Qualys Container Scanning Connector for Bamboo

User Guide

Version 1.6.2.2

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About this Guide

Welcome to Qualys Container Security! We'll help you get acquainted with the Qualys solutions for securing your Container environments like Images, Containers and Docker Hosts using the Qualys Cloud Security Platform.

About Qualys

Qualys, Inc. (NASDAQ: QLYS) is a pioneer and leading provider of cloud-based security and compliance solutions. The Qualys Cloud Platform and its integrated apps help businesses simplify security operations and lower the cost of compliance by delivering critical security intelligence on demand and automating the full spectrum of auditing, compliance and protection for IT systems and web applications.

Founded in 1999, Qualys has established strategic partnerships with leading managed service providers and consulting organizations including Accenture, BT, Cognizant Technology Solutions, Deutsche Telekom, Fujitsu, HCL, HP Enterprise, IBM, Infosys, NTT, Optiv, SecureWorks, Tata Communications, Verizon and Wipro. The company is also founding member of the Cloud Security Alliance (CSA). For more information, please visit www.qualys.com

Qualys Support

Qualys is committed to providing you with the most thorough support. Through online documentation, telephone help, and direct email support, Qualys ensures that your questions will be answered in the fastest time possible. We support you 7 days a week, 24 hours a day. Access online support information at www.qualys.com/support/.

About Container Security Documentation

This document provides information about using the Qualys Container Scanning Connector for Bamboo.

For information on using the Container Security UI to monitor vulnerabilities in Images, Containers, and Registries, refer to the Qualys Container Security User Guide.

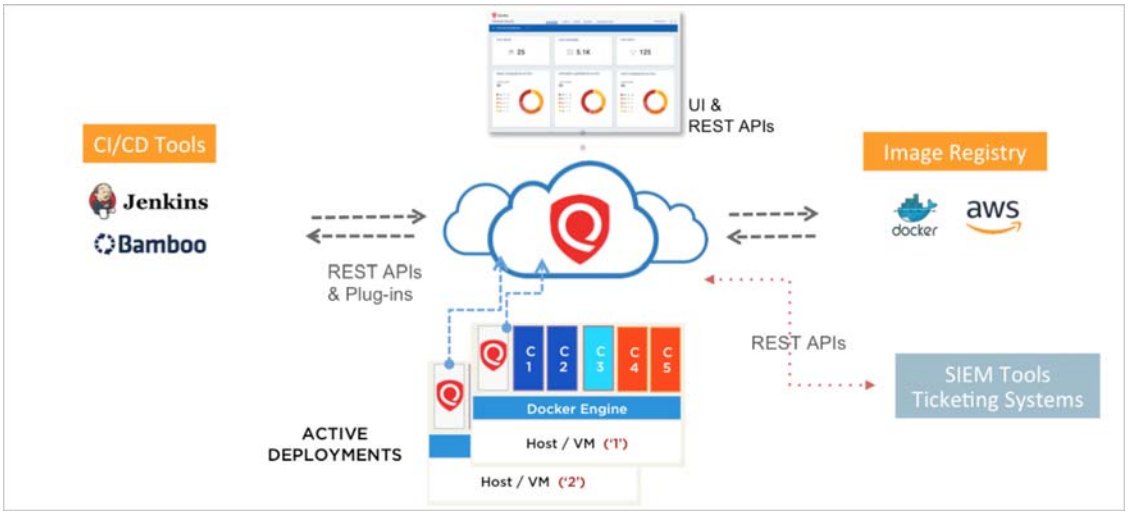
For information on deploying the sensor on MAC, CoreOS, and various orchestrators and cloud environments, refer to the Qualys Container Sensor Deployment Guide.

For information on using the Container Security API, refer to the Qualys Container Security API Guide.

For information on the Jenkins plugin, see Qualys Container Scanning Connector for Jenkins.

Container Security Overview

Qualys Container Security provides discovery, tracking, and continuously protecting container environments. This addresses vulnerability management for images and containers in their DevOps pipeline and deployments across cloud and on-premise environments.



With this version, Qualys Container Security supports

- Discovery, inventory, and near-real time tracking of container environments

- Vulnerability analysis for images and containers

- Vulnerability analysis for registries

- Integration with CI/CD pipeline using APIs (DevOps flow)

- Uses new 'Container Sensor' – providing native container support, distributed as container image

Upon installation, the sensor does automatic discovery of Images and Containers on the deployed host, provides a vulnerability analysis of them, and additionally it monitors and reports on the docker related events on the host. The sensor lists and scans registries for vulnerable images. The sensor container runs in non-privileged mode. It requires a persistent storage for storing and caching files.

Currently, the sensor only scans Images and Containers. For getting a vulnerability posture on the Host, you would require Qualys Cloud Agents or a scan through Qualys Virtual Scanner Appliance.

What data does Container Security collect?

The Qualys Container Security sensor fetches the following information about Images and Containers in your environment:

- **Inventory of Images and Containers** in your environment from commands such as **`docker ps`** that lists all containers.

- **Metadata information** about Images and Containers from commands such as **`docker inspect`** and **`docker info`** that fetches low level information on docker objects.

- **Event information** about Images and Containers from the docker host for docker events like created, started, killed, push, pull, etc.

- **Vulnerabilities** found on Images and Containers. This is the output of the vulnerability management manifests run for identifying vulnerability information in Images and Containers. This is primarily software package listing, services running, ports, etc.

For example, package manager outputs like **`rpm -qa`**, **`npm`**. This is supported across various Linux distributions (CentOS, Ubuntu, CoreOS, etc) and across images like Python, NodeJS, Ruby, and so on.

Qualys Container Scanning Connector for Bamboo

Qualys Container Security provides a plugin for Bamboo to get the security posture for the container images built via the tool. The plugin can be configured to fail or pass the container image builds based on the vulnerabilities detected.

Get Started

Follow the steps to get started with Container Security plugin for Bamboo.

What you'll need

- A valid Qualys subscription with the Container Security application activated.

- Access to Qualys Container Security application API endpoint from your build host.

- Requires the container sensor for CI/CD environment to be installed on the Bamboo build host. Refer to Qualys Container Security Sensor Deployment Guide for instructions on installing the container cicd sensor. You must pass the following parameter while deploying the sensor for CI/CD environment `--cicd-deployed-sensor or -c`.

- Bamboo CICD tool version 6.8.0 or later.

- Internet connection for agent to be able to connect to the Qualys Cloud Platform. Install sensor with proxy option if agent is running behind proxy.

- The Bamboo server and agents should have an open connection to the Qualys Cloud Platform in order to get data from the Qualys Cloud Platform for vulnerability reporting.

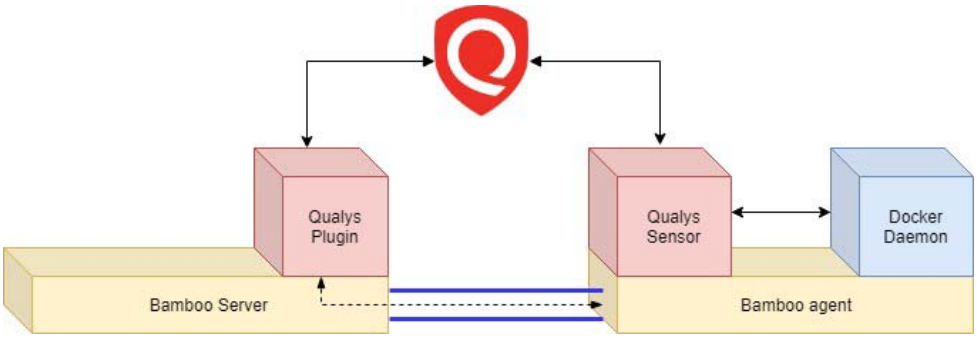
Bamboo plugin automatically tags images built out of CI/CD pipeline with the tag **qualys_scan_target:<image-sha>** to mark them for scanning and only those images are scanned for vulnerabilities. Once the scanning is over, Qualys Container Sensor will remove the tag. However, if an image has no other tag applied to it other than 'qualys_scan_target:<image-sha>', the sensor will retain the tag to avoid removal of the image from the host.

Note: Qualys Container Scanning Connector for Bamboo is verified against legacy type of installation of Bamboo server.

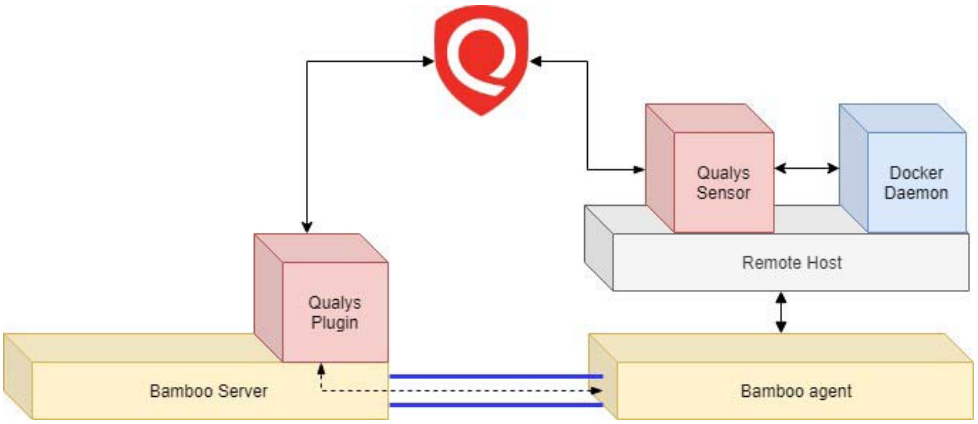
Recommended setup for server-agent deployment

Qualys Container Scanning Connector for Bamboo should be deployed on the Bamboo server. Qualys Container Security Sensor should be installed where the docker daemon is running. If the docker daemon is running on Bamboo agent, install the Sensor on Bamboo agent. If the docker daemon is running on a remote host, install the sensor over there.

Following figure shows the docker daemon running on Bamboo agent.



Following figure shows the docker daemon running on a remote host.



Install the Plugin

You can install the Qualys Container Scanning Connector for Bamboo in two ways: If the Atlassian Marketplace is accessible from within your Bamboo instance, you can install the plugin directly in your Bamboo instance. If the Atlassian Marketplace is not accessible from within your Bamboo instance (Atlassian server is not reachable), you can use your browser to download the plugin from the Atlassian Marketplace and then upload the plugin to your Bamboo instance.

Installing the Plugin when Atlassian Marketplace is accessible from Bamboo

1) To install the plugin from Bamboo, login to your Bamboo instance and then click Manage Apps.

2) On the Manage Apps page, click **find new apps**, and then search for Qualys. The search results will fetch the "Qualys Container Scanning Connector for Bamboo" plugin if it is compatible with your Bamboo Server version.

3) Click Install beside "Qualys Container Scanning Connector for Bamboo", and then click **Accept & Install** in the confirmation dialog.

The Bamboo plugin gets installed/updated in your Bamboo instance. In case of update, your existing configuration will continue to work. In case of fresh install, perform the configuration steps provided further in this document.

Installing the Plugin when Atlassian Marketplace is NOT accessible from Bamboo

1) Open your web browser and go to the Atlassian Marketplace, and search for Qualys. The search results will fetch the Qualys plugins irrespective of your version of Bamboo.

2) Click "Qualys Container Scanning Connector for Bamboo". You will see the Bamboo Server versions the plugin is compatible with.

3) If you want to install the plugin, click **Get it now**. The plugin jar file gets downloaded to your computer.

4) Go to your Bamboo instance, and then click Manage Apps.

5) On the Manage Apps page, click **Upload app** to upload the plugin jar file.

The Bamboo plugin gets installed/updated in your Bamboo instance. In case of update, your existing configuration will continue to work. In case of fresh install, perform the configuration steps provided further in this document.

Scanning CI/CD images

Configure the Bamboo plugin to automatically tag CI/CD images with 'qualys_scan_target:<image-sha>'.

Docker URL: Docker REST API URL / Docker socket path. Only unix:/// and tcp:// protocols allowed.

Cert File Path: If you are using remote server that communicate over https, you can provide a specific folder location which contains the files ca.pem, cert.pem and key.pem. For example, /var/bamboo_home/certs.

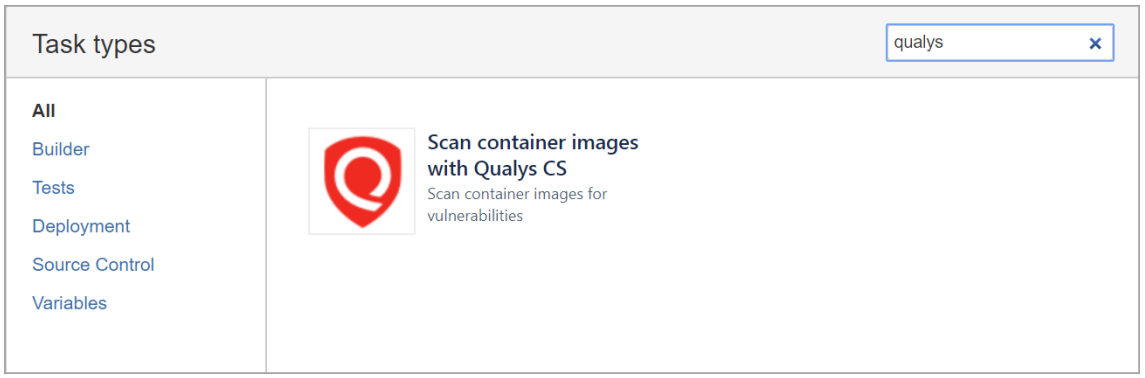
Docker URLs (unix socket or TCP) to be used in various docker deployment scenarios

Deployment scenario	Sensor location	Docker URL to be used
Job executed by Bamboo server AND Docker host == Bamboo server	Bamboo server host	UNIX unix:///var/run/docker.sock
Job executed by Bamboo server AND Docker Host == Remote docker host (any machine other than Bamboo server or agent)	Remote docker host	TCP path of the Remote Docker host: tcp://<ip_of_RDH>:<port> For example, tcp://10.115.67.61:2375
Job executed by Bamboo agent AND Docker host == Bamboo agent	Bamboo agent	UNIX unix:///var/run/docker.sock
Job executed by Bamboo agent AND Docker Host == Remote docker host (any machine other than Bamboo server or agent)	Remote docker host	TCP path of the Remote Docker host: tcp://<ip_of_RDH>:<port> For example, tcp://10.115.67.61:2375

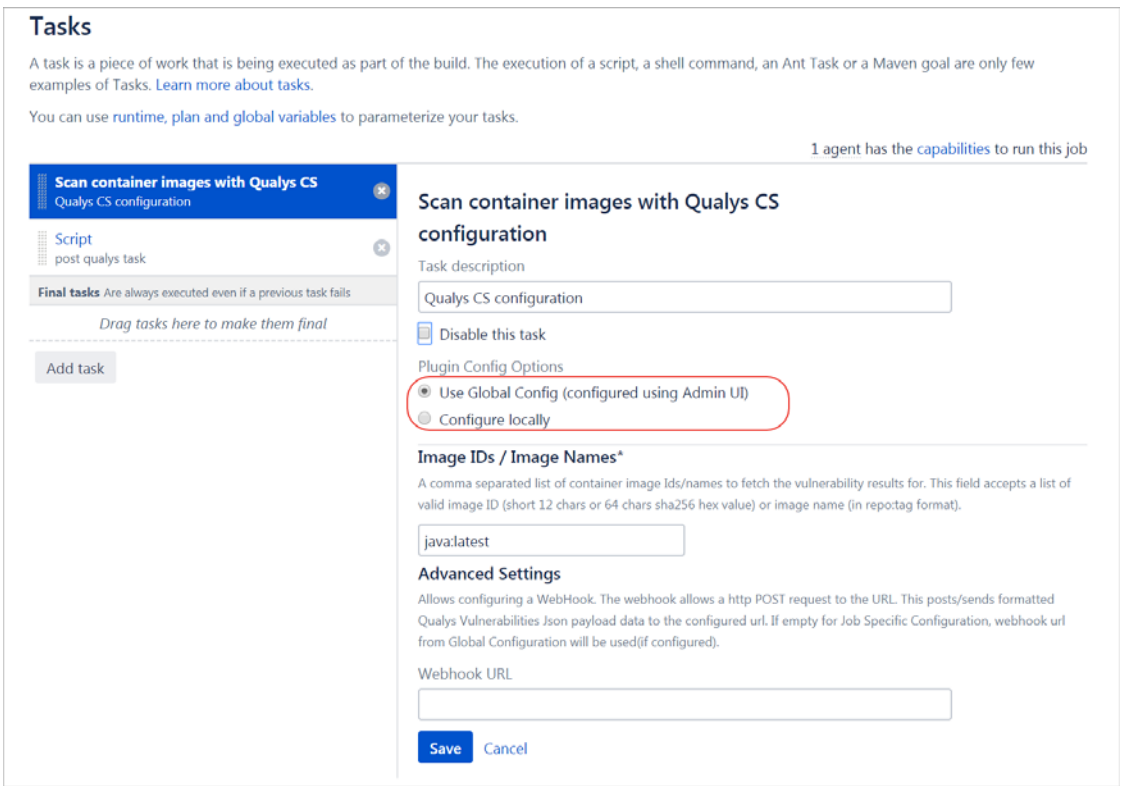
Start Using the Plugin

Qualys recommends to set up the Bamboo Plugin after the container image is built, and before the image is pushed to the registry. Ensure that you do not delete the image before the plugin setup is complete.

You can use this plugin as a task in your bamboo plan. In the Tasks tab, click Add Task, and simply search for “Qualys” to get the Scan container images with Qualys CS Plugin addon you uploaded earlier. Click the Qualys addon to add it as a task.



While setting up the plugin you can either provide **a global configuration or a local configuration** for Qualys Container Security. Global configuration can be set once and used for multiple projects.



To set a global configuration, go to Administration > Add-ons, then in the left pane under ADD-ONS, find and click Scan container images with Qualys CS Plugin. Then, provide the configuration details listed below.

If you want to set a local configuration, in the Tasks tab, select Scan container images with Qualys CS Plugin, and then select the Configure locally option. Note: Selecting the "Use Global Config" option here will let the task use the global configuration you have set under Administration > Add-ons > Scan container images with Qualys CS Plugin.

See Configuration Details

Define container image Ids

In the plugin configuration there is a field called image IDs/Image Names. This field is only available for local configuration. Set this to the container image Ids or names you want to report on.

Enter a single string value like imageIds: 'a1b2c3d4e5f6' or a comma-separated list like imageIds: 'a1b2c3d4e5f6,abcdef123456'. Specify an image name in the format `repo:tag`.

The plugin will only pull a report for the image Ids/names you specify. If you provide an image name, the plugin fetches the corresponding sha-256. The plugin tries to fetch the image sha using the docker socket path configured in global or local configuration. If your docker host is running locally to build tool/agent, the docker socket path is unix:///var/run/docker.sock; whereas if your docker host is running remotely, the docker socket path is the TCP URL to the remote docker host. See Scanning CI/CD images.

You can also define container image Ids in a variable and specify the variable as the value. Alternatively, you can inject bamboo variables using a task.

Using the WebHook

You can forward Bamboo job results to a WebHook URL.

You can set a global WebHook URL under Administration > Add-ons > Scan container images with Qualys CS Plugin, or a WebHook URL for local configuration in the Tasks tab for a plan, by selecting Scan container images with Qualys CS Plugin.

Note: WebHook URL specified under local configuration, for a particular project, will always take preference over the global WebHook URL specified under Administration > Add-ons > Scan container images with Qualys CS Plugin.

WebHook data sample

```
{
  "buildNumber": 135,
  "planName": "Bamboo Docker Image Analyzer Plugin 1.6.0.0 - Default Job",
  "planKey": "BDIAP1-BCP1FBCNATC-JOB1",
  "buildStatus": "Failed",
  "failReason": [
    {
```

```
    "imageId": "10c550a8b09e",
    "software": {
      "configured": "xz-utils, ABC, sed, UCF, unzip, TZDATA=2019a-0+deb9u1",
      "found": "sed=4.5-3.fc30"
    },
    "severities": {
      "1": {
        "configured": 0,
        "found": 1
      }
    },
    "cvss": {
      "configured": 1.9,
      "found": 6,
      "version": 2
    }
  }
],
"images": [
  {
    "imageId\/name": "fedora\/httpd",
    "imageId": "10c550a8b09e",
    "uuid": "71295b15-56f5-3202-a110-ee78c0b54f37",
    "sha": "10c550a8b09ec47729c1bb6e7a0dea57d9c58985a7e137a1dad181f41ca27cc9",
    "size": 321297635,
    "repo": [
      {
        "registry": "docker.io",
        "tag": "latest",
        "repository": "fedora\/httpd"
      }
    ],
    "operatingSystem": "Fedora 30",
    "layersCount": 7,
    "dockerVersion": "17.06.0-ce",
    "architecture": "amd64",
    "vulnerabilities": {
      "totalVulnerabilities": 6,
      "typeDetected": {
        "Confirmed": 1,
        "Potential": 5
      },
      "severity": {
        "Potential": {
          "1": 1,
          "2": 0,
          "3": 4,
          "4": 0,
```

```
            "5": 0
          },
          "Confirmed": {
            "1": 0,
            "2": 1,
            "3": 0,
            "4": 0,
            "5": 0
          }
        },
        "patchable": {
          "yes": 5,
          "no": 1
        }
      }
    }
  ]
}
```

Configuration Details

Provide the following configuration details:

(1) API login information (Select Use Proxy to provide proxy information).

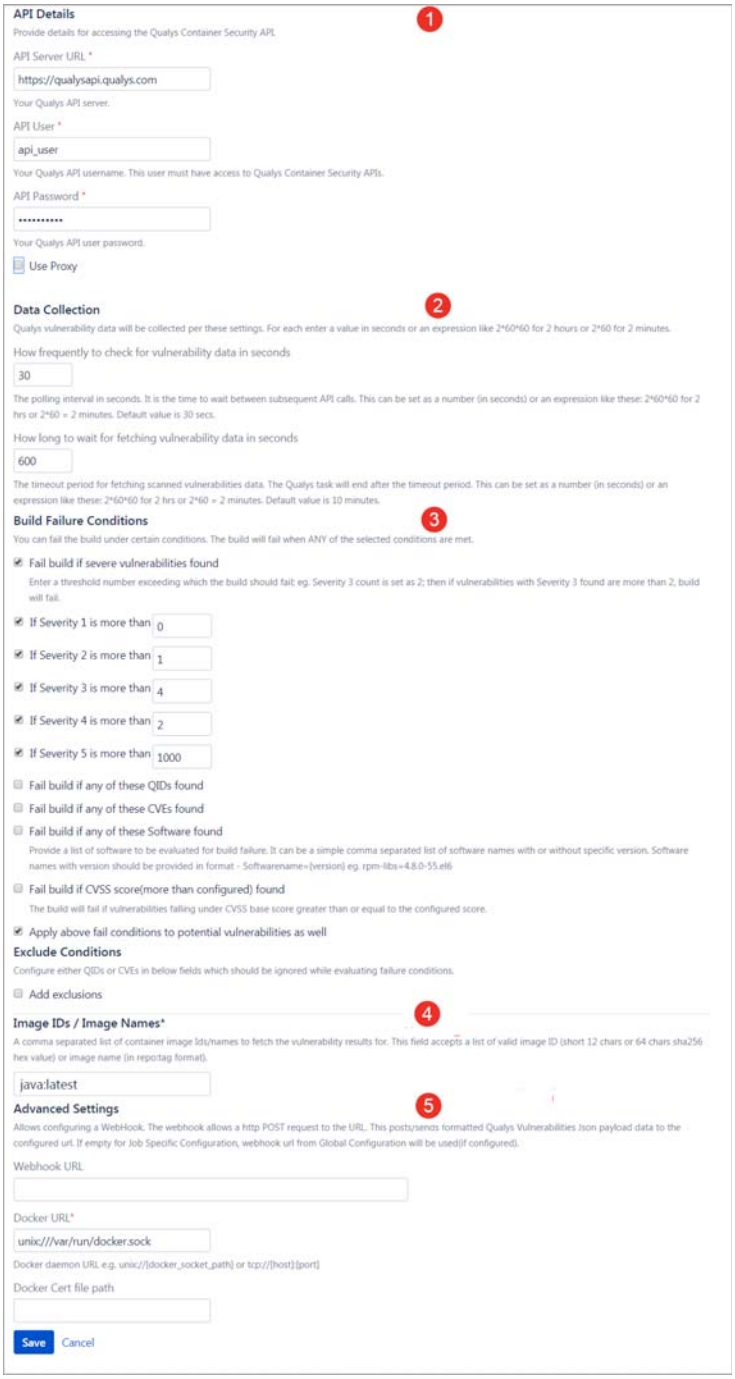
(3) data collection frequency.

(4) build failure conditions.

(5) container image IDs / image names to check for vulnerabilities. We internally use corresponding image sha-256 of the image IDs / image names. Note - When multiple images are specified in the image ID input and during the scan, if the build timeout is reached for any of them, then the plugin will generate the scan result and render the report for the images for which it receives the scan data.

(6) forward Bamboo job results to a WebHook URL.

When you're ready, click Save Configuration. When you click Save, we will use the API credentials that you have provided to verify that the plugin can call the Qualys Container Security API. An error is shown if the call to the Container Security API by plugin fails.



Qualys API Server URL

The Qualys API URL you should use for API requests depends on the Qualys platform where your account is located.

Click here to identify your Qualys platform and get the API URL. In the API URLs section, the API Gateway URL column in the table displays the gateway URLs for the corresponding Qualys platforms.

Qualys Container Scanning Connector uses gateway URL internally for both testing connectivity with Qualys platform and pulling vulnerability data from Qualys.

From Qualys Container Scanning Connector v1.6.1.1, the plugin will internally translate the platform URL input given by the user to its respective gateway URL.

Example:

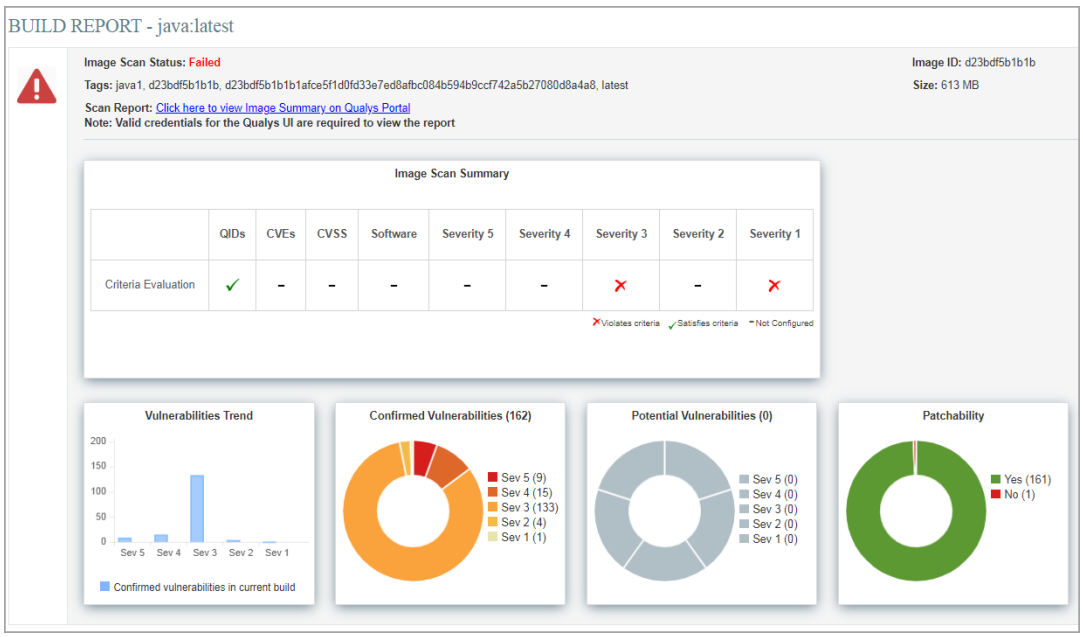
If the user with US POD 1 account has configured URL “https://qualysapi.qualys.com”, then while making API call, the plugin will translate this US POD 1 URL to its respective gateway URL that is “https://gateway.qg1.apps.qualys.com”.

If you are already using the plugin, then configure the gateway URL of the platform that has your account for the new jobs.

View Your Qualys Report

The plugin will generate one report for each container image in the build. Multiple image Ids will result in multiple reports. In a build, click the job which includes Qualys plugin, to see vulnerability details for the container image.

Note: If case of multiple image Ids, the build fails even if one image Id matches the fail condition. The build summary will show details of the image which matched the fail condition.



The Build Summary provides a dashboard view of your security posture. Go to Vulnerabilities for a list of detected QIDs, Installed Software to see software detected on the container image, and Layers to view a list of layers the image is made of.

Debugging and Troubleshooting

Where are the logs?

Bamboo logs are located at the following places on Linux.

Server logs - <bamboo_server_home>/logs/atlassian-bamboo.log

Agent logs - <bamboo_agent_home>/logs/atlassian-bamboo.log

HTTP codes in API response

All API calls and their responses are logged by the plugin and are visible in the Console Output. Here are the HTTP response codes you may see during plugin execution.

Code	Error	Description
204	No content	Qualys sensor is processing data. You'll see 200 OK when complete.
200	OK	You would see this code in two situations: 1) You might have received partial data from Qualys where image details are available but vulnerability data is not available. 2) Vulnerability data is also available. This is usually the last call, after which the thread for that image Id stops.
500	Internal server error	Qualys service is down or there was an issue processing data.
400	Bad request	Qualys API server is unable to understand the request.
401	Unauthorized	The credentials used for Qualys API server are incorrect or the user does not have access to the APIs.

If you don't see any API calls being made...

Make sure you're correctly passing image Ids to the plugin. When the plugin starts the execution, it will print the image Ids provided and you can see this in the Console Output. Check that the container image Ids you provided are printed.

Plugin times out, no report seen

The plugin is designed to keep polling the Qualys API until the configured timeout period is reached. If it does not get vulnerability data from Qualys within this period, it stops. In this case, the plugin will fail the build only if you have set any fail-on conditions. Otherwise, it will not fail the build. You will not see any report links since the plugin could not get vulnerability data, and could not prepare a report.

How to fix this?

On the Qualys Cloud Platform, go to Container Security > Assets > Images and verify if the image for which you are checking the vulnerabilities is present in the Images list.

If the image is not present console logs have the following entry:

```
Get scan result API for image e0111ddfea06 returned code : 404;
HTTP Code: 404. Image: Not known to Qualys. Vulnerabilities: To be
processed.. API Response : {"errorCode":"CMS-2002","message":"Data not
available for given Image Id.","timestamp":1554568122039}
```

Ensure that the Qualys Container Sensor is installed on the host where image is being built.

If the image is present console logs have the following entry:

```
Get scan result API for image cef4ca723229 returned code : 200;
Waiting for vulnerabilities data from Qualys for image id cef4ca723229
HTTP Code: 200. Image: known to Qualys. Vulnerabilities: To be processed.
```

Wait for the vulnerabilities data to be uploaded to the Qualys Cloud Platform.

Error: The trustAnchors parameter must be non-empty

The following error is seen in console logs when the trustStore used by Java for SSL connection between Bamboo Server/Agent and Qualys, is not found, couldn't be opened (permission issue), or is empty:

```
java.lang.RuntimeException: Unexpected error:
java.security.InvalidAlgorithmParameterException: the trustAnchors
parameter must be non-empty
```

You can fix this issue by reconfiguring/updating the certificates (ca-certs) present on the host where the Bamboo Server or Agent is installed. We have provided sample commands for CentOS and Ubuntu. Use the commands specific to the host OS running your Bamboo Server/Agent.

CentOS:

```
yum install -y ca-certificates
update-ca-trust force-enable
sudo ln -s /etc/ssl/your-cert.pem /etc/pki/ca-trust/source/anchors/your-
```

```
cert.pem
update-ca-trust
```

Alternative commands for CentOS:

```
yum reinstall ca-certificates
update-ca-trust
```

Ubuntu:

```
sudo update-ca-certificates -f
sudo /var/lib/dpkg/info/ca-certificates-java.postinst configure
```

Want to contact Support?

Access online support information at www.qualys.com/support/

You'll typically need to provide the following information for Qualys Bamboo plugin issues:

- Bamboo version

- Java version on which Bamboo is running

- Version of the Qualys Container Scanning Connector

- Bamboo server-agent topology

- Whether the Docker daemon is on Bamboo server or Bamboo agent or remote host