linux:**

```
./mysql -h <jdbc.host> -P <jdbc.port> -u <jdbc.user> -p <jdbc.schema>  
< <backup_location>/<backup_filename>
```

10. Shut down MySQL:

- **Windows:**

Use the Windows Service Manager application to shut down the MySQL service.

- **Linux:**

```
$CONTRAST_HOME/mysql/bin/mysqladmin.exe shutdown -h localhost -P 13306  
-u contrast -p
```

You are prompted for the password that is set in the encrypted properties editor.

11. Restart the fully-restored Contrast and MySQL together.

## Manage SSL

On-premises customers may need to use a Secure Sockets Layer (SSL) in the following situations:

- Setting up [HTTPS proxy authentication \(page 1528\)](#)
- Integrating with [LDAP \(page 1519\)](#) or [Active Directory \(page 1515\)](#)
- Securing communication between agents and the Contrast application

# Reference

These topics may be useful as an occasional reference on how to use Contrast:

- [Glossary \(page 1542\)](#)
- [Roles and permissions \(page 1552\)](#)
- [Agent supported technologies \(Java \(page 55\), .NET Framework \(page 63\), .Net Framework \(Legacy\), .NET Core \(page 70\), Node.js \(page 81\), Python \(page 94\), Ruby \(page 100\), Go \(page 103\)\)](#)
- [Application scoring guide \(page 1557\)](#)
- [Library scoring guide \(page 1216\)](#)
- [Log levels \(page 1559\)](#)
- [Supported browsers \(page 1563\)](#)
- [Regular expressions for application exclusions \(page 1405\)](#)

## Glossary of terms

These terms are defined specifically as they apply to users of Contrast. You can hover over these terms in other topics to pull up the definition in context.

|                                           |                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| account takeover (ATO)                    | An account takeover is the result of an attack that steals login credentials or otherwise breaks authentication in web applications.                                                                                                                                                                    |
| agent                                     | An agent is language-specific code that is installed in a web application to gather and analyze security data, and report findings to Contrast when necessary.                                                                                                                                          |
| application                               | An application is a logical grouping of customer code analyzed by a Contrast agent.                                                                                                                                                                                                                     |
| attack                                    | An <a href="#">attack (page 624)</a> is made up of one or more attack events that occur within a discrete time frame.                                                                                                                                                                                   |
| attack event                              | An attack event is a violation of Protect rules or other suspicious application activity in instrumented applications. The event corresponds to a single attack vector, such as an HTTP request or SQL query. Multiple attack events make up an attack, usually in the same area of code and timeframe. |
| brute-force attack                        | A brute-force attack is the systematic submission of many passwords or passphrases with the intent of eventually guessing correctly.                                                                                                                                                                    |
| chief information security officer (CISO) | The chief information security officer directs an organization's information security program to assure and demonstrate that sensitive assets are well-protected and staff can manage and prevent vulnerabilities.                                                                                      |
| command injection                         | Command injection attacks target the host operating system through a vulnerable application. They happen when a user passes unsafe data to a system shell through a form, cookie or HTTP header or some other part of the application.                                                                  |
| common language runtime (CLR)             | Common Language Runtime manages the execution of .NET Framework programs.                                                                                                                                                                                                                               |

|                                                    |                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Common Vulnerabilities and Exposures (CVE)         | <a href="#">Common Vulnerabilities and Exposures</a> is a list of publicly known cybersecurity vulnerabilities, used internationally to identify and track types of vulnerabilities.                                                                                                                                                                                            |
| container image                                    | A container image is a static file with executable code that can create a container on a computing system.                                                                                                                                                                                                                                                                      |
| continuous integration/continuous delivery (CI/CD) | Agile practice that encourages continuous iterations and automation in building, testing and deployment.                                                                                                                                                                                                                                                                        |
| Contrast command line interface (Contrast CLI)     | The Contrast CLI is a text-based user interface. It can be run in the development environment to get early software composition analysis (SCA) visibility of your open-source libraries before you build and deploy. Results from the CLI can be viewed in the text-based response and they are also represented as a <a href="#">dependency tree (page 1216)</a> in Contrast.  |
| Contrast Hub                                       | The <a href="#">Contrast Hub</a> is where on-premises customers can download the Contrast installer and license files and check for agent updates.                                                                                                                                                                                                                              |
| Contrast service                                   | The Contrast service is a program written in Go that connects the Contrast web interface with the Node.js, Ruby and Python agents.                                                                                                                                                                                                                                              |
| credential stuffing                                | Credential stuffing is a brute force attack that automatically injects pairs of breached usernames and passwords to access user accounts.                                                                                                                                                                                                                                       |
| cross-site scripting (XSS)                         | Cross-site scripting is an attack that occurs when malicious scripts are injected into a web application through user inputs that generate output without validating or encoding it.                                                                                                                                                                                            |
| dependency confusion                               | Dependency confusion, also known as a "substitution attack," is when an attacker registers the same name for an organization's internal library on a public package index in order to send vulnerable or malicious code into the organization's private code repositories.                                                                                                      |
| distroless image                                   | Distroless images contain only your application and its runtime dependencies. They do not contain package managers, shells, or any other programs you would expect to find in a standard Linux distribution.                                                                                                                                                                    |
| dynamic application security testing (DAST)        | A security testing technology that is designed to detect conditions that point to a security vulnerability in an application in its running state.                                                                                                                                                                                                                              |
| environment                                        | In Contrast, applications are organized into one of three environments: development, test (QA) and production.                                                                                                                                                                                                                                                                  |
| environment variable                               | Environment variables are values you can pass to software at runtime, usually key/value pairs that you define outside of an application. In Contrast, these are used to <a href="#">configure the agents (page 107)</a> that instrument your applications and make sure they work within your preferred frameworks as expected and report metadata you want to see in Contrast. |
| Exploit Prediction Scoring System (EPSS)           | <p>Calculation based on the likelihood of a vulnerability being exploited.</p> <p>EPSS provides a probability range between 0 to 1 (0 and 100%). A higher score indicates a vulnerability likely will be exploited within 30 days.</p>                                                                                                                                          |

|                                                       |                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                       | <p>The EPSS percentile is a percentage score assigned to a specific vulnerability that indicates how likely it is to be exploited compared to other vulnerabilities. For instance, a vulnerability with an EPSS percentile of 90% means it has a higher probability score than 90% of all other CVEs in the group.</p>       |
| false positive                                        | <p>A vulnerability that is falsely reported.</p>                                                                                                                                                                                                                                                                             |
| flow map                                              | <p>A flow map is a visualization of an instrumented application in Contrast that shows all back-end systems it uses and any other applications connected to it. This helps you assess risk by analyzing what else touches vulnerable applications.</p>                                                                       |
| instrument                                            | <p>Monitor applications with software agents that observe and report data at runtime. Contrast agents send security vulnerability data about your applications based on exercised routes.</p>                                                                                                                                |
| interactive application security testing (IAST)       | <p>Security technology that analyzes data flows within a running application to detect and report possible security vulnerabilities.</p>                                                                                                                                                                                     |
| IP allowlist                                          | <p>An IP allowlist is a rule that allows any HTTP request from IP addresses on that list.</p>                                                                                                                                                                                                                                |
| IP denylist                                           | <p>An IP denylist is a rule that blocks any HTTP request from IP addresses on that list.</p>                                                                                                                                                                                                                                 |
| library                                               | <p>A library is any packaged code included in an application. <a href="#">Libraries (page 1205)</a> can be public or private.</p>                                                                                                                                                                                            |
| lightweight directory access protocol (LDAP)          | <p>LDAP is a lightweight client-server protocol for accessing and maintaining directory services. In Contrast, on-premises can <a href="#">use LDAP (page 1519)</a> to manage users and logins.</p>                                                                                                                          |
| manifest                                              | <p>Files that are stored with a project to declare which dependencies are required by a project.</p>                                                                                                                                                                                                                         |
| National Institute of Standards and Technology (NIST) | <p>NIST is a <a href="#">government agency</a> that promotes U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology, in multiple fields including cybersecurity.</p>                                                                                                     |
| Not a problem                                         | <p><i>For library status.</i> This library has vulnerabilities that are acknowledged and the risks are acceptable.</p>                                                                                                                                                                                                       |
| Open Web Application Security Project (OWASP)         | <p><a href="#">Open Web Application Security Project®</a> is a nonprofit foundation that works to improve the security of software through an open platform that supports shared security projects and member education. The <a href="#">OWASP Top Ten</a> lists the most critical security defects in Web applications.</p> |
| path traversal                                        | <p>Path traversal is an attack that attempts to access critical system files and directories stored outside the web root folder. It uses variables that reference files with "dot-dot-slash" (../) sequences or absolute file paths.</p>                                                                                     |
| policy                                                | <p>A policy is the set of rules for a given application or library that triggers security violations, status changes, or notifications when certain conditions are true. Policies assure more consistent security standards across applications or teams.</p>                                                                |

|                                            |                                                                                                                                                                                                                                                                                |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| profiler chaining                          | Profiler chaining is a way to run the .NET Framework or .NET Core agent alongside other .NET profiler agents, such as performance or APM tools.                                                                                                                                |
| Remediated                                 | <i>For library status.</i> The vulnerable library has been remediated.                                                                                                                                                                                                         |
| Reported                                   | <i>For library status.</i> Status when a library with vulnerabilities is detected by Contrast.                                                                                                                                                                                 |
| Route                                      | A route, as reported in Contrast Assess, is a function signature of the method that handles requests to one or more URL patterns. The exact format can vary, depending on the language of the Contrast agent you are using. A route can have multiple URLs associated with it. |
| rule                                       | A rule is a security control used to identify a vulnerability or attack event. If the rule matches, the agent sends a vulnerability or attack event to Contrast for the affected application.                                                                                  |
| runtime application self-protection (RASP) | Contrast uses RASP methods to monitor attacks and actively defend applications in production.                                                                                                                                                                                  |
| score                                      | Contrast provides <a href="#">library (page 1216)</a> and <a href="#">application (page 1557)</a> scores that reflect the current security situation for your applications or libraries.                                                                                       |
| security assertion markup language (SAML)  | SAML is an XML-based standard used to create and exchange security information between online partners, such as single sign-on authentication.                                                                                                                                 |
| security incident event management (SIEM)  | SIEM systems collect and analyze security events and related data from other systems to support threat detection, compliance, and security incident management. Contrast integrates with several leading SIEM systems.                                                         |
| sensitive data masking                     | This feature redacts sensitive data in Contrast logs and other data transmissions from the Contrast agent, without affecting how that data is processed by the application.                                                                                                    |
| single sign-on (SSO)                       | Single sign-on is an authentication or user identification service that gives users access to multiple systems with only one set of credentials.                                                                                                                               |
| sink                                       | In <a href="#">data flow analysis (page 1316)</a> , the sink is where data ends. A sink is any external format or location to which data is written.                                                                                                                           |
| Software Composition Analysis (SCA)        | Identify vulnerable libraries, fail a build based on CVE severity, and view a dependency tree to understand the dependencies between libraries and where vulnerabilities have been introduced.                                                                                 |
| software development life cycle (SDLC)     | The series of steps by which ideas become software that is used by people.                                                                                                                                                                                                     |
| source                                     | In <a href="#">data flow analysis (page 1316)</a> , the source is where data starts. A source is any input data or request that enters a system.                                                                                                                               |
| SQL injection (SQLi)                       | A SQL Injection attack inserts or "injects" a SQL query within user input data from the client to get it into the application. The intent is to read or modify database data or send commands to the database ( <a href="#">for example</a> ).                                 |

|                                            |                                                                                                                                                        |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| stack trace                                | A stack trace lists the sequence of events that led to a failure. For Contrast, the stack trace shows the events that led to a security vulnerability. |
| static application security testing (SAST) | A method of finding potential vulnerabilities in applications without installing or running the application.                                           |
| testing coverage                           | This is a testing technique that monitors the number of tests that have been executed.                                                                 |
| unused functions                           | Also called shadow functions. This is a function on a cloud environment that has not been invoked for over 90 days.                                    |
| web application firewall (WAF)             | A WAF inspects and filters web traffic to defend applications from common attacks.                                                                     |
| webhook                                    | Integration method that sends real-time data from one application to another via HTTP every time a specified event occurs.                             |

## Open source software attributions

Contrast software includes source code from these open source software packages:

| Source code                          | Version | License                     |
|--------------------------------------|---------|-----------------------------|
| <a href="#">html2canvas</a>          | V1.4.1  | <a href="#">MIT license</a> |
| <a href="#">jsPDF</a>                | V2.5.1  | <a href="#">MIT license</a> |
| <a href="#">bubkoo/html-to-image</a> | V1.11.1 | <a href="#">MIT license</a> |

## Actions and permissions (Preview)

Each action that you assign to a role provides permissions to perform specific tasks and access to data.

[Actions can inherit permissions from other actions. \(page 1552\)](#) For example, the Edit application action includes all of the permissions that the View application action provides. In this case, only need to assign the Edit application action to a role and not both the Edit application and View application actions.



### NOTE

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

On-premises customers manage Contrast access by setting up [organization users and access groups \(page 1445\)](#).

## Organization actions and permissions

| This action:              | Includes these permissions:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | And is part of these built-in roles                                                                                                                                |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| View organization         | <b>General</b> <ul style="list-style-type: none"> <li>• Log in to the Contrast web interface</li> <li>• View your user profile</li> <li>• View notifications</li> </ul> <b>Reports</b> <ul style="list-style-type: none"> <li>• Generate application reports</li> </ul>                                                                                                                                                                                                                                                                                                | Organization viewer<br>Organization editor<br>Organization administrator<br>Organization rules administrator<br>App security administrator<br>DevOps administrator |
| Edit organization         | <b>General</b> <ul style="list-style-type: none"> <li>• View your user profile</li> <li>• View notifications</li> <li>• View score settings</li> <li>• View report settings</li> <li>• View organization settings</li> <li>• Access the Add new button</li> </ul> <b>Policies</b> <ul style="list-style-type: none"> <li>• View policies</li> </ul> <b>Security</b> <ul style="list-style-type: none"> <li>• Get agent keys</li> </ul> <b>Reports</b> <ul style="list-style-type: none"> <li>• View report settings</li> <li>• Generate application reports</li> </ul> | Organization editor<br>Organization administrator<br>Organization rules administrator                                                                              |
| Manage organization rules | <b>General</b> <ul style="list-style-type: none"> <li>• View your user profile</li> <li>• View notifications</li> <li>• View score settings</li> <li>• View organization settings</li> <li>• Enable or disable Protect</li> </ul> <b>Policies</b> <ul style="list-style-type: none"> <li>• Manage scoring policies</li> </ul> <b>Reports</b> <ul style="list-style-type: none"> <li>• View report settings</li> <li>• Generate application reports</li> </ul>                                                                                                          | Organization administrator<br>Organization rules administrator                                                                                                     |

| This action:                                                                                                                                                                                                                                                      | Includes these permissions:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | And is part of these built-in roles                                                                                                                       |                                                                                                                                    |                                                                                         |                                                                                                                                                      |                                                                                           |                                                                                                                                                               |                                                                                                                                                                                                                                                                   |                                                                                             |                                                                                       |  |                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--|----------------------------|
| Manage organization                                                                                                                                                                                                                                               | <table><tr><td><b>General</b><ul style="list-style-type: none"><li>• View your user profile</li><li>• View notifications</li><li>• View organization settings</li></ul></td><td><b>Integrations</b><ul style="list-style-type: none"><li>• View integration details</li><li>• Edit integration settings</li></ul></td></tr><tr><td><b>Servers</b><ul style="list-style-type: none"><li>• Manage server licenses</li></ul></td><td><b>Users</b><ul style="list-style-type: none"><li>• View users</li><li>• Create users</li><li>• Delete users</li><li>• Edit user settings</li></ul></td></tr><tr><td><b>Policies</b><ul style="list-style-type: none"><li>• Manage scoring policies</li></ul></td><td><b>Reports</b><ul style="list-style-type: none"><li>• View report settings</li><li>• Change report settings</li><li>• Generate application reports</li></ul></td></tr><tr><td><b>Security</b><ul style="list-style-type: none"><li>• Rotate API keys</li><li>• Manage agent keys</li><li>• Manage IP restrictions</li><li>• Manage password policy</li><li>• Manage session timeouts</li><li>• Manage two-step verification and SAML</li></ul></td><td><b>Protect</b><ul style="list-style-type: none"><li>• Enable and disable Protect</li></ul></td></tr><tr><td><b>Scan</b><ul style="list-style-type: none"><li>• Turn on dynamic scoring</li></ul></td><td></td></tr></table> | <b>General</b> <ul style="list-style-type: none"><li>• View your user profile</li><li>• View notifications</li><li>• View organization settings</li></ul> | <b>Integrations</b> <ul style="list-style-type: none"><li>• View integration details</li><li>• Edit integration settings</li></ul> | <b>Servers</b> <ul style="list-style-type: none"><li>• Manage server licenses</li></ul> | <b>Users</b> <ul style="list-style-type: none"><li>• View users</li><li>• Create users</li><li>• Delete users</li><li>• Edit user settings</li></ul> | <b>Policies</b> <ul style="list-style-type: none"><li>• Manage scoring policies</li></ul> | <b>Reports</b> <ul style="list-style-type: none"><li>• View report settings</li><li>• Change report settings</li><li>• Generate application reports</li></ul> | <b>Security</b> <ul style="list-style-type: none"><li>• Rotate API keys</li><li>• Manage agent keys</li><li>• Manage IP restrictions</li><li>• Manage password policy</li><li>• Manage session timeouts</li><li>• Manage two-step verification and SAML</li></ul> | <b>Protect</b> <ul style="list-style-type: none"><li>• Enable and disable Protect</li></ul> | <b>Scan</b> <ul style="list-style-type: none"><li>• Turn on dynamic scoring</li></ul> |  | Organization administrator |
| <b>General</b> <ul style="list-style-type: none"><li>• View your user profile</li><li>• View notifications</li><li>• View organization settings</li></ul>                                                                                                         | <b>Integrations</b> <ul style="list-style-type: none"><li>• View integration details</li><li>• Edit integration settings</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                           |                                                                                                                                    |                                                                                         |                                                                                                                                                      |                                                                                           |                                                                                                                                                               |                                                                                                                                                                                                                                                                   |                                                                                             |                                                                                       |  |                            |
| <b>Servers</b> <ul style="list-style-type: none"><li>• Manage server licenses</li></ul>                                                                                                                                                                           | <b>Users</b> <ul style="list-style-type: none"><li>• View users</li><li>• Create users</li><li>• Delete users</li><li>• Edit user settings</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                           |                                                                                                                                    |                                                                                         |                                                                                                                                                      |                                                                                           |                                                                                                                                                               |                                                                                                                                                                                                                                                                   |                                                                                             |                                                                                       |  |                            |
| <b>Policies</b> <ul style="list-style-type: none"><li>• Manage scoring policies</li></ul>                                                                                                                                                                         | <b>Reports</b> <ul style="list-style-type: none"><li>• View report settings</li><li>• Change report settings</li><li>• Generate application reports</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                           |                                                                                                                                    |                                                                                         |                                                                                                                                                      |                                                                                           |                                                                                                                                                               |                                                                                                                                                                                                                                                                   |                                                                                             |                                                                                       |  |                            |
| <b>Security</b> <ul style="list-style-type: none"><li>• Rotate API keys</li><li>• Manage agent keys</li><li>• Manage IP restrictions</li><li>• Manage password policy</li><li>• Manage session timeouts</li><li>• Manage two-step verification and SAML</li></ul> | <b>Protect</b> <ul style="list-style-type: none"><li>• Enable and disable Protect</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                           |                                                                                                                                    |                                                                                         |                                                                                                                                                      |                                                                                           |                                                                                                                                                               |                                                                                                                                                                                                                                                                   |                                                                                             |                                                                                       |  |                            |
| <b>Scan</b> <ul style="list-style-type: none"><li>• Turn on dynamic scoring</li></ul>                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                           |                                                                                                                                    |                                                                                         |                                                                                                                                                      |                                                                                           |                                                                                                                                                               |                                                                                                                                                                                                                                                                   |                                                                                             |                                                                                       |  |                            |
| Manage platform organization                                                                                                                                                                                                                                      | <b>Access control</b> <ul style="list-style-type: none"><li>• Manage user access groups</li><li>• Manage roles</li><li>• Manage resource groups.</li></ul> <b>Reports</b> <ul style="list-style-type: none"><li>• Generate application reports</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Organization administrator<br>DevOps administrator                                                                                                        |                                                                                                                                    |                                                                                         |                                                                                                                                                      |                                                                                           |                                                                                                                                                               |                                                                                                                                                                                                                                                                   |                                                                                             |                                                                                       |  |                            |
| View audit logs                                                                                                                                                                                                                                                   | <b>Security</b> <ul style="list-style-type: none"><li>• View audit log details</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Organization administrator                                                                                                                                |                                                                                                                                    |                                                                                         |                                                                                                                                                      |                                                                                           |                                                                                                                                                               |                                                                                                                                                                                                                                                                   |                                                                                             |                                                                                       |  |                            |

## Application actions and permissions

| This action:     | Includes these permissions:                                                                                                                                                                                      |                                                                                                                                                                                              | And is part of these built-in roles |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| View application | <b>General</b>                                                                                                                                                                                                   | <b>Vulnerabilities</b>                                                                                                                                                                       | Application viewer                  |
|                  | <ul style="list-style-type: none"><li>• View your user profile</li><li>• View notifications</li><li>• Customize score settings</li><li>• Change report settings</li><li>• Change notification settings</li></ul> | <ul style="list-style-type: none"><li>• View vulnerability details</li><li>• Export vulnerabilities, traces, and routes</li><li>• Replay HTTP requests</li><li>• Manage discussion</li></ul> | Application editor                  |
|                  | <b>Applications</b>                                                                                                                                                                                              | <b>Policies</b>                                                                                                                                                                              | Application administrator           |
|                  | <ul style="list-style-type: none"><li>• View application details</li><li>• View, edit, and delete tags</li></ul>                                                                                                 | <ul style="list-style-type: none"><li>• View application policies</li><li>• View application exclusions</li></ul>                                                                            | Application rules administrator     |
|                  | <b>Servers</b>                                                                                                                                                                                                   | <b>Reports</b>                                                                                                                                                                               | App security administrator          |
|                  | <ul style="list-style-type: none"><li>• View server details</li></ul>                                                                                                                                            | <ul style="list-style-type: none"><li>• Generate application reports</li></ul>                                                                                                               | App security engineer               |
|                  | <b>Libraries</b>                                                                                                                                                                                                 |                                                                                                                                                                                              | DevOps administrator                |
|                  | <ul style="list-style-type: none"><li>• View library details</li><li>• View tags</li><li>• View manifest details</li><li>• Export libraries</li></ul>                                                            |                                                                                                                                                                                              |                                     |



| This action:             | Includes these permissions:                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                               | And is part of these built-in roles                                                                                          |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Edit application         | <b>General</b> <ul style="list-style-type: none"> <li>• View your user profile</li> <li>• View notifications</li> <li>• View organization settings</li> <li>• View score settings</li> <li>• Change notification settings</li> </ul>                                                                                                                                                                | <b>Vulnerabilities</b> <ul style="list-style-type: none"> <li>• View vulnerability details</li> <li>• Send vulnerabilities to a bug tracker</li> <li>• Merge vulnerabilities</li> <li>• Edit vulnerability settings</li> <li>• Manage discussions</li> <li>• Delete vulnerabilities</li> <li>• Export vulnerabilities, traces, and routes</li> <li>• Replay HTTP requests</li> <li>• Manage traces</li> </ul> | Application editor<br><br>Application administrator<br><br>Application rules administrator<br><br>App security administrator |
|                          | <b>Applications</b> <ul style="list-style-type: none"> <li>• View application details</li> <li>• View tags</li> <li>• Merge applications</li> <li>• Archive applications</li> <li>• Restore applications</li> <li>• Edit and delete tags</li> <li>• Manage filters</li> </ul>                                                                                                                       | <b>Policies</b> <ul style="list-style-type: none"> <li>• View application policies</li> <li>• View application exclusions</li> <li>• Manage scoring policies</li> </ul>                                                                                                                                                                                                                                       |                                                                                                                              |
|                          | <b>Servers</b> <ul style="list-style-type: none"> <li>• View server details</li> <li>• Edit and delete tags</li> <li>• Edit server settings</li> </ul>                                                                                                                                                                                                                                              | <b>Reports</b> <ul style="list-style-type: none"> <li>• Generate application reports</li> <li>• Change report settings</li> </ul>                                                                                                                                                                                                                                                                             |                                                                                                                              |
|                          | <b>Libraries</b> <ul style="list-style-type: none"> <li>• View library details</li> <li>• View tags</li> <li>• Edit and delete tags</li> <li>• View manifest details</li> <li>• Export libraries</li> </ul>                                                                                                                                                                                         | <b>Protect</b> <ul style="list-style-type: none"> <li>• Enable and disable Protect</li> </ul>                                                                                                                                                                                                                                                                                                                 |                                                                                                                              |
| Manage application rules | <b>General</b> <ul style="list-style-type: none"> <li>• View your user profile</li> <li>• View notifications</li> </ul> <b>Architecture</b> <ul style="list-style-type: none"> <li>• View architecture details</li> </ul> <b>Policies</b> <ul style="list-style-type: none"> <li>• Manage Assess rule settings</li> <li>• Manage library policies</li> <li>• Manage remediation policies</li> </ul> | <b>Protect</b> <ul style="list-style-type: none"> <li>• Enable and disable Protect</li> </ul>                                                                                                                                                                                                                                                                                                                 | Application administrator<br><br>Application rules administrator<br><br>App Security administrator                           |

| This action:       | Includes these permissions:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | And is part of these built-in roles |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Manage application | <b>General</b> <ul style="list-style-type: none"> <li>Log in to the Contrast web interface</li> <li>View your user profile</li> <li>View notifications</li> <li>View organization settings</li> <li>View score settings</li> <li>Change report settings</li> <li>Change notification settings</li> </ul> <b>Applications</b> <ul style="list-style-type: none"> <li>View application details</li> <li>View tags</li> <li>Edit and delete tags</li> <li>Merge applications</li> <li>Archive applications</li> <li>Restore applications</li> <li>Manage filters</li> <li>Manage traces</li> <li>Manage bug tracker settings</li> <li>License applications</li> <li>Edit application settings</li> <li>Reset applications</li> <li>Delete applications</li> </ul> <b>Servers</b> <ul style="list-style-type: none"> <li>View server details</li> <li>Edit and delete tags</li> <li>Edit server settings</li> <li>Delete servers</li> <li>Manage server licenses</li> </ul> <b>Integrations</b> <ul style="list-style-type: none"> <li>View integration details</li> <li>Edit integration settings</li> </ul> <b>Libraries</b> <ul style="list-style-type: none"> <li>View library details</li> <li>View tags</li> <li>Edit and delete tags</li> <li>View manifest details</li> <li>Export libraries</li> </ul> <b>Vulnerabilities</b> <ul style="list-style-type: none"> <li>View vulnerability details</li> <li>Send vulnerabilities to a bug tracker</li> <li>Merge vulnerabilities</li> <li>Edit vulnerability settings</li> <li>Manage discussions</li> <li>Delete vulnerabilities</li> <li>Export vulnerabilities, traces, and routes</li> <li>Replay HTTP requests</li> <li>Manage traces</li> </ul> | <b>Policies</b> <ul style="list-style-type: none"> <li>View applications policies</li> <li>View application exclusions</li> <li>View scoring policies</li> </ul> <b>Architecture</b> <ul style="list-style-type: none"> <li>View architecture details.</li> </ul> <b>Protect</b> <ul style="list-style-type: none"> <li>Enable and disable Protect</li> </ul> <b>Reports</b> <ul style="list-style-type: none"> <li>Generate application reports</li> <li>View report settings</li> </ul> <b>Users</b> <ul style="list-style-type: none"> <li>Manage resource groups</li> </ul> | Application administrator           |

## Project actions and permissions

| This action: | Includes these permissions:                                                                                                                                    | And is part of these built-in roles                                                           |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| View project | <b>Scan</b> <ul style="list-style-type: none"> <li>View details about scan projects and scans</li> <li>Download scan results in a SARIF or CSV file</li> </ul> | Project viewer<br>Project administrator<br>App Security administrator<br>DevOps administrator |
| Upload scans | <b>Scan</b> <ul style="list-style-type: none"> <li>Upload files for scanning</li> </ul>                                                                        | Scan uploader<br>Project administrator<br>App security administrator                          |

| This action:               | Includes these permissions:                                                                                                                                                                                                                                                                                                                                                             | And is part of these built-in roles                 |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| View, edit, delete project | <b>Scan</b> <ul style="list-style-type: none"> <li>• Archive scan projects</li> <li>• Delete scan projects</li> <li>• Edit project settings</li> <li>• Change scan vulnerability status and severity</li> <li>• Upload files for scanning</li> <li>• Start scans</li> <li>• View details for scan projects and scans</li> <li>• Download scan results in a SARIF or CSV file</li> </ul> | Project administrator<br>App security administrator |
| Create project             | <b>Scan</b> <ul style="list-style-type: none"> <li>• Create scan projects</li> </ul>                                                                                                                                                                                                                                                                                                    | Project administrator                               |
| Edit project               | <b>Scan</b> <ul style="list-style-type: none"> <li>• Edit scan project settings</li> <li>• Upload files for scanning</li> <li>• View details for scan projects and scans</li> <li>• Download scan results in a SARIF or CSV file</li> </ul>                                                                                                                                             | Project administrator<br>App security administrator |
| Delete project             | <b>Scan</b> <ul style="list-style-type: none"> <li>• View details for scan projects and scans</li> <li>• Download scan results in a SARIF or CSV file</li> <li>• Delete scan projects</li> </ul>                                                                                                                                                                                        | Project administrator<br>App security administrator |

## Protect actions and permissions

| This action:                   | Includes these permissions:                                                                                                                                                                                                                                                          | And is part of these built-in resource groups                                |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| Access Protect                 | <b>Protect</b> <ul style="list-style-type: none"> <li>• View Protect data</li> </ul>                                                                                                                                                                                                 | Protect viewer<br>Protect policy administrator<br>Organization administrator |
| Manage Protect exclusions      | <b>Protect</b> <ul style="list-style-type: none"> <li>• View application exclusions for Protect rules</li> <li>• Create and edit application exclusions for Protect rules</li> </ul>                                                                                                 | Protect exclusion administrator<br>Organization administrator                |
| Manage Protect policies        | <b>Protect</b> <ul style="list-style-type: none"> <li>• View and edit Protect policies</li> <li>• Add or edit log enhancers</li> <li>• Manage attack alerts</li> <li>• Manage the IP denylist</li> <li>• Manage Protect licenses</li> <li>• Manage Protect rule settings.</li> </ul> | Protect policy administrator                                                 |
| Manage sensitive data policies | <b>Protect</b> <ul style="list-style-type: none"> <li>• View details for sensitive data policies</li> <li>• Edit policies for sensitive data</li> </ul>                                                                                                                              | Protect sensitive data administrator<br>Organization administrator           |
| View attack data               | <b>Protect</b> <ul style="list-style-type: none"> <li>• View attack event data</li> </ul>                                                                                                                                                                                            | App security engineer                                                        |

## SCA projects actions and permissions

| This action:      | Includes these permissions:                                                                 | And is part of these built-in roles                         |
|-------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| View SCA projects | <b>Libraries</b> <ul style="list-style-type: none"> <li>View SCA project details</li> </ul> | SCA project group viewer<br>SCA project group administrator |

| This action:        | Includes these permissions:                                                                                                                                                                                                                                                                       | And is part of these built-in roles |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Create SCA projects | <b>Libraries</b> <ul style="list-style-type: none"><li>• Connect to open source repositories for new SCA projects</li><li>• Create (and track, if using the <code>--track</code> option) new SCA project from the Contrast CLI</li></ul>                                                          | SCA project group administrator     |
| Delete SCA projects | <b>Libraries</b> <ul style="list-style-type: none"><li>• Disconnect open source repositories for SCA projects</li></ul>                                                                                                                                                                           | SCA project group administrator     |
| Manage SCA projects | <b>Libraries</b> <ul style="list-style-type: none"><li>• View SCA project details</li><li>• Connect to open source repositories for SCA projects</li><li>• Edit SCA project details</li><li>• Disconnect SCA projects</li><li>• Run additional or subsequent SCA scans for SCA projects</li></ul> | SCA project group administrator     |

## Serverless actions and permissions

| This action:    | Includes these permissions:                                                                                                    | And is part of these built-in roles |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| View Serverless | <b>Serverless</b> <ul style="list-style-type: none"><li>• View Serverless data</li><li>• Interact with API endpoints</li></ul> | Serverless user                     |

## Inherited actions

| This action: | Inherits permissions from this action: |
|--------------|----------------------------------------|
|              |                                        |
|              |                                        |
|              |                                        |
|              |                                        |
|              |                                        |

## Roles and permissions

Permissions and capabilities are granted to users depending on the role they are assigned. Roles exist at the [application \(page 1553\)](#), [organization \(page 1555\)](#) and (for on-premises customers) [system \(page 1557\)](#) levels. Most of these roles are defined when a user is assigned to an [access group \(page 1446\)](#).

You can also:

- [View your own permissions \(page 639\)](#)
- [Manage organization permissions \(page 1445\)](#)
- [Manage system permissions \(page 1500\)](#)
- [Grant Protect permissions \(page 1508\)](#)



### NOTE

API-Only users can access Contrast's REST API, but can't log in to the user interface. Contrast doesn't recommend the creation of administrator API accounts.

## Application roles

Application roles give users permissions and capabilities within a particular application. Application roles are assigned to [access groups \(page 1446\)](#).

Use these application roles to grant permissions and capabilities within an application:

**View**

The application View role (Application Viewer) has read-only access to the Contrast interface to see scores, libraries, vulnerabilities and comments, but cannot perform edits to traces to the application.

**View Permission Details (Application)**

| Application                           | Vulnerabilities                              | Libraries                                 | Policy                                |
|---------------------------------------|----------------------------------------------|-------------------------------------------|---------------------------------------|
| <input type="radio"/> Archive         | <input type="radio"/> Delete                 | <input checked="" type="radio"/> Manifest | <input type="radio"/> Edit            |
| <input type="radio"/> Delete          | <input type="radio"/> Discussion             | <input checked="" type="radio"/> Tag      | <input checked="" type="radio"/> View |
| <input type="radio"/> Edit            | <input type="radio"/> Edit                   | <input checked="" type="radio"/> View     |                                       |
| <input type="radio"/> License         | <input checked="" type="radio"/> Export      |                                           | <b>Exclusions</b>                     |
| <input type="radio"/> Merge           | <input checked="" type="radio"/> HTTP Replay | <b>Report</b>                             | <input type="radio"/> Create          |
| <input type="radio"/> Reset           | <input type="radio"/> Merge                  | <input type="radio"/> Generate            | <input checked="" type="radio"/> View |
| <input type="radio"/> Restore         | <input type="radio"/> Send to Bugtracker     | <b>Architecture</b>                       |                                       |
| <input checked="" type="radio"/> Tag  | <input checked="" type="radio"/> Tag         | <input type="radio"/> View                |                                       |
| <input checked="" type="radio"/> View | <input checked="" type="radio"/> View        |                                           |                                       |

Done

**Edit**

The application Edit role (Application Editor) can remediate findings, add tags, manage vulnerabilities, edit attributes, merge applications, add or delete applications, and create servers. The majority of Contrast users have this role.

**Edit Permission Details (Application)**

| Application                              | Vulnerabilities                                     | Libraries                                 | Policy                                |
|------------------------------------------|-----------------------------------------------------|-------------------------------------------|---------------------------------------|
| <input checked="" type="radio"/> Archive | <input checked="" type="radio"/> Delete             | <input checked="" type="radio"/> Manifest | <input type="radio"/> Edit            |
| <input type="radio"/> Delete             | <input checked="" type="radio"/> Discussion         | <input checked="" type="radio"/> Tag      | <input checked="" type="radio"/> View |
| <input type="radio"/> Edit               | <input checked="" type="radio"/> Edit               | <input checked="" type="radio"/> View     |                                       |
| <input type="radio"/> License            | <input checked="" type="radio"/> Export             |                                           | <b>Exclusions</b>                     |
| <input checked="" type="radio"/> Merge   | <input checked="" type="radio"/> HTTP Replay        | <b>Report</b>                             | <input type="radio"/> Create          |
| <input type="radio"/> Reset              | <input checked="" type="radio"/> Merge              | <input checked="" type="radio"/> Generate | <input checked="" type="radio"/> View |
| <input checked="" type="radio"/> Restore | <input checked="" type="radio"/> Send to Bugtracker | <b>Architecture</b>                       |                                       |
| <input checked="" type="radio"/> Tag     | <input checked="" type="radio"/> Tag                | <input type="radio"/> View                |                                       |
| <input checked="" type="radio"/> View    | <input checked="" type="radio"/> View               |                                           |                                       |

Done

**Rules Admin**

The application Rules Admin role (Application Rules Admin) can edit rules and policies in the application, enable Protect, and manage notifications and scoring for the application.

**Rules Admin Permission Details** (Application) ×**Application**

- ☒ Archive
- ☐ Delete
- ☐ Edit
- ☐ License
- ☒ Merge
- ☐ Reset
- ☒ Restore
- ☒ Tag
- ☒ View

**Vulnerabilities**

- ☒ Delete
- ☒ Discussion
- ☒ Edit
- ☒ Export
- ☒ HTTP Replay
- ☒ Merge
- ☒ Send to Bugtracker
- ☒ Tag
- ☒ View

**Libraries**

- ☒ Manifest
- ☒ Tag
- ☒ View

**Policy**

- ☒ Edit
- ☒ View

**Exclusions**

- ☒ Create
- ☒ View

**Report**

- ☒ Generate

**Architecture**

- ☒ View

Done

**Admin**

The application Admin role (Application Administrator) has no restrictions and can manage other users' access to the application.

**Admin Permission Details** (Application) ×**Application**

- ☒ Archive
- ☒ Delete
- ☒ Edit
- ☒ License
- ☒ Merge
- ☒ Reset
- ☒ Restore
- ☒ Tag
- ☒ View

**Vulnerabilities**

- ☒ Delete
- ☒ Discussion
- ☒ Edit
- ☒ Export
- ☒ HTTP Replay
- ☒ Merge
- ☒ Send to Bugtracker
- ☒ Tag
- ☒ View

**Libraries**

- ☒ Manifest
- ☒ Tag
- ☒ View

**Policy**

- ☒ Edit
- ☒ View

**Exclusions**

- ☒ Create
- ☒ View

**Report**

- ☒ Generate

**Architecture**

- ☒ View

Done

**Auditor**

The application Auditor role can only access the Contrast API, not the Contrast application. Users with this permission can only access the V3 audit API. [RBAC permissions \(page 1565\)](#) access the V4 API.

**Auditor Permission Details** (Application) ×**Application****Vulnerabilities****Libraries****Policy****Report****Exclusions****Architecture**

Done

The **No Access** role blocks user access to the application.

You can add application roles when you [create or edit an organization access group](#) (page 1446).

## See also

[View permissions](#) (page 639)

## Organization roles

Users may have different roles across different organizations.

Every user has a default role for the default organization.

These are the organization roles:

**View**

The View role for organizations (Organization Viewer) has read-only access to the Contrast interface to see scores, libraries, vulnerabilities, and comments but cannot edit traces to the application.

**View Permission Details (Organization)** ×

**General**

- ☒ Org Info
- ☐ Report Settings
- ☒ Score Settings

**Servers**

- ☐ Delete
- ☐ Edit
- ☐ License
- ☒ Tag
- ☒ View

**Security**

- ☐ Audit
- ☒ Get API Keys
- ☐ IP Range
- ☐ Rotate API Keys
- ☐ Password Policy
- ☐ Session Timeouts

**Integrations**

- ☐ Edit
- ☐ View

**Libraries**

- ☒ Manifest
- ☒ Tag
- ☒ View

**Policy**

- ☐ App Exclusions
- ☐ Assess Rules
- ☐ Library Policy
- ☐ Protection Policy
- ☐ Remediation Policy

Done

**Edit**

The Edit role for organizations (Organization Editor) can remediate findings, add tags, manage vulnerabilities, edit attributes, merge applications, add or delete applications, and create servers. The majority of Contrast users have this role.

**Edit Permission Details (Organization)** ×

**General**

- ☒ Org Info
- ☐ Report Settings
- ☒ Score Settings

**Servers**

- ☐ Delete
- ☐ Edit
- ☐ License
- ☒ Tag
- ☒ View

**Security**

- ☐ Audit
- ☒ Get API Keys
- ☐ IP Range
- ☐ Rotate API Keys
- ☐ Password Policy
- ☐ Session Timeouts

**Integrations**

- ☐ Edit
- ☐ View

**Libraries**

- ☒ Manifest
- ☒ Tag
- ☒ View

**Policy**

- ☐ App Exclusions
- ☐ Assess Rules
- ☐ Library Policy
- ☐ Protection Policy
- ☐ Remediation Policy

Done

## Rules Admin

The Rules Admin role for organizations (Organization Rules Admin) can edit rules and policies in the application, enable Protect, and manage notifications and scoring for the organization.

### Rules Admin Permission Details (Organization)

#### General

- ☒ Org Info
- ☐ Report Settings
- ☒ Score Settings

#### Servers

- ☐ Delete
- ☐ Edit
- ☐ License
- ☒ Tag
- ☒ View

#### Security

- ☐ Audit
- ☒ Get API Keys
- ☐ IP Range
- ☐ Rotate API Keys
- ☐ Password Policy
- ☐ Session Timeouts

#### Integrations

- ☐ Edit
- ☐ View

#### Libraries

- ☒ Manifest
- ☒ Tag
- ☒ View

#### Policy

- ☒ App Exclusions
- ☒ Assess Rules
- ☒ Library Policy
- ☒ Protection Policy
- ☒ Remediation Policy

Done

## Admin

The Admin role for an organization (Organization Administrator) is responsible for the configuration and management of the organization.

### Admin Permission Details (Organization)

#### General

- ☒ Org Info
- ☒ Report Settings
- ☒ Score Settings

#### Servers

- ☒ Delete
- ☒ Edit
- ☒ License
- ☒ Tag
- ☒ View

#### Security

- ☒ Audit
- ☒ Get API Keys
- ☒ IP Range
- ☒ Rotate API Keys
- ☒ Password Policy
- ☒ Session Timeouts

#### Integrations

- ☒ Edit
- ☒ View

#### Libraries

- ☒ Manifest
- ☒ Tag
- ☒ View

#### Policy

- ☒ App Exclusions
- ☒ Assess Rules
- ☒ Library Policy
- ☒ Protection Policy
- ☒ Remediation Policy

Done

## Auditor

The organization Auditor role can only access the Contrast API, not the Contrast application. Users with this permission can only access the V3 audit API. [RBAC permissions \(page 1565\)](#) access the V4 API.

### Auditor Permission Details (Organization)

#### General

#### Servers

#### Security

#### Integrations

#### Libraries

#### Policy

Done

You assign organization roles by [adding users to an organization access group \(page 1446\)](#).



## See also

[View permissions \(page 639\)](#)

## System roles



### NOTE

These roles are only available to on-premises customers.

When deciding how to [manage system administration \(page 1500\)](#), you can use these roles to assign permissions and capabilities:

- A **SuperAdmin** is responsible for the installation and setup of on-premises instances. They may also be responsible for the system administration of Contrast, however, this may be assigned to one or more System Administrators. **SuperAdmins** can configure organizations, applications, servers, vulnerabilities, users and groups.
- A **ServerAdmin** is identical to a SuperAdmin except without access to users or groups. They have access to the **ServerAdmin** option in the user menu, which allows them to configure organizations, applications, servers and vulnerabilities.
- A **System Administrator** is responsible for maintaining organizations and groups. They have access to the **SuperAdmin** option in the user menu, which allows them to configure organizations, applications, servers, vulnerabilities, users and groups.
- A **System Observer** has read-only access to organizations, users, applications, groups and traces. They have read-only access to the **Observer** option in the user menu, which allows them to view organizations, applications, servers, vulnerabilities and users.
- The **No Access** role for a particular organization blocks users from that organization.

## Application scoring guide

The application score helps you gauge the general performance of each application.

Scores are based on how much of the application has been exercised, as well as the amount and severity of vulnerabilities found for that application.

Numeric scores map to letter grades that are shown in Contrast:

- **A:** 90-100
- **B:** 80-89
- **C:** 70-79
- **D:** 60-69
- **F:** 35-59

To calculate the application score, find the average of the application's [library score \(page 1216\)](#) and the custom code score.

To calculate the custom code score, start with 100 points and subtract penalty points for the number of vulnerabilities found in your application times a penalty weight for their severity, shown here:

- **Critical:** Multiply the number of vulnerabilities by 20
- **High:** Multiply the number of vulnerabilities by 10
- **Medium:** Multiply the number of vulnerabilities by 5

- **Low:** Multiply the number of vulnerabilities by 1

Vulnerabilities are weighted differently depending on how likely they are to be exploited and how serious the effects would be.

For example, a SQL injection is considered **Critical** because automated tools exist to exploit them without expertise. An attacker who doesn't know anything about your application or schema can exfiltrate your entire database contents.

On the other hand, using a hashing algorithm like SHA-1 is considered **Low** because it has been known to exhibit serious weaknesses. Also it requires the resources of a very skilled attacker with extensive backing.



### TIP

For example, to calculate your application score:

First determine your custom code score. If your application had 0 **Critical**, 1 **High**, 2 **Medium** and 1 **Low** vulnerability, your custom code score would be:

$$100 - (20 \times 0) - (10 \times 1) - (5 \times 2) - (1 \times 1) = 79$$

If you are running Contrast on an application with a library score of 85 and a custom code score of 79, your application score would be 82 which would be a B.

$$85 + 79 = 164$$

$$164 / 2 = 82$$

To improve your score:

- [Enable Protect rules \(page 1412\)](#) and CVE shields to remove protected vulnerabilities from the score calculation.
- Remediate **Critical** and **High** vulnerabilities in your custom code.
- Address the vulnerable libraries.
- Update **High risk** libraries.

## Library scoring guide

Contrast provides letter grades for the security of your application's libraries so that you can use them as a reference point during analysis. The grades map to scores as follows:

- A: 90 - 100
- B: 80 - 89
- C: 70 - 79
- D: 60 - 69
- F: 35 - 59

Scores are based on three penalty factors:

- **Time:** The age of the library is calculated based on the number of full years between the release of the latest version and the version used in the application, multiplied by 2.5.
- **Status:** The status is calculated based on the number of versions that have been released since the current library in your application, multiplied by 10.

- **Security:** The CVE penalty of the library is the highest severity of all known CVEs for this library, multiplied by 10.

**NOTE**

Organization administrators can [adjust the scoring method \(page 1459\)](#) to include only security criteria.

**TIP**

For example:

If you're using a library from January 2010 and the latest version came out in September 2013, the number of full years passed is two. So your time penalty would be:

$$2 \times 2.5 = 5$$

If you're using Version 1.1.1, but Versions 1.1.2 and 1.1.3 have been released, your penalty would be:

$$2 \times 10 = 20$$

If you have a library with the scores 2.4 and 2.2, the penalty would be:

$$2.4 \times 10 = 24$$

The final score of the library is calculated by subtracting each of the three penalty values from 100.

$$100 - 5 - 20 - 24 = 51$$

A score of 51 maps to a letter grade of F.

## Log levels

The log level setting controls which events are processed by server logging, and can help you more effectively capture events. They can be [configured at a system level \(page 1493\)](#) or for a [particular server \(page 1197\)](#) by any user with Editor permissions.

Log levels follow the Log4j standard and honor their level designations as much as possible.

INFO is the default value. ERROR level is sufficient in most cases, unless a problem occurs and you need to collect more detailed metrics.

| Log level | Description                                                                                                                           |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------|
| ERROR     | Gives information about a serious error that needs to be addressed and may result in an unstable state.                               |
| WARN      | Gives a warning about an unexpected event to the user. The messages coming out of this level may not halt the progress of the system. |
| INFO      | Gives the progress and chosen state information. This level is useful for the end user.                                               |
| DEBUG     | Helps the developer debug the application. Level of the message logged is focused on providing support to an application developer.   |

| Log level | Description                                           |
|-----------|-------------------------------------------------------|
| TRACE     | Gives more detailed information than the DEBUG level. |

## Events and generic webhook variables

You can customize your [generic webhook \(page 1356\)](#) response with data from Contrast events such as `NEW_VULNERABILITY` and `SERVER_OFFLINE`. Each event contains [general \(page 1358\)](#), [application \(page 1358\)](#), [server \(page 1358\)](#) or [vulnerability \(page 1359\)](#) variables you can call in your payload request.

| Event                             | Variables                                                                                                                                                      |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ATTACK_END                        | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a>                                             |
| ATTACK_EVENT_COMMENT              | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a>                                             |
| ATTACK_UPDATE                     | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a>                                             |
| EXPIRING_LICENSE                  | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a>                                                                                  |
| NEW_ASSET (if new application)    | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> and <a href="#">Server (page 1358)</a> (if new application)                      |
| NEW_ATTACK_APPLICATION            | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a>                                             |
| NEW_ATTACK_UPDATE                 | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a>                                             |
| NEW_ATTACK                        | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a>                                             |
| NEW_VULNERABILITY_COMMENT         | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a> , <a href="#">Vulnerability (page 1359)</a> |
| NEW_VULNERABILITY                 | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a> , <a href="#">Vulnerability (page 1359)</a> |
| NEW_VULNERABLE_LIBRARY            | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a>                                                                                  |
| SERVER_OFFLINE                    | <a href="#">General (page 1358)</a> , <a href="#">Server (page 1358)</a>                                                                                       |
| VULNERABILITY_CHANGESTATUS_CLOSED | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a> , <a href="#">Vulnerability (page 1359)</a> |
| VULNERABILITY_CHANGESTATUS_OPEN   | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a> , <a href="#">Vulnerability (page 1359)</a> |
| VULNERABILITY_DUPLICATE           | <a href="#">General (page 1358)</a> , <a href="#">Application (page 1358)</a> , <a href="#">Server (page 1358)</a> , <a href="#">Vulnerability (page 1359)</a> |

## Generic webhook variables

You can customize your [generic webhook \(page 1356\)](#) response with data from Contrast events such as `NEW_VULNERABILITY` and `SERVER_OFFLINE`. Each event contains variables you can call in your payload request. Variables are either for general use or for an application, server or vulnerability.

| Variables                             | Description                                                                                                                  |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| <b>General variables</b>              |                                                                                                                              |
| <code>\$EventType</code>              | The event type responsible for triggering the webhook<br>For example: <code>SERVER_OFFLINE</code>                            |
| <code>\$Message</code>                | A message summarizing the event that triggered the webhook                                                                   |
| <code>\$OrganizationId</code>         | The unique ID Contrast assigns to an organization when it is created                                                         |
| <code>\$OrganizationName</code>       | The name of your organization                                                                                                |
| <code>\$Title</code>                  | Always returns "Contrast Security"                                                                                           |
| <b>Application variables</b>          |                                                                                                                              |
| <code>\$ApplicationChild</code>       | Returns true if the application is a child application, false if not                                                         |
| <code>\$ApplicationCode</code>        | A secondary shorthand that appears in the title of an application, and is blank by default<br>For example: <code>TEST</code> |
| <code>\$ApplicationContextPath</code> | The context path of the application<br>For example: <code>/example/somethingelse</code>                                      |

| Variables                                     | Description                                                                                                                                                                 |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| \$ApplicationFirstSeen                        | When the application was first seen, in Unix time<br>For example: 1572033840000                                                                                             |
| \$ApplicationHasParentApp                     | Returns true if the application has a parent, false if not                                                                                                                  |
| \$ApplicationImportance                       | Enumerated value of the application Importance level<br>For example: MEDIUM                                                                                                 |
| \$ApplicationId                               | The unique ID Contrast assigns to an application when it is created<br>For example: 49fe2978-1833-4441-83db-2b7o486d9413                                                    |
| \$ApplicationImportanceDescription            | The importance level assigned to the application For example: Medium                                                                                                        |
| \$ApplicationLanguage                         | The programming language of the application                                                                                                                                 |
| \$ApplicationLastSeen                         | When the application was last seen, in Unix time For example: 1572033840000                                                                                                 |
| \$ApplicationLicenseLevel                     | Whether or not the application has an Assess license Values: Licensed, Unlicensed                                                                                           |
| \$ApplicationMaster                           | Returns true if the application is a primary application, false if not                                                                                                      |
| \$ApplicationName                             | The name of the application                                                                                                                                                 |
| \$ApplicationParentAppId                      | The unique ID Contrast assigns to an application when it's created, in this case, the parent application, if it exists<br>For example: 49fe2978-1833-4441-83db-2b7o486d9413 |
| \$ApplicationTags                             | A comma separated list of the Application tags.                                                                                                                             |
| \$ApplicationTotalModules                     | The number of modules your application has                                                                                                                                  |
| <b>Server variables</b>                       |                                                                                                                                                                             |
| \$Environment                                 | The environment of the server For example: DEVELOPMENT or PRODUCTION                                                                                                        |
| \$ServerId                                    | The ID of the server involved in the event<br>If more than one server is involved, this is a comma-delimited list of server IDs.                                            |
| \$ServerName                                  | The name of the server involved in the event<br>If more than one server is involved, this is a comma-delimited list of server names                                         |
| <b>Vulnerability variables</b>                |                                                                                                                                                                             |
| \$Severity                                    | If this event is triggered by a vulnerability, this is the severity of the vulnerability                                                                                    |
| \$Status                                      | If this event is triggered by a vulnerability, this is the status of the vulnerability                                                                                      |
| \$TraceId                                     | If this event is triggered by a vulnerability, this is the vulnerability ID                                                                                                 |
| \$VulnerabilityAgentLanguage                  | The application language or framework name of the where the vulnerability was discovered (for example,.Java, .NET, Ruby, and so forth.)                                     |
| \$VulnerabilityAppVersionTags                 | The application versions the vulnerability is found in<br>For example: v1.2.3                                                                                               |
| \$VulnerabilityAutoRemediatedExpirationPeriod | Auto-remediated expiration period for the vulnerability, in Unix time<br>For example: 1572033840000                                                                         |
| \$VulnerabilityBugTrackerTickets              | A comma delimited list of tickets created when the vulnerability was sent to bugtracker<br>For example: ticket1, ticket2, ticket3                                           |
| \$VulnerabilityCategory                       | The category of vulnerability found For example: Injection                                                                                                                  |
| \$VulnerabilityClosedTime                     | When the vulnerability was closed, in Unix time<br>For example: 1572033840000                                                                                               |
| \$VulnerabilityConfidence                     | Confidence of the vulnerability                                                                                                                                             |

| Variables                               | Description                                                                                                        |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| \$VulnerabilityDefaultSeverity          | Default severity of the vulnerability                                                                              |
| \$VulnerabilityDiscovered               | When the vulnerability was first discovered, in Unix time<br>For example: 1572033840000                            |
| \$VulnerabilityEvidence                 | The evidence of the vulnerability                                                                                  |
| \$VulnerabilityInstanceUuid             | The unique ID Contrast assigns to a vulnerability instance when it is created<br>For example: R33T-N00B-TGIF-RM6P  |
| \$VulnerabilityFirstTimeSeen            | When the vulnerability was first seen, in Unix time For example: 1572033840000                                     |
| \$VulnerabilityImpact                   | The impact level of the vulnerability Values: Low, Medium, High                                                    |
| \$VulnerabilityLastTimeSeen             | Last time the vulnerability was seen, in Unix time For example: 1572033840000                                      |
| \$VulnerabilityInstanceLastTimeSeen     | Last time the vulnerability was seen, in Unix time For example: 1572033840000                                      |
| \$VulnerabilityLicenseLevel             | License level of the vulnerability                                                                                 |
| \$VulnerabilityLikelihood               | The likelihood of the vulnerability<br>Values: Low, Medium, High                                                   |
| \$VulnerabilityReportedToBugTracker     | When the vulnerability was sent to a bugtracker, in Unix time<br>For example: 1572033840000                        |
| \$VulnerabilityReportedToBugTrackerTime | Returns true If the vulnerability was sent to a bugtracker                                                         |
| \$VulnerabilityRule                     | Rule associated with the vulnerability                                                                             |
| \$VulnerabilityRuleName                 | Name of the rule associated to the vulnerability                                                                   |
| \$VulnerabilityRuleTitle                | Title of the rule associated to the vulnerability                                                                  |
| \$VulnerabilitySubStatus                | Substatus of the vulnerability                                                                                     |
| \$VulnerabilityTags                     | Custom tags associated with the vulnerability<br>For example: my-custom-tag                                        |
| \$VulnerabilityTitle                    | Title of the vulnerability                                                                                         |
| \$VulnerabilitySubStatusKeyCode         | Key code of the vulnerability substatus                                                                            |
| \$VulnerabilityTotalTracesReceived      | Total number of times the vulnerability was received                                                               |
| \$VulnerabilityUuid                     | The unique ID used to look up a vulnerability                                                                      |
| \$VulnerabilityVisible                  | true if the vulnerability is licensed and visible, false if not                                                    |
| \$VulnerabilityRule                     | If event is triggered by a vulnerability, this is the rule that the vulnerability violated                         |
| \$VulnerabilityTags                     | If event is triggered by a vulnerability, this is a comma-delimited list of tags associated with the vulnerability |

## Regular expression reference

Use this table, and the examples below, for reference when [creating application exclusions \(page 1424\)](#):

| Effect                                     | Pattern  | Example pattern | Example match          |
|--------------------------------------------|----------|-----------------|------------------------|
| Start of a string                          | ^        | ^w+             | Start of a string      |
| End of a string                            | \$       | w+\$            | End of a string        |
| Case-insensitive match of following string | (?i)     | (?i)%0a         | %0a or %0A             |
| A single character of: a, b or c           | [abc]    | [abc]+          | a bb ccc               |
| A character except: a, b or c              | [^abc]   | [^abc]+         | Anythingbutabc.        |
| A character in the range: a-z              | [a-z]    | [a-z]+          | Only a-z               |
| A character not in the range: a-z          | [^a-z]   | [^a-z]+         | Anythingbuta-z.        |
| A character in the range of: a-z or A-Z    | [a-zA-Z] | [a-zA-Z]+       | abc123DEF              |
| Any single character                       | .        | .+              | abc                    |
| Any whitespace character                   | \s       | \s              | anywhitespacecharacter |

| Effect                              | Pattern | Example pattern | Example match             |
|-------------------------------------|---------|-----------------|---------------------------|
| Any non-whitespace character        | \S      | \S+             | any non-whitespace        |
| Any digit                           | \d      | \d              | not 1 not 2               |
| Any non-digit                       | \D      | \D+             | not 1 not 2               |
| Zero or one of a                    | a?      | ba?             | ba b a                    |
| Zero or more of a                   | a*      | ba*             | a ba baa aaa ba b         |
| One or more of a                    | a+      | a+              | a aa aaa aaaa bab baab    |
| Exactly 3 of a                      | a{3}    | a{3}            | a aa aaa aaaa             |
| 3 or more of a                      | a{3,}   | a{3,}           | a aa aaa aaaa aaaaaa      |
| Between 3 and 6 of a                | a{3,6}  | a{3,6}          | a aa aaa aaaa aaaaaa aaaa |
| Period (dot) is a literal character | .       | a.b             | string.string             |

## Supported browsers

Contrast is web-based application for HTML5, and the interface is based on React and AngularJS. It works well with the latest version of any modern browser. Contrast actively tests our product in the **current and last major version** of the following browsers:

- Chrome
- Edge
- Firefox
- Safari

Opera browsers or older versions of Internet Explorer, Firefox, or Safari browsers may still work with Contrast, but some features may not display as intended.

## Contrast Beta Terms and Conditions

Contrast beta products and features adhere to these conditions:

- This product is in active development and undergoing continuous improvements.
- These beta products are provided as-is without warranty of any kind.
- Since beta products are still in development, there may be issues. Do not use beta versions in production environments.
- Customers may be required to sign additional agreements in order to use beta products.
- The beta program is for qualified users who want early access to new features and enhancements, and who agree to provide feedback. Please send comments, questions or bug reports about beta products to [support@contrastsecurity.com](mailto:support@contrastsecurity.com).

## Privacy and data collection

It's important that Contrast Security understands how customers are using our products so they can be improved. This information helps Contrast Security resolve problems and fix bugs.

We collect data through:

- [System diagnostics \(page 1532\)](#)
- [.NET Framework and .NET Core agent telemetry \(page 213\)](#)
- [Ruby telemetry \(page 510\)](#)
- [Python telemetry \(page 506\)](#)

The collected data is anonymous and does not contain application data. It is collected by Contrast Security, and is never shared. It is governed by [Contrast Security's Privacy Policy](#).

Protecting your privacy is important to us. If you suspect we are collecting sensitive data or the data is being insecurely or inappropriately handled, send an email to [security@contrastsecurity.com](mailto:security@contrastsecurity.com) for investigation.



## Preview releases

The content in this section represents new features currently not publicly available on the Contrast platform. These features are part of the Contrast pre-release customer testing program. If you want to be included in one or more of these areas, contact your Contrast representative.

### Topics in this section

- [Role-based access control \(page 1565\)](#)
- [Visual Studio Code \(page 1608\)](#)

### Role-based access control (Preview) ☁

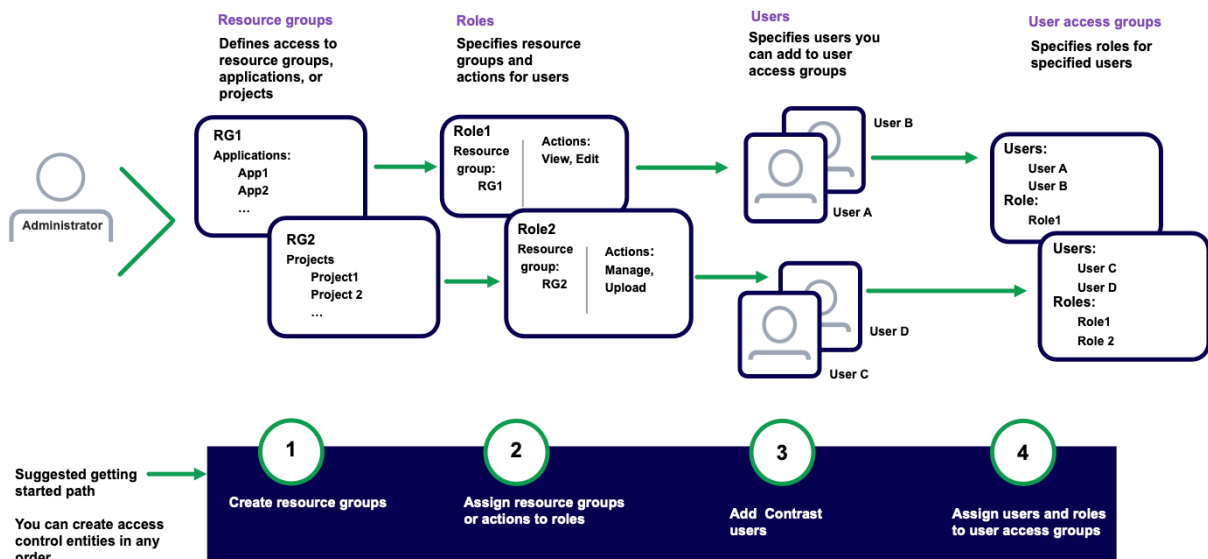
To manage user access to applications, projects, and organization settings in Contrast, set up resource groups, roles, and user access groups.



#### NOTE

This feature is supported for hosted customers only

On-premises customers manage Contrast access by setting up [organization users and access groups \(page 1445\)](#).



### Access control settings

Access control requires these settings:

- **Resource groups:** (page 1572) These groups determine which applications, SCA project groups, and scan projects users can access, depending on their assigned role. You can use built-in resource groups or create custom groups.
- **Roles:** (page 1579) Roles define the actions that users have permissions to perform. You can use built-in roles or create custom roles.

The built-in role, Organization administrator. lets you manage all user access groups, roles, and resource groups.

- **Users: (page 1588)** The list of Contrast users who you can add to user access groups.
- **User access groups: (page 1577)** These groups assign roles to users.  
You can use built-in user access groups or create custom user access groups.
- **Resource groups: (page 1572)** These groups determine which applications, SCA project groups, and scan projects users can access, depending on their assigned role.  
You can use built-in resource groups or create custom groups.
- **Roles: (page 1579)** Roles define the actions that users have permissions to perform.  
You can use built-in roles or create custom roles.  
The built-in role, Organization administrator. lets you manage all user access groups, roles, and resource groups.
- **Users: (page 1588)** The list of Contrast users who you can add to user access groups.
- **User access groups: (page 1577)** These groups assign roles to users.  
You can use built-in user access groups or create custom user access groups.

## Methods for managing access control

To manage access control, use either of these methods:

- **Contrast web interface**  
The Contrast web interface provides an visual method for setting up and managing access control. This method requires an Organization Administrator or Organization Admin role.
- **Access control APIs**  
The access control APIs are useful if you want to automate access control management or integrate it into existing systems. This method requires the `PLATFORM_ORG_MANAGE` permission.  
Read more about the [access control APIs](#).

## Naming standards and requirements

Names for resource groups, roles, and user access groups must be unique for each organization. For example, you can't create two roles with the name, **MyAdmins**.

Before you create custom roles or groups, consider developing a naming standard for all custom settings. Doing so will help make managing a large number of custom settings easier. One approach is to map the names of resource groups to the roles that you would associate with those groups. For example, if you create a resource group named **Ecommerce**, a good role name would be **Ecommerce Developer**. The users with this role are your developers working on ecommerce applications.

### Naming requirements for all custom settings

- Names can contain up to 50 alphanumeric characters.
- Descriptions can contain up to 1,024 characters.
- You can use special characters and spaces in names and descriptions.
- Names are case insensitive.  
For example, ecommerce developers and Ecommerce Developers are considered to be the same name.

## Access Control APIs

The [Access Control APIs](#) let you do many of the role-based access control tasks that you can do from the Contrast web interface.

## Actions and permissions (Preview) ☹

Each action that you assign to a role provides permissions to perform specific tasks and access to data.

Actions can inherit permissions from other actions. (page 1572) For example, the Edit application action includes all of the permissions that the View application action provides. In this case, only need to assign the Edit application action to a role and not both the Edit application and View application actions.



## NOTE

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

On-premises customers manage Contrast access by setting up [organization users and access groups](#) (page 1445).

## Organization actions and permissions

| This action:      | Includes these permissions:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | And is part of these built-in roles                                                                                                                                |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| View organization | <b>General</b> <ul style="list-style-type: none"> <li>Log in to the Contrast web interface</li> <li>View your user profile</li> <li>View notifications</li> </ul> <b>Reports</b> <ul style="list-style-type: none"> <li>Generate application reports</li> </ul>                                                                                                                                                                                                                                                                                    | Organization viewer<br>Organization editor<br>Organization administrator<br>Organization rules administrator<br>App security administrator<br>DevOps administrator |
| Edit organization | <b>General</b> <ul style="list-style-type: none"> <li>View your user profile</li> <li>View notifications</li> <li>View score settings</li> <li>View report settings</li> <li>View organization settings</li> <li>Access the Add new button</li> </ul> <b>Policies</b> <ul style="list-style-type: none"> <li>View policies</li> </ul> <b>Security</b> <ul style="list-style-type: none"> <li>Get agent keys</li> </ul> <b>Reports</b> <ul style="list-style-type: none"> <li>View report settings</li> <li>Generate application reports</li> </ul> | Organization editor<br>Organization administrator<br>Organization rules administrator                                                                              |

| This action:                                                                                                                                                                                                                                                             | Includes these permissions:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | And is part of these built-in roles                                                                                                                              |                                                                                                                                           |                                                                                                |                                                                                                                                                             |                                                                                                  |                                                                                                                                                                      |                                                                                                                                                                                                                                                                          |                                                                                                    |                                                                                              |  |                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|--|-----------------------------------|
| Manage organization rules                                                                                                                                                                                                                                                | <p><b>General</b></p> <ul style="list-style-type: none"><li>• View your user profile</li><li>• View notifications</li><li>• View score settings</li><li>• View organization settings</li><li>• Enable or disable Protect</li></ul> <p><b>Policies</b></p> <ul style="list-style-type: none"><li>• Manage scoring policies</li></ul> <p><b>Reports</b></p> <ul style="list-style-type: none"><li>• View report settings</li><li>• Generate application reports</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <p>Organization administrator</p> <p>Organization rules administrator</p>                                                                                        |                                                                                                                                           |                                                                                                |                                                                                                                                                             |                                                                                                  |                                                                                                                                                                      |                                                                                                                                                                                                                                                                          |                                                                                                    |                                                                                              |  |                                   |
| Manage organization                                                                                                                                                                                                                                                      | <table><tr><td><p><b>General</b></p><ul style="list-style-type: none"><li>• View your user profile</li><li>• View notifications</li><li>• View organization settings</li></ul></td><td><p><b>Integrations</b></p><ul style="list-style-type: none"><li>• View integration details</li><li>• Edit integration settings</li></ul></td></tr><tr><td><p><b>Servers</b></p><ul style="list-style-type: none"><li>• Manage server licenses</li></ul></td><td><p><b>Users</b></p><ul style="list-style-type: none"><li>• View users</li><li>• Create users</li><li>• Delete users</li><li>• Edit user settings</li></ul></td></tr><tr><td><p><b>Policies</b></p><ul style="list-style-type: none"><li>• Manage scoring policies</li></ul></td><td><p><b>Reports</b></p><ul style="list-style-type: none"><li>• View report settings</li><li>• Change report settings</li><li>• Generate application reports</li></ul></td></tr><tr><td><p><b>Security</b></p><ul style="list-style-type: none"><li>• Rotate API keys</li><li>• Manage agent keys</li><li>• Manage IP restrictions</li><li>• Manage password policy</li><li>• Manage session timeouts</li><li>• Manage two-step verification and SAML</li></ul></td><td><p><b>Protect</b></p><ul style="list-style-type: none"><li>• Enable and disable Protect</li></ul></td></tr><tr><td><p><b>Scan</b></p><ul style="list-style-type: none"><li>• Turn on dynamic scoring</li></ul></td><td></td></tr></table> | <p><b>General</b></p> <ul style="list-style-type: none"><li>• View your user profile</li><li>• View notifications</li><li>• View organization settings</li></ul> | <p><b>Integrations</b></p> <ul style="list-style-type: none"><li>• View integration details</li><li>• Edit integration settings</li></ul> | <p><b>Servers</b></p> <ul style="list-style-type: none"><li>• Manage server licenses</li></ul> | <p><b>Users</b></p> <ul style="list-style-type: none"><li>• View users</li><li>• Create users</li><li>• Delete users</li><li>• Edit user settings</li></ul> | <p><b>Policies</b></p> <ul style="list-style-type: none"><li>• Manage scoring policies</li></ul> | <p><b>Reports</b></p> <ul style="list-style-type: none"><li>• View report settings</li><li>• Change report settings</li><li>• Generate application reports</li></ul> | <p><b>Security</b></p> <ul style="list-style-type: none"><li>• Rotate API keys</li><li>• Manage agent keys</li><li>• Manage IP restrictions</li><li>• Manage password policy</li><li>• Manage session timeouts</li><li>• Manage two-step verification and SAML</li></ul> | <p><b>Protect</b></p> <ul style="list-style-type: none"><li>• Enable and disable Protect</li></ul> | <p><b>Scan</b></p> <ul style="list-style-type: none"><li>• Turn on dynamic scoring</li></ul> |  | <p>Organization administrator</p> |
| <p><b>General</b></p> <ul style="list-style-type: none"><li>• View your user profile</li><li>• View notifications</li><li>• View organization settings</li></ul>                                                                                                         | <p><b>Integrations</b></p> <ul style="list-style-type: none"><li>• View integration details</li><li>• Edit integration settings</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                  |                                                                                                                                           |                                                                                                |                                                                                                                                                             |                                                                                                  |                                                                                                                                                                      |                                                                                                                                                                                                                                                                          |                                                                                                    |                                                                                              |  |                                   |
| <p><b>Servers</b></p> <ul style="list-style-type: none"><li>• Manage server licenses</li></ul>                                                                                                                                                                           | <p><b>Users</b></p> <ul style="list-style-type: none"><li>• View users</li><li>• Create users</li><li>• Delete users</li><li>• Edit user settings</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                  |                                                                                                                                           |                                                                                                |                                                                                                                                                             |                                                                                                  |                                                                                                                                                                      |                                                                                                                                                                                                                                                                          |                                                                                                    |                                                                                              |  |                                   |
| <p><b>Policies</b></p> <ul style="list-style-type: none"><li>• Manage scoring policies</li></ul>                                                                                                                                                                         | <p><b>Reports</b></p> <ul style="list-style-type: none"><li>• View report settings</li><li>• Change report settings</li><li>• Generate application reports</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                  |                                                                                                                                           |                                                                                                |                                                                                                                                                             |                                                                                                  |                                                                                                                                                                      |                                                                                                                                                                                                                                                                          |                                                                                                    |                                                                                              |  |                                   |
| <p><b>Security</b></p> <ul style="list-style-type: none"><li>• Rotate API keys</li><li>• Manage agent keys</li><li>• Manage IP restrictions</li><li>• Manage password policy</li><li>• Manage session timeouts</li><li>• Manage two-step verification and SAML</li></ul> | <p><b>Protect</b></p> <ul style="list-style-type: none"><li>• Enable and disable Protect</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                  |                                                                                                                                           |                                                                                                |                                                                                                                                                             |                                                                                                  |                                                                                                                                                                      |                                                                                                                                                                                                                                                                          |                                                                                                    |                                                                                              |  |                                   |
| <p><b>Scan</b></p> <ul style="list-style-type: none"><li>• Turn on dynamic scoring</li></ul>                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                  |                                                                                                                                           |                                                                                                |                                                                                                                                                             |                                                                                                  |                                                                                                                                                                      |                                                                                                                                                                                                                                                                          |                                                                                                    |                                                                                              |  |                                   |
| Manage platform organization                                                                                                                                                                                                                                             | <p><b>Access control</b></p> <ul style="list-style-type: none"><li>• Manage user access groups</li><li>• Manage roles</li><li>• Manage resource groups.</li></ul> <p><b>Reports</b></p> <ul style="list-style-type: none"><li>• Generate application reports</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p>Organization administrator</p> <p>DevOps administrator</p>                                                                                                    |                                                                                                                                           |                                                                                                |                                                                                                                                                             |                                                                                                  |                                                                                                                                                                      |                                                                                                                                                                                                                                                                          |                                                                                                    |                                                                                              |  |                                   |
| View audit logs                                                                                                                                                                                                                                                          | <p><b>Security</b></p> <ul style="list-style-type: none"><li>• View audit log details</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <p>Organization administrator</p>                                                                                                                                |                                                                                                                                           |                                                                                                |                                                                                                                                                             |                                                                                                  |                                                                                                                                                                      |                                                                                                                                                                                                                                                                          |                                                                                                    |                                                                                              |  |                                   |

## Application actions and permissions

| This action:             | Includes these permissions:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | And is part of these built-in roles                                                                                                                                                                             |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| View application         | <div><div><div>General</div><div><ul style="list-style-type: none"><li>View your user profile</li><li>View notifications</li><li>Customize score settings</li><li>Change report settings</li><li>Change notification settings</li></ul></div></div><div><div>Applications</div><div><ul style="list-style-type: none"><li>View application details</li><li>View, edit, and delete tags</li></ul></div></div><div><div>Servers</div><div><ul style="list-style-type: none"><li>View server details</li></ul></div></div><div><div>Libraries</div><div><ul style="list-style-type: none"><li>View library details</li><li>View tags</li><li>View manifest details</li><li>Export libraries</li></ul></div></div></div>                                                                                                                                                                                                              | <div><div><div>Vulnerabilities</div><div><ul style="list-style-type: none"><li>View vulnerability details</li><li>Export vulnerabilities, traces, and routes</li><li>Replay HTTP requests</li><li>Manage discussion</li></ul></div></div><div><div>Policies</div><div><ul style="list-style-type: none"><li>View application policies</li><li>View application exclusions</li></ul></div></div><div><div>Reports</div><div><ul style="list-style-type: none"><li>Generate application reports</li></ul></div></div></div>                                                                                                                                                                                                                                                                                                                                                        | Application viewer<br><br>Application editor<br><br>Application administrator<br><br>Application rules administrator<br><br>App security administrator<br><br>App security engineer<br><br>DevOps administrator |
| Edit application         | <div><div><div>General</div><div><ul style="list-style-type: none"><li>View your user profile</li><li>View notifications</li><li>View organization settings</li><li>View score settings</li><li>Change notification settings</li></ul></div></div><div><div>Applications</div><div><ul style="list-style-type: none"><li>View application details</li><li>View tags</li><li>Merge applications</li><li>Archive applications</li><li>Restore applications</li><li>Edit and delete tags</li><li>Manage filters</li></ul></div></div><div><div>Servers</div><div><ul style="list-style-type: none"><li>View server details</li><li>Edit and delete tags</li><li>Edit server settings</li></ul></div></div><div><div>Libraries</div><div><ul style="list-style-type: none"><li>View library details</li><li>View tags</li><li>Edit and delete tags</li><li>View manifest details</li><li>Export libraries</li></ul></div></div></div> | <div><div><div>Vulnerabilities</div><div><ul style="list-style-type: none"><li>View vulnerability details</li><li>Send vulnerabilities to a bug tracker</li><li>Merge vulnerabilities</li><li>Edit vulnerability settings</li><li>Manage discussions</li><li>Delete vulnerabilities</li><li>Export vulnerabilities, traces, and routes</li><li>Replay HTTP requests</li><li>Manage traces</li></ul></div></div><div><div>Policies</div><div><ul style="list-style-type: none"><li>View application policies</li><li>View application exclusions</li><li>Manage scoring policies</li></ul></div></div><div><div>Reports</div><div><ul style="list-style-type: none"><li>Generate application reports</li><li>Change report settings</li></ul></div></div><div><div>Protect</div><div><ul style="list-style-type: none"><li>Enable and disable Protect</li></ul></div></div></div> | Application editor<br><br>Application administrator<br><br>Application rules administrator<br><br>App security administrator                                                                                    |
| Manage application rules | <div><div><div>General</div><div><ul style="list-style-type: none"><li>View your user profile</li><li>View notifications</li></ul></div></div><div><div>Architecture</div><div><ul style="list-style-type: none"><li>View architecture details</li></ul></div></div><div><div>Policies</div><div><ul style="list-style-type: none"><li>Manage Assess rule settings</li><li>Manage library policies</li><li>Manage remediation policies</li></ul></div></div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <div><div><div>Protect</div><div><ul style="list-style-type: none"><li>Enable and disable Protect</li></ul></div></div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Application administrator<br><br>Application rules administrator<br><br>App Security administrator                                                                                                              |

| This action:       | Includes these permissions:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | And is part of these built-in roles |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Manage application | <b>General</b> <ul style="list-style-type: none"> <li>Log in to the Contrast web interface</li> <li>View your user profile</li> <li>View notifications</li> <li>View organization settings</li> <li>View score settings</li> <li>Change report settings</li> <li>Change notification settings</li> </ul> <b>Applications</b> <ul style="list-style-type: none"> <li>View application details</li> <li>View tags</li> <li>Edit and delete tags</li> <li>Merge applications</li> <li>Archive applications</li> <li>Restore applications</li> <li>Manage filters</li> <li>Manage traces</li> <li>Manage bug tracker settings</li> <li>License applications</li> <li>Edit application settings</li> <li>Reset applications</li> <li>Delete applications</li> </ul> <b>Servers</b> <ul style="list-style-type: none"> <li>View server details</li> <li>Edit and delete tags</li> <li>Edit server settings</li> <li>Delete servers</li> <li>Manage server licenses</li> </ul> <b>Integrations</b> <ul style="list-style-type: none"> <li>View integration details</li> <li>Edit integration settings</li> </ul> <b>Libraries</b> <ul style="list-style-type: none"> <li>View library details</li> <li>View tags</li> <li>Edit and delete tags</li> <li>View manifest details</li> <li>Export libraries</li> </ul> <b>Vulnerabilities</b> <ul style="list-style-type: none"> <li>View vulnerability details</li> <li>Send vulnerabilities to a bug tracker</li> <li>Merge vulnerabilities</li> <li>Edit vulnerability settings</li> <li>Manage discussions</li> <li>Delete vulnerabilities</li> <li>Export vulnerabilities, traces, and routes</li> <li>Replay HTTP requests</li> <li>Manage traces</li> </ul> | <b>Policies</b> <ul style="list-style-type: none"> <li>View applications policies</li> <li>View application exclusions</li> <li>View scoring policies</li> </ul> <b>Architecture</b> <ul style="list-style-type: none"> <li>View architecture details.</li> </ul> <b>Protect</b> <ul style="list-style-type: none"> <li>Enable and disable Protect</li> </ul> <b>Reports</b> <ul style="list-style-type: none"> <li>Generate application reports</li> <li>View report settings</li> </ul> <b>Users</b> <ul style="list-style-type: none"> <li>Manage resource groups</li> </ul> | Application administrator           |

## Project actions and permissions

| This action: | Includes these permissions:                                                                                                                                    | And is part of these built-in roles                                                           |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| View project | <b>Scan</b> <ul style="list-style-type: none"> <li>View details about scan projects and scans</li> <li>Download scan results in a SARIF or CSV file</li> </ul> | Project viewer<br>Project administrator<br>App Security administrator<br>DevOps administrator |
| Upload scans | <b>Scan</b> <ul style="list-style-type: none"> <li>Upload files for scanning</li> </ul>                                                                        | Scan uploader<br>Project administrator<br>App security administrator                          |

| This action:               | Includes these permissions:                                                                                                                                                                                                                                                                                                                                                             | And is part of these built-in roles                 |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| View, edit, delete project | <b>Scan</b> <ul style="list-style-type: none"> <li>• Archive scan projects</li> <li>• Delete scan projects</li> <li>• Edit project settings</li> <li>• Change scan vulnerability status and severity</li> <li>• Upload files for scanning</li> <li>• Start scans</li> <li>• View details for scan projects and scans</li> <li>• Download scan results in a SARIF or CSV file</li> </ul> | Project administrator<br>App security administrator |
| Create project             | <b>Scan</b> <ul style="list-style-type: none"> <li>• Create scan projects</li> </ul>                                                                                                                                                                                                                                                                                                    | Project administrator                               |
| Edit project               | <b>Scan</b> <ul style="list-style-type: none"> <li>• Edit scan project settings</li> <li>• Upload files for scanning</li> <li>• View details for scan projects and scans</li> <li>• Download scan results in a SARIF or CSV file</li> </ul>                                                                                                                                             | Project administrator<br>App security administrator |
| Delete project             | <b>Scan</b> <ul style="list-style-type: none"> <li>• View details for scan projects and scans</li> <li>• Download scan results in a SARIF or CSV file</li> <li>• Delete scan projects</li> </ul>                                                                                                                                                                                        | Project administrator<br>App security administrator |

## Protect actions and permissions

| This action:                   | Includes these permissions:                                                                                                                                                                                                                                                          | And is part of these built-in resource groups                                |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| Access Protect                 | <b>Protect</b> <ul style="list-style-type: none"> <li>• View Protect data</li> </ul>                                                                                                                                                                                                 | Protect viewer<br>Protect policy administrator<br>Organization administrator |
| Manage Protect exclusions      | <b>Protect</b> <ul style="list-style-type: none"> <li>• View application exclusions for Protect rules</li> <li>• Create and edit application exclusions for Protect rules</li> </ul>                                                                                                 | Protect exclusion administrator<br>Organization administrator                |
| Manage Protect policies        | <b>Protect</b> <ul style="list-style-type: none"> <li>• View and edit Protect policies</li> <li>• Add or edit log enhancers</li> <li>• Manage attack alerts</li> <li>• Manage the IP denylist</li> <li>• Manage Protect licenses</li> <li>• Manage Protect rule settings.</li> </ul> | Protect policy administrator                                                 |
| Manage sensitive data policies | <b>Protect</b> <ul style="list-style-type: none"> <li>• View details for sensitive data policies</li> <li>• Edit policies for sensitive data</li> </ul>                                                                                                                              | Protect sensitive data administrator<br>Organization administrator           |
| View attack data               | <b>Protect</b> <ul style="list-style-type: none"> <li>• View attack event data</li> </ul>                                                                                                                                                                                            | App security engineer                                                        |

## SCA projects actions and permissions

| This action:      | Includes these permissions:                                                                 | And is part of these built-in roles                         |
|-------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| View SCA projects | <b>Libraries</b> <ul style="list-style-type: none"> <li>View SCA project details</li> </ul> | SCA project group viewer<br>SCA project group administrator |

| This action:        | Includes these permissions:                                                                                                                                                                                                                                                                       | And is part of these built-in roles |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Create SCA projects | <b>Libraries</b> <ul style="list-style-type: none"><li>• Connect to open source repositories for new SCA projects</li><li>• Create (and track, if using the <code>--track</code> option) new SCA project from the Contrast CLI</li></ul>                                                          | SCA project group administrator     |
| Delete SCA projects | <b>Libraries</b> <ul style="list-style-type: none"><li>• Disconnect open source repositories for SCA projects</li></ul>                                                                                                                                                                           | SCA project group administrator     |
| Manage SCA projects | <b>Libraries</b> <ul style="list-style-type: none"><li>• View SCA project details</li><li>• Connect to open source repositories for SCA projects</li><li>• Edit SCA project details</li><li>• Disconnect SCA projects</li><li>• Run additional or subsequent SCA scans for SCA projects</li></ul> | SCA project group administrator     |

## Serverless actions and permissions

| This action:    | Includes these permissions:                                                                                                    | And is part of these built-in roles |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| View Serverless | <b>Serverless</b> <ul style="list-style-type: none"><li>• View Serverless data</li><li>• Interact with API endpoints</li></ul> | Serverless user                     |

## Inherited actions

| This action: | Inherits permissions from this action: |
|--------------|----------------------------------------|
|              |                                        |
|              |                                        |
|              |                                        |
|              |                                        |
|              |                                        |

## Resource groups (Preview)

Resource groups let you specify the applications, projects, and organization settings that users can access, based on their assigned roles.



### NOTE

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

On-premises customers manage access to Contrast capabilities by setting up [organization users and access groups \(page 1445\)](#).

## Resource groups tab

The Resource groups tab displays the list of existing groups. From this tab, you can:

- View a list of resource groups.  
Use search to find specific groups.
- Manage resource groups:



- [Add a resource group \(page 1575\).](#)
- [Edit a resource group \(page 1573\).](#)
- [Delete a resource group \(page 1574\).](#)

**Organization Settings**

Organization  
Groups  
Users  
Access Control  
Security  
Agent  
Single Sign-On  
Integrations  
Servers  
Applications  
Notifications  
Report Settings  
Score Settings

Users **Resource Groups** Roles User Access Groups

**Resource Groups**

Search

+ Add Group

| RESOURCE GROUP              |          | DESCRIPTION                                                                                                                              |  |
|-----------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------|--|
| All applications            | Built-in | All applications added to Contrast. Provides access to Assess and Protect data. Actions define the permissions a user has for this data. |  |
| All projects                | Built-in | All scan projects defined in the system. Actions define the permissions a user has for projects.                                         |  |
| All roles                   | Built-in | Includes all built-in and custom roles. Actions define the permissions a user has for roles.                                             |  |
| All access control settings | Built-in | Includes all settings for access control entities. Actions define the permissions a user has for the entities.                           |  |
| Ecommerce projects          |          | Projects for Ecommerce development                                                                                                       |  |

## Built-in resource groups

You can select these built-in resource groups for access control roles:

- **All applications:** Provides access to all applications in your organization.
- **All Protect exclusions:** Provides access to all Protect exclusion settings
- **All Protect sensitive data policies:** Provides access to all sensitive-date policy settings.
- **All functions:** Provides access to all Serverless functions and data endpoints.
- **All projects:** Provides access to all scan projects in your organization.
- **All roles:** Provides access to all roles in your organization only.
- **All access control settings:** Provides access to all settings for users, roles, user access groups, and resource groups.
- **All organization settings:** Provides access to all organization settings, including management of all users access groups, resource groups, and roles.
- **All user access groups:** Provides access to all user access groups.
- **All resource groups:** Provides access to all resource groups.
- **All SCA project groups:** Provides access to all SCA projects.



### NOTE

You cannot change the settings for built-in resource groups. To view the settings for these groups, select the **View** icon ().

## Edit custom resource groups (Preview)

Use this procedure to change settings for a custom resource group. You cannot change settings for built-in resource groups.

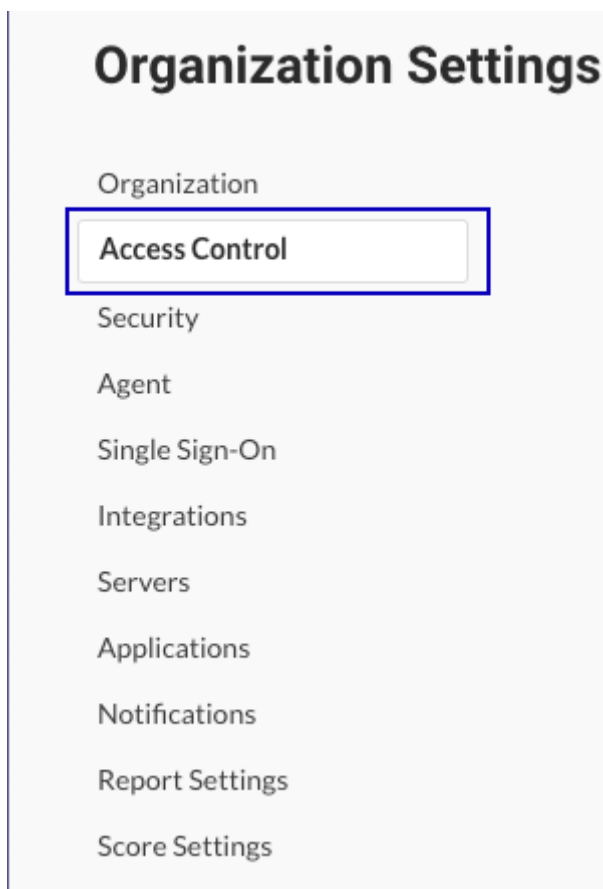
**NOTE**

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

On-premises customers manage access to Contrast by setting up [organization users and access groups \(page 1445\)](#).

**Steps**

1. From the user menu, select **Organization settings**.
2. Select **Access control**.



3. Select the **Resource groups** tab.
4. Select the **Edit** icon (✎) at the end of the row for the group you want to change.
5. Change the settings for the resource group and select **Save**.

**Delete custom resource groups (Preview)** ☹

Use this procedure to delete a custom resource group. You cannot delete built-in resource groups.

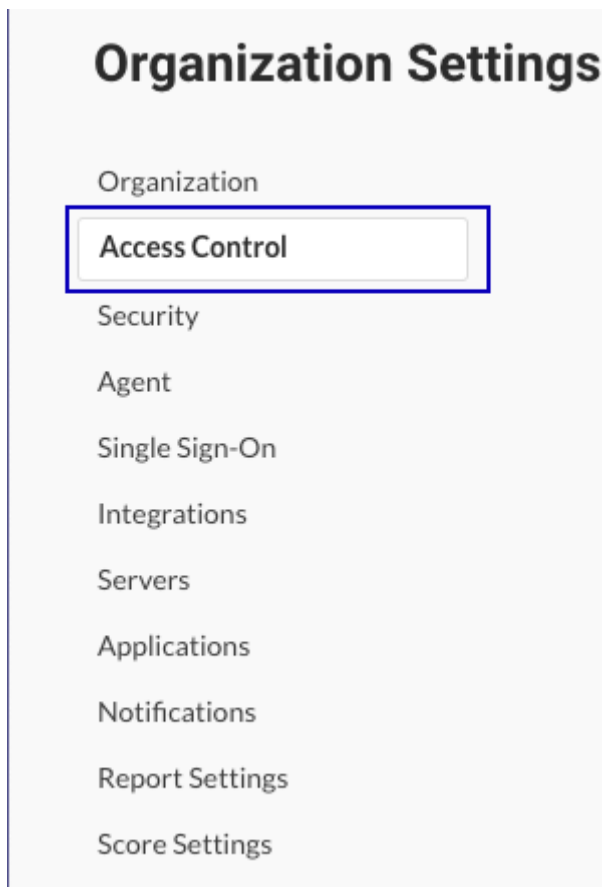
**NOTE**

This procedure is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

On-premises customers manage access to Contrast by setting up [organization users and access groups \(page 1445\)](#).

**Steps**

1. From the user menu, select **Organization settings**.
2. Select **Access control**.



3. Select the **Resource groups** tab.
4. Select the **Delete** icon (🗑️) at the end of the row for the group you want to delete.
5. In the Delete resource groups window, select **Delete**.

**Add resource groups (Preview)** ☹️

Custom resource groups let you specify the applications, projects, and organization settings that users can access.

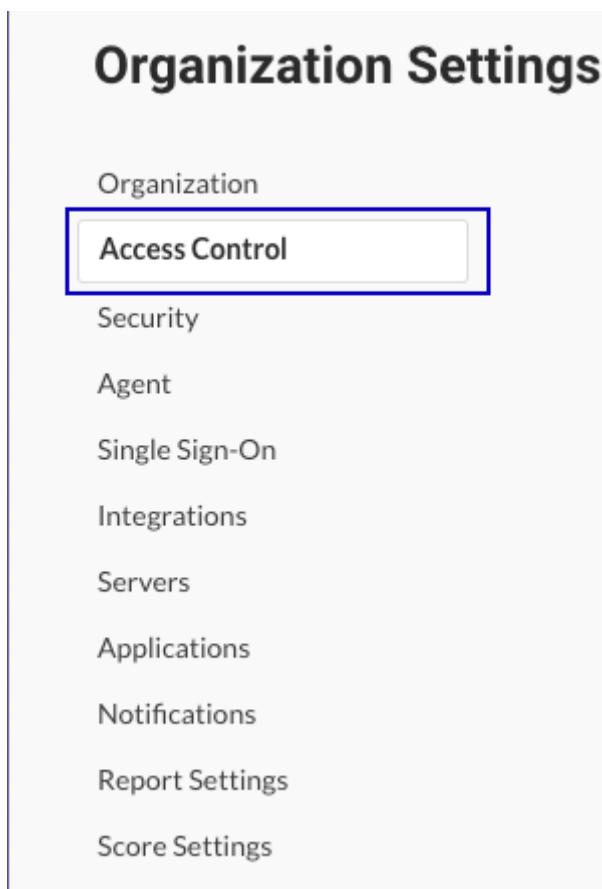
**NOTE**

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

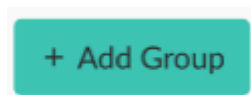
On-premises customers manage Contrast access by setting up [organization users and access groups \(page 1445\)](#).

**Steps**

1. From the user menu, select **Organization settings**.
2. Select **Access control**.



3. Select the **Resource groups** tab.
4. Select **Add group**.



5. In the Add resource group window, specify these settings:

**Organization Settings**

Organization  
Access Control  
Security  
Agent Keys  
Single Sign-On  
Integrations  
Servers  
Applications  
Notifications  
Score Settings

Users **Resource Groups** Roles User Access Groups

### Add resource group

A resource group is a collection of applications, SCA projects and scan projects that you assign to a user role.

Resource group name \*  
Ecommerce

Resource group description \*  
Applications for Ecommerce

Resource groups  
All applications X

Scan Projects

Applications

SCA project groups

Your resource group summary

Resource Group Name  
Ecommerce

Resource Group Description  
Applications for Ecommerce

Resource Groups  
All applications

Cancel Add

- **Resource group name:** Specify a descriptive name.  
The name must be unique for the organization. Use up to 255 characters, including spaces and special characters.
- **Resource group description:** Specify a description that's easy to understand.  
Consider using a description that identifies the purpose of the group. Use up to 1,024 characters, including spaces and special characters.
- **Resource groups:** Select resource groups to include in this group.  
The list of available resource groups might not show all individual resource groups that exist in your organization. If an individual resource group is part of another resource group, you can't select the individual group. You can, however, select the resource group that includes the individual resource group. For example:
  - You create Resource Group 1 and include MyResource group.
  - When you create Resource Group 2, you don't see MyResource group in the list. You do see Resource Group 1, which you can add to Resource Group 2.If you select resource groups, selecting an individual project or application is not allowed. You might want to nest resource groups as a way of providing easy access to multiple resource groups for specific users. For example, if you have multiple resource groups for your Ecommerce development, and some users need access to all of these groups, you could create a main Ecommerce resource group that includes all the lower level Ecommerce resource groups
- **Scan projects:** Select individual scan projects to include in this group.  
If you select individual scan projects, selecting resource groups is not allowed.
- **Applications:** Select individual applications to include in this group.  
If you select individual applications, selecting resource groups is not allowed.
- **SCA project groups:** Select individual SCA project groups to include in this group.  
If you select individual project groups, selecting resource groups is not allowed.

## 6. Select Add.

You can now assign this resource group to a role.

## User access groups (Preview) ☹️

User access groups let you specify specific roles and resource groups for one or more users. Roles and resource groups define the permissions for users.

You can add users to built-in user access groups or create [custom groups \(page 1598\)](#).

**NOTE**

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

On-premises customers manage access to Contrast by setting up [organization users and access groups \(page 1445\)](#).

**User access groups tab**

The User access groups tab displays the list of existing groups. From this tab, you can:

- View a list of user access groups.  
Use search to find specific groups.
- [Add a user access group \(page 1598\)](#)
- [Edit a user access group \(page 1600\)](#)
- [Delete a user access group \(page 1601\)](#)

**Organization Settings**

Organization  
Groups  
Users  
Access Control  
Security  
Agent  
Single Sign-On  
Integrations  
Servers  
Applications  
Notifications  
Report Settings  
Score Settings

Users   Resource Groups   Roles   **User Access Groups**

**User Access Groups**

Search + Add Group

| GROUP                      |          | DESCRIPTION                                                                                                          | MEMBERS |  |
|----------------------------|----------|----------------------------------------------------------------------------------------------------------------------|---------|--|
| DevOps Administrators      | Built-in | Users who manage application settings and projects.                                                                  | 0       |  |
| AppSecurity Administrators | Built-in | Users who manage applications and projects, as well as view organization data.                                       | 0       |  |
| Organization viewers       | Built-in | Users who view organization data.                                                                                    | 0       |  |
| Organization editors       | Built-in | Users who view and edit organization data, such as view agent keys, manage notifications, and manage score settings. | 0       |  |
| Ecommerce                  |          | Ecommerce team                                                                                                       | 1       |  |

**Built-in user access groups**

You can add users to these built-in user access groups:

| This built-in group:              | Includes these built-in roles:   |
|-----------------------------------|----------------------------------|
| Organization viewers              | Organization viewer              |
| Organization editors              | Organization editor              |
| Organization rules administrators | Organization rules administrator |
| Organization administrators       | Application administrator        |
|                                   | Project administrator            |
|                                   | Organization administrator       |
|                                   | Protect viewer                   |
|                                   | Serverless user                  |
|                                   | SCA project group administrator  |

| This built-in group:       | Includes these built-in roles: |
|----------------------------|--------------------------------|
| AppSecurity administrators | App Security administrator     |
| DevOps administrators      | DevOps administrator           |
| Developers                 | Organization viewer            |
|                            | Protect viewer                 |
|                            | Serverless user                |
|                            | Scan uploader                  |
|                            | Application viewer             |
|                            | Project viewer                 |
|                            | SCA project group viewer       |
| Scan manager               | Project viewer                 |
| Protect viewers            | Protect viewer                 |
| Serverless users           | Serverless user                |

**NOTE**

Other than adding or removing users, you cannot change the settings for the built-in user access groups.

**See also**

[Built-in roles \(page 1579\)](#)

**Roles (Preview)** ☹

Roles let you define the applications, projects, and organization settings that users with a specific role can access.

**NOTE**

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact Contrast support.

On-premises customers manage access to Contrast by setting up [organization users and groups \(page 1445\)](#).

Contrast provides a set of built-in roles or you can add custom roles.

**Roles tab**

The Roles tab displays the list of existing roles. From this tab, you can:

- View a list of roles.  
Use search to find specific roles.
- [Add a custom role \(page 1583\)](#)
- [Edit a custom role \(page 1585\)](#).
- [Copy roles \(page 1586\)](#)

- [Delete a custom role. \(page 1587\)](#)

### Organization Settings

Organization

Access Control

Security

Agent

Single Sign-On

Integrations

Servers

Applications

Notifications

Report Settings

Score Settings

Resource Groups

Roles

User Access Groups

### Roles

Search

+ Add Role

| ROLE                             | DESCRIPTION                             |                                   |
|----------------------------------|-----------------------------------------|-----------------------------------|
| Organization editor              | Organization Editor                     |                                   |
| Organization rules administrator | Organization Rules Administrator        |                                   |
| Manage project                   | System Role to Manage All Projects      |                                   |
| Ecommerce developers             | Developers on the Ecommerce team in NYC | <div><div></div><div></div></div> |

## Built-in roles and actions

Each action associated with a role provides [permissions for a specific set of tasks and data \(page 1546\)](#).



### NOTE

You cannot change the settings for the built-in roles. To view the settings for roles, select the **View** icon (👁).

## Organization roles

| This role:                       | Includes these built-in resource groups: | And these actions:           |
|----------------------------------|------------------------------------------|------------------------------|
| Organization viewer              | All organization settings                | View organization            |
| Organization editor              | All organization settings                | Edit organization settings   |
| Organization administrator       | All access control settings              | Manage organization          |
|                                  | All organization settings                | Manage platform organization |
|                                  |                                          | View audit logs              |
| Organization rules administrator | All organization settings                | Manage organization rules    |

## App Security roles

| This role:                 | Includes these built-in resource groups: | And these actions:          |
|----------------------------|------------------------------------------|-----------------------------|
| App Security administrator | All applications                         | Manage application rule     |
|                            | All organization settings                | View, edit, delete projects |
|                            | All projects                             | View organization           |



## DevOps roles

| This role:           | Includes the built-in resource groups: | And these actions:  |
|----------------------|----------------------------------------|---------------------|
| DevOps administrator | All applications                       | Manage organization |
|                      | All organization settings              | View application    |
|                      | All projects                           | View project        |
|                      | All resource groups                    | View organization   |
|                      | All roles                              |                     |
|                      | All user access groups                 |                     |

## Application roles

| This role                       | Includes these built-in resource groups: | And these actions:      |
|---------------------------------|------------------------------------------|-------------------------|
| Application viewer              | All applications                         | View application        |
| Application editor              | All applications                         | Edit application        |
| Application administrator       | All applications                         | Manage application      |
| Application rules administrator | All applications                         | Manage application rule |

## Scan project roles

| This role:            | Includes these built-in resource groups: | And these actions:          |
|-----------------------|------------------------------------------|-----------------------------|
| Project viewer        | All projects                             | View project                |
| Scan uploader         | All projects                             | Upload scans                |
| Project administrator | All projects                             | View, edit, delete projects |
|                       |                                          | Create project              |

## Protect roles

| This role:                           | Includes these built-in resource groups: | And these actions:                     |
|--------------------------------------|------------------------------------------|----------------------------------------|
| Protect viewer                       | All applications                         | Access Protect                         |
| Protect policies administrator       | All applications                         | Manage Protect policies                |
| Protect exclusions administrator     | All Protect exclusions                   | Manage Protect exclusions              |
| Protect sensitive data administrator | All Protect sensitive data policies      | Manage protect sensitive data policies |

## SCA roles

| This role:                      | Includes these built-in resource groups: | And these actions:              |
|---------------------------------|------------------------------------------|---------------------------------|
| SCA project group administrator | All organization settings                | Create SCA projects             |
|                                 | All SCA project groups                   | View, edit, delete SCA projects |
| SCA project group viewer        | All SCA project groups                   | View SCA projects               |

## Serverless roles

| This role:      | Includes these built-in resource groups: | And these actions: |
|-----------------|------------------------------------------|--------------------|
| Serverless user | All functions                            | View Serverless    |

## Best practices for custom roles (Preview)

If you have multiple teams collaborating on one or more projects, consider creating custom roles. Custom roles ensure that your teams have access to the appropriate resources and the correct permissions for those resources.

You can view the settings for the built-in roles to help you determine the types of actions and resource groups to add to your custom roles.

## Custom role planning

Your first step is to create a plan for your custom roles.

- **Think about the roles that people currently have.**  
For example, do you have managers and lead developers who need different access than other developers?
- **Think about the resources your teams need to work on.**  
For example, will any of your teams use static scanning to check for vulnerabilities? In this case, they will need access to scan projects.  
Consider which applications your teams are working on so you can ensure they have access to them.
- **Think about the tasks or actions that individuals need to perform for the resources they need to access.**  
For example, do individuals need to change organization settings? Do they need to be able to upload artifacts for scanning? Do they need to access application data?

## Resource groups

Consider these best practices:

- For ease in management, create resource groups that include one type of resource only. For example, keep your project resources in one group and your applications in another.  
If a built-in resource group meets your needs, you could also use it instead of creating a custom group.
- Use roles to specify the actions users can take for the different resource groups.

## Example

This example shows one approach for creating custom roles.

In this example, an administrator is creating custom roles for development teams collaborating on an ecommerce product.

### Step 1: Create a plan for all the custom roles

- **Current roles:** For this project, there are development managers, development leads, front-end developers working on a user interface, and back-end developers creating services and APIs. All of these teams collaborate together.
- **Resources:** The Ecommerce product includes shared application components that are instrumented with Contrast agents as well as scan projects for code that is scanned early in the development cycle.
- **Actions:** The development managers and leads need to be able to manage all settings for applications and scan projects. The front-end developers need to be able to access shared user interface modules. The back-end developers need to be able to access APIs and back-end services.

### Step 2: Create custom resource groups

To accommodate the different permissions you need to assign to different users, you create these resource groups:

- **Shared UI applications:** This resource group includes the UI-focused applications that front-end developers need to test at runtime.
- **Shared UI projects:** This resource group includes the UI-focused scan projects that front-end developers run to find vulnerabilities during the early stages of development.
- **Shared API applications:** This resource group includes the shared API applications that back-end developers need to test at runtime.

- **Shared back-end services:** This resource group includes the shared services that back-end developers need to test at runtime.

You group all the resource groups into a parent resource group called **Ecommerce development**.

All custom roles will include the parent group. You use actions to determine which role can access specific resources and the permissions users have for these resources.

### Step 3: Create custom roles.

You set up these roles to use the parent resource group, Ecommerce development, with specific actions:

- **Ecommerce administrator:** This role is for the Ecommerce development managers and leads. It includes these actions:
  - **Manage application rules:** Lets users perform tasks such as changing Assess or Protect rules, setting remediation policies, and setting library policies.
  - **Manage application:** Lets users change application settings.
  - **Create project:** Lets users create scan projects.
  - **View, edit, delete project:** Lets user view, edit or delete scan projects.
  - **Delete project:** Lets user delete scan projects.
  - **View organization:** Lets users perform tasks such as viewing score settings and getting API keys.
- **Ecommerce front-end developer:** This role is for the Ecommerce front-end developers. It includes these actions:
  - **View application:** Lets users view application data such as vulnerabilities, application details, and library details.
  - **Edit application:** Lets users perform tasks such as merging applications, sending data to bug trackers, editing vulnerability settings
  - **View organization:** Lets users perform tasks such as viewing score settings and getting API keys.
  - **Upload scans:** Lets users scan code for vulnerabilities for existing projects.  
The action applies to uploading code to the Contrast web interface, using the CLI, and using the Scan local engine. The user who creates projects needs the Create, View, create, edit project action.
- **Ecommerce back-end developers**
  - **View applications:** Lets users view application data such as vulnerabilities, application details, and library details.
  - **Edit application:** Lets users perform tasks such as merging applications, sending data to bug trackers, editing vulnerability settings
  - **View organization:** Lets users perform tasks such as viewing score settings and getting API keys.

### Step 4:, Create custom users groups

You create user access groups for each role and assign individual users, based on the resources they need to access.

- **Ecommerce administrators:** Includes all users with the Ecommerce administrator role.
- **Ecommerce front-end developers:** Includes all users with the Ecommerce front-end developer role.
- **Ecommerce back-end developers:** Includes all users with the Ecommerce back-end developer role.

## Add roles (Preview) ☹

Create roles to customize which Contrast resources and actions users can access.

**NOTE**

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

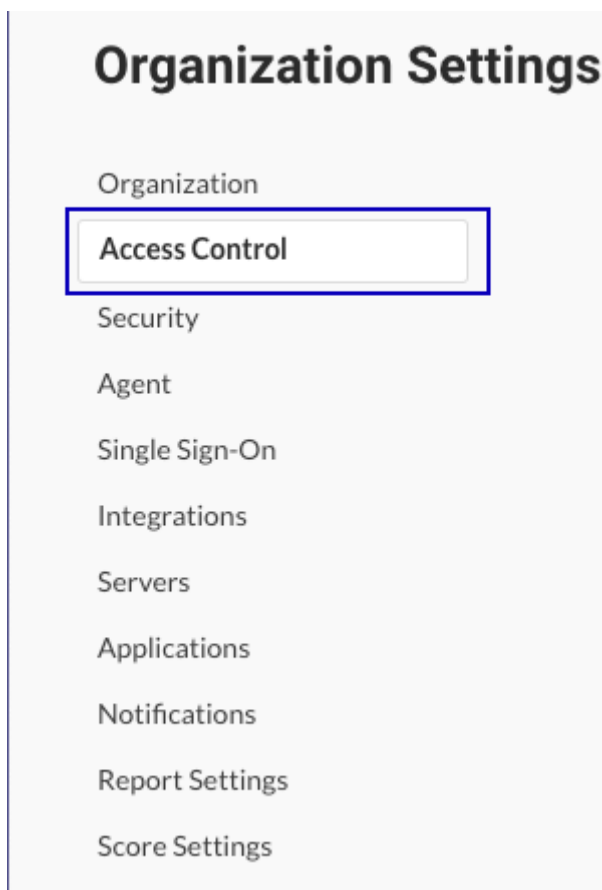
On-premises customers manage Contrast access by setting up [organization users and access groups](#) (page 1445).

**Before you begin**

- **Hosted customers:** You need a role with the Manage user access action.
- **On-premises customers:** Manage access to Contrast by setting up [organization users and access groups](#). (page 1445)
- Determine if you need to [add a custom resource group](#) (page 1575) for the role.

**Steps**

1. From the user menu, select **Organization settings**.
2. Select **Access control**.



3. Select the **Roles** tab.
4. Select **Add role**.



5. Specify the role settings and select **Add**:

**Organization Settings**

Resource Groups **Roles** User Access Groups

### Add role

Roles define the applications and scan projects that users can access as well as permissions for specific actions.

Role name <sup>+</sup>  
Ecommerce developer

Role description <sup>+</sup>  
Developers on the Ecommerce team

Actions determine the permissions assigned to this role.  
Resource groups determine which applications and scan projects a user with this role can access.

Actions <sup>+</sup>  
SAST\_SCAN\_UPLOAD x

Resource groups <sup>+</sup>  
All Ecommerce projects x

**Your role summary** ⓘ

- Resource Group Name  
Ecommerce developer
- Resource Group Description  
Developers on the Ecommerce team
- Resource Groups  
All Ecommerce projects
- Actions  
Upload scans  
Manage project

Cancel Add

- Role name:** Specify the name for the role.  
The name must be unique for the organization. Use up to 255 characters, including spaces and special characters.
- Role description:** Specify a description of the role.  
Consider using a description that indicates the purpose of the role. Use up to 1,024 characters, including spaces and special characters.
- Actions:** Select the [actions \(page 1546\)](#) for the group.  
The list of actions is organized according to the type of resource they affect. If the actions you select don't apply to the resource groups you select, Contrast notifies you that a mismatch in your selection exists when you select **Add**.  
If you receive this message, you can keep your existing settings, add the appropriate resource to the selected resource groups, or change your action selection.
- Resource groups:** Select one or more resource groups.  
Select a [built-in resource group \(page 1572\)](#) or a [custom group \(page 1575\)](#). If the resource groups you select don't apply to the actions you select **Add**, Contrast notifies you that a mismatch in your selection exists when you select **Add**.  
If you receive this message, you can keep your existing settings, change your action selection, or add the appropriate resource to the selected resource groups.

## Edit custom roles (Preview) ⓘ

Use this procedure to edit a custom role. You cannot change built-in roles.



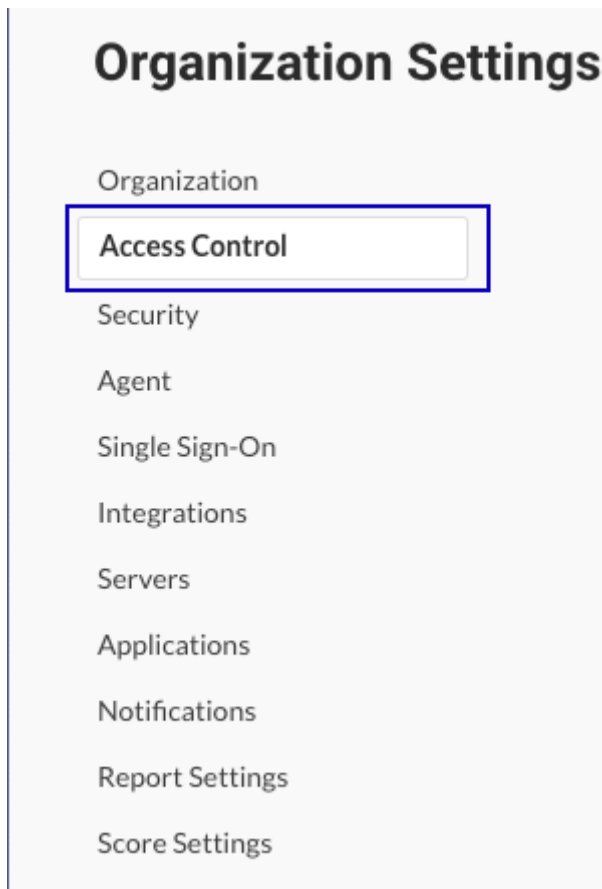
### NOTE

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

On-premises customers manage access to Contrast by setting up [organization users and access groups \(page 1445\)](#).

## Steps

1. From the user menu, select **Organization settings**.
2. Select **Access control**.



3. Select the **Roles** tab.
4. To edit an existing role, select the **Edit** icon (✎) at the end of the row for the role you want to change.
5. Change the settings, as needed and select **Save**.

## Copy roles (Preview) ☹

You can copy an existing role, change its settings, and add it as a new role.

Copying a role is useful if you need several roles with the same or similar settings or if you want to use a specific role as a template.

### Before you begin

- **Hosted customers:** You need a role with the Manage platform organization action.
- **On-premises customers:** Manage access to Contrast by setting up [organization users and access groups \(page 1445\)](#).
- You can copy built-in or custom roles.

## Steps

1. From the user menu, select **Organization settings**.
2. Select **Access control**.

3. Select the **Roles** tab.
4. Locate the role you want to copy and select the **Copy** icon (📄) at the end of the row.
5. Change any of the settings and select **Add**.  
Contrast creates a role with the new settings.

## Delete roles (Preview) ☹️

Use this procedure to delete a custom role. You cannot delete built-in roles.



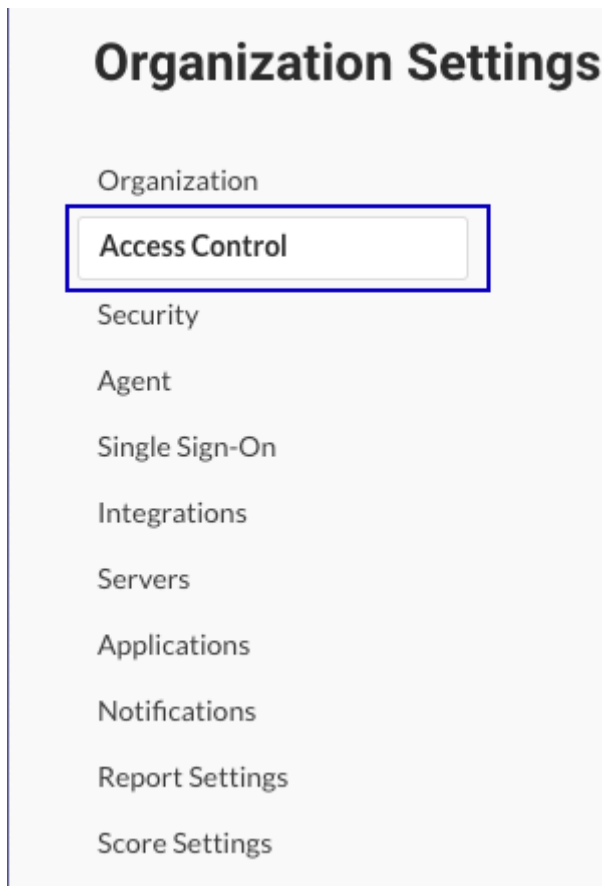
### NOTE

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

On-premises customers manage access to Contrast by setting up [organization users and access groups \(page 1445\)](#).

## Steps

1. From the user menu, select **Organization settings**.
2. Select **Access control**.



3. Select the **Roles** tab.
4. Select the **Delete** icon (🗑️) at the end of the row for the role you want to delete.

- In the Delete role window, select **Delete**.

## Users (Preview) ☹

Once you add users to the Users list, you can assign them to specific user access groups.



### NOTE

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

On-premises customers manage access to Contrast by setting up [organization users and groups](#). (page 1445)

## Users tab

The Users tab shows details about the Contrast users:

- Name:** The first and last name of the user.
- Access groups:** The user access groups assigned to the user.  
User Access groups determine the roles assigned to the user. The roles determine the actions and resources for the user.
- Type:** The type of account: user, API or guest.  
To copy the credentials for the API user, select the cloud icon (☼) next to the type. Then, select the copy icon (📋) next to the credentials.  
To change a guest account to a standard account, select **Guest** in the Type column and then, select **Add user**.
- Status:** The current status of the user account:
  - Active:** The user has access to Contrast data.
  - Waiting for activation:** Users need to respond to the activation email from Contrast before they can access Contrast data.
  - Inactive:** The account is no longer in use.  
To re-activate the account, select the Activate icon (☹) and select **Activate**.
  - Locked:** The user is locked out of their account based on a security policy.  
To unlock the account, select the check mark next to it and select **Unlock**.
- Last login:** The most recent date and time when the user logged in to Contrast.

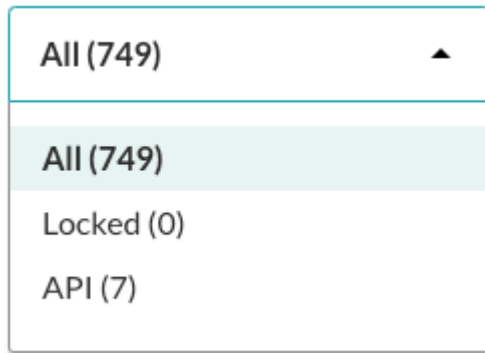
| Users   Resource Groups   Roles   User Access Groups |                                       |        |          |                     |            |  |
|------------------------------------------------------|---------------------------------------|--------|----------|---------------------|------------|--|
| All (86) ▼                                           |                                       | Search |          | Sort by<br>Name     | + Add User |  |
| NAME (USERNAME)                                      | ACCESS GROUPS                         | TYPE   | STATUS   | LAST LOG IN         | ACTIONS    |  |
| user1@mycompany.com                                  | Organization Administration           | —      | ☑ Active | 2023/09/05 02:39 PM | ✎ 🗑        |  |
| user2@mycompany.com                                  | Organization Administration Developer | API ☼  | ☑ Active | 2023/18/05 11:44 AM | ✎ 🗑        |  |
| user3@mycompany.com                                  | Organization Administration           | —      | ☑ Active | 2023/19/05 04:04 PM | ✎ 🗑        |  |
| user4@mycompany.com                                  | Organization Administration           | —      | ☑ Active | 2023/12/05 09:09 AM | ✎ 🗑        |  |
| user5@mycompany.com                                  | Organization Administration Developer | API ☼  | ☑ Active | 2023/12/05 01:48 PM | ✎ 🗑        |  |



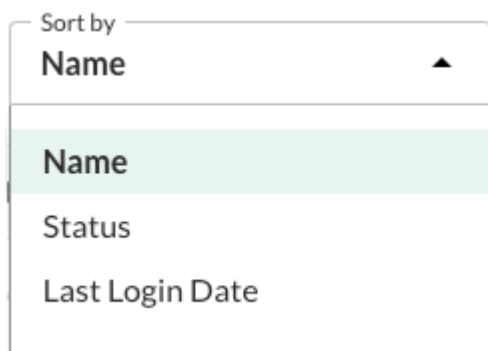
## Filters and sorting

You can refine the view by selecting one of these filters:

- **All:** Displays all users
- **Locked:** Displays users with a locked account.
- **API:** Displays user with API access.



You can sort the view by Name, Status, and Last login date.



## Tasks

From this tab, you can:

- [Add a user \(page 1589\)](#) and assign them to one or more user access groups.
- [Edit a user's details \(page 1591\)](#).
- [Delete a user \(page 1593\)](#).
- [Add a user \(page 1589\)](#) and assign them to one or more user access groups.
- [Edit a user's details \(page 1591\)](#).
- [Delete a user \(page 1593\)](#).

### Add a user (Preview) ☹

Use this procedure to add a user.

**NOTE**

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#)

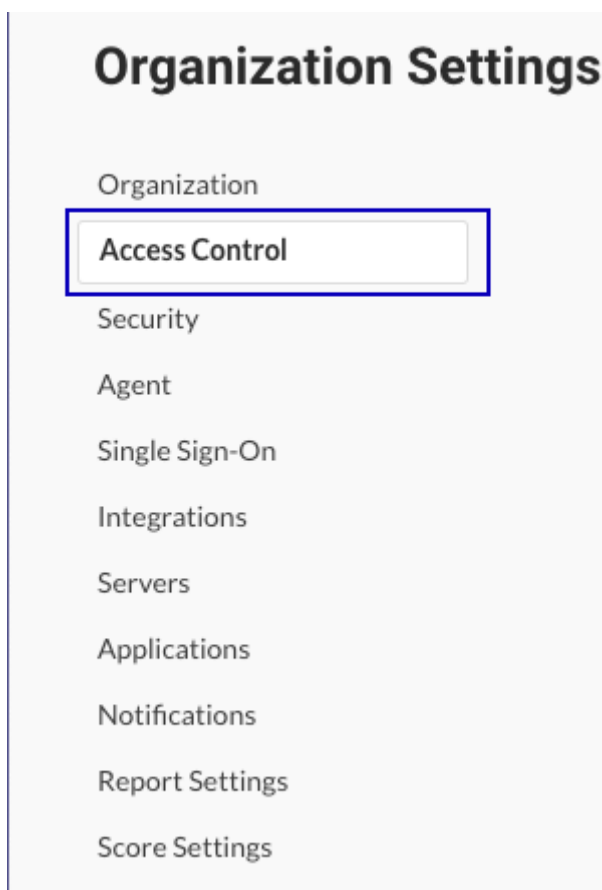
On-premises customers manage Contrast access by setting up [organization users and access groups \(page 1445\)](#).

**Before you begin**

- **On-premises users:** Use the [Add or edit a user at an organization level \(page 1445\)](#) procedure.

**Steps**

1. From the user menu, select **Organization settings**.
2. Select **Access control**.



3. Select the **Users** tab.
4. Select **Add user**.
5. Specify the user details:

[Users](#) [Resource Groups](#) [Roles](#) [User Access Groups](#)

### Add User

First Name \*

Sally

Last Name \*

Jones

Email \*

sally.jones@mycompany.com

Restrict UI Access

☐ API Only

#### ALLOW ACCESS

User Access Groups

Organization Edit x

#### DATE AND TIME PREFERENCES

Date Format

MM/dd/yyyy

Time Format

hh:mm a

Time Zone

(GMT-05:00) Eastern Time (U...

Cancel

Add

#### User Summary

User Access Groups:

Built-in

Organization Edit

- **First name:** The user's first name.
- **Last name:** The user's last name.
- **Email:** The user's email address
- **Restrict UI access:** Select the API only option if you want the user to have access to the Contrast API but not the web interface.  
When you select this setting, a user cannot log in to the Contrast web interface with a password. When you clear the setting, a user can log in with their password and continue to use the API as well.
- **Allow access:** Select a built-in or custom user access group.  
The access group determines the actions and resources available to the user.
- **Date and time preferences:** Select the time format, the date format, and the time zone for the user.

6. Select **Add**.

## Edit a user (Preview) ☹️

Use this procedure to edit user details.

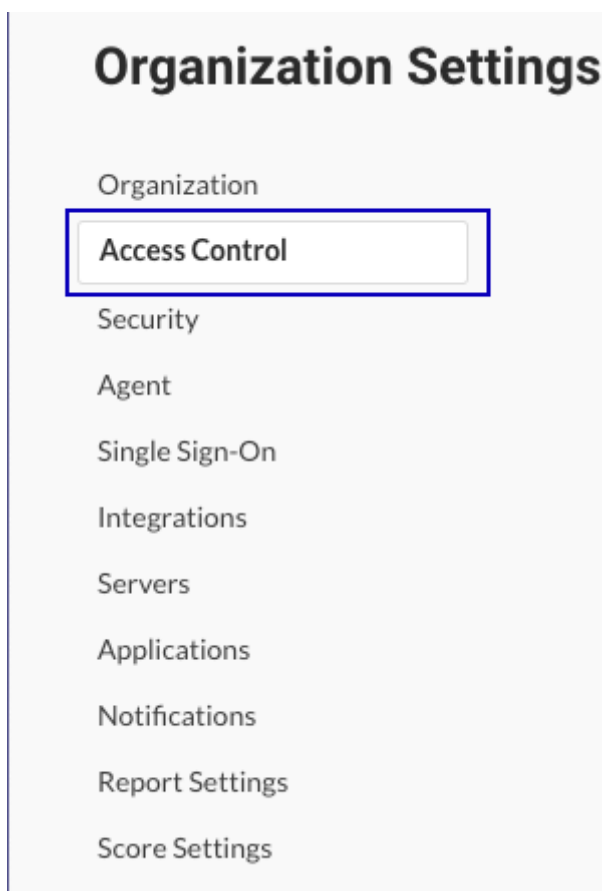
**NOTE**

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

On-premises customers manage access to Contrast by setting up [organization users and access groups \(page 1445\)](#).

**Steps**

1. From the user menu, select **Organization settings**.
2. Select **Access control**.



3. Select the **Users** tab.
4. Select the **Edit** icon (✎) at the end of the row for the user whose details you want to change.
5. Change the settings, as needed and select **Save**.  
To change a user's email address, [add a new user \(page 1589\)](#) and include the new address.

**Enable or disable a user account (Preview)**

If a user account is in a **Disabled** state, the user cannot log in to Contrast or use their API keys for authentication. Contrast keeps the original user settings which it applies when you enable the user account again.

**Before you begin**

- You need a role with the Manage organization action.

## Steps

1. From the user menu, select **Organization settings**.
2. Select **Access control**.
3. Select **Users**.
4. Find the user you want to deactivate and select the **Edit** icon (✎) at the end of the row.
5. Under Enable user, clear the **Enabled** checkbox to deactivate a user.  
To enable the user again, select the checkbox.

## Delete a user (Preview) ☹

Use this procedure to delete a user.



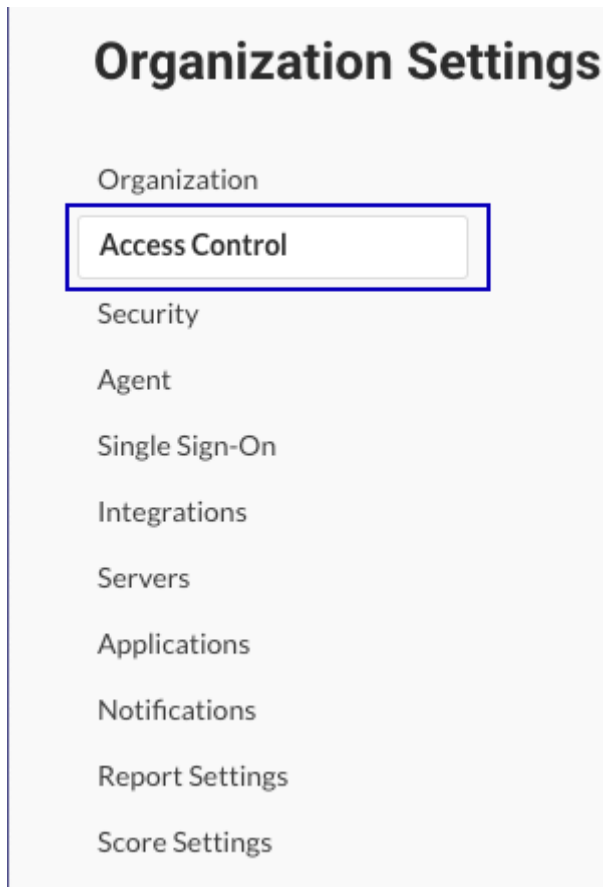
### NOTE

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

On-premises customers manage access to Contrast by setting up [organization users and access groups \(page 1445\)](#).

## Steps

1. From the user menu, select **Organization settings**.
2. Select **Access control**.



3. Select the **Users** tab.
4. Select the **Delete** icon (🗑️) at the end of the row for the user you want to delete.
5. In the Delete user window, select **Delete**.

## View my permissions (Preview)

As a Contrast user, you can view your assigned permissions for role-based access control in your user profile. This information is useful if you need to understand which resources you can access and what you can do with those resources.



### NOTE

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

On-premises customers manage Contrast access by setting up [organization users and access groups \(page 1445\)](#).

## Steps

1. From the user menu, select **User settings**.
2. Select **My permissions**.
3. To sort the Resource or Actions columns, select the **Sort** icon (↑).

## User permission details

Contrast displays these details for the resources and actions assigned to you:

- **Resource:** A resource is an application or Scan project that you can access.
- **Actions:** An action represents what you can do with the assigned resource.  
[Actions and permissions \(page 1546\)](#) provides additional details about what each action lets you do with a resource.

## View user permissions (Preview)

As an administrator, you can view the permissions and settings for users in your organization.



### NOTE

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

On-premises customers manage Contrast access by setting up [organization users and access groups \(page 1445\)](#).

## Before you begin

- A role with any of these actions: Edit organization, Manage organization rules, or Manage organization.

## Steps

1. From the user menu, select **Organization settings**.
2. Select **Access control**.
3. Select **Users**.
4. For a specific user, select the **Key** icon (🔑).
5. To sort the view, select the **Sort** icon (↑) next to any of the column headings.
6. To view details about the user's resource groups, roles, or user access groups, select the link in the column.

You can change the details for any custom resource group, role, or user access group.

## User permission details

For each user, Contrast displays these details:

- **Resource:** The applications and Scan projects the user can access.
- **Resource group:** The resource group that includes the resources a user can access.
- **Actions:** The actions the user can perform for each resource.  
[Actions and permissions \(page 1546\)](#) provides additional details about what each action lets users do with a resource.
- **Roles:** The role assigned to the user that includes their assigned actions and resource groups.
- **User access group:** The user access group associated with the user's role.

## Create an API only user (Preview) ☹

Create an API user account that you can use for all plugins or integrations.

**NOTE**

This procedure is for hosted customers who have role-based access turned on.

If you are an on-premises customer or do not have role-based access turned on, use this [Create API user \(page 1447\)](#) procedure.

**Best practice:** Add a user account that's only purpose is for use with plugins and integrations. Doing so avoids a situation where a user leaves and you delete that user's account. The deletion of that account would result in breaking the plugins and integrations that you use.

An API only account does not receive email notifications, even if the notification settings are turned on.

**Before you begin**

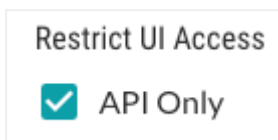
- API users can access Contrast's REST API but cannot log in to the Contrast web interface.
- If you configured your organization to use SAML-based single sign-on (SSO), you can still create an API user.
- Access control guidelines:
  - If you have role-based access control turned on and you need an API only user to run scripts that pull data, the View application action should be sufficient.
  - If you have role-based access control turned on and you need an API only user to remediate vulnerabilities, add applications to Contrast, or run scans, the Edit application action should be sufficient.
  - If you are using role-based access control, assign the user access groups that include the relevant applications and projects to the API only user.
  - Avoid assigning Administrator actions to an API only user. Administrator actions and roles provide additional permissions that an API only user doesn't usually need.

**Steps**

1. From the user menu, select **Organization settings**.
2. Select **Access control**.
3. Select the **Users** tab.
4. Select **Add user**.




5. Enter the user's first name, last name, and email address.
6. Select the **API access** option.



7. Select **Add**.
8. In the Users list, verify you see the new user with the API label in the Type column.



9. To use the API access account, get the connection strings:
  - a. In the Users list, select the API icon  in the Type column and copy the Service key and Authorization Header.

The Service key is unique to each individual user. The value of the Authorization Header contains `base64(username:service_key)`.



Other keys, such as the Organization ID and API key are shared across all users.

- b. Use these credentials when you use a Contrast API.

## User access groups (Preview)

User access groups let you specify specific roles and resource groups for one or more users. Roles and resource groups define the permissions for users.

You can add users to built-in user access groups or create [custom groups \(page 1598\)](#).



### NOTE

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

On-premises customers manage access to Contrast by setting up [organization users and access groups \(page 1445\)](#).

## User access groups tab

The User access groups tabs displays the list of existing groups. From this tab, you can:

- View a list of user access groups.  
Use search to find specific groups.
- [Add a user access group \(page 1598\)](#)
- [Edit a user access group \(page 1600\)](#)
- [Delete a user access group \(page 1601\)](#)

### Organization Settings

- Organization
- Groups
- Users
- Access Control**
- Security
- Agent
- Single Sign-On
- Integrations
- Servers
- Applications
- Notifications
- Report Settings
- Score Settings

Users   Resource Groups   Roles   **User Access Groups**

#### User Access Groups

[+ Add Group](#)

| GROUP                      |          | DESCRIPTION                                                                                                          | MEMBERS |  |
|----------------------------|----------|----------------------------------------------------------------------------------------------------------------------|---------|--|
| DevOps Administrators      | Built-in | Users who manage application settings and projects.                                                                  | 0       |  |
| AppSecurity Administrators | Built-in | Users who manage applications and projects, as well as view organization data.                                       | 0       |  |
| Organization viewers       | Built-in | Users who view organization data.                                                                                    | 0       |  |
| Organization editors       | Built-in | Users who view and edit organization data, such as view agent keys, manage notifications, and manage score settings. | 0       |  |
| Ecommerce                  |          | Ecommerce team                                                                                                       | 1       |  |

## Built-in user access groups

You can add users to these built-in user access groups:

| This built-in group: | Includes these built-in roles: |
|----------------------|--------------------------------|
| Organization viewers | Organization viewer            |

| This built-in group:              | Includes these built-in roles:   |
|-----------------------------------|----------------------------------|
| Organization editors              | Organization editor              |
| Organization rules administrators | Organization rules administrator |
| Organization administrators       | Application administrator        |
|                                   | Project administrator            |
|                                   | Organization administrator       |
|                                   | Protect viewer                   |
|                                   | Serverless user                  |
|                                   | SCA project group administrator  |
| AppSecurity administrators        | App Security administrator       |
| DevOps administrators             | DevOps administrator             |
| Developers                        | Organization viewer              |
|                                   | Protect viewer                   |
|                                   | Serverless user                  |
|                                   | Scan uploader                    |
|                                   | Application viewer               |
|                                   | Project viewer                   |
|                                   | SCA project group viewer         |
| Scan manager                      | Project viewer                   |
| Protect viewers                   | Protect viewer                   |
| Serverless users                  | Serverless user                  |

**NOTE**

Other than adding or removing users, you cannot change the settings for the built-in user access groups.

**See also**

[Built-in roles \(page 1579\)](#)

**Add user access groups (Preview) ☹**

Create user access groups to let a collection of users access projects, applications, and organization settings. The roles you assign to users in the group determine which capabilities they can access.

**NOTE**

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

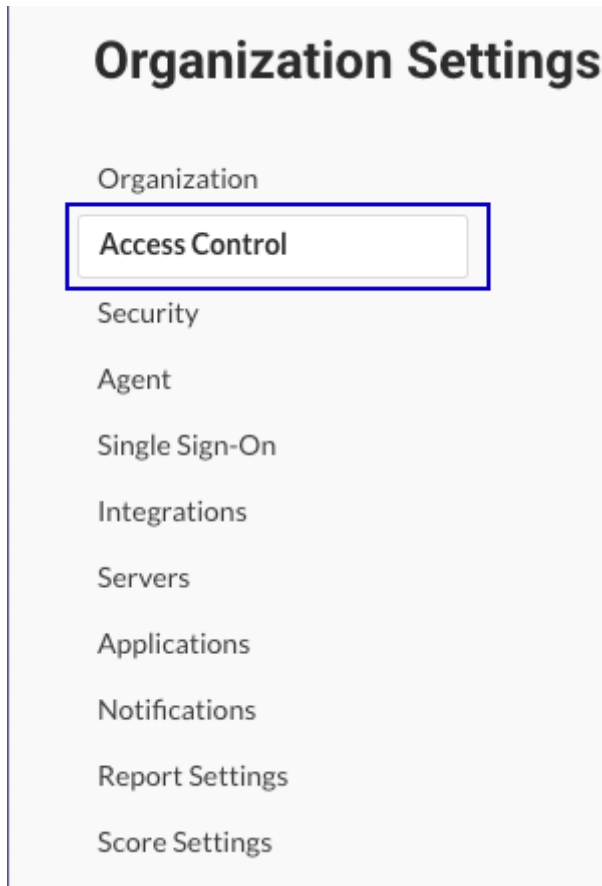
On-premises customers manage access to Contrast by setting up [organization users and access groups \(page 1445\)](#).

## Before you begin

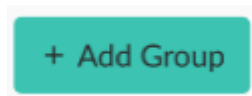
- [Add users \(page 1589\)](#), if necessary.
- Determine whether you need to [add custom roles \(page 1583\)](#) or [custom resource groups \(page 1575\)](#).

## Steps

1. From the user menu, select **Organization settings**.
2. Select **Access control**.



3. In the User access groups tab, select **Add group**.



4. In the Add user access group window, specify these settings:

**Organization Settings**

Organization

Access Control

Security

Agent

Single Sign-On

Integrations

Servers

Applications

Notifications

Report Settings

Score Settings

Users Resource Groups Roles **User Access Groups**

### Add user access group

User access groups assign users to roles. For easier management of these groups, use descriptive names and easy-to-identify descriptions.

User access group name \*  
Ecommerce

User access group description \*  
Ecommerce team

Users \*  
user1@mycompany.com x user2@mycompany.com x

Roles \*  
Developer x

**Your user access group summary**

User access group name  
Ecommerce

User access group description  
Ecommerce team

Users  
user1@mycompany.com  
user2@mycompany.com

Roles  
Developer

Cancel Add

- **User access group name:** Specify a name for the user group.  
The name must be unique for the organization. Use up to 255 characters, including spaces and special characters.
- **User access group description:** Specify a description of the group.  
Consider using a description that clearly identifies the purpose of the group. Use up to 1024 characters, including spaces and special characters.
- **Users:** Specify users for the group.  
To display a list of users, select the triangle ▾ at the end of the box or start typing a name.  
If you don't see specific users, go to the **Users** page under **user menu > Organization settings** and verify that they are Contrast organization users.
- **Roles:** From the dropdown, select one or more roles to apply to all users in the group.  
You can select [built-in roles \(page 1579\)](#) or [custom roles \(page 1583\)](#).

5. Select **Add**.

## Edit user access groups (Preview) ⓘ

Use this procedure to edit a user access group.

For built-in user access groups, you can only change the users assigned to the group.



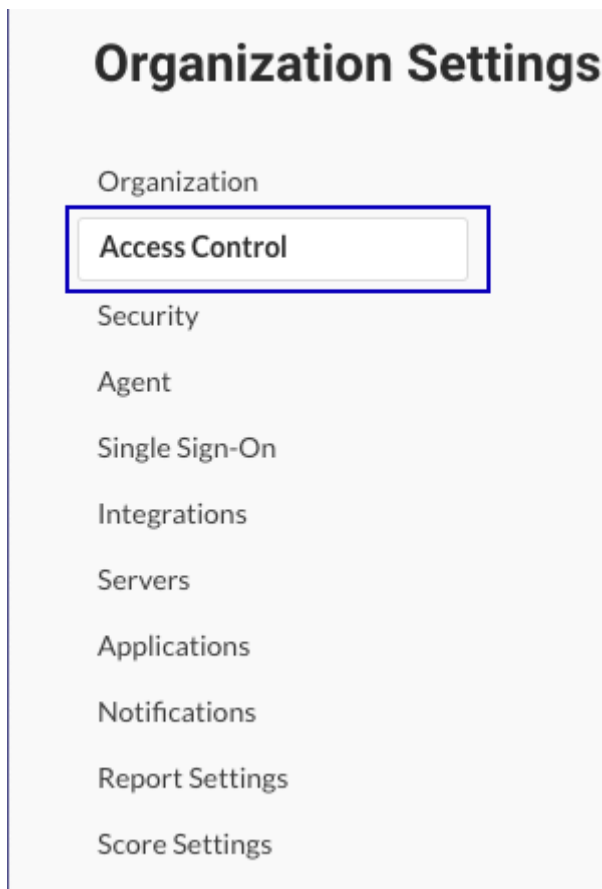
### NOTE

This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact [Contrast support](#).

On-premises customers manage access to Contrast by setting up [organization users and access groups \(page 1445\)](#).

## Steps

1. From the user menu, select **Organization settings**.
2. Select **Access control**.



3. Select the **User access groups** tab.
4. Select the **Edit** icon (✎) at the end of the row for the group you want to change.
5. Change the settings, as needed and select **Save**.

## Delete custom user access groups (Preview) ☹️

Use this procedure to delete a custom user access group. You cannot delete built-in user access groups.



### NOTE

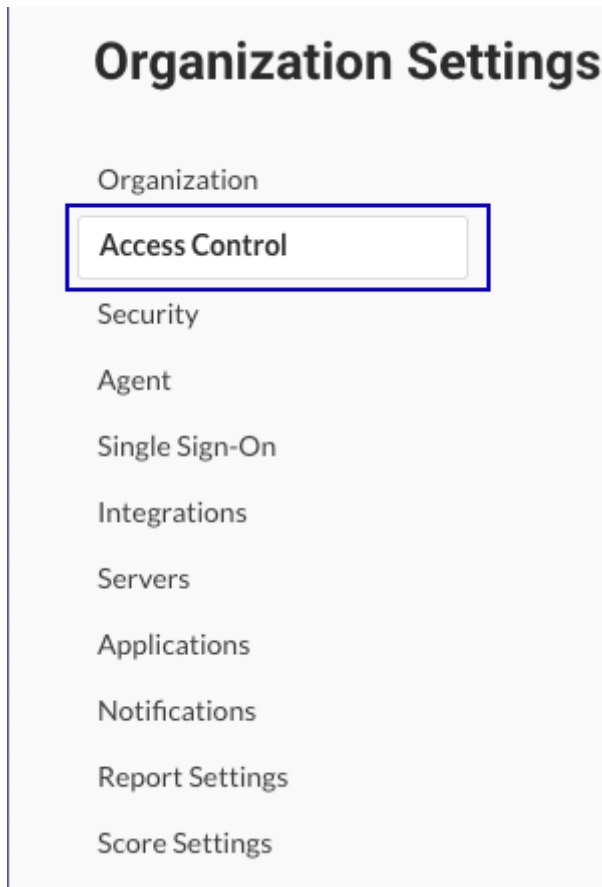
This feature is supported for hosted customers only and is in preview mode. For access to this feature, contact Contrast support.

On-premises customers manage access to Contrast by setting up [organization users and access groups \(page 1445\)](#).

## Steps

1. From the user menu, select **Organization settings**.

2. Select **Access control**.



3. Select the **User access groups** tab.
4. Select the **Delete** icon (🗑️) at the end of the row for the group you want to delete.
5. In the Delete user access group window, select **Delete**.

## Authorization troubleshooting for access control (Preview) 🕒



### NOTE

Role-based access control is supported for hosted customers only and is in preview mode. If you want to be an early adopter, contact [Contrast support](#).

## Authorization for access control

Authorization for access control determines the actions a user can take for a specific resource. If a user receives a 403 (Forbidden message), Contrast access control has determined that the user does not have enough permissions to perform the requested operation. Access control considers these elements during authorization:

- **User:** The person performing a request.
- **Action:** The operation you want to perform. For example, viewing, editing, or managing.
- **Resource:** The resource that access control protects from unauthorized access. For example, applications, Scan projects, user access groups, resource groups, and roles.

## Access control: troubleshooting steps

1. Check the user permissions.
  - a. Under the user menu, select Organization settings.
  - b. Select **Access control**.
  - c. In the Users tab, find the user in the list and select the key icon (🔑) in the Actions column.
  - d. If the user is assigned the correct roles and resources, go to the next step. Otherwise, update the user settings.

You can also retrieve a user's role-based access control permissions by using the [Contrast API](#).

2. (Optional) Verify effective user permissions.

The Contrast web interface lets you view permissions and settings for individual users, however, you can also use the [Contrast API](#) to verify the effective user permissions, such as:

- Resources (applications, Scan projects, and functions) that the user can access.
- The actions assigned to the user.
- The role, user access group, and resource group combination that provides the user permissions.

[Access control queries \(page 1603\)](#) provides examples of how to use the Contrast API to check user settings and permissions.

If the user settings and permissions look correct, contact [Contrast support](#) for additional help. Otherwise, update the user settings and permissions.

## Examples: Access control queries for troubleshooting (Preview) 🔄



### NOTE

This feature is supported for hosted customers only and is in preview mode. If you want to be an early adopter, contact Contrast support.

This topic provides examples of how to use the [Contrast API](#) to get access control details when you troubleshoot authorization issues.

To use the API to get role-based access control information for a user, you need a role that includes the Manage organization and Manage platform organization actions.

### User ID query

Use this query to get a user's ID.

1. Set these environment variables:

```
HOSTNAME=http://<YourHostName>
ADMIN_APIKEY=<ServiceKey>
ADMIN_AUTH=<AdminAuthorization>
ORGID=<OrganizationId>
USER_EMAIL=<UserEmail>
USERID=<obtained in the next step>
```

In the Contrast web interface, you can get variable values under the **user menu > User settings** for the administrator or the user.

- Replace <YourHostName> with the URL for your Contrast instance. For example: `https://mycompany.com/Contrast`.

- Replace <ServiceKey> with the Service key for the administrator.
  - Replace <AdminAuthorization> with the Authorization header for the administrator.
  - Replace <OrganizationID> with the ID for the organization where the user is a member.
  - Replace <UserEmail> with the user's email address used to log in to Contrast.
2. To find the user's ID, run this query.

```
curl -X GET --location "$HOSTNAME/api/v4/organizations/$ORGID/users/$USER_EMAIL" \
  -H "API-Key: $ADMIN_APIKEY" \
  -H "Authorization: $ADMIN_AUTH"
```

**Sample response with the user ID highlighted:**

```
{
  "userId": "4790deb8-972d-47c8-b2d0-219617999c83",
  "username": "contrast_view",
  "organizationId": "2f95790d-64dd-4344-9b1c-920021d112bb",
  "firstName": "NX374ERI11",
  "lastName": "KFG0S17TX6",
  "status": "ACTIVE",
  "type": "STANDARD",
  "enabled": true,
  "language": "en",
  "dateTimePreferences": {
    "dateFormat": "MM/dd/yyyy",
    "timeFormat": "hh:mm a",
    "timeZone": "EST"
  },
  "auditDates": {
    "lastLoginTime": "2024-05-29T14:28:00.000+00:00",
    "creationDate": "2024-04-23T20:33:21.000+00:00"
  },
  "userAccessGroupMembership": [
    {
      "userAccessGroupId": "725e7af7-8cf4-44b3-a6d2-b30e6df6573e"
    },
    {
      "userAccessGroupId": "eeb65497-1e65-4eb3-99af-b781a4ce7d29"
    },
    {
      "userAccessGroupId": "12565428-1063-41c4-ada0-cbee082f5eca"
    }
  ],
  "apiOnly": false,
  "external": false,
  "serviceKey": "demo"
}
```

3. Assign the user ID to the USERID variable:

```
USERID=4790deb8-972d-47c8-b2d0-219617999c83
```

### User access query

Run this query to get all access control details for a user.

```
curl -X GET --location "$HOSTNAME/api/v4/organizations/$ORGID/access-control-query/users/$USERID" \
```



```
-H "API-Key: $ADMIN_APIKEY" \
-H "Authorization: $ADMIN_AUTH"
```

### Login permission query

Run this query to determine if a user has login permissions.

The user must have a role that includes at least the View organization action. Run this query:

```
curl -s -X GET --location "$HOSTNAME/api/v4/organizations/$ORGID/access-
control-query/users/$USERID" -H "API-Key: $ADMIN_APIKEY" -H "Authorization:
$ADMIN_AUTH" \
  | jq | grep ORG_SETTINGS | sort | uniq | wc -l | if grep -q 0; then
echo "Not configured for login"; else echo "Configured for login"; fi
```

#### Sample result:

```
Configured for login
```

### User role query

Run this query to find all the roles assigned to a user.

```
curl -s -X GET --location "$HOSTNAME/api/v4/organizations/$ORGID/access-
control-query/users/$USERID" -H "API-Key: $ADMIN_APIKEY" -H "Authorization:
$ADMIN_AUTH" \
  | jq | grep roleName | sort | uniq
```

#### Sample result:

```
"roleName": "ORGANIZATION_VIEW_ROLE",
"roleName": "rg with 1 app role",
```

### User access group query

Run this query to find all the user access groups assigned to the user.

```
curl -s -X GET --location "$HOSTNAME/api/v4/organizations/$ORGID/access-
control-query/users/$USERID" -H "API-Key: $ADMIN_APIKEY" -H "Authorization:
$ADMIN_AUTH" \
  | jq | grep userAccessGroupName | sort | uniq
```

#### Sample result:

```
"userAccessGroupName": "Organization View",
"userAccessGroupName": "rg with 1 app uag",
```

### Resource types, actions, and ID query

Run this query to get a list of of resources, actions and IDs for a user.

```
curl -s -X GET --location "$HOSTNAME/api/v4/organizations/$ORGID/access-
control-query/users/$USERID" \
  -H "API-Key: $ADMIN_APIKEY" \
  -H "Authorization: $ADMIN_AUTH" | jq '.accessList[] | "\(.resourceType)
\(.actions) \(.resourceId)"' | sort | uniq
```

#### Sample result:

```
"APPLICATION
[\"APPLICATION_EDIT\", \"APPLICATION_RULES_ADMIN\", \"APPLICATION_ADMIN\", \"AP
PLICATION_VIEW\"] 0383916c-956b-418b-a114-0ffc3420cb1c"
```

```

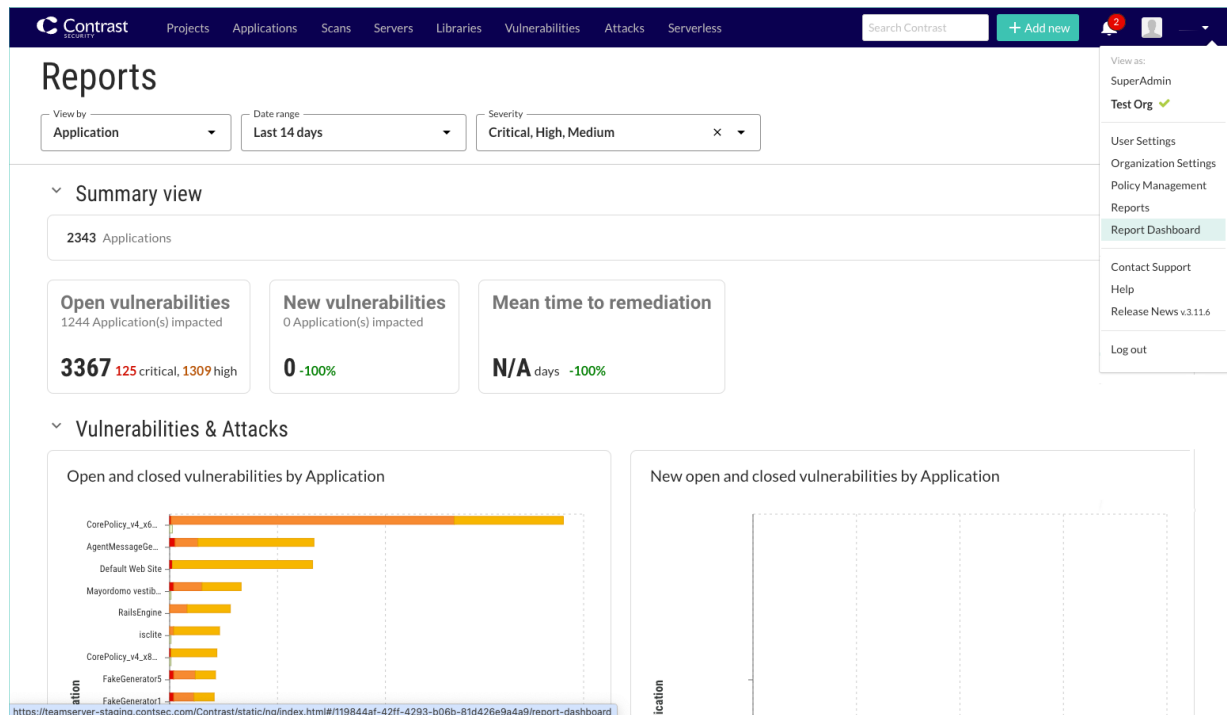
"APPLICATION
[\"APPLICATION_EDIT\", \"APPLICATION_RULES_ADMIN\", \"APPLICATION_ADMIN\", \"APPLICATION_VIEW\"] 1a7539c4-2339-4524-958d-b60482ebf1f8"
"APPLICATION
[\"APPLICATION_EDIT\", \"APPLICATION_RULES_ADMIN\", \"APPLICATION_ADMIN\", \"APPLICATION_VIEW\"] 2762d3b4-1033-406e-94cc-f4040b6e7111"
"APPLICATION
[\"APPLICATION_EDIT\", \"APPLICATION_RULES_ADMIN\", \"APPLICATION_ADMIN\", \"APPLICATION_VIEW\"] 7843ab03-84a7-4f21-93bf-37e7bf47f94d"
"APPLICATION
[\"APPLICATION_EDIT\", \"APPLICATION_RULES_ADMIN\", \"APPLICATION_ADMIN\", \"APPLICATION_VIEW\"] 97b1a6a1-ee34-4974-9ee2-4c92733de2bb"
"APPLICATION
[\"APPLICATION_EDIT\", \"APPLICATION_RULES_ADMIN\", \"APPLICATION_ADMIN\", \"APPLICATION_VIEW\"] a8b804ad-cbe4-43e7-a03f-3f639f5680ab"
"APPLICATION
[\"APPLICATION_EDIT\", \"APPLICATION_RULES_ADMIN\", \"APPLICATION_ADMIN\", \"APPLICATION_VIEW\"] d0c389d7-744c-4f2a-b391-8bf41c0dc09c"
"APPLICATION
[\"APPLICATION_EDIT\", \"APPLICATION_RULES_ADMIN\", \"APPLICATION_ADMIN\", \"APPLICATION_VIEW\"] de9248b1-e8f5-43b9-a4e3-8a65e844691d"
"APPLICATION [\"PROTECT_ACCESS\", \"PROTECT_POLICIES_MANAGE\"]
0383916c-956b-418b-a114-0ffc3420cb1c"
"APPLICATION [\"PROTECT_ACCESS\", \"PROTECT_POLICIES_MANAGE\"]
1a7539c4-2339-4524-958d-b60482ebf1f8"
"APPLICATION [\"PROTECT_ACCESS\", \"PROTECT_POLICIES_MANAGE\"]
2762d3b4-1033-406e-94cc-f4040b6e7111"
"APPLICATION [\"PROTECT_ACCESS\", \"PROTECT_POLICIES_MANAGE\"]
7843ab03-84a7-4f21-93bf-37e7bf47f94d"
"APPLICATION [\"PROTECT_ACCESS\", \"PROTECT_POLICIES_MANAGE\"] 97b1a6a1-ee34-4974-9ee2-4c92733de2bb"
"APPLICATION [\"PROTECT_ACCESS\", \"PROTECT_POLICIES_MANAGE\"] a8b804ad-cbe4-43e7-a03f-3f639f5680ab"
"APPLICATION [\"PROTECT_ACCESS\", \"PROTECT_POLICIES_MANAGE\"]
d0c389d7-744c-4f2a-b391-8bf41c0dc09c"

```

## Report dashboard (Preview)

The report dashboard lets you view aggregated statistics for vulnerabilities in your organization. It also provides details that help you understand your organization's progress with managing and fixing vulnerabilities.

If you are using [role-based access control \(page 1565\)](#), the report shows details based on the resources associated with your role.



## Report dashboard details

### • Summary view

- If you select Application in the View by filter, the summary shows the total number of applications included in this report. If you select [application metadata \(page 1456\)](#), the summary also shows the number of values found for the selected metadata. .
- **Open vulnerabilities:** The number of vulnerabilities that have no closed date or have a closed date that occurred after the selected time frame.
- **New vulnerabilities:** The number of vulnerabilities that Contrast first detected during the selected time frame.
- **Mean time to remediation:** The average time it took to close a security vulnerability during the selected time frame.

### • Vulnerabilities and attacks

To see additional details, hover over the bars in each chart.

- **Open and closed vulnerabilities:** All open and closed vulnerabilities as of the current date.
- **New open and closed vulnerabilities:** Vulnerabilities that were opened or closed during the selected time frame. vulnerabilities
- **Top vulnerability types to fix:** The vulnerabilities that Contrast considers the most important ones to fix.
- **Open and closed rates:** Trends that show the rate at which teams close open vulnerabilities

### • Application or metadata group

This section shows details for all applications or the applications that use the selected metadata. To view additional details, hover over the bars in the chart.

- **Name or Value:** The application name or the value for selected metadata.
- **Onboarded apps:** The number of applications added to Contrast or the number of applications in Contrast that use the selected metadata.
- **Open vulns:** The number of vulnerabilities with an open status in the specified time frame
- **New vulns:** The number of vulnerabilities that Contrast reported in the specified time frame
- **Closed:** The number of vulnerabilities that closed in the specified time frame.
- **Mean time to remediation:** The average time it took to fix the vulnerabilities in the specified time frame.

## See also

[View report dashboard \(page 1608\)](#)

## View report dashboard (Preview)

### Before you begin

- **User and groups:** If you are using [users and groups \(page 1445\)](#) for access control, you need an Organization Admin role.
- **Role-based access control:** If your organization has [role-based access control \(page 1565\)](#) turned on, you need a role with the View application action. The dashboard shows details based on the resource groups associated with your role.

### Steps

1. From the user menu, select **Report dashboard**.
2. Use these filters to refine the view:
  - **View by:** Select **Application** to create a view of all application vulnerability details or select [application metadata \(page 1456\)](#) to view details based on the metadata.
  - **Date range:** Select a time frame or select **Custom** to create a customized time frame.
  - **Severity:** Select one or more vulnerability severity levels.

## Export Aggregated Vulnerability report (Preview)

You can export the details on the report dashboard to a PDF file.

### Before you begin

- **User and groups:** If you are using [users and groups \(page 1445\)](#) for access control, you need an Organization Admin role.  
The report includes all displayed details.
- **Role-based access control:** If your organization has [role-based access control \(page 1565\)](#) turned on, you need a role with the View application action.  
The report includes details based on the resources associated with your role.  
Role-based access control is a preview feature and not available to all users. If you want to use it, contact your Contrast representative.

### Steps

1. From the user menu, select **Report dashboard**.
2. Optionally, select filters to refine the view.
3. Select **Export PDF** at the top of the page.
4. Specify a download location when prompted to do so.

## Contrast Visual Studio Code plugin (Preview)



### NOTE

Integration is to be used with [Contrast Scan \(page 32\)](#).

Use the [Contrast Visual Studio Code](#) IDE (Integrated Development Environment) plugin to integrate security vulnerabilities with projects ([Scan \(page 32\)](#)). The Contrast plugin lets developers view the vulnerabilities identified during the most recent security scans and take remedial actions. The Contrast plugin provides thorough information about vulnerabilities associated with projects on a near real-time basis. The plugin offers filters based on severity, status, and discovery date to customize the vulnerability data to view.

The key features include a vulnerability report to view vulnerabilities associated with applications for projects in Scan, provide a tree view on the list of the vulnerabilities related to the current file open in the IDE with visual indicators based on criticality, see which line of code has a vulnerability through visual indicators, automate the collection of vulnerabilities for applications and projects based on a schedule.

## Before you begin

- Make sure you have the supported system requirements:
  - CPU: Quad-core
  - RAM: 16 GB
  - Storage: SSD, 128 GB
  - Monitor: 1080p
- Make sure you have the supported software requirements:
  - Operating systems: Ubuntu 22.04.5 LTS or Windows 11
  - Node: 20.17.0
  - VSCode: 1.93.0 and above

## Download Visual Studio Code

1. Go to [Visual Studio Code](#).
2. Click the **Download** button. The website will automatically detect your operating system and provide the appropriate installer.
  - Windows: `.exe` file
  - Mac: `.dmg` file
  - Linux: `.deb`, `.rpm`, or `.tar.gz` file
3. Continue by installing the Visual Studio Code.

## Install Visual Studio Code

### Linux

1. Open a terminal and go to the directory where you downloaded the file.
2. Run the command:

```
bash: sudo apt install ./code_*.deb
```

3. Continue by launching Visual Studio code.

### Windows

1. Go to the directory where you downloaded the file and open the `.exe` file.
2. Follow the installation wizard:
  - Accept the license agreement
  - Choose the installation folder
  - Select optional tasks like adding VS Code to the PATH
3. Click **Install** and then **Finish**.

4. Continue by launching Visual Studio code.

## macOS

1. Go to the directory where you downloaded the file and open the `.dmg` file.
2. Drag the *Visual Studio Code* icon into the **Applications** folder.
3. Continue by launching Visual Studio code.

## Launch Visual Studio Code

1. Locate and open Visual Studio Code.
  - **Linux:** Use your desktop menu or run code from the terminal.
  - **Windows:** Search for **Visual Studio Code** under the **Start** menu.
  - **Mac:** Open it from the **Applications** folder.
2. Continue by installing the Contrast plugin.

## Install the Contrast Visual Studio Code plugin

Select one of these options.

### Install the plugin via Visual Studio Marketplace

Follow the steps from the [marketplace](#).

1. Search for and then open **VS Code**.
2. Go to the **Extensions** view.
3. Search for **Contrast IDE** and select it to view more details.
4. Click the **Install** button on the extension's page.
5. If required, restart the VSCode after installing the Contrast extension.

### Install the plugin via manual installation

1. Launch Visual Studio Code on your system.
2. Go to the **Extensions** view.
3. Click the *more options* icon ( `:` ) in the top-right corner and select **Install from VSIX**.
4. Go to the location of the `.vsix` file and select it to install the plugin.