



OpenShift Dedicated 4

Jenkins

Contains information about Jenkins for OpenShift Dedicated

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Abstract

Jenkins for OpenShift Dedicated clusters.

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CHAPTER 1. CONFIGURING JENKINS IMAGES

OpenShift Dedicated provides a container image for running Jenkins. This image provides a Jenkins server instance, which can be used to set up a basic flow for continuous testing, integration, and delivery.

The image is based on the Red Hat Universal Base Images (UBI).

OpenShift Dedicated follows the [LTS](#) release of Jenkins. OpenShift Dedicated provides an image that contains Jenkins 2.x.

The OpenShift Dedicated Jenkins images are available on [Quay.io](#) or [registry.redhat.io](#).

For example:

```
$ podman pull registry.redhat.io/ocp-tools-4/jenkins-rhel8:<image_tag>
```

To use these images, you can either access them directly from these registries or push them into your OpenShift Dedicated container image registry. Additionally, you can create an image stream that points to the image, either in your container image registry or at the external location. Your OpenShift Dedicated resources can then reference the image stream.

But for convenience, OpenShift Dedicated provides image streams in the **openshift** namespace for the core Jenkins image as well as the example Agent images provided for OpenShift Dedicated integration with Jenkins.

1.1. CONFIGURATION AND CUSTOMIZATION

You can manage Jenkins authentication in two ways:

- OpenShift Dedicated OAuth authentication provided by the OpenShift Dedicated Login plugin.
- Standard authentication provided by Jenkins.

1.1.1. OpenShift Dedicated OAuth authentication

OAuth authentication is activated by configuring options on the **Configure Global Security** panel in the Jenkins UI, or by setting the **OPENSHIFT_ENABLE_OAUTH** environment variable on the Jenkins **Deployment configuration** to anything other than **false**. This activates the OpenShift Dedicated Login plugin, which retrieves the configuration information from pod data or by interacting with the OpenShift Dedicated API server.

Valid credentials are controlled by the OpenShift Dedicated identity provider.

Jenkins supports both browser and non-browser access.

Valid users are automatically added to the Jenkins authorization matrix at log in, where OpenShift Dedicated roles dictate the specific Jenkins permissions that users have. The roles used by default are the predefined **admin**, **edit**, and **view**. The login plugin executes self-SAR requests against those roles in the project or namespace that Jenkins is running in.

Users with the **admin** role have the traditional Jenkins administrative user permissions. Users with the **edit** or **view** role have progressively fewer permissions.

The default OpenShift Dedicated **admin**, **edit**, and **view** roles and the Jenkins permissions those roles are assigned in the Jenkins instance are configurable.

When running Jenkins in an OpenShift Dedicated pod, the login plugin looks for a config map named **openshift-jenkins-login-plugin-config** in the namespace that Jenkins is running in.

If this plugin finds and can read in that config map, you can define the role to Jenkins Permission mappings. Specifically:

- The login plugin treats the key and value pairs in the config map as Jenkins permission to OpenShift Dedicated role mappings.
- The key is the Jenkins permission group short ID and the Jenkins permission short ID, with those two separated by a hyphen character.
- If you want to add the **Overall Jenkins Administrator** permission to an OpenShift Dedicated role, the key should be **Overall-Administrator**.
- To get a sense of which permission groups and permissions IDs are available, go to the matrix authorization page in the Jenkins console and IDs for the groups and individual permissions in the table they provide.
- The value of the key and value pair is the list of OpenShift Dedicated roles the permission should apply to, with each role separated by a comma.
- If you want to add the **Overall Jenkins Administrator** permission to both the default **admin** and **edit** roles, as well as a new Jenkins role you have created, the value for the key **Overall-Administrator** would be **admin,edit,jenkins**.



NOTE

The **admin** user that is pre-populated in the OpenShift Dedicated Jenkins image with administrative privileges is not given those privileges when OpenShift Dedicated OAuth is used. To grant these permissions the OpenShift Dedicated cluster administrator must explicitly define that user in the OpenShift Dedicated identity provider and assign the **admin** role to the user.

Jenkins users' permissions that are stored can be changed after the users are initially established. The OpenShift Dedicated Login plugin polls the OpenShift Dedicated API server for permissions and updates the permissions stored in Jenkins for each user with the permissions retrieved from OpenShift Dedicated. If the Jenkins UI is used to update permissions for a Jenkins user, the permission changes are overwritten the next time the plugin polls OpenShift Dedicated.

You can control how often the polling occurs with the **OPENSIFT_PERMISSIONS_POLL_INTERVAL** environment variable. The default polling interval is five minutes.

The easiest way to create a new Jenkins service using OAuth authentication is to use a template.

1.1.2. Jenkins authentication

Jenkins authentication is used by default if the image is run directly, without using a template.

The first time Jenkins starts, the configuration is created along with the administrator user and password. The default user credentials are **admin** and **password**. Configure the default password by setting the **JENKINS_PASSWORD** environment variable when using, and only when using, standard Jenkins authentication.

Procedure

- Create a Jenkins application that uses standard Jenkins authentication by entering the following command:

```
$ oc new-app -e \
  JENKINS_PASSWORD=<password> \
  ocp-tools-4/jenkins-rhel8
```

1.2. JENKINS ENVIRONMENT VARIABLES

The Jenkins server can be configured with the following environment variables:

Variable	Definition	Example values and settings
OPENSIFT_ENABLE_OAUTH	Determines whether the OpenShift Dedicated Login plugin manages authentication when logging in to Jenkins. To enable, set to true .	Default: false
JENKINS_PASSWORD	The password for the admin user when using standard Jenkins authentication. Not applicable when OPENSIFT_ENABLE_OAUTH is set to true .	Default: password
JAVA_MAX_HEAP_PARAMETER, CONTAINER_HEAP_PERCENT, JENKINS_MAX_HEAP_UPPER_BOUND_MB	<p>These values control the maximum heap size of the Jenkins JVM. If JAVA_MAX_HEAP_PARAMETER is set, its value takes precedence. Otherwise, the maximum heap size is dynamically calculated as CONTAINER_HEAP_PERCENT of the container memory limit, optionally capped at JENKINS_MAX_HEAP_UPPER_BOUND_MB MiB.</p> <p>By default, the maximum heap size of the Jenkins JVM is set to 50% of the container memory limit with no cap.</p>	<p>JAVA_MAX_HEAP_PARAMETER example setting: -Xmx512m</p> <p>CONTAINER_HEAP_PERCENT default: 0.5, or 50%</p> <p>JENKINS_MAX_HEAP_UPPER_BOUND_MB example setting: 512 MiB</p>

Variable	Definition	Example values and settings
JAVA_INITIAL_HEAP_PARAMETER, CONTAINER_INITIAL_PERCENT	<p>These values control the initial heap size of the Jenkins JVM. If JAVA_INITIAL_HEAP_PARAMETER is set, its value takes precedence. Otherwise, the initial heap size is dynamically calculated as CONTAINER_INITIAL_PERCENT of the dynamically calculated maximum heap size.</p> <p>By default, the JVM sets the initial heap size.</p>	<p>JAVA_INITIAL_HEAP_PARAMETER example setting: -Xms32m</p> <p>CONTAINER_INITIAL_PERCENT example setting: 0.1, or 10%</p>
CONTAINER_CORE_LIMIT	If set, specifies an integer number of cores used for sizing numbers of internal JVM threads.	Example setting: 2
JAVA_TOOL_OPTIONS	Specifies options to apply to all JVMs running in this container. It is not recommended to override this value.	Default: - XX:+UnlockExperimentalVMOptions - XX:+UseCGroupMemoryLimitForHeap - Dsun.zip.disableMemoryMapping=true
JAVA_GC_OPTS	Specifies Jenkins JVM garbage collection parameters. It is not recommended to override this value.	Default: - XX:+UseParallelGC - XX:MinHeapFreeRatio=5 - XX:MaxHeapFreeRatio=10 - XX:GCTimeRatio=4 - XX:AdaptiveSizePolicyWeight=90
JENKINS_JAVA_OVERRIDES	Specifies additional options for the Jenkins JVM. These options are appended to all other options, including the Java options above, and may be used to override any of them if necessary. Separate each additional option with a space; if any option contains space characters, escape them with a backslash.	Example settings: -Dfoo -Dbar; -Dfoo=first\ value -Dbar=second\ value.
JENKINS_OPTS	Specifies arguments to Jenkins.	

Variable	Definition	Example values and settings
INSTALL_PLUGINS	Specifies additional Jenkins plugins to install when the container is first run or when OVERWRITE_PV_PLUGINS_WITH_IMAGE_PLUGINS is set to true . Plugins are specified as a comma-delimited list of name:version pairs.	Example setting: git:3.7.0,subversion:2.10.2
OPENSIFT_PERMISSIONS_POLL_INTERVAL	Specifies the interval in milliseconds that the OpenShift Dedicated Login plugin polls OpenShift Dedicated for the permissions that are associated with each user that is defined in Jenkins.	Default: 300000 - 5 minutes
OVERWRITE_PV_CONFIG_WITH_IMAGE_CONFIG	When running this image with an OpenShift Dedicated persistent volume (PV) for the Jenkins configuration directory, the transfer of configuration from the image to the PV is performed only the first time the image starts because the PV is assigned when the persistent volume claim (PVC) is created. If you create a custom image that extends this image and updates the configuration in the custom image after the initial startup, the configuration is not copied over unless you set this environment variable to true .	Default: false
OVERWRITE_PV_PLUGINS_WITH_IMAGE_PLUGINS	When running this image with an OpenShift Dedicated PV for the Jenkins configuration directory, the transfer of plugins from the image to the PV is performed only the first time the image starts because the PV is assigned when the PVC is created. If you create a custom image that extends this image and updates plugins in the custom image after the initial startup, the plugins are not copied over unless you set this environment variable to true .	Default: false

Variable	Definition	Example values and settings
ENABLE_FATAL_ERROR_LOG_FILE	When running this image with an OpenShift Dedicated PVC for the Jenkins configuration directory, this environment variable allows the fatal error log file to persist when a fatal error occurs. The fatal error file is saved at /var/lib/jenkins/logs .	Default: false
AGENT_BASE_IMAGE	Setting this value overrides the image used for the jnlp container in the sample Kubernetes plugin pod templates provided with this image. Otherwise, the image from the jenkins-agent-base-rhel8:latest image stream tag in the openshift namespace is used.	Default: image-registry.openshift-image-registry.svc:5000/openshift/jenkins-agent-base-rhel8:latest
JAVA_BUILDER_IMAGE	Setting this value overrides the image used for the java-builder container in the java-builder sample Kubernetes plugin pod templates provided with this image. Otherwise, the image from the java:latest image stream tag in the openshift namespace is used.	Default: image-registry.openshift-image-registry.svc:5000/openshift/java:latest
JAVA_FIPS_OPTIONS	Setting this value controls how the JVM operates when running on a FIPS node. For more information, see Configure Red Hat build of OpenJDK 11 in FIPS mode .	Default: - Dcom.redhat.fips=false

1.3. PROVIDING JENKINS CROSS PROJECT ACCESS

If you are going to run Jenkins somewhere other than your same project, you must provide an access token to Jenkins to access your project.

Procedure

1. Identify the secret for the service account that has appropriate permissions to access the project that Jenkins must access by entering the following command:

```
$ oc describe serviceaccount jenkins
```

Example output

```
-
```

```
Name:    default
Labels:  <none>
Secrets: { jenkins-token-uyswp  }
         { jenkins-dockercfg-xcr3d }
Tokens:  jenkins-token-izv1u
         jenkins-token-uyswp
```

In this case the secret is named **jenkins-token-uyswp**.

- Retrieve the token from the secret by entering the following command:

```
$ oc describe secret <secret name from above>
```

Example output

```
Name:    jenkins-token-uyswp
Labels:  <none>
Annotations:  kubernetes.io/service-account.name=jenkins,kubernetes.io/service-
account.uid=32f5b661-2a8f-11e5-9528-3c970e3bf0b7
Type:  kubernetes.io/service-account-token
Data
====
ca.crt: 1066 bytes
token: eyJhbGc..<content cut>....wRA
```

The token parameter contains the token value Jenkins requires to access the project.

1.4. JENKINS CROSS VOLUME MOUNT POINTS

The Jenkins image can be run with mounted volumes to enable persistent storage for the configuration:

- /var/lib/jenkins** is the data directory where Jenkins stores configuration files, including job definitions.

1.5. CUSTOMIZING THE JENKINS IMAGE THROUGH SOURCE-TO-IMAGE

To customize the official OpenShift Dedicated Jenkins image, you can use the image as a source-to-image (S2I) builder.

You can use S2I to copy your custom Jenkins jobs definitions, add additional plugins, or replace the provided **config.xml** file with your own, custom, configuration.

To include your modifications in the Jenkins image, you must have a Git repository with the following directory structure:

plugins

This directory contains those binary Jenkins plugins you want to copy into Jenkins.

plugins.txt

This file lists the plugins you want to install using the following syntax:

```
pluginId:pluginVersion
```

configuration/jobs

This directory contains the Jenkins job definitions.

configuration/config.xml

This file contains your custom Jenkins configuration.

The contents of the **configuration/** directory is copied to the **/var/lib/jenkins/** directory, so you can also include additional files, such as **credentials.xml**, there.

Sample build configuration to customize the Jenkins image in OpenShift Dedicated

```
apiVersion: build.openshift.io/v1
kind: BuildConfig
metadata:
  name: custom-jenkins-build
spec:
  source: 1
    git:
      uri: https://github.com/custom/repository
      type: Git
  strategy: 2
    sourceStrategy:
      from:
        kind: ImageStreamTag
        name: jenkins:2
        namespace: openshift
      type: Source
  output: 3
    to:
      kind: ImageStreamTag
      name: custom-jenkins:latest
```

- 1** The **source** parameter defines the source Git repository with the layout described above.
- 2** The **strategy** parameter defines the original Jenkins image to use as a source image for the build.
- 3** The **output** parameter defines the resulting, customized Jenkins image that you can use in deployment configurations instead of the official Jenkins image.

1.6. CONFIGURING THE JENKINS KUBERNETES PLUGIN

The OpenShift Jenkins image includes the preinstalled [Kubernetes plugin for Jenkins](#) so that Jenkins agents can be dynamically provisioned on multiple container hosts using Kubernetes and OpenShift Dedicated.

To use the Kubernetes plugin, OpenShift Dedicated provides an OpenShift Agent Base image that is suitable for use as a Jenkins agent.



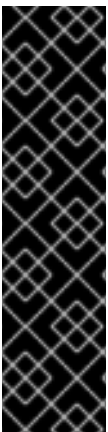
IMPORTANT

OpenShift Dedicated 4.11 moves the OpenShift Jenkins and OpenShift Agent Base images to the **ocp-tools-4** repository at **registry.redhat.io** so that Red Hat can produce and update the images outside the OpenShift Dedicated lifecycle. Previously, these images were in the OpenShift Dedicated install payload and the **openshift4** repository at **registry.redhat.io**.

The OpenShift Jenkins Maven and NodeJS Agent images were removed from the OpenShift Dedicated 4.11 payload. Red Hat no longer produces these images, and they are not available from the **ocp-tools-4** repository at **registry.redhat.io**. Red Hat maintains the 4.10 and earlier versions of these images for any significant bug fixes or security CVEs, following the [OpenShift Dedicated lifecycle policy](#).

For more information, see the "Important changes to OpenShift Jenkins images" link in the following "Additional resources" section.

The Maven and Node.js agent images are automatically configured as Kubernetes pod template images within the OpenShift Dedicated Jenkins image configuration for the Kubernetes plugin. That configuration includes labels for each image that you can apply to any of your Jenkins jobs under their **Restrict where this project can be run** setting. If the label is applied, jobs run under an OpenShift Dedicated pod running the respective agent image.



IMPORTANT

In OpenShift Dedicated 4.10 and later, the recommended pattern for running Jenkins agents using the Kubernetes plugin is to use pod templates with both **jnlp** and **sidecar** containers. The **jnlp** container uses the OpenShift Dedicated Jenkins Base agent image to facilitate launching a separate pod for your build. The **sidecar** container image has the tools needed to build in a particular language within the separate pod that was launched. Many container images from the Red Hat Container Catalog are referenced in the sample image streams in the **openshift** namespace. The OpenShift Dedicated Jenkins image has a pod template named **java-build** with sidecar containers that demonstrate this approach. This pod template uses the latest Java version provided by the **java** image stream in the **openshift** namespace.

The Jenkins image also provides auto-discovery and auto-configuration of additional agent images for the Kubernetes plugin.

With the OpenShift Dedicated sync plugin, on Jenkins startup, the Jenkins image searches within the project it is running, or the projects listed in the plugin's configuration, for the following items:

- Image streams with the **role** label set to **jenkins-agent**.
- Image stream tags with the **role** annotation set to **jenkins-agent**.
- Config maps with the **role** label set to **jenkins-agent**.

When the Jenkins image finds an image stream with the appropriate label, or an image stream tag with the appropriate annotation, it generates the corresponding Kubernetes plugin configuration. This way, you can assign your Jenkins jobs to run in a pod running the container image provided by the image stream.

The name and image references of the image stream, or image stream tag, are mapped to the name and image fields in the Kubernetes plugin pod template. You can control the label field of the Kubernetes plugin pod template by setting an annotation on the image stream, or image stream tag

object, with the key **agent-label**. Otherwise, the name is used as the label.



NOTE

Do not log in to the Jenkins console and change the pod template configuration. If you do so after the pod template is created, and the OpenShift Dedicated Sync plugin detects that the image associated with the image stream or image stream tag has changed, it replaces the pod template and overwrites those configuration changes. You cannot merge a new configuration with the existing configuration.

Consider the config map approach if you have more complex configuration needs.

When it finds a config map with the appropriate label, the Jenkins image assumes that any values in the key-value data payload of the config map contain Extensible Markup Language (XML) consistent with the configuration format for Jenkins and the Kubernetes plugin pod templates. One key advantage of config maps over image streams and image stream tags is that you can control all the Kubernetes plugin pod template parameters.

Sample config map for jenkins-agent

```
kind: ConfigMap
apiVersion: v1
metadata:
  name: jenkins-agent
  labels:
    role: jenkins-agent
data:
  template1: |-
    <org.csanchez.jenkins.plugins.kubernetes.PodTemplate>
    <inheritFrom></inheritFrom>
    <name>template1</name>
    <instanceCap>2147483647</instanceCap>
    <idleMinutes>0</idleMinutes>
    <label>template1</label>
    <serviceAccount>jenkins</serviceAccount>
    <nodeSelector></nodeSelector>
    <volumes/>
    <containers>
    <org.csanchez.jenkins.plugins.kubernetes.ContainerTemplate>
    <name>jnlp</name>
    <image>openshift/jenkins-agent-maven-35-centos7:v3.10</image>
    <privileged>>false</privileged>
    <alwaysPullImage>>true</alwaysPullImage>
    <workingDir>/tmp</workingDir>
    <command></command>
    <args>${computer.jnlpMac} ${computer.name}</args>
    <ttyEnabled>>false</ttyEnabled>
    <resourceRequestCpu></resourceRequestCpu>
    <resourceRequestMemory></resourceRequestMemory>
    <resourceLimitCpu></resourceLimitCpu>
    <resourceLimitMemory></resourceLimitMemory>
    <envVars/>
    </org.csanchez.jenkins.plugins.kubernetes.ContainerTemplate>
    </containers>
    <envVars/>
```



```

<annotations/>
<imagePullSecrets/>
<nodeProperties/>
</org.csanchez.jenkins.plugins.kubernetes.PodTemplate>

```

The following example shows two containers that reference image streams in the **openshift** namespace. One container handles the JNLP contract for launching Pods as Jenkins Agents. The other container uses an image with tools for building code in a particular coding language:

```

kind: ConfigMap
apiVersion: v1
metadata:
  name: jenkins-agent
  labels:
    role: jenkins-agent
data:
  template2: |-
    <org.csanchez.jenkins.plugins.kubernetes.PodTemplate>
      <inheritFrom></inheritFrom>
      <name>template2</name>
      <instanceCap>2147483647</instanceCap>
      <idleMinutes>0</idleMinutes>
      <label>template2</label>
      <serviceAccount>jenkins</serviceAccount>
      <nodeSelector></nodeSelector>
      <volumes/>
      <containers>
        <org.csanchez.jenkins.plugins.kubernetes.ContainerTemplate>
          <name>jnlp</name>
          <image>image-registry.openshift-image-registry.svc:5000/openshift/jenkins-agent-base-
rhel8:latest</image>
          <privileged>>false</privileged>
          <alwaysPullImage>>true</alwaysPullImage>
          <workingDir>/home/jenkins/agent</workingDir>
          <command></command>
          <args>$(JENKINS_SECRET) \$(JENKINS_NAME)</args>
          <ttyEnabled>>false</ttyEnabled>
          <resourceRequestCpu></resourceRequestCpu>
          <resourceRequestMemory></resourceRequestMemory>
          <resourceLimitCpu></resourceLimitCpu>
          <resourceLimitMemory></resourceLimitMemory>
          <envVars/>
        </org.csanchez.jenkins.plugins.kubernetes.ContainerTemplate>
        <org.csanchez.jenkins.plugins.kubernetes.ContainerTemplate>
          <name>java</name>
          <image>image-registry.openshift-image-registry.svc:5000/openshift/java:latest</image>
          <privileged>>false</privileged>
          <alwaysPullImage>>true</alwaysPullImage>
          <workingDir>/home/jenkins/agent</workingDir>
          <command>cat</command>
          <args></args>
          <ttyEnabled>>true</ttyEnabled>
          <resourceRequestCpu></resourceRequestCpu>
          <resourceRequestMemory></resourceRequestMemory>
          <resourceLimitCpu></resourceLimitCpu>
          <resourceLimitMemory></resourceLimitMemory>

```

```

    <envVars/>
  </org.csanchez.jenkins.plugins.kubernetes.ContainerTemplate>
</containers>
<envVars/>
<annotations/>
<imagePullSecrets/>
<nodeProperties/>
</org.csanchez.jenkins.plugins.kubernetes.PodTemplate>

```



NOTE

Do not log in to the Jenkins console and change the pod template configuration. If you do so after the pod template is created, and the OpenShift Dedicated Sync plugin detects that the image associated with the image stream or image stream tag has changed, it replaces the pod template and overwrites those configuration changes. You cannot merge a new configuration with the existing configuration.

Consider the config map approach if you have more complex configuration needs.

After it is installed, the OpenShift Dedicated Sync plugin monitors the API server of OpenShift Dedicated for updates to image streams, image stream tags, and config maps and adjusts the configuration of the Kubernetes plugin.

The following rules apply:

- Removing the label or annotation from the config map, image stream, or image stream tag deletes any existing **PodTemplate** from the configuration of the Kubernetes plugin.
- If those objects are removed, the corresponding configuration is removed from the Kubernetes plugin.
- If you create appropriately labeled or annotated **ConfigMap**, **ImageStream**, or **ImageStreamTag** objects, or add labels after their initial creation, this results in the creation of a **PodTemplate** in the Kubernetes-plugin configuration.
- In the case of the **PodTemplate** by config map form, changes to the config map data for the **PodTemplate** are applied to the **PodTemplate** settings in the Kubernetes plugin configuration. The changes also override any changes that were made to the **PodTemplate** through the Jenkins UI between changes to the config map.

To use a container image as a Jenkins agent, the image must run the agent as an entry point. For more details, see the official [Jenkins documentation](#).

Additional resources

- [Important changes to OpenShift Jenkins images](#)

1.7. JENKINS PERMISSIONS

If in the config map the **<serviceAccount>** element of the pod template XML is the OpenShift Dedicated service account used for the resulting pod, the service account credentials are mounted into the pod. The permissions are associated with the service account and control which operations against the OpenShift Dedicated master are allowed from the pod.

Consider the following scenario with service accounts used for the pod, which is launched by the Kubernetes Plugin that runs in the OpenShift Dedicated Jenkins image.

If you use the example template for Jenkins that is provided by OpenShift Dedicated, the **jenkins** service account is defined with the **edit** role for the project Jenkins runs in, and the master Jenkins pod has that service account mounted.

The two default Maven and NodeJS pod templates that are injected into the Jenkins configuration are also set to use the same service account as the Jenkins master.

- Any pod templates that are automatically discovered by the OpenShift Dedicated sync plugin because their image streams or image stream tags have the required label or annotations are configured to use the Jenkins master service account as their service account.
- For the other ways you can provide a pod template definition into Jenkins and the Kubernetes plugin, you have to explicitly specify the service account to use. Those other ways include the Jenkins console, the **podTemplate** pipeline DSL that is provided by the Kubernetes plugin, or labeling a config map whose data is the XML configuration for a pod template.
- If you do not specify a value for the service account, the **default** service account is used.
- Ensure that whatever service account is used has the necessary permissions, roles, and so on defined within OpenShift Dedicated to manipulate whatever projects you choose to manipulate from the within the pod.

1.8. CREATING A JENKINS SERVICE FROM A TEMPLATE

Templates provide parameter fields to define all the environment variables with predefined default values. OpenShift Dedicated provides templates to make creating a new Jenkins service easy. The Jenkins templates should be registered in the default **openshift** project by your cluster administrator during the initial cluster setup.

The two available templates both define deployment configuration and a service. The templates differ in their storage strategy, which affects whether the Jenkins content persists across a pod restart.



NOTE

A pod might be restarted when it is moved to another node or when an update of the deployment configuration triggers a redeployment.

- **jenkins-ephemeral** uses ephemeral storage. On pod restart, all data is lost. This template is only useful for development or testing.
- **jenkins-persistent** uses a Persistent Volume (PV) store. Data survives a pod restart.

To use a PV store, the cluster administrator must define a PV pool in the OpenShift Dedicated deployment.

After you select which template you want, you must instantiate the template to be able to use Jenkins.

Procedure

- Create a new Jenkins application using one of the following methods:
 - A PV:

```
$ oc new-app jenkins-persistent
```

- Or an **emptyDir** type volume where configuration does not persist across pod restarts:

```
$ oc new-app jenkins-ephemeral
```

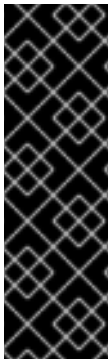
With both templates, you can run **oc describe** on them to see all the parameters available for overriding.

For example:

```
$ oc describe jenkins-ephemeral
```

1.9. USING THE JENKINS KUBERNETES PLUGIN

In the following example, the **openshift-jee-sample BuildConfig** object causes a Jenkins Maven agent pod to be dynamically provisioned. The pod clones some Java source code, builds a WAR file, and causes a second **BuildConfig, openshift-jee-sample-docker** to run. The second **BuildConfig** layers the new WAR file into a container image.



IMPORTANT

OpenShift Dedicated 4.11 removed the OpenShift Jenkins Maven and NodeJS Agent images from its payload. Red Hat no longer produces these images, and they are not available from the **ocp-tools-4** repository at **registry.redhat.io**. Red Hat maintains the 4.10 and earlier versions of these images for any significant bug fixes or security CVEs, following the [OpenShift Dedicated lifecycle policy](#).

For more information, see the "Important changes to OpenShift Jenkins images" link in the following "Additional resources" section.

Sample BuildConfig that uses the Jenkins Kubernetes plugin

```
kind: List
apiVersion: v1
items:
- kind: ImageStream
  apiVersion: image.openshift.io/v1
  metadata:
    name: openshift-jee-sample
- kind: BuildConfig
  apiVersion: build.openshift.io/v1
  metadata:
    name: openshift-jee-sample-docker
  spec:
    strategy:
      type: Docker
    source:
      type: Docker
      dockerfile: |-
        FROM openshift/wildfly-101-centos7:latest
        COPY ROOT.war /wildfly/standalone/deployments/ROOT.war
        CMD $STI_SCRIPTS_PATH/run
    binary:
```

```

    asFile: ROOT.war
  output:
    to:
      kind: ImageStreamTag
      name: openshift-jee-sample:latest
- kind: BuildConfig
  apiVersion: build.openshift.io/v1
  metadata:
    name: openshift-jee-sample
  spec:
    strategy:
      type: JenkinsPipeline
      jenkinsPipelineStrategy:
        jenkinsfile: |-
          node("maven") {
            sh "git clone https://github.com/openshift/openshift-jee-sample.git ."
            sh "mvn -B -Popenshift package"
            sh "oc start-build -F openshift-jee-sample-docker --from-file=target/ROOT.war"
          }
    triggers:
      - type: ConfigChange

```

It is also possible to override the specification of the dynamically created Jenkins agent pod. The following is a modification to the preceding example, which overrides the container memory and specifies an environment variable.

Sample BuildConfig that uses the Jenkins Kubernetes plugin, specifying memory limit and environment variable

```

kind: BuildConfig
apiVersion: build.openshift.io/v1
metadata:
  name: openshift-jee-sample
spec:
  strategy:
    type: JenkinsPipeline
    jenkinsPipelineStrategy:
      jenkinsfile: |-
        podTemplate(label: "mypod", 1
          cloud: "openshift", 2
          inheritFrom: "maven", 3
          containers: [
            containerTemplate(name: "jnlp", 4
              image: "openshift/jenkins-agent-maven-35-centos7:v3.10", 5
              resourceRequestMemory: "512Mi", 6
              resourceLimitMemory: "512Mi", 7
              envVars: [
                envVar(key: "CONTAINER_HEAP_PERCENT", value: "0.25") 8
              ]
            ]) {
          node("mypod") { 9
            sh "git clone https://github.com/openshift/openshift-jee-sample.git ."
            sh "mvn -B -Popenshift package"
            sh "oc start-build -F openshift-jee-sample-docker --from-file=target/ROOT.war"

```

```

    }
  }
  triggers:
  - type: ConfigChange

```

- 1 A new pod template called **mypod** is defined dynamically. The new pod template name is referenced in the node stanza.
- 2 The **cloud** value must be set to **openshift**.
- 3 The new pod template can inherit its configuration from an existing pod template. In this case, inherited from the Maven pod template that is pre-defined by OpenShift Dedicated.
- 4 This example overrides values in the pre-existing container, and must be specified by name. All Jenkins agent images shipped with OpenShift Dedicated use the Container name **jnlp**.
- 5 Specify the container image name again. This is a known issue.
- 6 A memory request of **512 Mi** is specified.
- 7 A memory limit of **512 Mi** is specified.
- 8 An environment variable **CONTAINER_HEAP_PERCENT**, with value **0.25**, is specified.
- 9 The node stanza references the name of the defined pod template.

By default, the pod is deleted when the build completes. This behavior can be modified with the plugin or within a pipeline Jenkinsfile.

Upstream Jenkins has more recently introduced a YAML declarative format for defining a **podTemplate** pipeline DSL in-line with your pipelines. An example of this format, using the sample **java-builder** pod template that is defined in the OpenShift Dedicated Jenkins image:

```

def nodeLabel = 'java-buidler'

pipeline {
  agent {
    kubernetes {
      cloud 'openshift'
      label nodeLabel
      yml """
apiVersion: v1
kind: Pod
metadata:
  labels:
    worker: ${nodeLabel}
spec:
  containers:
  - name: jnlp
    image: image-registry.openshift-image-registry.svc:5000/openshift/jenkins-agent-base-rhel8:latest
    args: ["$(JENKINS_SECRET)", "$(JENKINS_NAME)"]
  - name: java
    image: image-registry.openshift-image-registry.svc:5000/openshift/java:latest
  command:
  - cat
  tty: true
      """
    }
  }
}

```

```

"""
}
}

options {
  timeout(time: 20, unit: 'MINUTES')
}

stages {
  stage('Build App') {
    steps {
      container("java") {
        sh "mvn --version"
      }
    }
  }
}
}
}
}

```

Additional resources

- [Important changes to OpenShift Jenkins images](#)

1.10. JENKINS MEMORY REQUIREMENTS

When deployed by the provided Jenkins Ephemeral or Jenkins Persistent templates, the default memory limit is **1 Gi**.

By default, all other process that run in the Jenkins container cannot use more than a total of **512 MiB** of memory. If they require more memory, the container halts. It is therefore highly recommended that pipelines run external commands in an agent container wherever possible.

And if **Project** quotas allow for it, see recommendations from the Jenkins documentation on what a Jenkins master should have from a memory perspective. Those recommendations proscribe to allocate even more memory for the Jenkins master.

It is recommended to specify memory request and limit values on agent containers created by the Jenkins Kubernetes plugin. Admin users can set default values on a per-agent image basis through the Jenkins configuration. The memory request and limit parameters can also be overridden on a per-container basis.

You can increase the amount of memory available to Jenkins by overriding the **MEMORY_LIMIT** parameter when instantiating the Jenkins Ephemeral or Jenkins Persistent template.

1.11. ADDITIONAL RESOURCES

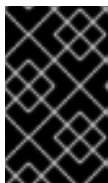
- [Important changes to OpenShift Jenkins images](#)

CHAPTER 2. JENKINS AGENT

OpenShift Dedicated provides a base image for use as a Jenkins agent.

The Base image for Jenkins agents does the following:

- Pulls in both the required tools, headless Java, the Jenkins JNLP client, and the useful ones, including **git**, **tar**, **zip**, and **nss**, among others.
- Establishes the JNLP agent as the entry point.
- Includes the **oc** client tool for invoking command line operations from within Jenkins jobs.
- Provides Dockerfiles for both Red Hat Enterprise Linux (RHEL) and **localdev** images.



IMPORTANT

Use a version of the agent image that is appropriate for your OpenShift Dedicated release version. Embedding an **oc** client version that is not compatible with the OpenShift Dedicated version can cause unexpected behavior.

The OpenShift Dedicated Jenkins image also defines the following sample **java-builder** pod template to illustrate how you can use the agent image with the Jenkins Kubernetes plugin.

The **java-builder** pod template employs two containers:

- A **jnlp** container that uses the OpenShift Dedicated Base agent image and handles the JNLP contract for starting and stopping Jenkins agents.
- A **java** container that uses the **java** OpenShift Dedicated Sample ImageStream, which contains the various Java binaries, including the Maven binary **mvn**, for building code.

2.1. JENKINS AGENT IMAGES

The OpenShift Dedicated Jenkins agent images are available on [Quay.io](https://quay.io) or registry.redhat.io.

Jenkins images are available through the Red Hat Registry:

```
$ docker pull registry.redhat.io/ocp-tools-4/jenkins-rhel8:<image_tag>
```

```
$ docker pull registry.redhat.io/ocp-tools-4/jenkins-agent-base-rhel8:<image_tag>
```

To use these images, you can either access them directly from [Quay.io](https://quay.io) or registry.redhat.io or push them into your OpenShift Dedicated container image registry.

2.2. JENKINS AGENT ENVIRONMENT VARIABLES

Each Jenkins agent container can be configured with the following environment variables.

Variable	Definition	Example values and settings
JAVA_MAX_HEAP_PARAM, CONTAINER_HEAP_PERCENT, JENKINS_MAX_HEAP_UPPER_BOUND_MB	<p>These values control the maximum heap size of the Jenkins JVM. If JAVA_MAX_HEAP_PARAM is set, its value takes precedence. Otherwise, the maximum heap size is dynamically calculated as CONTAINER_HEAP_PERCENT of the container memory limit, optionally capped at JENKINS_MAX_HEAP_UPPER_BOUND_MB MiB.</p> <p>By default, the maximum heap size of the Jenkins JVM is set to 50% of the container memory limit with no cap.</p>	<p>JAVA_MAX_HEAP_PARAM example setting: -Xmx512m</p> <p>CONTAINER_HEAP_PERCENT default: 0.5, or 50%</p> <p>JENKINS_MAX_HEAP_UPPER_BOUND_MB example setting: 512 MiB</p>
JAVA_INITIAL_HEAP_PARAM, CONTAINER_INITIAL_PERCENT	<p>These values control the initial heap size of the Jenkins JVM. If JAVA_INITIAL_HEAP_PARAM is set, its value takes precedence. Otherwise, the initial heap size is dynamically calculated as CONTAINER_INITIAL_PERCENT of the dynamically calculated maximum heap size.</p> <p>By default, the JVM sets the initial heap size.</p>	<p>JAVA_INITIAL_HEAP_PARAM example setting: -Xms32m</p> <p>CONTAINER_INITIAL_PERCENT example setting: 0.1, or 10%</p>
CONTAINER_CORE_LIMIT	<p>If set, specifies an integer number of cores used for sizing numbers of internal JVM threads.</p>	<p>Example setting: 2</p>
JAVA_TOOL_OPTIONS	<p>Specifies options to apply to all JVMs running in this container. It is not recommended to override this value.</p>	<p>Default: - XX:+UnlockExperimentalVMOptions - XX:+UseCGroupMemoryLimitForHeap - Dsun.zip.disableMemoryMapping=true</p>

Variable	Definition	Example values and settings
JAVA_GC_OPTS	Specifies Jenkins JVM garbage collection parameters. It is not recommended to override this value.	Default: -XX:+UseParallelGC -XX:MinHeapFreeRatio=5 -XX:MaxHeapFreeRatio=10 -XX:GCTimeRatio=4 -XX:AdaptiveSizePolicyWeight=90
JENKINS_JAVA_OVERRIDES	Specifies additional options for the Jenkins JVM. These options are appended to all other options, including the Java options above, and can be used to override any of them, if necessary. Separate each additional option with a space and if any option contains space characters, escape them with a backslash.	Example settings: -Dfoo -Dbar; -Dfoo=first\ value -Dbar=second\ value
USE_JAVA_VERSION	Specifies the version of Java version to use to run the agent in its container. The container base image has two versions of java installed: java-11 and java-1.8.0 . If you extend the container base image, you can specify any alternative version of java using its associated suffix.	The default value is java-11 . Example setting: java-1.8.0

2.3. JENKINS AGENT MEMORY REQUIREMENTS

A JVM is used in all Jenkins agents to host the Jenkins JNLP agent as well as to run any Java applications such as **javac**, Maven, or Gradle.

By default, the Jenkins JNLP agent JVM uses 50% of the container memory limit for its heap. This value can be modified by the **CONTAINER_HEAP_PERCENT** environment variable. It can also be capped at an upper limit or overridden entirely.

By default, any other processes run in the Jenkins agent container, such as shell scripts or **oc** commands run from pipelines, cannot use more than the remaining 50% memory limit without provoking an OOM kill.

By default, each further JVM process that runs in a Jenkins agent container uses up to 25% of the container memory limit for its heap. It might be necessary to tune this limit for many build workloads.

2.4. JENKINS AGENT GRADLE BUILDS

Hosting Gradle builds in the Jenkins agent on OpenShift Dedicated presents additional complications because in addition to the Jenkins JNLP agent and Gradle JVMs, Gradle spawns a third JVM to run tests if they are specified.

The following settings are suggested as a starting point for running Gradle builds in a memory constrained Jenkins agent on OpenShift Dedicated. You can modify these settings as required.

- Ensure the long-lived Gradle daemon is disabled by adding **org.gradle.daemon=false** to the **gradle.properties** file.
- Disable parallel build execution by ensuring **org.gradle.parallel=true** is not set in the **gradle.properties** file and that **--parallel** is not set as a command line argument.
- To prevent Java compilations running out-of-process, set **java { options.fork = false }** in the **build.gradle** file.
- Disable multiple additional test processes by ensuring **test { maxParallelForks = 1 }** is set in the **build.gradle** file.
- Override the Gradle JVM memory parameters by the **GRADLE_OPTS**, **JAVA_OPTS** or **JAVA_TOOL_OPTIONS** environment variables.
- Set the maximum heap size and JVM arguments for any Gradle test JVM by defining the **maxHeapSize** and **jvmArgs** settings in **build.gradle**, or through the **-Dorg.gradle.jvmargs** command line argument.

2.5. JENKINS AGENT POD RETENTION

Jenkins agent pods, are deleted by default after the build completes or is stopped. This behavior can be changed by the Kubernetes plugin pod retention setting. Pod retention can be set for all Jenkins builds, with overrides for each pod template. The following behaviors are supported:

- **Always** keeps the build pod regardless of build result.
- **Default** uses the plugin value, which is the pod template only.
- **Never** always deletes the pod.
- **On Failure** keeps the pod if it fails during the build.

You can override pod retention in the pipeline Jenkinsfile:

```
podTemplate(label: "mypod",
  cloud: "openshift",
  inheritFrom: "maven",
  podRetention: onFailure(), 1
  containers: [
    ...
  ]) {
  node("mypod") {
    ...
  }
}
```

- 1** Allowed values for **podRetention** are **never()**, **onFailure()**, **always()**, and **default()**.



WARNING

Pods that are kept might continue to run and count against resource quotas.

CHAPTER 3. IMPORTANT CHANGES TO OPENSIFT JENKINS IMAGES

OpenShift Dedicated 4.11 moves the OpenShift Jenkins and OpenShift Agent Base images to the **ocp-tools-4** repository at **registry.redhat.io**. It also removes the OpenShift Jenkins Maven and NodeJS Agent images from its payload:

- OpenShift Dedicated 4.11 moves the OpenShift Jenkins and OpenShift Agent Base images to the **ocp-tools-4** repository at **registry.redhat.io** so that Red Hat can produce and update the images outside the OpenShift Dedicated lifecycle. Previously, these images were in the OpenShift Dedicated install payload and the **openshift4** repository at **registry.redhat.io**.
- OpenShift Dedicated 4.10 deprecated the OpenShift Jenkins Maven and NodeJS Agent images. OpenShift Dedicated 4.11 removes these images from its payload. Red Hat no longer produces these images, and they are not available from the **ocp-tools-4** repository at **registry.redhat.io**. Red Hat maintains the 4.10 and earlier versions of these images for any significant bug fixes or security CVEs, following the [OpenShift Dedicated lifecycle policy](#).

These changes support the OpenShift Dedicated 4.10 recommendation to use [multiple container Pod Templates with the Jenkins Kubernetes Plugin](#).

3.1. RELOCATION OF OPENSIFT JENKINS IMAGES

OpenShift Dedicated 4.11 makes significant changes to the location and availability of specific OpenShift Jenkins images. Additionally, you can configure when and how to update these images.

What stays the same with the OpenShift Jenkins images?

- The Cluster Samples Operator manages the **ImageStream** and **Template** objects for operating the OpenShift Jenkins images.
- By default, the Jenkins **DeploymentConfig** object from the Jenkins pod template triggers a redeployment when the Jenkins image changes. By default, this image is referenced by the **jenkins:2** image stream tag of Jenkins image stream in the **openshift** namespace in the **ImageStream** YAML file in the Samples Operator payload.
- If you upgrade from OpenShift Dedicated 4.10 and earlier to 4.11, the deprecated **maven** and **nodejs** pod templates are still in the default image configuration.
- If you upgrade from OpenShift Dedicated 4.10 and earlier to 4.11, the **jenkins-agent-maven** and **jenkins-agent-nodejs** image streams still exist in your cluster. To maintain these image streams, see the following section, "What happens with the **jenkins-agent-maven** and **jenkins-agent-nodejs** image streams in the **openshift** namespace?"

What changes in the support matrix of the OpenShift Jenkins image?

Each new image in the **ocp-tools-4** repository in the **registry.redhat.io** registry supports multiple versions of OpenShift Dedicated. When Red Hat updates one of these new images, it is simultaneously available for all versions. This availability is ideal when Red Hat updates an image in response to a security advisory. Initially, this change applies to OpenShift Dedicated 4.11 and later. It is planned that this change will eventually apply to OpenShift Dedicated 4.9 and later.

Previously, each Jenkins image supported only one version of OpenShift Dedicated and Red Hat might update those images sequentially over time.

What additions are there with the OpenShift Jenkins and Jenkins Agent Base ImageStream and ImageStreamTag objects?

By moving from an in-payload image stream to an image stream that references non-payload images, OpenShift Dedicated can define additional image stream tags. Red Hat has created a series of new image stream tags to go along with the existing **"value": "jenkins:2"** and **"value": "image-registry.openshift-image-registry.svc:5000/openshift/jenkins-agent-base-rhel8:latest"** image stream tags present in OpenShift Dedicated 4.10 and earlier. These new image stream tags address some requests to improve how the Jenkins-related image streams are maintained.

About the new image stream tags:

ocp-upgrade-redeploy

To update your Jenkins image when you upgrade OpenShift Dedicated, use this image stream tag in your Jenkins deployment configuration. This image stream tag corresponds to the existing **2** image stream tag of the **jenkins** image stream and the **latest** image stream tag of the **jenkins-agent-base-rhel8** image stream. It employs an image tag specific to only one SHA or image digest. When the **ocp-tools-4** image changes, such as for Jenkins security advisories, Red Hat Engineering updates the Cluster Samples Operator payload.

user-maintained-upgrade-redeploy

To manually redeploy Jenkins after you upgrade OpenShift Dedicated, use this image stream tag in your Jenkins deployment configuration. This image stream tag uses the least specific image version indicator available. When you redeploy Jenkins, run the following command: **\$ oc import-image jenkins:user-maintained-upgrade-redeploy -n openshift**. When you issue this command, the OpenShift Dedicated **ImageStream** controller accesses the **registry.redhat.io** image registry and stores any updated images in the OpenShift image registry's slot for that Jenkins **ImageStreamTag** object. Otherwise, if you do not run this command, your Jenkins deployment configuration does not trigger a redeployment.

scheduled-upgrade-redeploy

To automatically redeploy the latest version of the Jenkins image when it is released, use this image stream tag in your Jenkins deployment configuration. This image stream tag uses the periodic importing of image stream tags feature of the OpenShift Dedicated image stream controller, which checks for changes in the backing image. If the image changes, for example, due to a recent Jenkins security advisory, OpenShift Dedicated triggers a redeployment of your Jenkins deployment configuration. See "Configuring periodic importing of image stream tags" in the following "Additional resources."

What happens with the jenkins-agent-maven and jenkins-agent-nodejs image streams in the openshift namespace?

The OpenShift Jenkins Maven and NodeJS Agent images for OpenShift Dedicated were deprecated in 4.10, and are removed from the OpenShift Dedicated install payload in 4.11. They do not have alternatives defined in the **ocp-tools-4** repository. However, you can work around this by using the sidecar pattern described in the "Jenkins agent" topic mentioned in the following "Additional resources" section.

However, the Cluster Samples Operator does not delete the **jenkins-agent-maven** and **jenkins-agent-nodejs** image streams created by prior releases, which point to the tags of the respective OpenShift Dedicated payload images on **registry.redhat.io**. Therefore, you can pull updates to these images by running the following commands:

```
$ oc import-image jenkins-agent-nodejs -n openshift
```

```
$ oc import-image jenkins-agent-maven -n openshift
```

3.2. CUSTOMIZING THE JENKINS IMAGE STREAM TAG

To override the default upgrade behavior and control how the Jenkins image is upgraded, you set the image stream tag value that your Jenkins deployment configurations use.

The default upgrade behavior is the behavior that existed when the Jenkins image was part of the install payload. The image stream tag names, **2** and **ocp-upgrade-redeploy**, in the **jenkins-rhel.json** image stream file use SHA-specific image references. Therefore, when those tags are updated with a new SHA, the OpenShift Dedicated image change controller automatically redeploys the Jenkins deployment configuration from the associated templates, such as **jenkins-ephemeral.json** or **jenkins-persistent.json**.

For new deployments, to override that default value, you change the value of the **JENKINS_IMAGE_STREAM_TAG** in the **jenkins-ephemeral.json** Jenkins template. For example, replace the **2** in **"value": "jenkins:2"** with one of the following image stream tags:

- **ocp-upgrade-redeploy**, the default value, updates your Jenkins image when you upgrade OpenShift Dedicated.
- **user-maintained-upgrade-redeploy** requires you to manually redeploy Jenkins by running **\$ oc import-image jenkins:user-maintained-upgrade-redeploy -n openshift** after upgrading OpenShift Dedicated.
- **scheduled-upgrade-redeploy** periodically checks the given **<image>:<tag>** combination for changes and upgrades the image when it changes. The image change controller pulls the changed image and redeploys the Jenkins deployment configuration provisioned by the templates. For more information about this scheduled import policy, see the "Adding tags to image streams" in the following "Additional resources."



NOTE

To override the current upgrade value for existing deployments, change the values of the environment variables that correspond to those template parameters.

Prerequisites

- You are running OpenShift Jenkins on OpenShift Dedicated 4.
- You know the namespace where OpenShift Jenkins is deployed.

Procedure

- Set the image stream tag value, replacing **<namespace>** with namespace where OpenShift Jenkins is deployed and **<image_stream_tag>** with an image stream tag:

Example

```
$ oc patch dc jenkins -p '{"spec":{"triggers":[{"type":"ImageChange","imageChangeParams":{"automatic":true,"containerNames":["jenkins"],"from":{"kind":"ImageStreamTag","namespace":"<namespace>","name":"jenkins:<image_stream_tag>"}}]}}'
```

TIP

Alternatively, to edit the Jenkins deployment configuration YAML, enter **\$ oc edit dc/jenkins -n <namespace>** and update the **value: 'jenkins:<image_stream_tag>'** line.

3.3. ADDITIONAL RESOURCES

- [Adding tags to image streams](#)
- [Configuring periodic importing of image stream tags](#)
- [Jenkins agent](#)
- [Certified **jenkins** images](#)
- [Certified **jenkins-agent-base** images](#)
- [Certified **jenkins-agent-maven** images](#)
- [Certified **jenkins-agent-nodejs** images](#)