



Red Hat CodeReady Workspaces 2.7

End-user Guide

Using Red Hat CodeReady Workspaces 2.7

Red Hat CodeReady Workspaces 2.7 End-user Guide

Using Red Hat CodeReady Workspaces 2.7

Robert Kratky
rkratky@redhat.com

Michal Maléř
mmaler@redhat.com

Fabrice Flore-Thébault
ffloreth@redhat.com

Yana Hontyk
yhontyk@redhat.com

Legal Notice

Copyright © 2021 Red Hat, Inc.

The text of and illustrations in this document are licensed by Red Hat under a Creative Commons Attribution–Share Alike 3.0 Unported license ("CC-BY-SA"). An explanation of CC-BY-SA is available at

<http://creativecommons.org/licenses/by-sa/3.0/>

. In accordance with CC-BY-SA, if you distribute this document or an adaptation of it, you must provide the URL for the original version.

Red Hat, as the licensor of this document, waives the right to enforce, and agrees not to assert, Section 4d of CC-BY-SA to the fullest extent permitted by applicable law.

Red Hat, Red Hat Enterprise Linux, the Shadowman logo, the Red Hat logo, JBoss, OpenShift, Fedora, the Infinity logo, and RHCE are trademarks of Red Hat, Inc., registered in the United States and other countries.

Linux[®] is the registered trademark of Linus Torvalds in the United States and other countries.

Java[®] is a registered trademark of Oracle and/or its affiliates.

XFS[®] is a trademark of Silicon Graphics International Corp. or its subsidiaries in the United States and/or other countries.

MySQL[®] is a registered trademark of MySQL AB in the United States, the European Union and other countries.

Node.js[®] is an official trademark of Joyent. Red Hat is not formally related to or endorsed by the official Joyent Node.js open source or commercial project.

The OpenStack[®] Word Mark and OpenStack logo are either registered trademarks/service marks or trademarks/service marks of the OpenStack Foundation, in the United States and other countries and are used with the OpenStack Foundation's permission. We are not affiliated with, endorsed or sponsored by the OpenStack Foundation, or the OpenStack community.

All other trademarks are the property of their respective owners.

Abstract

Information for users using Red Hat CodeReady Workspaces.

Table of Contents

MAKING OPEN SOURCE MORE INCLUSIVE	8
CHAPTER 1. NAVIGATING CODEREADY WORKSPACES	9
1.1. NAVIGATING CODEREADY WORKSPACES USING THE DASHBOARD	9
1.1.1. Logging in to CodeReady Workspaces on OpenShift for the first time using OAuth	9
1.1.2. Logging in to CodeReady Workspaces on OpenShift for the first time registering as a new user	9
1.1.3. Logging in to CodeReady Workspaces using crwctl	10
1.1.4. Finding CodeReady Workspaces cluster URL using the OpenShift 4 CLI	11
1.2. IMPORTING CERTIFICATES TO BROWSERS	12
1.2.1. Adding certificates to Google Chrome on Linux or Windows	12
1.2.2. Adding certificates to Google Chrome and Safari on macOS	12
1.2.3. Adding certificates to Firefox	13
1.3. ACCESSING CODEREADY WORKSPACES FROM OPENSIFT DEVELOPER PERSPECTIVE	13
1.3.1. OpenShift Developer Perspective integration with CodeReady Workspaces	14
1.3.2. Editing the code of applications running in OpenShift Container Platform using CodeReady Workspaces	14
1.3.3. Accessing CodeReady Workspaces from Red Hat Applications menu	15
CHAPTER 2. CHE-THEIA IDE BASICS	16
2.1. DEFINING CUSTOM COMMANDS FOR CHE-THEIA	16
2.1.1. Che-Theia task types	16
2.1.2. Running and debugging	17
2.1.3. Editing a task and launch configuration	21
2.2. VERSION CONTROL	22
2.2.1. Managing Git configuration: identity	22
2.2.2. Accessing a Git repository using HTTPS	23
2.2.3. Accessing a Git repository using a generated SSH key pair	24
2.2.3.1. Generating an SSH key using the CodeReady Workspaces command palette	24
2.2.3.2. Adding the associated public key to a repository or account on GitHub	24
2.2.3.3. Adding the associated public key to a Git repository or account on GitLab	25
2.2.4. Managing pull requests using the GitHub PR plug-in	25
2.2.4.1. Using the GitHub Pull Requests plug-in	25
2.3. CHE-THEIA TROUBLESHOOTING	26
2.4. DIFFERENCES IN HOW CHE-THEIA WEBVIEW WORKS ON A SINGLE-HOST MODE COMPARING TO A MULTI-HOST MODE	27
2.4.1. What's a Webview	27
2.4.2. Webview in a multi-host mode	27
2.4.3. Webview in single-host mode	27
CHAPTER 3. DEVELOPER WORKSPACES	28
3.1. CONFIGURING A WORKSPACE USING A DEVFILE	29
3.1.1. What is a devfile	29
3.1.2. Creating a workspace from the default branch of a Git repository	30
3.1.3. Creating a workspace from a feature branch of a Git repository	31
3.1.4. Creating a workspace from a publicly accessible standalone devfile using HTTP	31
3.1.5. Overriding devfile values using factory parameters	32
3.1.6. Creating a workspace using crwctl and a local devfile	34
3.1.7. Allowing users to define workspace deployment labels and annotations	35
3.2. MAKING A WORKSPACE PORTABLE USING A DEVFILE	37
3.2.1. A minimal devfile	37
3.2.2. Generating workspace names	38
3.2.3. Writing a devfile for a project	38

3.2.3.1. Preparing a minimal devfile	39
3.2.3.2. Specifying multiple projects in a devfile	39
3.2.4. Devfile reference	40
3.2.4.1. Adding projects to a devfile	40
3.2.4.1.1. Project-source type: git	41
3.2.4.1.2. Project-source type: zip	42
3.2.4.1.3. Project clone-path parameter: clonePath	42
3.2.4.2. Adding components to a devfile	42
3.2.4.2.1. Component type: cheEditor	42
3.2.4.2.2. Component type: chePlugin	43
3.2.4.2.3. Specifying an alternative component registry	43
3.2.4.2.4. Specifying a component by linking to its descriptor	43
3.2.4.2.5. Tuning chePlugin component configuration	43
3.2.4.2.6. Component type: kubernetes	44
3.2.4.2.7. Overriding container entrypoints	44
3.2.4.2.8. Overriding container environment variables	45
3.2.4.2.9. Specifying mount-source option	45
3.2.4.2.10. Component type: dockerimage	46
3.2.4.2.11. Mounting project sources	46
3.2.4.2.12. Container Entrypoint	47
3.2.4.2.13. Persistent Storage	47
3.2.4.2.14. Specifying container memory limit for components	48
3.2.4.2.15. Specifying container memory request for components	48
3.2.4.2.16. Specifying container CPU limit for components	49
3.2.4.2.17. Specifying container CPU request for components	49
3.2.4.2.18. Environment variables	50
3.2.4.2.19. Endpoints	51
3.2.4.2.20. OpenShift resources	54
3.2.4.3. Adding commands to a devfile	56
3.2.4.3.1. CodeReady Workspaces-specific commands	57
3.2.4.3.2. Editor-specific commands	57
3.2.4.3.3. Command preview URL	58
3.2.4.3.3.1. Setting the default way of opening preview URLs	59
3.2.4.4. Devfile attributes	59
3.2.4.4.1. Attribute: editorFree	59
3.2.4.4.2. Attribute: persistVolumes (ephemeral mode)	59
3.2.4.4.3. Attribute: asyncPersist (asynchronous storage)	60
3.2.4.4.4. Attribute: mergePlugins	60
3.2.5. Objects supported in Red Hat CodeReady Workspaces 2.7	61
3.3. CREATING AND CONFIGURING A NEW CODEREADY WORKSPACES 2.7 WORKSPACE	61
3.3.1. Creating a new workspace from the dashboard	61
3.3.2. Adding projects to your workspace	62
3.3.3. Configuring the workspace and adding tools	64
3.3.3.1. Adding plug-ins	64
3.3.3.2. Defining the workspace editor	64
3.3.3.3. Defining specific container images	65
3.3.3.4. Adding commands to your workspace	67
3.4. IMPORTING OPENSIFT APPLICATIONS INTO A WORKSPACE	69
3.4.1. Including a OpenShift application in a workspace devfile definition	69
3.4.2. Adding a OpenShift application to an existing workspace using the dashboard	71
3.4.3. Generating a devfile from an existing OpenShift application	72
3.5. REMOTELY ACCESSING WORKSPACES	73
3.5.1. Remotely accessing workspaces using oc	74

3.5.2. Downloading and uploading a file to a workspace using the command-line interface	75
3.6. CREATING A WORKSPACE FROM CODE SAMPLE	76
3.6.1. Creating a workspace from Get Started view of User Dashboard	76
3.6.2. Creating a workspace from Custom Workspace view of User Dashboard	78
3.6.3. Changing the configuration of an existing workspace	79
3.6.4. Running an existing workspace from the User Dashboard	81
3.6.4.1. Running an existing workspace from the User Dashboard with the Run button	81
3.6.4.2. Running an existing workspace from the User Dashboard using the Open button	81
3.6.4.3. Running an existing workspace from the User Dashboard using the Recent Workspaces	82
3.7. CREATING A WORKSPACE BY IMPORTING THE SOURCE CODE OF A PROJECT	83
3.7.1. Select a sample from the Dashboard, then change the devfile to include your project	84
3.7.2. Importing from the Dashboard into an existing workspace	84
3.7.2.1. Editing the commands after importing a project	85
3.7.3. Importing to a running workspace using the Git: Clone command	86
3.7.4. Importing to a running workspace with git clone in a terminal	87
3.8. MOUNTING A SECRET AS A FILE OR AN ENVIRONMENT VARIABLE INTO A WORKSPACE CONTAINER	88
3.8.1. Mounting a secret as a file into a workspace container	89
3.8.2. Mounting a secret as an environment variable into a workspace container	91
3.8.3. Mounting a git credentials store into a workspace container	93
3.8.4. The use of annotations in the process of mounting a secret into a workspace container	94
3.9. AUTHENTICATING ON BITBUCKET SERVERS	94
CHAPTER 4. CUSTOMIZING DEVELOPER ENVIRONMENTS	97
4.1. WHAT IS A CHE-THEIA PLUG-IN	97
4.1.1. Features and benefits of Che-Theia plug-ins	98
4.1.2. Che-Theia plug-in concept in detail	98
4.1.2.1. Client-side and server-side Che-Theia plug-ins	98
4.1.2.2. Che-Theia plug-in APIs	99
4.1.2.3. Che-Theia plug-in capabilities	99
4.1.2.4. VS Code extensions and Eclipse Theia plug-ins	100
4.1.3. Che-Theia plug-in metadata	100
4.1.4. Che-Theia plug-in lifecycle	105
4.1.5. Embedded and remote Che-Theia plug-ins	106
4.1.5.1. Embedded (local) plug-ins	106
4.1.5.2. Remote plug-ins	107
4.1.5.3. Comparison matrix	107
4.1.6. Remote plug-in endpoint	108
4.1.6.1. Defining a launch remote plug-in endpoint using Dockerfile	108
4.1.6.1.1. Using a wrapper script	109
4.1.6.2. Defining a launch remote plug-in endpoint in a meta.yaml file	110
4.2. ADDING A VS CODE EXTENSION TO A WORKSPACE	112
4.2.1. Adding a VS Code extension using the CodeReady Workspaces Plugins panel	112
4.2.2. Adding a VS Code extension using the workspace configuration	112
4.3. PUBLISHING METADATA FOR A VS CODE EXTENSION	113
4.4. TESTING A VISUAL STUDIO CODE EXTENSION IN CODEREADY WORKSPACES	115
4.4.1. Testing a VS Code extension using GitHub gist	115
4.4.2. Verifying the VS Code extension API compatibility level	119
4.5. USING ALTERNATIVE IDES IN CODEREADY WORKSPACES	120
4.6. SUPPORT FOR JETBRAINS IDES	120
4.6.1. Using IntelliJ Idea Community Edition	121
4.6.2. Using IntelliJ Idea Ultimate Edition	122
4.6.3. Using WebStorm	124

4.6.4. Provisioning JetBrains activation code for offline use	125
4.6.4.1. JetBrains product-name mapping	127
4.7. ADDING TOOLS TO CODEREADY WORKSPACES AFTER CREATING A WORKSPACE	128
4.7.1. Additional tools in the CodeReady Workspaces workspace	128
4.7.2. Adding a language support plug-in to a CodeReady Workspaces workspace	129
CHAPTER 5. USING ARTIFACT REPOSITORIES IN A RESTRICTED ENVIRONMENT	131
5.1. USING MAVEN ARTIFACT REPOSITORIES	131
5.1.1. Defining repositories in settings.xml	131
5.1.2. Defining Maven settings.xml file across workspaces	133
5.1.2.1. Openshift 3.11 and OpenShift <1.13	134
5.1.3. Using self-signed certificates in Maven projects	134
5.2. USING GRADLE ARTIFACT REPOSITORIES	135
5.2.1. Downloading different versions of Gradle	135
5.2.2. Configuring global Gradle repositories	136
5.2.3. Using self-signed certificates in Gradle projects	136
5.3. USING PYTHON ARTIFACT REPOSITORIES	137
5.3.1. Configuring Python to use a non-standard registry	137
5.3.2. Using self-signed certificates in Python projects	138
5.4. USING GO ARTIFACT REPOSITORIES	139
5.4.1. Configuring Go to use a non-standard-registry	139
5.4.2. Using self-signed certificates in Go projects	139
5.5. USING NUGET ARTIFACT REPOSITORIES	140
5.5.1. Configuring NuGet to use a non-standard artifact repository	140
5.5.2. Using self-signed certificates in NuGet projects	140
5.6. USING NPM ARTIFACT REPOSITORIES	141
CHAPTER 6. TROUBLESHOOTING CODEREADY WORKSPACES	143
6.1. VIEWING CODEREADY WORKSPACES WORKSPACES LOGS	143
6.1.1. Viewing logs from language servers and debug adapters	143
6.1.1.1. Checking important logs	143
6.1.1.2. Detecting memory problems	143
6.1.1.3. Logging the client-server traffic for debug adapters	144
6.1.1.4. Viewing logs for Python	144
6.1.1.5. Viewing logs for Go	144
6.1.1.5.1. Finding the GOPATH	144
6.1.1.5.2. Viewing the Debug Console log for Go	145
6.1.1.5.3. Viewing the Go logs output in the Output panel	146
6.1.1.6. Viewing logs for the NodeDebug NodeDebug2 adapter	146
6.1.1.7. Viewing logs for Typescript	146
6.1.1.7.1. Enabling the label switched protocol (LSP) tracing	146
6.1.1.7.2. Viewing the Typescript language server log	146
6.1.1.7.3. Viewing the Typescript logs output in the Output panel	147
6.1.1.8. Viewing logs for Java	147
6.1.1.8.1. Verifying the state of the Eclipse JDT Language Server	147
6.1.1.8.2. Verifying the Eclipse JDT Language Server features	147
6.1.1.8.3. Viewing the Java language server log	148
6.1.1.8.4. Logging the Java language server protocol (LSP) messages	148
6.1.1.9. Viewing logs for Intelephense	148
6.1.1.9.1. Logging the Intelephense client-server communication	148
6.1.1.9.2. Viewing Intelephense events in the Output panel	148
6.1.1.10. Viewing logs for PHP-Debug	149
6.1.1.11. Viewing logs for XML	149

6.1.1.1.1. Verifying the state of the XML language server	149
6.1.1.1.2. Checking XML language server feature flags	149
6.1.1.1.3. Enabling XML Language Server Protocol (LSP) tracing	150
6.1.1.1.4. Viewing the XML language server log	150
6.1.1.12. Viewing logs for YAML	150
6.1.1.12.1. Verifying the state of the YAML language server	150
6.1.1.12.2. Checking the YAML language server feature flags	151
6.1.1.12.3. Enabling YAML Language Server Protocol (LSP) tracing	151
6.1.1.13. Viewing logs for Dotnet with Omnisharp-Theia plug-in	152
6.1.1.13.1. Omnisharp-Theia plug-in	152
6.1.1.13.2. Verifying the state of the Omnisharp-Theia plug-in language server	152
6.1.1.13.3. Checking Omnisharp Che-Theia plug-in language server features	152
6.1.1.13.4. Viewing Omnisharp-Theia plug-in logs in the Output panel	152
6.1.1.14. Viewing logs for Dotnet with NetcoredebugOutput plug-in	152
6.1.1.14.1. NetcoredebugOutput plug-in	152
6.1.1.14.2. Verifying the state of the NetcoredebugOutput plug-in	153
6.1.1.14.3. Viewing NetcoredebugOutput plug-in logs in the Output panel	153
6.1.1.15. Viewing logs for Camel	153
6.1.1.15.1. Verifying the state of the Camel language server	153
6.1.1.15.2. Viewing Camel logs in the Output panel	154
6.1.2. Viewing Che-Theia IDE logs	154
6.1.2.1. Viewing Che-Theia editor logs using the OpenShift CLI	154
6.2. TROUBLESHOOTING SLOW WORKSPACES	156
6.2.1. Improving workspace start time	156
6.2.2. Improving workspace runtime performance	157
6.3. TROUBLESHOOTING NETWORK PROBLEMS	158
6.4. STARTING A CODEREADY WORKSPACES WORKSPACE IN DEBUG MODE	159
6.5. RESTARTING A CODEREADY WORKSPACES WORKSPACE IN DEBUG MODE AFTER START FAILURE	159
CHAPTER 7. OPENSIFT CONNECTOR OVERVIEW	161
7.1. FEATURES OF OPENSIFT CONNECTOR	161
7.2. INSTALLING OPENSIFT CONNECTOR IN CODEREADY WORKSPACES	162
7.3. AUTHENTICATING WITH OPENSIFT CONNECTOR FROM CODEREADY WORKSPACES WHEN THE OPENSIFT OAUTH SERVICE DOES NOT AUTHENTICATE THE CODEREADY WORKSPACES INSTANCE	163
7.4. CREATING COMPONENTS WITH OPENSIFT CONNECTOR IN CODEREADY WORKSPACES	164
7.5. CONNECTING SOURCE CODE FROM GITHUB TO AN OPENSIFT COMPONENT USING OPENSIFT CONNECTOR	165
CHAPTER 8. TELEMETRY OVERVIEW	167
8.1. USE CASES	167
8.2. HOW IT WORKS	167
8.3. CREATING A TELEMETRY PLUG-IN	168
8.3.1. Getting Started	169
Optional: creating a server that receives events	169
8.3.2. Creating a new Maven project	171
8.3.3. Running the application	172
8.3.4. Creating a concrete implementation of AnalyticsManager and adding specialized logic	173
8.3.5. Implementing isEnabled()	174
8.3.6. Implementing onEvent()	174
8.3.7. Implementing increaseDuration()	175
8.3.8. Implementing onActivity()	175
8.3.9. Implementing destroy()	176
8.3.10. Packaging the Quarkus application	176

8.3.11. Creating a meta.yaml for your plug-in.	176
8.3.12. Updating CodeReady Workspaces to reference your telemetry plug-in	178
8.4. THE WOOPRA TELEMETRY PLUGIN	180

MAKING OPEN SOURCE MORE INCLUSIVE

Red Hat is committed to replacing problematic language in our code, documentation, and web properties. We are beginning with these four terms: master, slave, blacklist, and whitelist. Because of the enormity of this endeavor, these changes will be implemented gradually over several upcoming releases. For more details, see [our CTO Chris Wright's message](#).

CHAPTER 1. NAVIGATING CODEREADY WORKSPACES

This chapter describes available methods to navigate Red Hat CodeReady Workspaces.

- [Section 1.1, “Navigating CodeReady Workspaces using the Dashboard”](#)
- [Section 1.2, “Importing certificates to browsers”](#)
- [Section 1.3, “Accessing CodeReady Workspaces from OpenShift Developer Perspective”](#)

1.1. NAVIGATING CODEREADY WORKSPACES USING THE DASHBOARD

The **Dashboard** is accessible on your cluster from a URL like `http://<https://codeready-
<openshift_deployment_name>.<domain_name>/dashboard/`. This section describes how to access this URL on OpenShift.

1.1.1. Logging in to CodeReady Workspaces on OpenShift for the first time using OAuth

This section describes how to log in to CodeReady Workspaces on OpenShift for the first time using OAuth.

Prerequisites

- Contact the administrator of the OpenShift instance to obtain the **Red Hat CodeReady Workspaces URL**.

Procedure

1. Navigate to the **Red Hat CodeReady Workspaces URL** to display the Red Hat CodeReady Workspaces login page.
2. Choose the **OpenShift OAuth** option.
3. The **Authorize Access** page is displayed.
4. Click on the **Allow selected permissions** button.
5. Update the account information: specify the **Username**, **Email**, **First name** and **Last name** fields and click the **Submit** button.

Validation steps

- The browser displays the Red Hat CodeReady Workspaces **Dashboard**.

1.1.2. Logging in to CodeReady Workspaces on OpenShift for the first time registering as a new user

This section describes how to log in to CodeReady Workspaces on OpenShift for the first time registering as a new user.

Prerequisites

- Contact the administrator of the OpenShift instance to obtain the **Red Hat CodeReady Workspaces URL**.
- Self-registration is enabled. See https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/administration_guide/index#enabling-self-registration_crw.

Procedure

1. Navigate to the **Red Hat CodeReady Workspaces URL** to display the Red Hat CodeReady Workspaces login page.
2. Choose the **Register as a new user** option.
3. Update the account information: specify the **Username, Email, First name** and **Last name** field and click the **Submit** button.

Validation steps

- The browser displays the Red Hat CodeReady Workspaces **Dashboard**.

1.1.3. Logging in to CodeReady Workspaces using crwctl

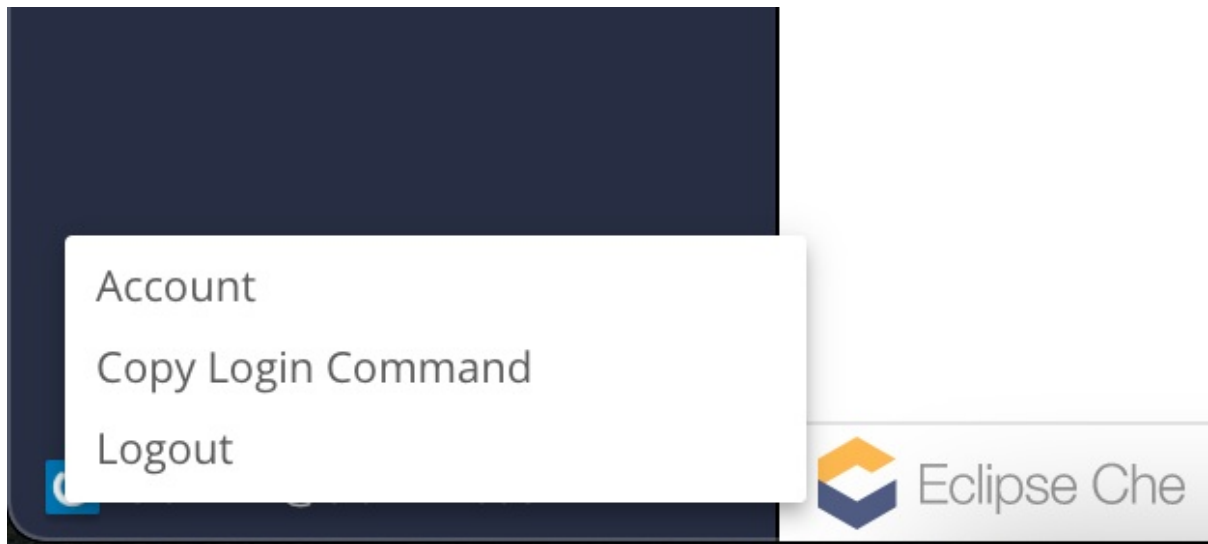
This section describes how to log in to CodeReady Workspaces using crwctl tool by copying login command from Red Hat CodeReady Workspaces Dashboard.

Prerequisites

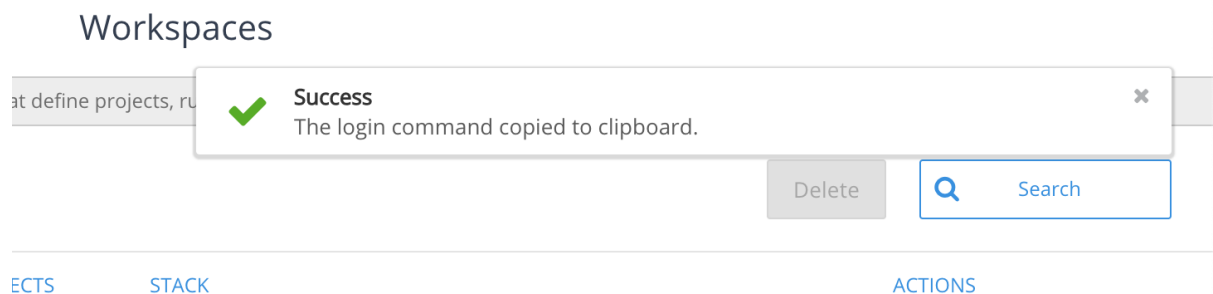
- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#installing-codeready-workspaces_crw.
- The CodeReady Workspaces CLI management tool. See https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#using-the-crwctl-management-tool_crw.
- Red Hat CodeReady Workspaces Dashboard is opened in a browser.

Procedure

1. Open the user's context menu in the lower-left corner and select **Copy Login Command**



2. Wait for the notification message:



3. Paste the login command into a terminal and observe a successful login:

```
$ chectl auth:login ...
Successfully logged into <server> as <user>
```

1.1.4. Finding CodeReady Workspaces cluster URL using the OpenShift 4 CLI

This section describes how to obtain the CodeReady Workspaces cluster URL using the OpenShift 4 command line interface (CLI). The URL can be retrieved from the OpenShift logs or from the **checluster** Custom Resource.

Prerequisites

- An instance of Red Hat CodeReady Workspaces running on OpenShift.
- User is located in a CodeReady Workspaces installation project.

Procedure

1. To retrieve the CodeReady Workspaces cluster URL from the **checluster** CR (Custom Resource), run:

```
$ oc get checluster --output jsonpath='{.items[0].status.cheURL}'
```

2. Alternatively, to retrieve the CodeReady Workspaces cluster URL from the OpenShift logs, run:

```
$ oc logs --tail=10 `(oc get pods -o name | grep operator)` | \
  grep "available at" | \
  awk -F'available at: ' '{print $2}' | sed 's//'
```

1.2. IMPORTING CERTIFICATES TO BROWSERS

This section describes how to import a root certificate authority into a web browser to use CodeReady Workspaces with self-signed TLS certificates.

When a TLS certificate is not trusted, the error message **"Your CodeReady Workspaces server may be using a self-signed certificate. To resolve the issue, import the server CA certificate in the browser."** blocks the login process. To prevent this, add the public part of the self-signed CA certificate into the browser after installing CodeReady Workspaces.

1.2.1. Adding certificates to Google Chrome on Linux or Windows

Procedure

1. Navigate to URL where CodeReady Workspaces is deployed.
2. Save the certificate:
 - a. Click the warning or open lock icon on the left of the address bar.
 - b. Click **Certificates** and navigate to the **Details** tab.
 - c. Select the top-level certificate which is the Root certificate authority and export it:
 - On Linux, click the **Export** button.
 - On Windows, click the **Save to file** button.
3. Go to [Google Chrome Settings](#), then to the **Authorities** tab
4. In the left panel, select **Advanced** and continue to **Privacy and security**.
5. At the center of the screen, click **Manage certificates** and navigate to **Authorities** tab.
6. Click the **Import** button and open the saved certificate file.
7. Select **Trust this certificate for identifying websites** and click the **OK** button.
8. After adding the CodeReady Workspaces certificate to the browser, the address bar displays the closed lock icon next to the URL, indicating a secure connection.

1.2.2. Adding certificates to Google Chrome and Safari on macOS

Procedure

1. Navigate to URL where CodeReady Workspaces is deployed.
2. Save the certificate:
 - a. Click the lock icon on the left of the address bar.

- b. Click **Certificates**.
 - c. Select the certificate to use and drag and drop its displayed large icon to the desktop.
3. Open the **Keychain Access** application.
4. Select the **System** keychain and drag and drop the saved certificate file to it.
5. Double-click the imported CA, then go to **Trust** and select **When using this certificate: Always Trust**.
6. Restart the browser for the added certificated to take effect.

1.2.3. Adding certificates to Firefox

Procedure

1. Navigate to URL where CodeReady Workspaces is deployed.
2. Save the certificate:
 - a. Click the lock icon on the left of the address bar.
 - b. Click the > button next to the **Connection not secure** warning.
 - c. Click the **More information** button.
 - d. Click the **View Certificate** button on the **Security** tab.
 - e. Select the second certificate tab. The certificate Common Name should start with **ingress-operator**
 - f. Click the **PEM (cert)** link and save the certificate.
3. Navigate to [about:preferences](#), search for **certificates**, and click **View Certificates**.
4. Go to the **Authorities** tab, click the **Import** button, and open the saved certificate file.
5. Check **Trust this CA to identify websites** and click **OK**.
6. Restart Firefox for the added certificated to take effect.
7. After adding the CodeReady Workspaces certificate to the browser, the address bar displays the closed lock icon next to the URL, indicating a secure connection.

1.3. ACCESSING CODEREADY WORKSPACES FROM OPENSIFT DEVELOPER PERSPECTIVE

OpenShift Container Platform provides a view switcher to make a transition between:

- **Administrator** - The traditional administration-focused console.
- **Developer** - A high-level of abstraction over OpenShift components to allow developers to focus on application development.

The OpenShift Developer Perspective enables a developer-focused view in the OpenShift 4 web console.

**NOTE**

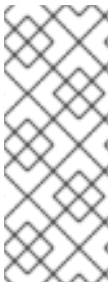
OpenShift Developer Perspective is a default part of OpenShift Container Platform starting with version 4.2.

1.3.1. OpenShift Developer Perspective integration with CodeReady Workspaces

This section provides information about OpenShift Developer Perspective support for CodeReady Workspaces.

When the CodeReady Workspaces Operator is deployed into OpenShift Container Platform 4.2 and later, it creates a **ConsoleLink** Custom Resource (CR). This adds an interactive link to the **Red Hat Applications** menu for accessing the CodeReady Workspaces installation using the OpenShift Developer Perspective console.

To access the **Red Hat Applications** menu, click the three-by-three matrix icon on the main screen of the OpenShift web console. The CodeReady Workspaces **Console Link**, displayed in the drop-down menu, creates a new workspace or redirects the user to an existing one.

**NOTE****OpenShift Container Platform console links are not created when CodeReady Workspaces is used with HTTP resources**

When installing CodeReady Workspaces with the **From Git** option, the OpenShift Developer Perspective console link is only created if CodeReady Workspaces is deployed with HTTPS. The console link will not be created if an HTTP resource is used.

1.3.2. Editing the code of applications running in OpenShift Container Platform using CodeReady Workspaces

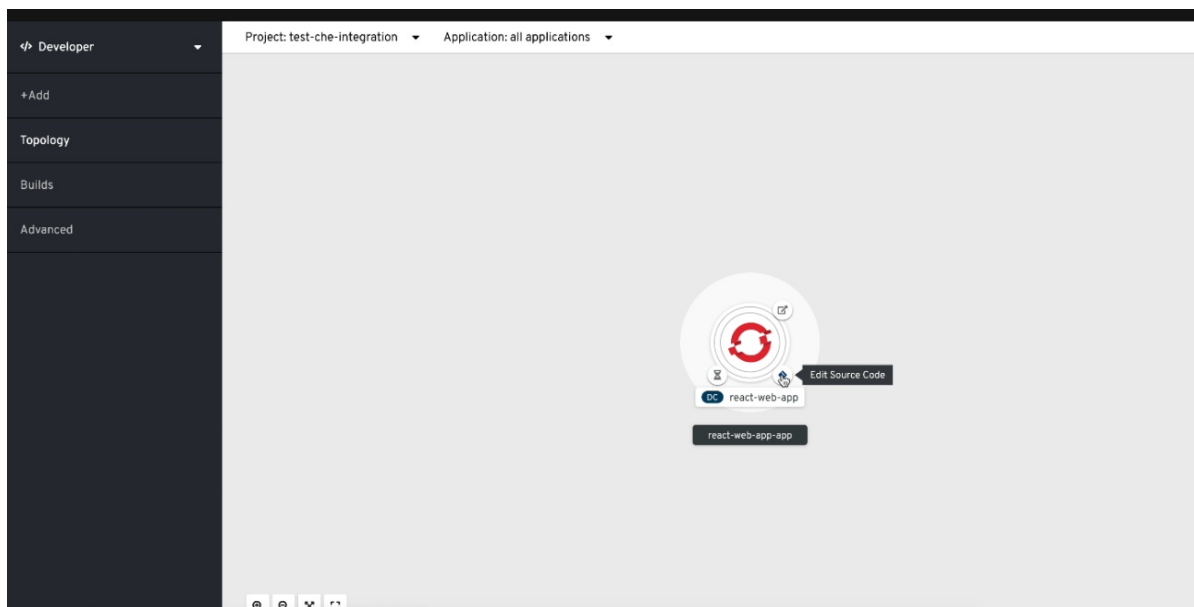
This section describes how to start editing the source code of applications running on OpenShift using CodeReady Workspaces.

Prerequisites

- CodeReady Workspaces is deployed on the same OpenShift 4 cluster.

Procedure

1. Open the **Topology** view to list all projects.
2. In the **Select an Application** search field, type **workspace** to list all workspaces.
3. Click the workspace to edit.
The deployments are displayed as graphical circles surrounded by circular buttons. One of these buttons is **Edit Source Code**.



- To edit the code of an application using CodeReady Workspaces, click the **Edit Source Code** button. This redirects to a workspace with the cloned source code of the application component.

1.3.3. Accessing CodeReady Workspaces from Red Hat Applications menu

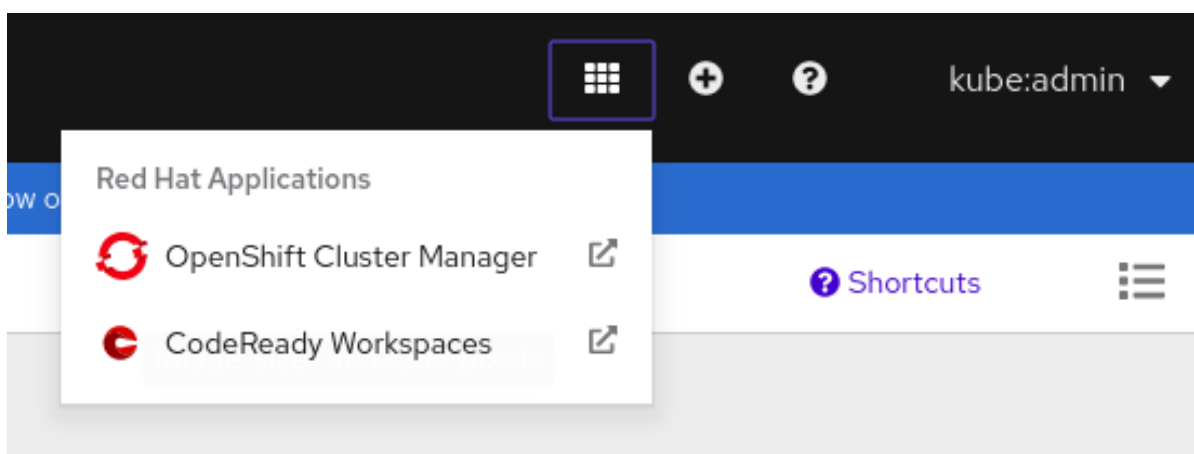
This section describes how to access CodeReady Workspaces workspaces from the **Red Hat Applications** menu on OpenShift Container Platform.

Prerequisites

- The CodeReady Workspaces Operator is available in OpenShift 4.

Procedure

- Open the **Red Hat Applications** menu by clicking the three-by-three matrix icon in the upper right corner of the main screen. The drop-down menu displays the available applications.



- Click the **CodeReady Workspaces** link to open the CodeReady Workspaces Dashboard.

CHAPTER 2. CHE-THEIA IDE BASICS

This section describes basics workflows and commands for Che-Theia: the native integrated development environment for Red Hat CodeReady Workspaces.

- [Section 2.1, “Defining custom commands for Che-Theia”](#)
- [Section 2.2, “Version Control”](#)
- [Section 2.3, “Che-Theia Troubleshooting”](#)
- [Section 2.4, “Differences in how Che-Theia Webview works on a single-host mode comparing to a multi-host mode”](#)

2.1. DEFINING CUSTOM COMMANDS FOR CHE-THEIA

The Che-Theia IDE allows users to define custom commands in a devfile that are then available when working in a workspace.

This is useful, for example, for:

- Simplifying building, running, and debugging projects.
- Allowing lead developers to customize workspaces based on team requirements.
- Reducing time needed to onboard new team members.

See also [Section 3.1, “Configuring a workspace using a devfile”](#).

2.1.1. Che-Theia task types

The following is an example of the **commands** section of a devfile.

```
commands:

- name: Package Native App
  actions:
  - type: exec
    component: centos-quarkus-maven
    command: "mvn package -Dnative -Dmaven.test.skip"
    workdir: ${CHE_PROJECTS_ROOT}/quarkus-quickstarts/getting-started

- name: Start Native App
  actions:
  - type: exec
    component: ubi-minimal
    command: ./getting-started-1.0-SNAPSHOT-runner
    workdir: ${CHE_PROJECTS_ROOT}/quarkus-quickstarts/getting-started/target

- name: Attach remote debugger
  actions:
  - type: vscode-launch
    referenceContent: |
      {
        "version": "0.2.0",
```

```

"configurations": [
  {
    "type": "java",
    "request": "attach",
    "name": "Attach to Remote Quarkus App",
    "hostName": "localhost",
    "port": 5005
  }
]
}

```

CodeReady Workspaces commands

Package Native App and Start Native App

The CodeReady Workspaces commands are to be used to define tasks that will be executed in the workspace container.

- The **exec** type implies that the CodeReady Workspaces runner is used for command execution. The user can specify the component in whose container the command is executed.
- The **command** field contains the command line for execution.
- The **workdir** is the working directory in which the command is executed.
- The **component** field refers to the container where the command will be executed. The field contains the component **alias** where the container is defined.

VS Code launch configurations

Attach remote debugger

VS Code launch configurations are usually used to define debugging configuration. To trigger these configurations, press **F5** or choose **Start Debugging** from the **Debug** menu. The configurations provide information to the debugger, such as the port to connect to for debugging or the type of the application to debug (Node.js, Java, and others.).

- The type is **vscode-launch**.
- It contains the launch configurations in the VS Code format.
- For more information about VS Code launch configurations, see the Debugging section on the [Visual Studio documentation page](#).

Tasks of type **che**, also known as **exec** commands, can be executed from the **Terminal→Run Task** menu or by selecting them in the **My Workspace** panel. Other tasks are only available from **Terminal→Run Task**. Launch configurations are available in the Che-Theia debugger.

Examples

- [An example of a theia task](#)
- [An example of a vscode-launch task](#)

2.1.2. Running and debugging

Che-Theia supports the [Debug Adapter Protocol](#). This protocol defines a generic way for how a development tool can communicate with a debugger. It means Che-Theia works with all [implementations](#).

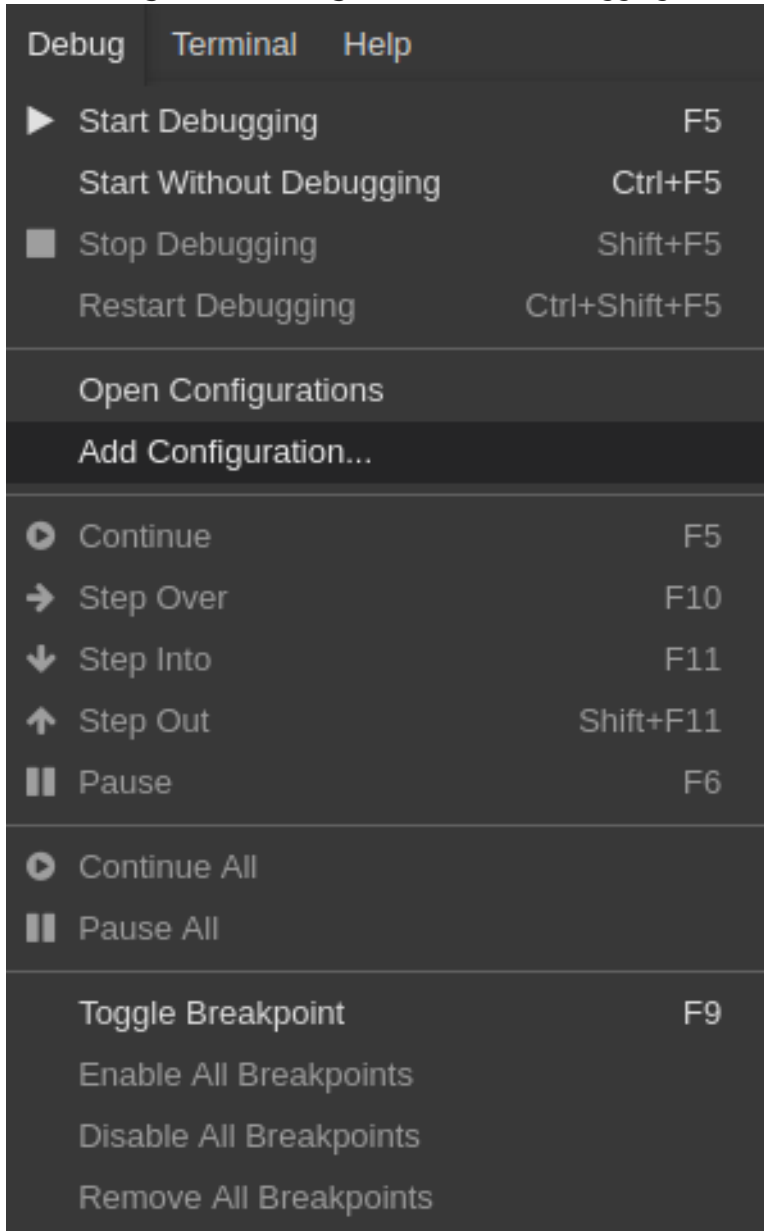
Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).

Procedure

To debug an application:

1. Click **Debug** → **Add Configuration** to add debugging or launch configuration to the project.



2. From the pop-up menu, select the appropriate configuration for the application that you want to debug.

```

launch.json
1  {
2    // Use IntelliSense to learn about possible attributes.
3    // Hover to view descriptions of existing attributes.
4    "version": "0.2.0",
5    "configurations": [
6
7    ]
8  }

```

- {} Java: Attach to Remote Program ⓘ
- {} Java: Launch Program
- {} Java: Launch Program with Arguments Prompt
- {} Node.js: Attach
- {} Node.js: Attach to Process
- {} Node.js: Attach to Remote Program
- {} Node.js: Electron Main
- {} Node.js: Gulp task
- {} Node.js: Launch Program
- {} Node.js: Launch via NPM
- {} Node.js: Mocha Tests
- {} Node.js: Nodemon Setup

- Update the configuration by modifying or adding attributes.

```

launch.json x
1  {
2    // Use IntelliSense to learn about possible attributes.
3    // Hover to view descriptions of existing attributes.
4    "version": "0.2.0",
5    "configurations": [
6      {
7        "type": "java",
8        "name": "Debug (Launch)",
9        "request": "launch",
10       "cwd": "${workspaceFolder}",
11       "console": "internalConsole",
12       "stopOnEntry": false,
13       "mainClass": "HelloWorld",
14       "args": ""
15     }
16   ]
17 }

```

- Breakpoints can be toggled by clicking the editor margin.

```

HelloWorld.java x
1  /*
2   * HelloWorld.java
3   */
4  public class HelloWorld
5  {
6      public static void main(String[] args) {
7          System.out.println("Hello World!");
8      }
9  }

```

- After opening a context menu, use the **Edit Breakpoint** command to add conditions.

```

6      public static void main(String[] args) {
7          System.out.println("Hello World!");
      }

```

Expression
Expression
Hit Count
Log Message

The IDE then displays the **Expression** input field.

```

6      public static void main(String... args) {
7          System.out.println("Hello World!");
8      }
9  }
10

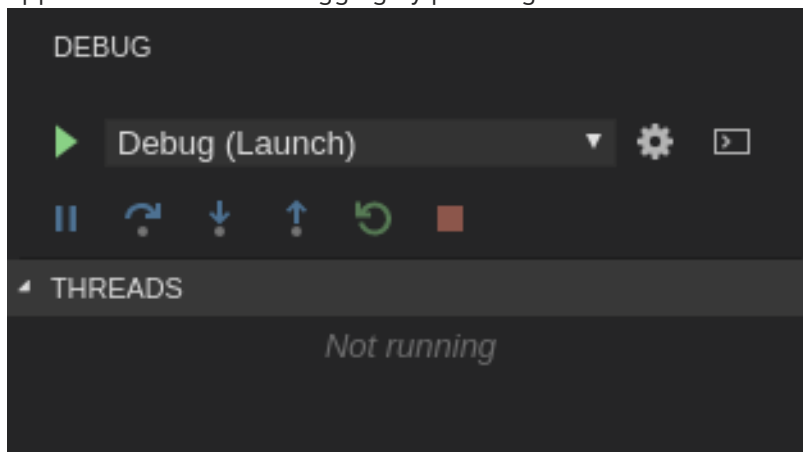
```

Run | Debug
Expression
Break when expression evaluates to true. 'Enter' to accept, 'esc' to cancel.

- To start debugging, click **View→Debug**.

View	Go	Debug	Terminal	Help
Find Command...				F1
Call Hierarchy				Ctrl+Shift+F1
Debug				Ctrl+Shift+D
Debug Console				Ctrl+Shift+Y
Explorer				Ctrl+Shift+E
Git History				Alt+H
Outline				
Output				Ctrl+Shift+U
Plugins				Ctrl+Shift+L
Problems				Ctrl+Shift+M
SCM				Ctrl+Shift+G
Search				
Type Hierarchy				Ctrl+Shift+H
Toggle Bottom Panel				Ctrl+J
Collapse All Side Panels				Alt+Shift+C

7. In the **Debug** view, select the configuration and press **F5** to debug the application. Or, start the application without debugging by pressing **Ctrl+F5**.



2.1.3. Editing a task and launch configuration

Procedure

To customize the configuration file:

1. Edit the **tasks.json** or **launch.json** configuration files.
2. Add new definitions to the configuration file or modify the existing ones.

**NOTE**

The changes are stored in the configuration file.

- To customize the task configuration provided by plug-ins, select the **Terminal → Configure Tasks** menu option, and choose the task to configure. The configuration is then copied to the **tasks.json** file and is available for editing.

2.2. VERSION CONTROL

Red Hat CodeReady Workspaces natively supports the [VS Code SCM model](#). By default, Red Hat CodeReady Workspaces includes the native [VS Code Git extension](#) as a Source Code Management (SCM) provider.

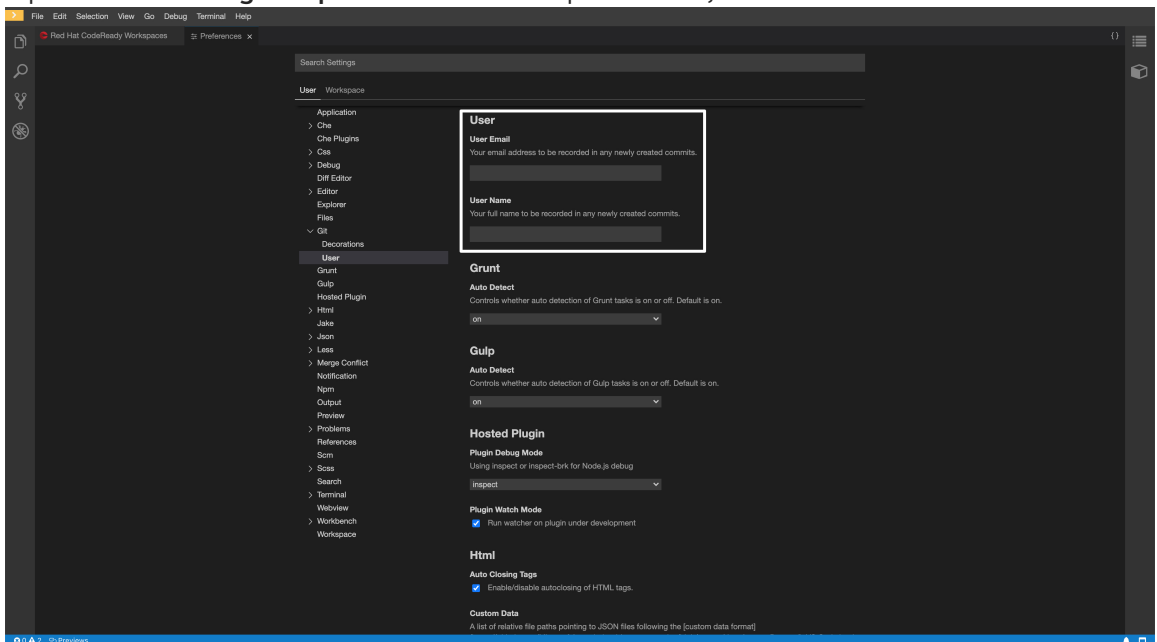
2.2.1. Managing Git configuration: identity

The first thing to do before starting to use Git is to set a user name and email address. This is important because every Git commit uses this information.

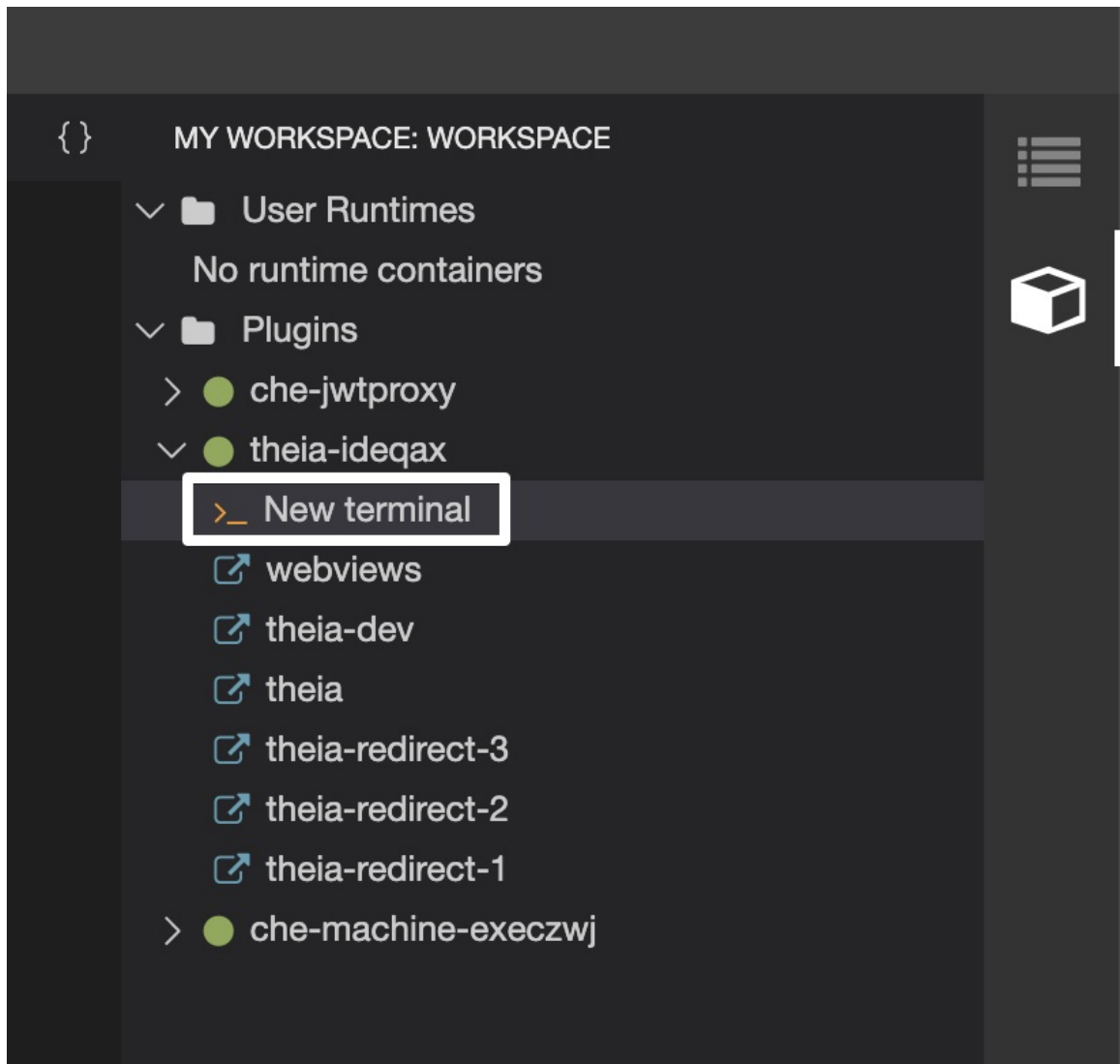
Procedure

- To configure Git identity using the CodeReady Workspaces user interface:

- Open **File > Settings > Open Preferences** or press **Ctrl+.**



- In the opened window, navigate to the **Git → User** sub-section and enter the User mail and User name values.
- To configure Git identity using the command line, open the terminal of the Che-Theia container.
 - Navigate to the **My Workspace** view, and open **Plugins > theia-ide... > New terminal**



2. Execute the following commands:

```
$ git config --global user.name "John Doe"
$ git config --global user.email johndoe@example.com
```

Che-Theia permanently stores this information in the current container and restores it for other containers on future workspace starts.

2.2.2. Accessing a Git repository using HTTPS

Procedure

To clone a repository using HTTPS:

1. Use the `clone` command provided by the Visual Studio Code **Git** extension.

Alternatively, use the native Git commands in the terminal to clone a project.

1. Navigate to destination folder using the `cd` command.
2. Use **git clone** to clone a repository:

```
$ git clone <link>
```

Red Hat CodeReady Workspaces supports Git self-signed TLS certificates. See https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#deploying-codeready-workspaces-with-support-for-git-repositories-with-self-signed-certificates_crw to learn more.

2.2.3. Accessing a Git repository using a generated SSH key pair

2.2.3.1. Generating an SSH key using the CodeReady Workspaces command palette

The following section describes a generation of an SSH key using the CodeReady Workspaces command palette and its further use in Git provider communication. This SSH key restricts permissions for the specific Git provider, therefore, the user has to create a unique SSH key for each Git provider in use.

Prerequisites

- A running instance of CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#installing-codeready-workspaces_crw.
- An existing workspace defined on this instance of CodeReady Workspaces [Section 3.3, “Creating and configuring a new CodeReady Workspaces 2.7 workspace”](#).
- Personal [GitHub account](#) or other Git provider account created.

Procedure

A common SSH key pair that works with all the Git providers is present by default. To start using it, add the public key to the Git provider.

1. Generate an SSH key pair that only works with a particular Git provider:
 - In the CodeReady Workspaces IDE, press **F1** to open the Command Palette, or navigate to **View → Find Command** in the top menu.
The **command palette** can be also activated by pressing **Ctrl+Shift+p** (or **Cmd+Shift+p** on macOS).
 - Search for **SSH: generate key pair for particular host** by entering **generate** into the search box and pressing **Enter** once filled.
 - Provide the hostname for the SSH key pair such as, for example, **github.com**.
The SSH key pair is generated.
2. Click the **View** button in the lower-right corner and copy the public key from the editor and add it to the Git provider.
You can now use another command from the command palette: **Clone git repository** by providing an SSH secured URL.

2.2.3.2. Adding the associated public key to a repository or account on GitHub

To add the associated public key to a repository or account on GitHub:

1. Navigate to github.com.
2. Click the drop-down arrow next to the user icon in the upper right corner of the window.

3. Click **Settings** → **SSH and GPG keys** and then click the **New SSH key** button.
4. In the **Title** field, type a title for the key, and in the **Key** field, paste the public key copied from CodeReady Workspaces.
5. Click the **Add SSH key** button.

2.2.3.3. Adding the associated public key to a Git repository or account on GitLab

To add the associated public key to a Git repository or account on GitLab:

1. Navigate to gitlab.com.
2. Click the user icon in the upper right corner of the window.
3. Click **Settings** → **SSH Keys**.
4. In the **Title** field, type a title for the key and in the **Key** field, paste the public key copied from CodeReady Workspaces.
5. Click the **Add key** button.

2.2.4. Managing pull requests using the GitHub PR plug-in

To manage GitHub pull requests, the VS Code GitHub Pull Request plug-in is available in the list of plug-ins of the workspace.

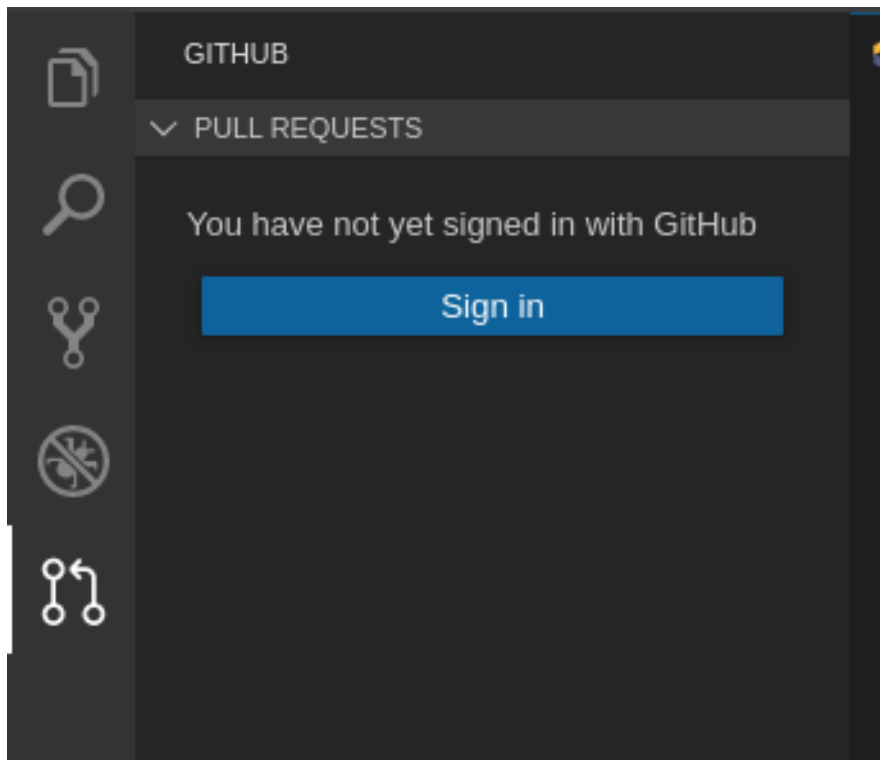
2.2.4.1. Using the GitHub Pull Requests plug-in

Prerequisites

- GitHub OAuth is configured. See [Configuring GitHub OAuth](#).

Procedure

- Sign in to GitHub, using the **Accounts** menu or the **Sign in** button in the plugin's view:



To sign out from GitHub use the **Accounts** menu in the left bottom side, or **GitHub Pull Requests: Sign out of GitHub** command.

Additional resources

- [vscode GitHub Pull Requests plugin documentation](#)

2.3. CHE-THEIA TROUBLESHOOTING

This section describes some of the most frequent issues with the Che-Theia IDE.

Che-Theia shows a notification with the following message: Plugin runtime crashed unexpectedly, all plugins are not working, please reload the page. Probably there is not enough memory for the plugins.

This means that one of the Che-Theia plug-ins that are running in the Che-Theia IDE container requires more memory than the container has. To fix this problem, increase the amount of memory for the Che-Theia IDE container:

1. Navigate to the CodeReady Workspaces Dashboard.
2. Select the workspace in which the problem happened.
3. Switch to the **Devfile** tab.
4. In the **components** section of the devfile, find a component of the **cheEditor** type.
5. Add a new property, **memoryLimit: 1024M** (or increase the value if it already exists).
6. Save changes and restart the workspace.

2.4. DIFFERENCES IN HOW CHE-THEIA WEBVIEW WORKS ON A SINGLE-HOST MODE COMPARING TO A MULTI-HOST MODE

Depending on which Che deployment strategy is used, single-host or multi-host, there're differences in how Che-Theia Webview API works.

2.4.1. What's a Webview

Webview Plug-in API allows creating a view within Che-Theia to show an arbitrary HTML content. Internally, it's implemented with an [iframe](#) and [service worker](#).

2.4.2. Webview in a multi-host mode

When Red Hat CodeReady Workspaces is deployed in a multi-host mode, webview content is served on a separate [origin](#). That means it's isolated from the main Che-Theia context. So, a contributed view has no access:

- to the top-level DOM
- to the Che-Theia state, like local storage, cookies, and so on.

2.4.3. Webview in single-host mode

When Red Hat CodeReady Workspaces is deployed in a single-host mode, webview content is loaded through the same origin as the main Che-Theia context. It means that nothing prevents external content from accessing the main Che-Theia in a browser. So, pay extra attention to what content may be loaded by different Plugins that contribute the webviews.

CHAPTER 3. DEVELOPER WORKSPACES

Red Hat CodeReady Workspaces provides developer workspaces with everything needed to a code, build, test, run, and debug applications. To allow that, the developer workspaces provide four main components:

1. The source code of a project.
2. A web-based integrated development environment (IDE).
3. Tool dependencies, needed by developers to work on a project.
4. Application runtime: a replica of the environment where the application runs in production.

Pods manage each component of a CodeReady Workspaces workspace. Therefore, everything running in a CodeReady Workspaces workspace is running inside containers. This makes a CodeReady Workspaces workspace highly portable.

The embedded browser-based IDE is the point of access for everything running in a CodeReady Workspaces workspace. This makes a CodeReady Workspaces workspace easy to share.



IMPORTANT

By default, it is possible to run only one workspace at a time. To increase the number of concurrent workspaces a user can run, patch the checluster:

```
$ oc patch checluster codeready-workspaces -n openshift-workspaces --type=merge \
-p '{"spec": {"server": {"customCheProperties": {
"CHE_LIMITS_USER_WORKSPACES_RUN_COUNT": "-1" } } }'
```

For additional information, see: [Users workspace limits](#).

Table 3.1. Features and benefits

Features	Traditional IDE workspaces	Red Hat CodeReady Workspaces workspaces
Configuration and installation required	Yes.	No.
Embedded tools	Partial. IDE plug-ins need configuration. Dependencies need installation and configuration. Example: JDK, Maven, Node.	Yes. Plug-ins provide their dependencies.
Application runtime provided	No. Developers have to manage that separately.	Yes. Application runtime is replicated in the workspace.
Shareable	No. Or not easily	Yes. Developer workspaces are shareable with a URL.

Features	Traditional IDE workspaces	Red Hat CodeReady Workspaces workspaces
Versionable	No	Yes. Devfiles exist with project source code.
Accessible from anywhere	No. Installation is needed.	Yes. Only requires a browser.

To start a CodeReady Workspaces workspace, following options are available:

- [Section 3.3, "Creating and configuring a new CodeReady Workspaces 2.7 workspace"](#)
- [Section 3.1, "Configuring a workspace using a devfile"](#)

Use the Dashboard to discover CodeReady Workspaces 2.7:

- [Section 3.6, "Creating a workspace from code sample"](#)
- [Section 3.7, "Creating a workspace by importing the source code of a project"](#)

Use a devfile as the preferred way to start a CodeReady Workspaces 2.7 workspace:

- [Section 3.2, "Making a workspace portable using a devfile"](#)
- [Section 3.4, "Importing OpenShift applications into a workspace"](#)

Use the browser-based IDE as the preferred way to interact with a CodeReady Workspaces 2.7 workspace. For an alternative way to interact with a CodeReady Workspaces 2.7 workspace, see: [Section 3.5, "Remotely accessing workspaces"](#).

3.1. CONFIGURING A WORKSPACE USING A DEVFILE

To quickly and easily configure a CodeReady Workspaces workspace, use a devfile. For an introduction to devfiles and instructions for their use, see the instructions in this section.

3.1.1. What is a devfile

A devfile is a file that describes and define a development environment:

- The source code.
- The development components, such as browser IDE tools and application runtimes.
- A list of pre-defined commands.
- Projects to clone.

A devfiles is a YAML file that CodeReady Workspaces consumes and transforms into a cloud workspace composed of multiple containers. It is possible to store a devfile remotely or locally, in any number of ways, such as:

- In a git repository, in the root folder, or on a feature branch.

- On a publicly accessible web server, accessible through HTTP.
- Locally as a file, and deployed using **crwctl**.
- In a collection of devfiles, known as a [devfile registry](#).

When creating a workspace, CodeReady Workspaces uses that definition to initiate everything and run all the containers for the required tools and application runtimes. CodeReady Workspaces also mounts file-system volumes to make source code available to the workspace.

Devfiles can be versioned with the project source code. When there is a need for a workspace to fix an old maintenance branch, the project devfile provides a definition of the workspace with the tools and the exact dependencies to start working on the old branch. Use it to instantiate workspaces on demand.

CodeReady Workspaces maintains the devfile up-to-date with the tools used in the workspace:

- Elements of the project, such as the path, git location, or branch.
- Commands to perform daily tasks such as build, run, test, and debug.
- The runtime environment with its container images needed for the application to run.
- Che-Theia plug-ins with tools, IDE features, and helpers that a developer would use in the workspace, for example, Git, Java support, SonarLint, and Pull Request.

3.1.2. Creating a workspace from the default branch of a Git repository

It is possible to create a CodeReady Workspaces workspace by pointing to a devfile that is stored in a Git source repository. The CodeReady Workspaces instance then uses the discovered [devfile.yaml](#) file to build a workspace using the factory URL (**/f?url=**) API.

The factory URL exist in two forms:

- the short form **/#\$URL**
- long **/f?url=\$URL** form that supports additional configuration parameters used in previous versions of CodeReady Workspaces

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#installing-codeready-workspaces_crw.
- The **devfile.yaml** or **.devfile.yaml** file is located in the root folder of a Git repository that is available over HTTPS. See [Section 3.2, “Making a workspace portable using a devfile”](#) for detailed information about creating and using devfiles.

Procedure

Run the workspace by opening the following URL: **https://codeready-
<openshift_deployment_name>.<domain_name>/f?url=https://<GitRepository>**

Example

```
https://che.openshift.io/f?url=https://github.com/eclipse/che
```

3.1.3. Creating a workspace from a feature branch of a Git repository

A CodeReady Workspaces workspace can be created by pointing to devfile that is stored in a Git source repository on a feature branch of the user's choice. The CodeReady Workspaces instance then uses the discovered devfile to build a workspace.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#installing-codeready-workspaces_crw.
- The **devfile.yaml** or **.devfile.yaml** file is located in the root folder of a Git repository, on a specific branch of the user's choice that is accessible over HTTPS. See [Section 3.2, "Making a workspace portable using a devfile"](#) for detailed information about creating and using devfiles.

Procedure

Execute the workspace by opening the following URL: **`https://codeready-
<openshift_deployment_name>.<domain_name>/f?url=<GitHubBranch>`**

Example

Use following URL format to open an experimental `quarkus-quickstarts` branch hosted on che.openshift.io.

```
https://che.openshift.io/f?url=https://github.com/maxandersen/quarkus-quickstarts/tree/che
```

3.1.4. Creating a workspace from a publicly accessible standalone devfile using HTTP

A workspace can be created using a devfile, the URL of which is pointing to the raw content of the devfile. The CodeReady Workspaces instance then uses the discovered devfile to build a workspace.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#installing-codeready-workspaces_crw.
- The publicly-accessible standalone **devfile.yaml** file. See [Section 3.2, "Making a workspace portable using a devfile"](#) for detailed information about creating and using devfiles.

Procedure

1. Execute the workspace by opening the following URL: **`https://codeready-
<openshift_deployment_name>.<domain_name>/f?url=https://<yourhosturl>/devfile.yaml`**

Example

```
https://che.openshift.io/f?url=https://gist.githubusercontent.com/themr0c/ef8e59a162748a8be07e900b6401e6a8/raw/8802c20743cde712bbc822521463359a60d1f7a9/devfile.yaml
```

3.1.5. Overriding devfile values using factory parameters

Values in the following sections of a remote devfile can be overridden using specially constructed additional factory parameters:

- **apiVersion**
- **metadata**
- **projects**
- **attributes**

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#installing-codeready-workspaces_crw.
- A publicly accessible standalone **devfile.yaml** file. See [Section 3.2, “Making a workspace portable using a devfile”](#) for detailed information about creating and using devfiles.

Procedure

1. Open the workspace by navigating to the following URL: **`https://codeready-
<openshift_deployment_name>.<domain_name>/f?
url=https://<hostURL>/devfile.yaml&override.<parameter.path>=<value>`**

Example 3.1. Example of overriding the `generateName` property

Consider the following initial devfile:

```
apiVersion: 1.0.0
metadata:
  generateName: golang-
projects:
  ...
```

To add or override **generateName** value, use the following factory URL:

```
https://che.openshift.io/f?
url=https://gist.githubusercontent.com/themr0c/ef8e59a162748a8be07e900b6401e6a8/raw/8802c20
743cde712bbc822521463359a60d1f7a9/devfile.yaml&override.metadata.generateName=myprefix
```

The resulting workspace has the following devfile model:

```
apiVersion: 1.0.0
metadata:
  generateName: myprefix
projects:
  ...
```

Example 3.2. Example of overriding project source branch property

Consider the following initial devfile:

```

apiVersion: 1.0.0
metadata:
  generateName: java-mysql-
projects:
  - name: web-java-spring-petclinic
    source:
      type: git
      location: "https://github.com/spring-projects/spring-petclinic.git"
...

```

To add or override source **branch** value, use the following factory URL:

```

https://che.openshift.io/f?
url=https://gist.githubusercontent.com/themr0c/ef8e59a162748a8be07e900b6401e6a8/raw/8802c20743cde712bbc822521463359a60d1f7a9/devfile.yaml&override.projects.web-java-spring-petclinic.source.branch=1.0.x

```

The resulting workspace has the following devfile model:

```

apiVersion: 1.0.0
metadata:
  generateName: java-mysql-
projects:
  - name: web-java-spring-petclinic
    source:
      type: git
      location: "https://github.com/spring-projects/spring-petclinic.git"
      branch: 1.0.x
...

```

Example 3.3. Example of overriding or creating an attribute value

Consider the following initial devfile:

```

apiVersion: 1.0.0
metadata:
  generateName: golang-
attributes:
  persistVolumes: false
projects:
...

```

To add or override **persistVolumes** attribute value, use the following factory URL:

```

https://che.openshift.io/f?
url=https://gist.githubusercontent.com/themr0c/ef8e59a162748a8be07e900b6401e6a8/raw/8802c20743cde712bbc822521463359a60d1f7a9/devfile.yaml&override.attributes.persistVolumes=true

```

The resulting workspace has the following devfile model:

```
---
apiVersion: 1.0.0
metadata:
  generateName: golang-
attributes:
  persistVolumes: true
projects:
...
```

When overriding attributes, everything that follows the **attributes** keyword is interpreted as an attribute name, so a user can use dot-separated names:

```
https://che.openshift.io/f?
url=https://gist.githubusercontent.com/themr0c/ef8e59a162748a8be07e900b6401e6a8/raw/8802c20743cde712bbc822521463359a60d1f7a9/devfile.yaml&override.attributes.dot.name.format.attribute=true
```

The resulting workspace has the following devfile model:

```
apiVersion: 1.0.0
metadata:
  generateName: golang-
attributes:
  dot.name.format.attribute: true
projects:
...
```

Verification steps

1. Using CodeReady Workspaces Dashboard, move to the **Devfile** tab of the newly created workspace and check its content.

3.1.6. Creating a workspace using crwctl and a local devfile

A CodeReady Workspaces workspace can be created by pointing the **crwctl** tool to a locally stored devfile. The CodeReady Workspaces instance then uses the discovered devfile to build a workspace.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#installing-codeready-workspaces_crw.
- The CodeReady Workspaces CLI management tool. See https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#using-the-crwctl-management-tool_crw.
- The devfile is available on the local filesystem in the current working directory. See [Section 3.2, “Making a workspace portable using a devfile”](#) for detailed information about creating and using devfiles.

- You are logged in to Red Hat CodeReady Workspaces. See [Logging in to CodeReady Workspaces using crwctl](#).

Example

Download the **devfile.yaml** file from the [GitHub repository](#) to the current working directory.

Procedure

1. Run a workspace from a devfile using the **workspace:create** parameter with the **crwctl** tool as follows:

```
$ crwctl workspace:create --name=<WORKSPACE_NAME> \ 1
--devfile=devfile.yaml --start \
-n openshift-workspaces
```

- 1 The workspace name to create



NOTE

If **--devfile** flag is omitted then **crwctl** looks for **devfile.yaml** or **devfile.yml** files in the current directory to create a workspace from.

3.1.7. Allowing users to define workspace deployment labels and annotations

This section describes how to customize workspace deployment labels and annotation using factory parameters.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#installing-codeready-workspaces_crw.
- A publicly accessible standalone **devfile.yaml** file. See [Section 3.2, “Making a workspace portable using a devfile”](#) for detailed information about creating and using devfiles.

Procedure

1. Open the workspace by navigating to the following URL: **https://codeready-
<openshift_deployment_name>.<domain_name>/f?
url=https://<hostURL>/devfile.yaml&workspaceDeploymentLabels=<url_encoded_comma
_separated_key_values>&workspaceDeploymentAnnotations=<url_encoded_comma_sep
arated_key_values override>**

Example 3.4. Example of overriding the deployment labels

Consider the following labels to add:

```
ike.target=preference-v1
ike.session=test
```

To add or override labels, use the following factory URL:

```
https://che.openshift.io/f?
url=https://gist.githubusercontent.com/themr0c/ef8e59a162748a8be07e900b6401e6a8/raw/8802c20
743cde712bbc822521463359a60d1f7a9/devfile.yaml&workspaceDeploymentLabels=ike.target%3Dpre
ference-v1%2CIke.session%3Dtest
```

The resulting workspace has the following deployment labels:

```
apiVersion: apps/v1
kind: Deployment
metadata:
  annotations:
    deployment.kubernetes.io/revision: "1"
  creationTimestamp: "2020-10-27T14:03:26Z"
  generation: 1
  labels:
    che.component.name: che-docs-dev
    che.original_name: che-docs-dev
    che.workspace_id: workspacegl2g1shejjufpkd
    ike.session: test
    ike.target: preference-v1
  name: workspacegl2g1shejjufpkd.che-docs-dev
  namespace: opentlc-mgr-che
  resourceVersion: "107516"
spec:
  ...
```

Example 3.5. Example of overriding the deployment annotations

Consider the following annotations to add:

```
ike.A1=preference-v1
ike.A=test
```

To add or override annotations, use the following factory URL:

```
https://che.openshift.io/f?
url=https://gist.githubusercontent.com/themr0c/ef8e59a162748a8be07e900b6401e6a8/raw/8802c20
743cde712bbc822521463359a60d1f7a9/devfile.yaml&workspaceDeploymentAnnotations=ike.A1%3
Dpreference-v1%2CIke.A%3Dtest
```

The resulting workspace has the following deployment annotations:

```
apiVersion: apps/v1
kind: Deployment
metadata:
  annotations:
    deployment.kubernetes.io/revision: "1"
    ike.A: test
    ike.A1: preference-v1
  creationTimestamp: "2020-10-28T09:58:52Z"
  generation: 1
```



```

labels:
  che.component.name: che-docs-dev
  che.original_name: che-docs-dev
  che.workspace_id: workspacexrtf710v64rl5ouz
  name: workspacexrtf710v64rl5ouz.che-docs-dev
  namespace: opentlc-mgr-che
  resourceVersion: "213191"
...

```

Verification steps

To display the deployment labels and annotations:

1. Get the name of the user's namespace:
 - a. Using CodeReady Workspaces Dashboard, move to the **Workspaces** tab and read the name of the OpenShift Namespace field.

1. Log in to the cluster:

- a. Retrieve the CodeReady Workspaces cluster URL from the **checluster** CR (Custom Resource), run:

```
$ oc get checluster --output jsonpath='{.items[0].status.cheURL}'
```

- b. Log in:

```
$ oc login -u <username> -p <password> <cluster_URL>
```

1. Display the deployment labels and annotations for all deployments in the namespace using the OpenShift Namespace name from the first step:

```
$ oc get deployment -n <NAMESPACE> -o=custom-
columns="NAMESPACE:.metadata.namespace,NAME:.metadata.name,LABELS:.metadata.lab
els,ANNOTATIONS:.metadata.annotations"
```

Additional resources

- [Section 3.2, "Making a workspace portable using a devfile"](#)

3.2. MAKING A WORKSPACE PORTABLE USING A DEVFILE

To transfer a configured CodeReady Workspaces workspace, create and export the devfile of the workspace and load the devfile on a different host to initialize a new instance of the workspace. For detailed instructions on how to create such a devfile, see below.

3.2.1. A minimal devfile

The following is the minimum content required in a devfile:

- [apiVersion](#)
- [metadata name](#)

```
apiVersion: 1.0.0
metadata:
  name: crw-in-crw-out
```

For a complete devfile example, see [Red Hat CodeReady Workspaces in CodeReady Workspaces devfile.yaml](#).



NOTE

A choice of use of the parameter **generateName** or **name** is optional, but only one of these parameters has to be chosen by a user and defined. When both attributes are specified, **generateName** is ignored. See [Section 3.2.2, "Generating workspace names"](#).

```
metadata:
  generatedName:
```

or

```
metadata:
  name:
```

3.2.2. Generating workspace names

To specify a prefix for automatically generated workspace names, set the **generateName** parameter in the devfile:

```
apiVersion: 1.0.0
metadata:
  generateName: crw-
```

The workspace name will be in the **<generateName>YYYYY** format (for example, **che-2y7kp**). **Y** is random **[a-z0-9]** character.

The following naming rules apply when creating workspaces:

- When **name** is defined, it is used as the workspace name: **<name>**
- When only **generateName** is defined, it is used as the base of the generated name: **<generateName>YYYYY**



NOTE

For workspaces created using a factory, defining **name** or **generateName** has the same effect. The defined value is used as the name prefix: **<name>YYYYY** or **<generateName>YYYYY**. When both **generateName** and **name** are defined, **generateName** takes precedence.

3.2.3. Writing a devfile for a project

This section describes how to create a minimal devfile for your project and how to include more than one projects in a devfile.

3.2.3.1. Preparing a minimal devfile

A minimal devfile sufficient to run a workspace consists of the following parts:

- Specification version
- Name

Example of a minimal devfile with no project

```
apiVersion: 1.0.0
metadata:
  name: minimal-workspace
```

Without any further configuration, a workspace with the default editor is launched along with its default plug-ins, which are configured on the CodeReady Workspaces Server. Che-Theia is configured as the default editor along with the **CodeReady Workspaces Machine Exec** plug-in. When launching a workspace within a Git repository using a factory, the project from the given repository and branch is created by default. The project name then matches the repository name.

Add the following parts for a more functional workspace:

- List of components: Development components and user runtimes
- List of projects: Source code repositories
- List of commands: Actions to manage the workspace components, such as running the development tools, starting the runtime environments, and others

Example of a minimal devfile with a project

```
apiVersion: 1.0.0
metadata:
  name: petclinic-dev-environment
projects:
  - name: petclinic
    source:
      type: git
      location: 'https://github.com/spring-projects/spring-petclinic.git'
components:
  - type: chePlugin
    id: redhat/java/latest
```

3.2.3.2. Specifying multiple projects in a devfile

A single devfile can define multiple projects, which are cloned to the desired destination. These projects are created inside a user's workspace after the workspace is started.

For each project, specify the following:

- The type of the source repository - this can be .git or .zip. For additional information, see the [Devfile reference](#) section.
- The location of the source repository - an URL to a Git repository or ZIP archive.

- Optionally, the directory to which the project is cloned. If none is specified, the default directory is used, which is a directory that matches the project name or project Git repository.

Example of a devfile with two projects

In the following example, the projects **frontend** and **backend** act as examples of a user's projects. Each project is located in a separate repository.

- The **backend** project has a specific requirement to be cloned into the **src/github.com/<github-organization>/<backend>/** directory under the source root, implicitly defined by the CodeReady Workspaces runtime.
- The **frontend** project will be cloned into the **<frontend>/** directory under the source root.

```
apiVersion: 1.0.0
metadata:
  name: example-devfile
projects:
- name: <frontend>
  source:
    type: git
    location: https://github.com/<github-organization>/<frontend>.git
- name: <backend>
  clonePath: src/github.com/<github-organization>/<backend>
  source:
    type: git
    location: https://github.com/<github-organization>/<backend>.git
```

Additional resources

For a detailed explanation of all devfile component assignments and possible values, see:

- [Specification repository](#)
- [Detailed json-schema documentation](#)

These sample devfiles are a good source of inspiration:

- [Sample devfiles for Red Hat CodeReady Workspaces workspaces used by default in the user interface.](#)
- [Sample devfiles for Red Hat CodeReady Workspaces workspaces from Red Hat Developer program.](#)

3.2.4. Devfile reference

This section contains devfile reference and instructions on how to use the various elements that devfiles consist of.

3.2.4.1. Adding projects to a devfile

Usually a devfile contains one or more projects. A workspace is created to develop those projects. Projects are added in the **projects** section of devfiles.

Each project in a single devfile must have:

- Unique name
- Source specified

Project source consists of two mandatory values: **type** and **location**.

type

The kind of project-source provider.

location

The URL of project source.

CodeReady Workspaces supports the following project types:

git

Projects with sources in Git. The location points to a clone link.

github

Same as **git** but for projects hosted on [GitHub](#) only. Use **git** for projects that do not use GitHub-specific features.

zip

Projects with sources in a ZIP archive. Location points to a ZIP file.

3.2.4.1.1. Project-source type: git

```
source:
  type: git
  location: https://github.com/eclipse/che.git
  startPoint: master 1
  tag: 7.2.0
  commitId: 36fe587
  branch: 7.20.x
  sparseCheckoutDir: core 2
```

1 **startPoint**: The general value for **tag**, **commitId**, and **branch**. The **startPoint**, **tag**, **commitId**, and **branch** parameters are mutually exclusive. When more than one is supplied, the following order is used: **startPoint**, **tag**, **commitId**, **branch**.

2 **sparseCheckoutDir**: The template for the sparse checkout Git feature. This is useful when only a part of a project, typically a single directory, is needed.

Example 3.6. sparseCheckoutDir parameter settings

- Set to **/my-module/** to create only the root **my-module** directory (and its content).
- Omit the leading slash (**my-module/**) to create all **my-module** directories that exist in the project. Including, for example, **/addons/my-module/**. The trailing slash indicates that only directories with the given name (including their content) are created.
- Use wildcards to specify more than one directory name. For example, setting **module-*** checks out all directories of the given project that start with **module-**.

For more information, see [Sparse checkout in Git documentation](#).

3.2.4.1.2. Project-source type: zip

```
source:
  type: zip
  location: http://host.net/path/project-src.zip
```

3.2.4.1.3. Project clone-path parameter: clonePath

The **clonePath** parameter specifies the path into which the project is to be cloned. The path must be relative to the **/projects/** directory, and it cannot leave the **/projects/** directory. The default value is the project name.

Example devfile with projects

```
apiVersion: 1.0.0
metadata:
  name: my-project-dev
projects:
- name: my-project-resource
  clonePath: resources/my-project
  source:
    type: zip
    location: http://host.net/path/project-res.zip
- name: my-project
  source:
    type: git
    location: https://github.com/my-org/project.git
    branch: develop
```

3.2.4.2. Adding components to a devfile

Each component in a single devfile must have a unique name.

3.2.4.2.1. Component type: cheEditor

Describes the editor used in the workspace by defining its **id**. A devfile can only contain one component of the **cheEditor** type.

```
components:
- alias: theia-editor
  type: cheEditor
  id: eclipse/che-theia/next
```

When **cheEditor** is missing, a default editor is provided along with its default plug-ins. The default plug-ins are also provided for an explicitly defined editor with the same **id** as the default one (even if it is a different version). Che-Theia is configured as default editor along with the **CodeReady Workspaces Machine Exec** plug-in.

To specify that a workspace requires no editor, use the [editorFree:true attribute](#) in the devfile attributes.

3.2.4.2.2. Component type: chePlugin

Describes plug-ins in a workspace by defining their **id**. It is allowed to have several **chePlugin** components.

```
components:
- alias: exec-plugin
  type: chePlugin
  id: eclipse/che-machine-exec-plugin/0.0.1
```

Both types above use an ID, which is slash-separated publisher, name and version of plug-in from the CodeReady Workspaces Plug-in registry.

List of available Eclipse Che plug-ins and more information about registry can be found in the [Eclipse Che plug-in registry](#) GitHub repository.

3.2.4.2.3. Specifying an alternative component registry

To specify an alternative registry for the **cheEditor** and **chePlugin** component types, use the **registryUrl** parameter:

```
components:
- alias: exec-plugin
  type: chePlugin
  registryUrl: https://my-customregistry.com
  id: eclipse/che-machine-exec-plugin/0.0.1
```

3.2.4.2.4. Specifying a component by linking to its descriptor

An alternative way of specifying **cheEditor** or **chePlugin**, instead of using the editor or plug-in **id** (and optionally an alternative registry), is to provide a direct link to the component descriptor (typically named **meta.yaml**) by using the **reference** field:

```
components:
- alias: exec-plugin
  type: chePlugin
  reference: https://raw.githubusercontent.com.../plugin/1.0.1/meta.yaml
```



NOTE

It is impossible to mix the **id** and **reference** fields in a single component definition; they are mutually exclusive.

3.2.4.2.5. Tuning chePlugin component configuration

A chePlugin component may need to be precisely tuned, and in such case, component preferences can be used. The example shows how to configure JVM using plug-in preferences.

```
id: redhat/java/0.38.0
type: chePlugin
preferences:
  java.jdt.ls.vmargs: '-noverify -Xmx1G -XX:+UseG1GC -XX:+UseStringDeduplication'
```

Preferences may also be specified as an array:

```
id: redhat/java/0.38.0
type: chePlugin
preferences:
  go.lintFlags: ["--enable-all", "--new"]
```

3.2.4.2.6. Component type: kubernetes

A complex component type that allows to apply configuration from a list of OpenShift components.

The content can be provided through the **reference** attribute, which points to the file with the component content.

```
components:
- alias: mysql
  type: kubernetes
  reference: petclinic.yaml
  selector:
    app.kubernetes.io/name: mysql
    app.kubernetes.io/component: database
    app.kubernetes.io/part-of: petclinic
```

Alternatively, to post a devfile with such components to REST API, the contents of the OpenShift **List** object can be embedded into the devfile using the **referenceContent** field:

```
components:
- alias: mysql
  type: kubernetes
  reference: petclinic.yaml
  referenceContent: |
    kind: List
    items:
    -
      apiVersion: v1
      kind: Pod
      metadata:
        name: ws
      spec:
        containers:
        ... etc
```

3.2.4.2.7. Overriding container endpoints

As with the [understood](#) by OpenShift).

There can be more containers in the list (contained in Pods or Pod templates of deployments). To select which containers to apply the endpoint changes to.

The endpoints can be defined as follows:

```
components:
- alias: appDeployment
  type: kubernetes
```



```
reference: app-deployment.yaml
entrypoints:
- parentName: mysqlServer
  command: ['sleep']
  args: ['infinity']
- parentSelector:
  app: prometheus
  args: ['-f', '/opt/app/prometheus-config.yaml']
```

The **entrypoints** list contains constraints for picking the containers along with the **command** and **args** parameters to apply to them. In the example above, the constraint is **parentName: mysqlServer**, which will cause the command to be applied to all containers defined in any parent object called **mysqlServer**. The parent object is assumed to be a top level object in the list defined in the referenced file, which is **app-deployment.yaml** in the example above.

Other types of constraints (and their combinations) are possible:

containerName

the name of the container

parentName

the name of the parent object that (indirectly) contains the containers to override

parentSelector

the set of labels the parent object needs to have

A combination of these constraints can be used to precisely locate the containers inside the referenced OpenShift **List**.

3.2.4.2.8. Overriding container environment variables

To provision or override entrypoints in a OpenShift component, configure it in the following way:

```
components:
- alias: appDeployment
  type: kubernetes
  reference: app-deployment.yaml
  env:
  - name: ENV_VAR
    value: value
```

This is useful for temporary content or without access to editing the referenced content. The specified environment variables are provisioned into each init container and containers inside all Pods and Deployments.

3.2.4.2.9. Specifying mount-source option

To specify a project sources directory mount into container(s), use the **mountSources** parameter:

```
components:
- alias: appDeployment
  type: kubernetes
  reference: app-deployment.yaml
  mountSources: true
```

If enabled, project sources mounts will be applied to every container of the given component. This parameter is also applicable for **chePlugin** type components.

3.2.4.2.10. Component type: dockerimage

A component type that allows to define a container image-based configuration of a container in a workspace. The **dockerimage** type of component brings in custom tools into the workspace. The component is identified by its image.

```

components:
  - alias: maven
    type: dockerimage
    image: quay.io/eclipse/che-java11-maven:nightly
    volumes:
      - name: mavenrepo
        containerPath: /root/.m2
    env:
      - name: ENV_VAR
        value: value
    endpoints:
      - name: maven-server
        port: 3101
        attributes:
          protocol: http
          secure: 'true'
          public: 'true'
          discoverable: 'false'
    memoryLimit: 1536M
    memoryRequest: 256M
    command: ['tail']
    args: ['-f', '/dev/null']

```

Example of a minimaldockerimage component

```

apiVersion: 1.0.0
metadata:
  name: MyDevfile
components:
  - type: dockerimage
    image: golang
    memoryLimit: 512Mi
    command: ['sleep', 'infinity']

```

It specifies the type of the component, **dockerimage** and the **image** attribute names the image to be used for the component using the usual Docker naming conventions, that is, the above **type** attribute is equal to **docker.io/library/golang:latest**.

A **dockerimage** component has many features that enable augmenting the image with additional resources and information needed for meaningful integration of the **tool** provided by the image with Red Hat CodeReady Workspaces.

3.2.4.2.11. Mounting project sources

For the **dockerimage** component to have access to the project sources, you must set the **mountSources** attribute to **true**.

```

apiVersion: 1.0.0
metadata:
  name: MyDevfile
components:
  - type: dockerimage
    image: golang
    memoryLimit: 512Mi
    command: ['sleep', 'infinity']

```

The sources is mounted on a location stored in the **CHE_PROJECTS_ROOT** environment variable that is made available in the running container of the image. This location defaults to **/projects**.

3.2.4.2.12. Container Entrypoint

The **command** attribute of the **dockerimage** along with other arguments, is used to modify the **entrypoint** command of the container created from the image. In Red Hat CodeReady Workspaces the container is needed to run indefinitely so that you can connect to it and execute arbitrary commands in it at any time. Because the availability of the **sleep** command and the support for the **infinity** argument for it is different and depends on the base image used in the particular images, CodeReady Workspaces cannot insert this behavior automatically on its own. However, you can take advantage of this feature to, for example, start necessary servers with modified configurations, and so on.

3.2.4.2.13. Persistent Storage

Components of any type can specify the custom volumes to be mounted on specific locations within the image. Note that the volume names are shared across all components and therefore this mechanism can also be used to share file systems between components.

Example specifying volumes for **dockerimage** type:

```

apiVersion: 1.0.0
metadata:
  name: MyDevfile
components:
  - type: dockerimage
    image: golang
    memoryLimit: 512Mi
    mountSources: true
    command: ['sleep', 'infinity']
    volumes:
      - name: cache
        containerPath: /.cache

```

Example specifying volumes for **cheEditor/chePlugin** type:

```

apiVersion: 1.0.0
metadata:
  name: MyDevfile
components:
  - type: cheEditor
    alias: theia-editor
    id: eclipse/che-theia/next
    env:
      - name: HOME
        value: $(CHE_PROJECTS_ROOT)

```

```
volumes:
- name: cache
  containerPath: /.cache
```

Example specifying volumes for **kubernetes/openshift** type:

```
apiVersion: 1.0.0
metadata:
  name: MyDevfile
components:
- type: openshift
  alias: mongo
  reference: mongo-db.yaml
  volumes:
- name: mongo-persistent-storage
  containerPath: /data/db
```

3.2.4.2.14. Specifying container memory limit for components

To specify a container(s) memory limit for **dockerimage**, **chePlugin** or **cheEditor**, use the **memoryLimit** parameter:

```
components:
- alias: exec-plugin
  type: chePlugin
  id: eclipse/che-machine-exec-plugin/0.0.1
  memoryLimit: 1Gi
- alias: maven
  type: dockerimage
  image: quay.io/eclipse/che-java11-maven:nightly
  memoryLimit: 512M
```

This limit will be applied to every container of the given component.

For the **cheEditor** and **chePlugin** component types, RAM limits can be described in the plug-in descriptor file, typically named **meta.yaml**.

If none of them are specified, system-wide defaults will be applied (see description of **CHE_WORKSPACE_SIDECAR_DEFAULT__MEMORY__LIMIT__MB** system property).

3.2.4.2.15. Specifying container memory request for components

To specify a container(s) memory request for **dockerimage**, **chePlugin** or **cheEditor**, use the **memoryRequest** parameter:

```
components:
- alias: exec-plugin
  type: chePlugin
  id: eclipse/che-machine-exec-plugin/0.0.1
  memoryLimit: 1Gi
  memoryRequest: 512M
- alias: maven
  type: dockerimage
```

```
image: quay.io/eclipse/che-java11-maven:nightly
memoryLimit: 512M
memoryRequest: 256M
```

This limit will be applied to every container of the given component.

For the **cheEditor** and **chePlugin** component types, RAM requests can be described in the plug-in descriptor file, typically named **meta.yaml**.

If none of them are specified, system-wide defaults are applied (see description of **CHE_WORKSPACE_SIDECAR_DEFAULT_MEMORY_REQUEST_MB** system property).

3.2.4.2.16. Specifying container CPU limit for components

To specify a container(s) CPU limit for **chePlugin**, **cheEditor** or **dockerimage** use the **cpuLimit** parameter:

```
components:
- alias: exec-plugin
  type: chePlugin
  id: eclipse/che-machine-exec-plugin/0.0.1
  cpuLimit: 1.5
- alias: maven
  type: dockerimage
  image: quay.io/eclipse/che-java11-maven:nightly
  cpuLimit: 750m
```

This limit will be applied to every container of the given component.

For the **cheEditor** and **chePlugin** component types, CPU limits can be described in the plug-in descriptor file, typically named **meta.yaml**.

If none of them are specified, system-wide defaults are applied (see description of **CHE_WORKSPACE_SIDECAR_DEFAULT_CPU_LIMIT_CORES** system property).

3.2.4.2.17. Specifying container CPU request for components

To specify a container(s) CPU request for **chePlugin**, **cheEditor** or **dockerimage** use the **cpuRequest** parameter:

```
components:
- alias: exec-plugin
  type: chePlugin
  id: eclipse/che-machine-exec-plugin/0.0.1
  cpuLimit: 1.5
  cpuRequest: 0.225
- alias: maven
  type: dockerimage
  image: quay.io/eclipse/che-java11-maven:nightly
  cpuLimit: 750m
  cpuRequest: 450m
```

This limit will be applied to every container of the given component.

For the **cheEditor** and **chePlugin** component types, CPU requests can be described in the plug-in descriptor file, typically named **meta.yaml**.

If none of them are specified, system-wide defaults are applied (see description of **CHE_WORKSPACE_SIDECAR_DEFAULT_CPU_REQUEST_CORES** system property).

3.2.4.2.18. Environment variables

Red Hat CodeReady Workspaces allows you to configure Docker containers by modifying the environment variables available in component's configuration. Environment variables are supported by the following component types: **dockerimage**, **chePlugin**, **cheEditor**, **kubernetes**, **openshift**. In case component has multiple containers, environment variables will be provisioned to each container.

```
apiVersion: 1.0.0
metadata:
  name: MyDevfile
components:
- type: dockerimage
  image: golang
  memoryLimit: 512Mi
  mountSources: true
  command: ['sleep', 'infinity']
  env:
    - name: GOPATH
      value: $(CHE_PROJECTS_ROOT)/go
- type: cheEditor
  alias: theia-editor
  id: eclipse/che-theia/next
  memoryLimit: 2Gi
  env:
    - name: HOME
      value: $(CHE_PROJECTS_ROOT)
```



NOTE

- The variable expansion works between the environment variables, and it uses the Kubernetes convention for the variable references.
- The predefined variables are available for use in custom definitions.

The following environment variables are pre-set by the CodeReady Workspaces server:

- **CHE_PROJECTS_ROOT**: The location of the projects directory (note that if the component does not mount the sources, the projects will not be accessible).
- **CHE_WORKSPACE_LOGS_ROOT_DIR**: The location of the logs common to all the components. If the component chooses to put logs into this directory, the log files are accessible from all other components.
- **CHE_API_INTERNAL**: The URL to the CodeReady Workspaces server API endpoint used for communication with the CodeReady Workspaces server.
- **CHE_WORKSPACE_ID**: The ID of the current workspace.
- **CHE_WORKSPACE_NAME**: The name of the current workspace.

- **CHE_WORKSPACE_NAMESPACE:** The CodeReady Workspaces project of the current workspace. This environment variable is the name of the user or organization that the workspace belongs to. Note that this is different from the OpenShift project to which the workspace is deployed.
- **CHE_MACHINE_TOKEN:** The token used to authenticate the request against the CodeReady Workspaces server.
- **CHE_MACHINE_AUTH_SIGNATURE_PUBLIC_KEY:** The public key used to secure the communication with the CodeReady Workspaces server.
- **CHE_MACHINE_AUTH_SIGNATURE_ALGORITHM:** The encryption algorithm used in the secured communication with the CodeReady Workspaces server.

A devfile may only need the **CHE_PROJECTS_ROOT** environment variable to locate the cloned projects in the component's container. More advanced devfiles might use the **CHE_WORKSPACE_LOGS_ROOT_DIR** environment variable to read the logs (for example as part of a devfile command). The environment variables used to securely access the CodeReady Workspaces server are mostly out of scope for devfiles and are present only for advanced use cases that are usually handled by the CodeReady Workspaces plug-ins.

3.2.4.2.19. Endpoints

Components of any type can specify the endpoints that the Docker image exposes. These endpoints can be made accessible to the users if the CodeReady Workspaces cluster is running using a Kubernetes ingress or an OpenShift route and to the other components within the workspace. You can create an endpoint for your application or database, if your application or database server is listening on a port and you want to be able to directly interact with it yourself or you want other components to interact with it.

Endpoints have several properties as shown in the following example:

```
apiVersion: 1.0.0
metadata:
  name: MyDevfile
projects:
- name: my-go-project
  clonePath: go/src/github.com/acme/my-go-project
  source:
    type: git
    location: https://github.com/acme/my-go-project.git
components:
- type: dockerimage
  image: golang
  memoryLimit: 512Mi
  mountSources: true
  command: ['sleep', 'infinity']
  env:
  - name: GOPATH
    value: $(CHE_PROJECTS_ROOT)/go
  - name: GOCACHE
    value: /tmp/go-cache
endpoints:
- name: web
  port: 8080
  attributes:
    discoverable: false
```

```

    public: true
    protocol: http
- type: dockerimage
  image: postgres
  memoryLimit: 512Mi
  env:
    - name: POSTGRES_USER
      value: user
    - name: POSTGRES_PASSWORD
      value: password
    - name: POSTGRES_DB
      value: database
  endpoints:
    - name: postgres
      port: 5432
      attributes:
        discoverable: true
        public: false

```

Here, there are two Docker images, each defining a single endpoint. Endpoint is an accessible port that can be made accessible inside the workspace or also publicly (example, from the UI). Each endpoint has a name and port, which is the port on which certain server running inside the container is listening. The following are a few attributes that you can set on the endpoint:

- **discoverable:** If an endpoint is discoverable, it means that it can be accessed using its name as the host name within the workspace containers (in the OpenShift terminology, a service is created for it with the provided name). 55
- **public:** The endpoint will be accessible outside of the workspace, too (such endpoint can be accessed from the CodeReady Workspaces user interface). Such endpoints are publicized always on port **80** or **443** (depending on whether **tls** is enabled in CodeReady Workspaces).
- **protocol:** For public endpoints the protocol is a hint to the UI on how to construct the URL for the endpoint access. Typical values are **http**, **https**, **ws**, **wss**.
- **secure:** A boolean (defaulting to **false**) specifying whether the endpoint is put behind a JWT proxy requiring a JWT workspace token to grant access. The JWT proxy is deployed in the same Pod as the server and assumes the server listens solely on the local loopback interface, such as **127.0.0.1**.



WARNING

Listening on any other interface than the local loopback poses a security risk because such server is accessible without the JWT authentication within the cluster network on the corresponding IP addresses.

- **path:** The path portion of the URL to the endpoint. This defaults to **/**, meaning that the endpoint is assumed to be accessible at the web root of the server defined by the component.
- **unsecuredPaths:** A comma-separated list of endpoint paths that are to stay unsecured even if the **secure** attribute is set to **true**.

- **cookiesAuthEnabled**: When set to **true** (the default is **false**), the JWT workspace token is automatically fetched and included in a workspace-specific cookie to allow requests to pass through the JWT proxy.

**WARNING**

This setting potentially allows a [CSRF](#) attack when used in conjunction with a server using POST requests.

When starting a new server within a component, CodeReady Workspaces autodetects this, and the UI offers to automatically expose this port as a **public** port. This is useful for debugging a web application, for example. It is impossible to do this for servers that autostart with the container (for example, a database server). For such components, specify the endpoints explicitly.

Example specifying endpoints for **kubernetes/openshift** and **chePlugin/cheEditor** types:

```

apiVersion: 1.0.0
metadata:
  name: MyDevfile
components:
- type: cheEditor
  alias: theia-editor
  id: eclipse/che-theia/next
  endpoints:
  - name: 'theia-extra-endpoint'
    port: 8880
    attributes:
      discoverable: true
      public: true

- type: chePlugin
  id: redhat/php/latest
  memoryLimit: 1Gi
  endpoints:
  - name: 'php-endpoint'
    port: 7777

- type: chePlugin
  alias: theia-editor
  id: eclipse/che-theia/next
  endpoints:
  - name: 'theia-extra-endpoint'
    port: 8880
    attributes:
      discoverable: true
      public: true

- type: openshift
  alias: webapp
  reference: webapp.yaml
  endpoints:

```

```

- name: 'web'
  port: 8080
  attributes:
    discoverable: false
    public: true
    protocol: http

- type: openshift
  alias: mongo
  reference: mongo-db.yaml
  endpoints:
  - name: 'mongo-db'
    port: 27017
    attributes:
      discoverable: true
      public: false

```

3.2.4.2.20. OpenShift resources

To describe complex deployments, include references to OpenShift resource lists in the devfile. The OpenShift resource lists become a part of the workspace.



IMPORTANT

- CodeReady Workspaces merges all resources from the OpenShift resource lists into a single deployment.
- Be careful when designing such lists to avoid name conflicts and other problems.

Table 3.2. Supported OpenShift resources

Platform	Supported resources
OpenShift	deployments, pods, services, persistent volume claims, secrets, ConfigMaps, Routes

```

apiVersion: 1.0.0
metadata:
  name: MyDevfile
projects:
  - name: my-go-project
    clonePath: go/src/github.com/acme/my-go-project
    source:
      type: git
      location: https://github.com/acme/my-go-project.git
components:
  - type: kubernetes
    reference: ../relative/path/postgres.yaml

```

The preceding component references a file that is relative to the location of the devfile itself. Meaning, this devfile is only loadable by a CodeReady Workspaces factory to which you supply the location of the devfile and therefore it is able to figure out the location of the referenced OpenShift resource list.

The following is an example of the **postgres.yaml** file.

```
apiVersion: v1
kind: List
items:
-
  apiVersion: v1
  kind: Deployment
  metadata:
    name: postgres
    labels:
      app: postgres
  spec:
    template:
      metadata:
        name: postgres
        app:
          name: postgres
      spec:
        containers:
        - image: postgres
          name: postgres
          ports:
            - name: postgres
              containerPort: 5432
          volumeMounts:
            - name: pg-storage
              mountPath: /var/lib/postgresql/data
        volumes:
        - name: pg-storage
          persistentVolumeClaim:
            claimName: pg-storage
-
  apiVersion: v1
  kind: Service
  metadata:
    name: postgres
    labels:
      app: postgres
      name: postgres
  spec:
    ports:
      - port: 5432
        targetPort: 5432
    selector:
      app: postgres
-
  apiVersion: v1
  kind: PersistentVolumeClaim
  metadata:
    name: pg-storage
    labels:
      app: postgres
  spec:
    accessModes:
      - ReadWriteOnce
```

```
resources:
  requests:
    storage: 1Gi
```

For a basic example of a devfile with an associated OpenShift list, see [web-nodejs-with-db-sample](#) on redhat-developer GitHub.

If you use generic or large resource lists from which you will only need a subset of resources, you can select particular resources from the list using a selector (which, as the usual OpenShift selectors, works on the labels of the resources in the list).

```
apiVersion: 1.0.0
metadata:
  name: MyDevfile
projects:
  - name: my-go-project
    clonePath: go/src/github.com/acme/my-go-project
    source:
      type: git
      location: https://github.com/acme/my-go-project.git
components:
  - type: kubernetes
    reference: ../relative/path/postgres.yaml
    selector:
      app: postgres
```

Additionally, it is also possible to modify the entrypoints (command and arguments) of the containers present in the resource list. For details of the advanced use case, see [Defining specific container images](#).

3.2.4.3. Adding commands to a devfile

A devfile allows to specify commands to be available for execution in a workspace. Every command can contain a subset of actions, which are related to a specific component in whose container it will be executed.

```
commands:
  - name: build
    actions:
      - type: exec
        component: mysql
        command: mvn clean
        workdir: /projects/spring-petclinic
```

You can use commands to automate the workspace. You can define commands for building and testing your code, or cleaning the database.

The following are two kinds of commands:

- CodeReady Workspaces specific commands: You have full control over what component executes the command.
- Editor specific commands: You can use the editor-specific command definitions (example: **tasks.json** and **launch.json** in Che-Theia, which is equivalent to how these files work in VS Code).

3.2.4.3.1. CodeReady Workspaces-specific commands

Each CodeReady Workspaces-specific command features:

- An **actions** attribute that specifies a command to execute.
- A **component** attribute that specifies the container in which to execute the command.

The commands are run using the default shell in the container.

```

apiVersion: 1.0.0
metadata:
  name: MyDevfile
projects:
  - name: my-go-project
    clonePath: go/src/github.com/acme/my-go-project
    source:
      type: git
      location: https://github.com/acme/my-go-project.git
components:
  - type: dockerimage
    image: golang
    alias: go-cli
    memoryLimit: 512Mi
    mountSources: true
    command: ['sleep', 'infinity']
    env:
      - name: GOPATH
        value: ${CHE_PROJECTS_ROOT}/go
      - name: GOCACHE
        value: /tmp/go-cache
commands:
  - name: compile and run
    actions:
      - type: exec
        component: go-cli
        command: "go get -d && go run main.go"
        workdir: "${CHE_PROJECTS_ROOT}/src/github.com/acme/my-go-project"

```



NOTE

- If a component to be used in a command must have an alias. This alias is used to reference the component in the command definition. Example: **alias: go-cli** in the component definition and **component: go-cli** in the command definition. This ensures that Red Hat CodeReady Workspaces can find the correct container to run the command in.
- A command can have only one action.

3.2.4.3.2. Editor-specific commands

If the editor in the workspace supports it, the devfile can specify additional configuration in the editor-specific format. This is dependent on the integration code present in the workspace editor itself and so is not a generic mechanism. However, the default Che-Theia editor within Red Hat CodeReady Workspaces is equipped to understand the **tasks.json** and **launch.json** files provided in the devfile.

```

apiVersion: 1.0.0
metadata:
  name: MyDevfile
projects:
  - name: my-go-project
    clonePath: go/src/github.com/acme/my-go-project
    source:
      type: git
      location: https://github.com/acme/my-go-project.git
commands:
  - name: tasks
    actions:
      - type: vscode-task
        referenceContent: >
          {
            "version": "2.0.0",
            "tasks": [
              {
                "label": "create test file",
                "type": "shell",
                "command": "touch ${workspaceFolder}/test.file"
              }
            ]
          }

```

This example shows association of a **tasks.json** file with a devfile. Notice the **vscode-task** type that instructs the Che-Theia editor to interpret this command as a tasks definition and **referenceContent** attribute that contains the contents of the file itself. You can also save this file separately from the devfile and use **reference** attribute to specify a relative or absolute URL to it.

In addition to the **vscode-task** commands, the Che-Theia editor understands **vscode-launch** type using which you can specify the launch configurations.

3.2.4.3.3. Command preview URL

It is possible to specify a preview URL for commands that expose web UI. This URL is offered for opening when the command is executed.

```

commands:
  - name: tasks
    previewUrl:
      port: 8080 1
      path: /myweb 2
    actions:
      - type: exec
        component: go-cli
        command: "go run webserver.go"
        workdir: ${CHE_PROJECTS_ROOT}/webserver

```

1 TCP port where the application listens. Mandatory parameter.

2 The path part of the URL to the UI. Optional parameter. The default is root (/).

The example above opens `http://__<server-domain>_/myweb`, where `<server-domain>` is the URL to the dynamically created OpenShift Route.

3.2.4.3.3.1. Setting the default way of opening preview URLs

By default, a notification that asks the user about the URL opening preference is displayed.

To specify the preferred way of previewing a service URL:

1. Open CodeReady Workspaces preferences in **File → Settings → Open Preferences** and find **che.task.preview.notifications** in the **CodeReady Workspaces** section.
2. Choose from the list of possible values:
 - **on** – enables a notification for asking the user about the URL opening preferences
 - **alwaysPreview** – the preview URL opens automatically in the **Preview** panel as soon as a task is running
 - **alwaysGoTo** – the preview URL opens automatically in a separate browser tab as soon as a task is running
 - **off** – disables opening the preview URL (automatically and with a notification)

3.2.4.4. Devfile attributes

Devfile attributes can be used to configure various features.

3.2.4.4.1. Attribute: editorFree

When an editor is not specified in a devfile, a default is provided. When no editor is needed, use the **editorFree** attribute. The default value of **false** means that the devfile requests the provisioning of the default editor.

Example of a devfile without an editor

```
apiVersion: 1.0.0
metadata:
  name: petclinic-dev-environment
components:
  - alias: myApp
    type: kubernetes
    reference: my-app.yaml
attributes:
  editorFree: true
```

3.2.4.4.2. Attribute: persistVolumes (ephemeral mode)

By default, volumes and PVCs specified in a devfile are bound to a host folder to persist data even after a container restart. To disable data persistence to make the workspace faster, such as when the volume back end is slow, modify the **persistVolumes** attribute in the devfile. The default value is **true**. Set to **false** to use **emptyDir** for configured volumes and PVC.

Example of a devfile with ephemeral mode enabled

```
apiVersion: 1.0.0
metadata:
  name: petclinic-dev-environment
projects:
  - name: petclinic
    source:
      type: git
      location: 'https://github.com/che-samples/web-java-spring-petclinic.git'
attributes:
  persistVolumes: false
```

3.2.4.4.3. Attribute: `asyncPersist` (asynchronous storage)

When `persistVolumes` is set to `false` (see above), the additional attribute `asyncPersist` can be set to `true` to enable asynchronous storage. See https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#configuring-storage-types_crw for more details.

Example of a devfile with asynchronous storage enabled

```
apiVersion: 1.0.0
metadata:
  name: petclinic-dev-environment
projects:
  - name: petclinic
    source:
      type: git
      location: 'https://github.com/che-samples/web-java-spring-petclinic.git'
attributes:
  persistVolumes: false
  asyncPersist: true
```

3.2.4.4.4. Attribute: `mergePlugins`

This property can be set to manually control how plugins are included in the workspace. When the property `mergePlugins` is set to `true`, Che will attempt to avoid running multiple instances of the same container by combining plugins. The default value when this property is not included in a devfile is governed by the Che configuration property `che.workspace.plugin_broker.default_merge_plugins`; adding the `mergePlugins: false` attribute to a devfile will disable plugin merging for that workspace.

Example of a devfile with plugin merging disabled

```
apiVersion: 1.0.0
metadata:
  name: petclinic-dev-environment
projects:
  - name: petclinic
    source:
      type: git
      location: 'https://github.com/che-samples/web-java-spring-petclinic.git'
attributes:
  mergePlugins: false
```


3.2.5. Objects supported in Red Hat CodeReady Workspaces 2.7

The following table lists the objects that are partially supported in Red Hat CodeReady Workspaces 2.7:

Object	API	Kuberne tes Infra	OpenShi ft Infra	Notes
Pod	Kuberne tes	Yes	Yes	-
Deploy ment	Kuberne tes	Yes	Yes	-
ConfigM ap	Kuberne tes	Yes	Yes	-
PVC	Kuberne tes	Yes	Yes	-
Secret	Kuberne tes	Yes	Yes	-
Service	Kuberne tes	Yes	Yes	-
Ingress	Kuberne tes	Yes	No	Minishift allows you to create Ingress and it works when the host is specified (OpenShift creates a route for it). But, the loadBalancer IP is not provisioned. To add Ingress support for the OpenShift infrastructure node, generate routes based on the provided Ingress.
Route	OpenShi ft	No	Yes	The OpenShift recipe must be made compatible with the Kubernetes Infrastructure and, instead of the provided route, generate Ingress.
Templat e	OpenShi ft	Yes	Yes	The Kubernetes API does not support templates. A workspace with a template in the recipe starts successfully and the default parameters are resolved.

Additional resources

- [Devfile specifications](#)

3.3. CREATING AND CONFIGURING A NEW CODEREADY WORKSPACES 2.7 WORKSPACE

3.3.1. Creating a new workspace from the dashboard

This procedure describes how to create and edit a new CodeReady Workspaces devfile using the **Dashboard**.

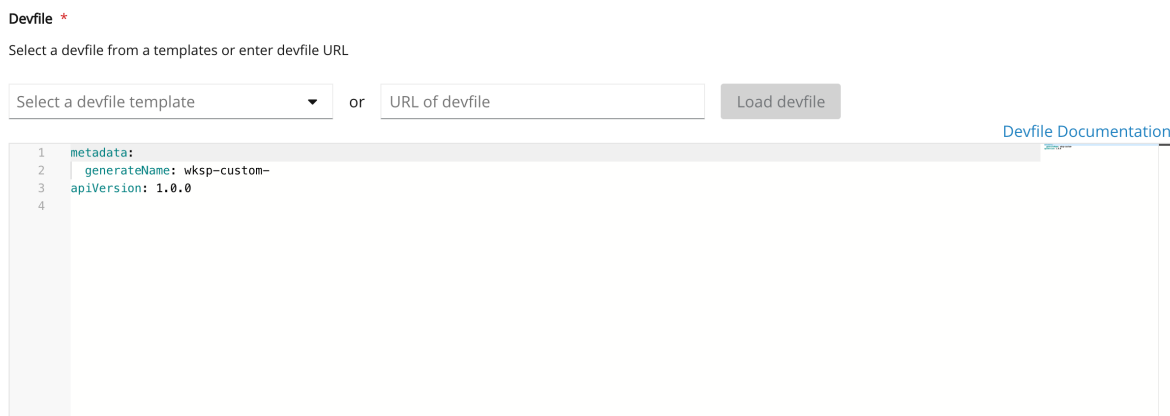
Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).

Procedure

To edit the devfile:

1. In the **Workspaces** window, click the **Add Workspace** button. The **Custom Workspace** page should be opened.
2. Scroll down to the **Devfile** section and edit the devfile using **Devfile editor**.



See an example below:

Example - Adding a .git project into a workspace using a devfile

In the following instance, the project **crw** acts as the example of a user's project. A user specifies this project using the **name** attribute of a devfile. The **location** attribute defines the source repository represented by an URL to a Git repository or ZIP archive.

To add a project into the workspace, add or edit the following section:

```

projects:
  - name: <crw>
    source:
      type: git
      location: 'https://github.com/<github-organization>/<crw>.git'

```

For additional information, see the [Section 3.2.4, "Devfile reference"](#) section.

3.3.2. Adding projects to your workspace

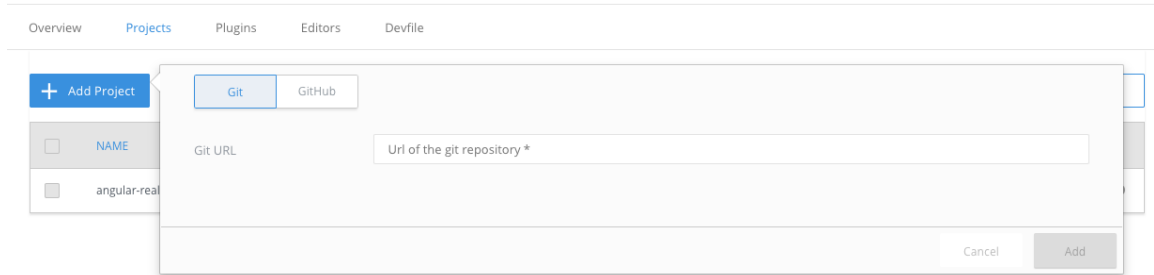
Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- An existing workspace defined on this instance of Red Hat CodeReady Workspaces. See [Creating and configuring a new CodeReady Workspaces 2.7 workspace](#).

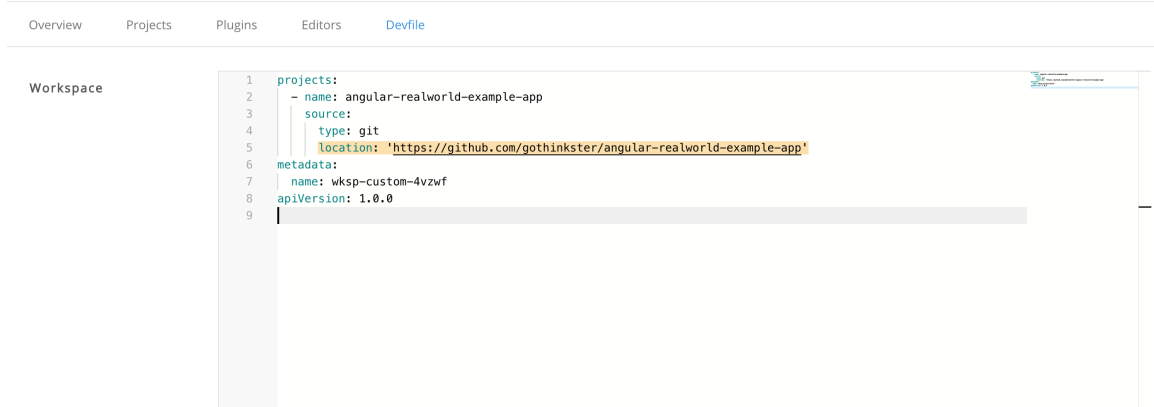
Procedure

To add a project to your workspace:

1. Navigate to **Workspaces** page and click the workspace you want to update. Here you have two ways to add a project to your workspace:
2. From the **Projects** tab.
 - a. Open the **Projects** tab, and then click the **Add Project** button.
 - b. Choose if you want to import the project by Git URL or from your GitHub account.



3. From the **Devfile** tab.
 - a. Open the **Devfile** tab.
 - b. In the **Devfile editor**, add **projects** section with desired project.



For demonstration example, see below:

Example - Adding a .git project into a workspace using a devfile

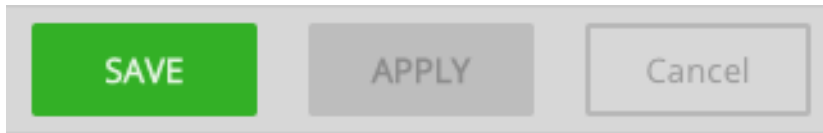
In the following instance, the project **crw** acts as the example of a user's project. A user specifies this project using the **name** attribute of a devfile. The **location** attribute defines the source repository represented by an URL to a Git repository or ZIP archive.

To add a project into the workspace, add or edit the following section:

```
projects:
  - name: <crw>
    source:
      type: git
      location: 'https://github.com/<github-organization>/<crw>.git'
```

For additional information, see the [Section 3.2.4, "Devfile reference"](#) section.

1. Once the project is added, click **Save** button to save this workspace configuration, or click **Apply** button to apply changes to the running workspace.



3.3.3. Configuring the workspace and adding tools

3.3.3.1. Adding plug-ins

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- An existing workspace defined on this instance of Red Hat CodeReady Workspaces. See [Creating and configuring a new CodeReady Workspaces 2.7 workspace](#).

Procedure

To add plug-ins to your workspace:

1. Click the **Plugins** tab.
2. Enable the plug-in that you want to add and click the **Save** button.

3.3.3.2. Defining the workspace editor

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- An existing workspace defined on this instance of Red Hat CodeReady Workspaces. See [Creating and configuring a new CodeReady Workspaces 2.7 workspace](#).

Procedure

To define the editor to use with the workspace:

1. Click the **Editors** tab.



NOTE

The recommended editor for CodeReady Workspaces 2.7 is Che-Theia.

2. Enable the editor to add and click the **Save** button.
3. Click the **Devfile** tab to view the changes.

Workspace

```

1 metadata:
2   name: wksp-che7
3 projects:
4   - name: web-spring-java-simple
5     source:
6       location: 'https://github.com/codenvy-templates/web-spring-java-simple.git'
7       type: git
8 components:
9   - mountSources: false
10    id: eclipse/che-machine-exec-plugin/latest
11    type: chePlugin
12   - mountSources: false
13    id: redhat/java/latest
14    type: chePlugin
15   - mountSources: false
16    id: eclipse/che-theia/latest
17    type: cheEditor
18 apiVersion: 1.0.0
19

```

3.3.3.3. Defining specific container images

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- An existing workspace defined on this instance of Red Hat CodeReady Workspaces. See [Creating and configuring a new CodeReady Workspaces 2.7 workspace](#).

Procedure

To add a new container image:

1. In the **Devfile** tab, add the following section under the **components** property:

```

components:
- mountSources: true
  command:
    - sleep
  args:
    - infinity
  memoryLimit: 1Gi
  alias: maven3-jdk11
  type: dockerimage
  endpoints:
    - name: 8080/tcp
      port: 8080
  volumes:
    - name: projects
      containerPath: /projects
  image: 'maven:3.6.0-jdk-11'

```

2. Add a CodeReady Workspaces 2.6 recipe content to the CodeReady Workspaces 2.7 devfile as **referenceContent**:

Workspace

```

45 - env: {}
46   args:
47     - infinity
48   selector: {}
49   memoryLimit: 512Mi
50   preferences: {}
51   volumes: []
52   entrypoints: []
53   referenceContent: |
54     apiVersion: v1
55     kind: Pod
56     metadata:
57       name: ws
58     spec:
59       containers:
60         -
61           image: 'rhche/centos_jdk8:latest'
62           name: dev
63           resources:
64             limits:
65               memory: 512Mi
66   command:
67     - sleep
68   endpoints: []
69   mountSources: true
70   type: kubernetes
71 apiVersion: 1.0.0
72 attributes: {}
73

```

- a. Set the type from the original CodeReady Workspaces 2.6 configuration. The following is an example of the resulting file:

```

type: kubernetes
referenceContent: |
  apiVersion: v1
  kind: Pod
  metadata:
    name: ws
  spec:
    containers:
      -
        image: 'rhche/centos_jdk8:latest'
        name: dev
        resources:
          limits:
            memory: 512Mi

```

3. Copy the required fields, such as **image**, **volumes**, and **endpoints** from the old workspace. See below:

```

17 endpoints:
18   - name: 8080/tcp
19     port: 8080
20 volumes:
21   - name: m2
22     containerPath: /home/user/.m2
23 image: 'maven:3.6.0-jdk-11'

```

4. If needed, change the **memoryLimit** and **alias** variables. The field **alias** is used to set a name for the component and if not manually set, it is generated from the values of the **image** attribute field.

```

image: 'maven:3.6.0-jdk-11'
alias: maven3-jdk11

```

- To specify the **RAM** component requirements, set the **memoryLimit**, **memoryRequest**, or both.

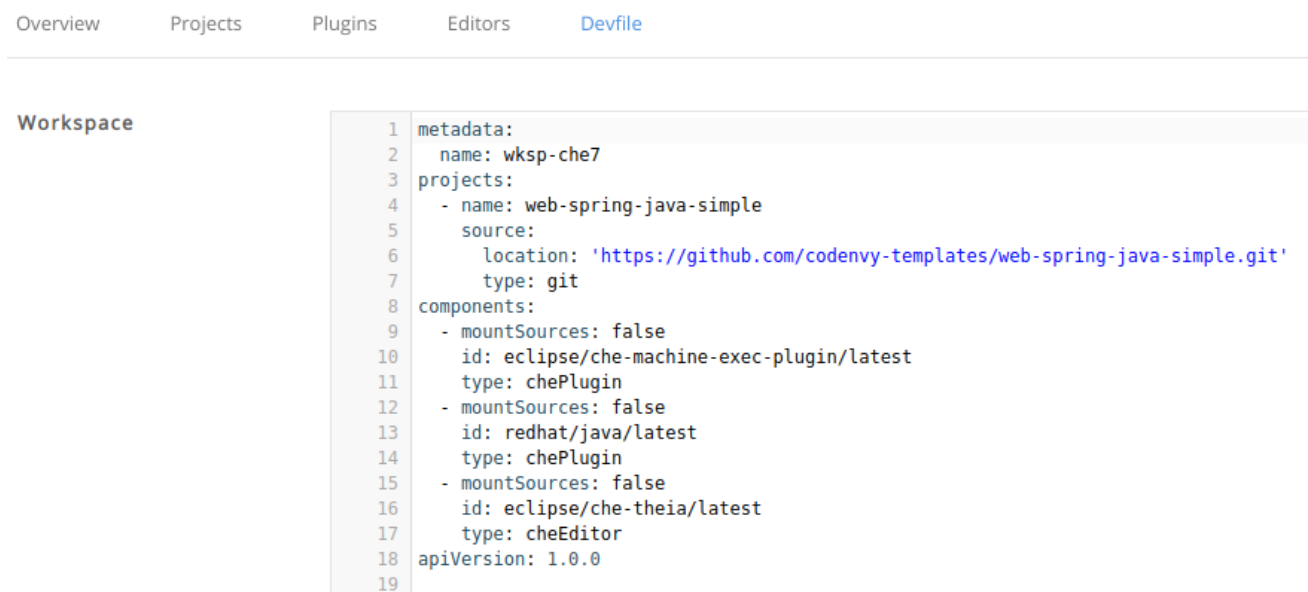
```
alias: maven3-jdk11
memoryLimit: 256M
memoryRequest: 128M
```

- Repeat the steps to add additional container images.

3.3.3.4. Adding commands to your workspace

The following image is a demonstration of workspace configuration commands in CodeReady Workspaces 2.7:

Figure 3.1. An example of the Workspace configuration commands in CodeReady Workspaces 2.7



Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- An existing workspace defined on this instance of Red Hat CodeReady Workspaces. See [Creating and configuring a new CodeReady Workspaces 2.7 workspace](#).

Procedure

To define commands to your workspace, edit the workspace devfile:

- Add or edit the **command** section with the first command. Change the **name** and the **command** fields from the original workspace configuration (see the preceding equivalence table).

```
commands:
- name: build
  actions:
- type: exec
  command: mvn clean install
```

2. To add a new command or edit command from other devfile, copy the following YAML code into the **command** section and define the a command.
 - a. Change the **name** and the **command** fields from the original workspace configuration, as shown in the introduction screenshot of this chapter.

```
- name: build and run
  actions:
    - type: exec
      command: mvn clean install && java -jar
```

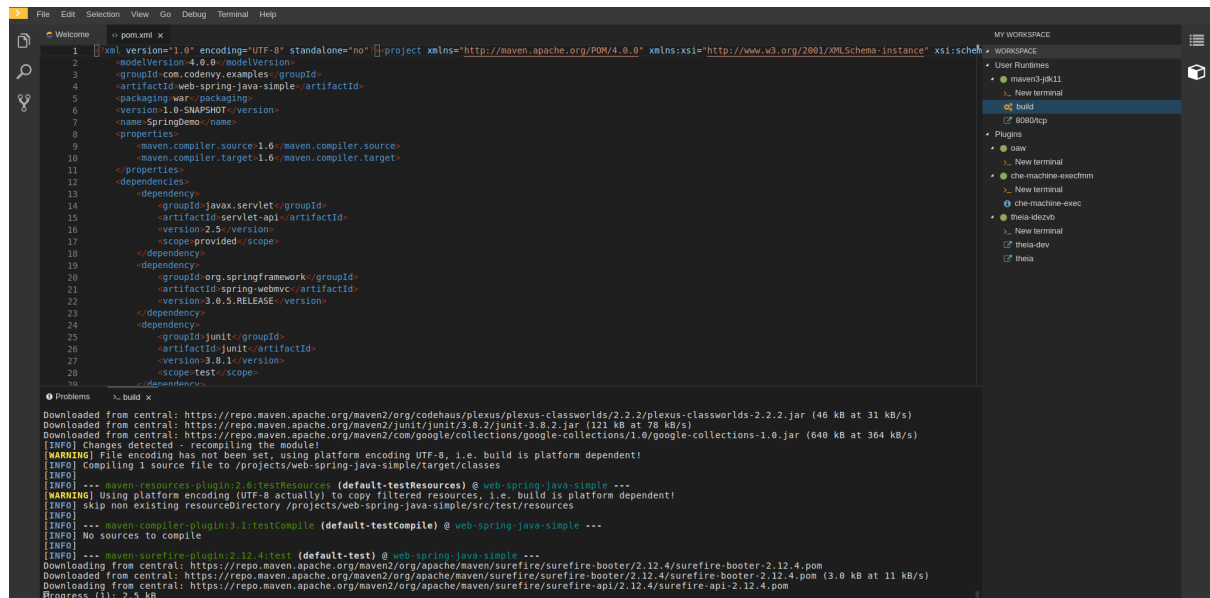
3. Optionally, add the **component** field into **actions**. This indicates the component alias where the command will be performed.
4. Repeat step 2 to add more commands to the devfile.
5. Click the **Devfile** tab to view the changes.

Overview Projects Plugins Editors **Devfile**

Workspace

```
13     port: 8080
14     command:
15       - sleep
16     args:
17       - infinity
18     memoryLimit: 1Gi
19     type: dockerimage
20     volumes:
21       - name: projects
22         containerPath: /projects
23     image: 'maven:3.6.0-jdk-11'
24     alias: maven3-jdk11
25     - mountSources: false
26       id: redhat/java/latest
27       type: chePlugin
28     - mountSources: false
29       id: eclipse/che-machine-exec-plugin/latest
30       type: chePlugin
31     - mountSources: false
32       id: eclipse/che-theia/latest
33       type: cheEditor
34     apiVersion: 1.0.0
35     commands:
36       - name: build
37         actions:
38           - workdir: /projects/web-spring-java-simple
39             type: exec
40             command: mvn clean install
41             component: maven3-jdk11
```

6. Save changes and start the new CodeReady Workspaces 2.7 workspace.



3.4. IMPORTING OPENSIFT APPLICATIONS INTO A WORKSPACE

To deploy a new instance of an application in a CodeReady Workspaces workspace, use one of the following scenarios:

- Modifying an existing workspace: [Using the Dashboard user interface](#)
- From a running application: [Generating a devfile with `crwctl`](#)

3.4.1. Including an OpenShift application in a workspace devfile definition

This procedure describes how to define a CodeReady Workspaces workspace devfile to include a OpenShift application.

For demonstration purposes, the section uses a sample OpenShift application having the following two Pods:

- A Node.js application specified by this [nodejs-app.yaml](#)
- A MongoDB Pod specified by this [mongo-db.yaml](#)

To run the application on a OpenShift cluster:

```
$ node=https://raw.githubusercontent.com/redhat-developer/devfile/master/samples/web-nodejs-with-db-sample/nodejs-app.yaml && \
mongo=https://raw.githubusercontent.com/redhat-developer/devfile/master/samples/web-nodejs-with-db-sample/mongo-db.yaml && \
oc apply -f ${mongo} && \
oc apply -f ${node}
```

The devfile format is used to define a CodeReady Workspaces workspace, and its format is described in the [Section 3.2, “Making a workspace portable using a devfile”](#) section.

Prerequisites

- You are logged in to the cluster with a running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).

- The **crwctl** management tool is available. See the https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#using-the-crwctl-management-tool_crw section.

Procedure

1. Create the simplest devfile:

```
apiVersion: 1.0.0
metadata:
  name: minimal-workspace 1
```

- 1 Only the name **minimal-workspace** is specified. After the CodeReady Workspaces server processes this devfile, the devfile is converted to a minimal CodeReady Workspaces workspace that only has the default editor (Che-Theia) and the default editor plug-ins, including, for example, the terminal.

2. To add OpenShift applications to a workspace, modify the devfile and add the **Kubernetes** component type.

For example, to embed the NodeJS-Mongo application in the **minimal-workspace**:

```
apiVersion: 1.0.0
metadata:
  name: minimal-workspace
components:
  - type: openshift
    reference: https://raw.githubusercontent.com/.../mongo-db.yaml
  - alias: nodejs-app
    type: openshift
    reference: https://raw.githubusercontent.com/.../nodejs-app.yaml
entrypoints:
  - command: ['sleep'] 1
    args: ['infinity']
```

- 1 The **sleep infinity** command is added as the entrypoint of the Node.js application. The command prevents the application from starting at the workspace start phase. This configuration allows the user to start the application when needed for testing or debugging purposes.

3. Add the commands in the devfile to make it easier for a developer to test the application:

```
apiVersion: 1.0.0
metadata:
  name: nodejs-with-db
projects:
  - name: nodejs-mongo-app
    source:
      type: git
      location: 'https://github.com/ijason/NodeJS-Sample-App.git'
      commitId: 187d468 # refers to the last commitId the project compiles (with express3)
components:
  - type: openshift
    reference: https://raw.githubusercontent.com/redhat-
```

```

developer/devfile/master/samples/web-nodejs-with-db-sample/mongo-db.yaml
- alias: nodejs-app
  type: openshift
  reference: https://raw.githubusercontent.com/redhat-developer/devfile/master/samples/web-nodejs-with-db-sample/nodejs-app.yaml
commands:
- name: run 1
  actions:
  - type: exec
    component: nodejs-app
    command: cd ${CHE_PROJECTS_ROOT}/nodejs-mongo-app/EmployeeDB/ && npm
install && sed -i -- "s/localhost/mongo/g" app.js && node app.js

```

- 1** The **run** command added to the devfile is available as a task in Che-Theia from the command palette. When executed, the command starts the Node.js application.

4. Use the devfile to create and start a workspace:

```
$ crwctl workspace:start --devfile <devfile-path>
```

3.4.2. Adding a OpenShift application to an existing workspace using the dashboard

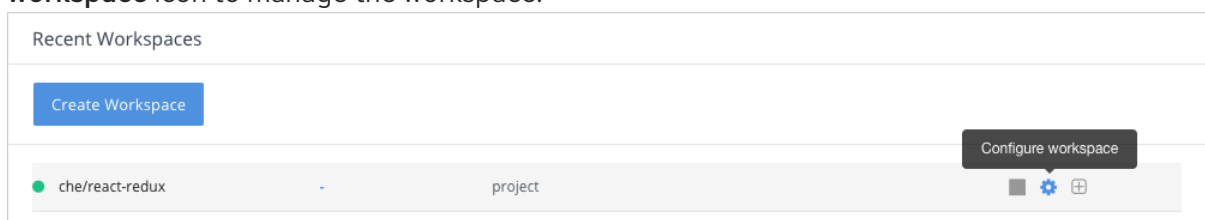
This procedure demonstrates how to modify an existing workspace and import the OpenShift application using the newly created devfile.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- An existing workspace defined on this instance of Red Hat CodeReady Workspaces [Section 3.3, "Creating and configuring a new CodeReady Workspaces 2.7 workspace"](#).

Procedure

1. After the creation of a workspace, use the **Workspace** menu and then the **Configure workspace** icon to manage the workspace.



2. To modify the workspace details, use the **Devfile** tab. The workspace details are displayed in this tab in the devfile format.

Workspaces > react-redux ● Running STOP OPEN

Overview Projects Plugins Editors **Devfile**

Workspace

```

1  apiVersion: 1.0.0
2  metadata:
3    name: react-redux
4  projects:
5    - source:
6      branch: master
7      location: 'https://github.com/gothinkster/react-redux-realworld-example-app'
8      type: git
9      name: react-redux-realworld-example-app
10 components:
11   - preferences: {}
12     memoryLimit: 512Mi
13     args: []
14     env: []
15     selector: {}
16     entrypoints: []
17     endpoints: []
18     command: []
19     volumes: []
20     id: che-incubator/typescript/latest
21     type: chePlugin
22   - preferences: {}
23     memoryLimit: 512Mi
24     args: []
25     env: []
26     selector: {}
27     entrypoints: []
28     image: 'quay.io/eclipse/che-nodejs8-centos:nightly'
29     endpoints:

```

- To add a OpenShift component, use the **Devfile** editor on the dashboard.
- For the changes to take effect, save the devfile and restart the CodeReady Workspaces workspace.

3.4.3. Generating a devfile from an existing OpenShift application

This procedure demonstrates how to generate a devfile from an existing OpenShift application using the **crwctl** tool.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- The **crwctl** management tool is available. See https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#using-the-crwctl-management-tool_crw.

Procedure

- To generate a devfile, use:

```
$ crwctl devfile:generate
```

- It is also possible to generate a devfile from, for example, the **NodeJS-MongoDB** application that includes the **NodeJS** component, using the **crwctl devfile:generate** command:

Example:

```
$ crwctl devfile:generate --selector="app=nodejs"
apiVersion: 1.0.0
```

```

metadata:
  name: crwctl-generated
components:
- type: kubernetes
  alias: app=nodejs
  referenceContent: |
    kind: List
    apiVersion: v1
    metadata:
      name: app=nodejs
    items:
      - apiVersion: apps/v1
        kind: Deployment
        metadata:
          labels:
            app: nodejs
            name: web
  (...)

```

The Node.js application YAML definition is available in the devfile, inline, using the **referenceContent** attribute.

- To include support for a language, use the **--language** parameter:

```

$ crwctl devfile:generate --selector="app=nodejs" --language="typescript"
apiVersion: 1.0.0
metadata:
  name: crwctl-generated
components:
- type: kubernetes
  alias: app=nodejs
  referenceContent: |
    kind: List
    apiVersion: v1
  (...)
- type: chePlugin
  alias: typescript-ls
  id: che-incubator/typescript/latest

```

2. Use the generated devfile to start a CodeReady Workspaces workspace with **crwctl**.

```
$ crwctl workspace:start --devfile=devfile.yaml
```

3.5. REMOTELY ACCESSING WORKSPACES

This section describes how to remotely access CodeReady Workspaces workspaces outside of the browser.

CodeReady Workspaces workspaces exist as containers and are, by default, modified from a browser window. In addition to this, there are the following methods of interacting with a CodeReady Workspaces workspace:

- Opening a command line in the workspace container using the OpenShift command-line tool, **oc**.

- Uploading and downloading files using the **oc** tool.

3.5.1. Remotely accessing workspaces using **oc**

To access CodeReady Workspaces workspaces remotely using OpenShift command-line tool (**oc**), follow the instructions in this section.

Prerequisites

- The **oc**, version 1.5.0 or higher, is available. For information about installed version, use:

```
$ oc version
Client Version: version.Info{Major:"1", Minor:"15", GitVersion:"v1.15.0"
...

```

Procedure

In the example below:

- **workspace7b2wemdf3hx7s3ln.maven-74885cf4d5-kf2q4** is the name of the Pod.
 - **crw** is the project.
1. To find the name of the OpenShift project and the Pod that runs the CodeReady Workspaces workspace:

```
$ oc get pod -l che.workspace_id --all-namespaces
NAMESPACE  NAME
AGE
crw         workspace7b2wemdf3hx7s3ln.maven-74885cf4d5-kf2q4  4/4   Running  0
6m4s

```

2. To find the name of the container:

```
$ NAMESPACE=crw
$ POD=workspace7b2wemdf3hx7s3ln.maven-74885cf4d5-kf2q4
$ oc get pod ${POD} -o custom-columns=CONTAINERS:.spec.containers[*].name
CONTAINERS
maven,che-machine-execpau,theia-ide6dj,vscode-javaw92

```

3. When you have the project, pod name, and the name of the container, use the ``oc `` command to open a remote shell:

```
$ NAMESPACE=crw
$ POD=workspace7b2wemdf3hx7s3ln.maven-74885cf4d5-kf2q4
$ CONTAINER=maven
$ oc exec -ti -n ${NAMESPACE} ${POD} -c ${CONTAINER} bash
user@workspace7b2wemdf3hx7s3ln $

```

4. From the container, execute the **build** and **run** commands (as if from the CodeReady Workspaces workspace terminal):

```
user@workspace7b2wemdf3hx7s3ln $ mvn clean install
[INFO] Scanning for projects...
(...)
```

Additional resources

- For more about **oc**, see the [Getting started with the CLI](#).

3.5.2. Downloading and uploading a file to a workspace using the command-line interface

This procedure describes how to use the `oc` tool to download or upload files remotely from or to an CodeReady Workspaces workspace.`

Prerequisites

- A running instance of CodeReady Workspaces. To install an instance of CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- Remote access to the CodeReady Workspaces workspace you intend to modify. For instructions see [Remotely accessing workspaces](#).
- The **oc**, version 1.5.0 or higher, is available. For information about installed version, use:

```
$ oc version
Client Version: version.Info{Major:"1", Minor:"15", GitVersion:"v1.15.0"
...

```

Procedure

The following procedure uses **crw** as an example of a user project.

- To download a local file named **downloadme.txt** from a workspace container to the current home directory of the user, use the following in the CodeReady Workspaces remote shell.

```
$ REMOTE_FILE_PATH=/projects/downloadme.txt
$ NAMESPACE=crw
$ POD=workspace7b2wemdf3hx7s3ln.maven-74885cf4d5-kf2q4
$ CONTAINER=maven
$ oc cp ${NAMESPACE}/${POD}:${REMOTE_FILE_PATH} ~/downloadme.txt -c
${CONTAINER}
```

- To upload a local file named **uploadme.txt** to a workspace container in the **/projects** directory:

```
$ LOCAL_FILE_PATH=./uploadme.txt
$ NAMESPACE=crw
$ POD=workspace7b2wemdf3hx7s3ln.maven-74885cf4d5-kf2q4
$ CONTAINER=maven
$ oc cp ${LOCAL_FILE_PATH} ${NAMESPACE}/${POD}:/projects -c ${CONTAINER}
```

Using the preceding steps, the user can also download and upload directories.

Additional resources

- For more about **oc**, see the [Getting started with the CLI](#).

3.6. CREATING A WORKSPACE FROM CODE SAMPLE

Every stack includes a sample codebase, which is defined by the devfile of the stack. This section explains how to create a workspace from this code sample in a sequence of three procedures.

1. Creating a workspace from the user dashboard:
 - a. Using the [Get Started view](#).
 - b. Using the [Custom Workspace view](#).
2. [Changing the configuration of the workspace](#) to add code sample.
3. [Running an existing workspace from the user dashboard](#) .

For more information about devfiles, see [Section 3.1, "Configuring a workspace using a devfile"](#) .

3.6.1. Creating a workspace from Get Started view of User Dashboard

This section describes how to create a workspace from the User Dashboard.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#installing-codeready-workspaces_crw.

Procedure

1. Navigate to the CodeReady Workspaces Dashboard. See [Section 1.1, "Navigating CodeReady Workspaces using the Dashboard"](#).
2. In the left navigation panel, go to **Get Started**.
3. Click the **Get Started** tab.
4. In the gallery, there is list of samples that may be used to build and run projects.

Get Started







Custom Workspace

Select a Sample

Select a sample to create your first workspace.

Filter by

 Temporary Storage ⓘ 26 items


 <p>NodeJS Angular Web Application Stack for developing NodeJS Angular Web Application</p>	 <p>Apache Camel K Stack with tooling ready to develop Integration projects with Apache Camel K</p>	 <p>Apache Camel based on Spring Boot Stack with environment ready to develop Integration projects with Apache Camel based on Spring Boot.</p>
 <p>Mainframe Basic Stack Che4z Mainframe Basic Stack is an all-in-one extension pack for developers working with z/OS applications, suitable for all levels of mainframe experience, even beginners.</p>	 <p>C/C++ Stack with C/C++ and Clang 8</p>	 <p>.NET Core Stack with .Net 2.2</p>



CHANGING RESOURCE LIMITS

Changing the memory requirements is only possible from the devfile. See [Section 3.6.3, "Changing the configuration of an existing workspace"](#).

5. Start the workspace: click the chosen stack card.



NodeJS Angular Web Application
Stack for developing NodeJS Angular Web Application



NEW WORKSPACE NAME

Workspace name can be auto-generated based on the underlying devfile of the stack. Generated names always consist of the devfile **metadata.generateName** property as the prefix and four random characters.

3.6.2. Creating a workspace from Custom Workspace view of User Dashboard

This section describes how to create a workspace from the User Dashboard.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#installing-codeready-workspaces_crw.

Procedure

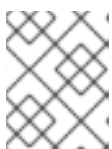
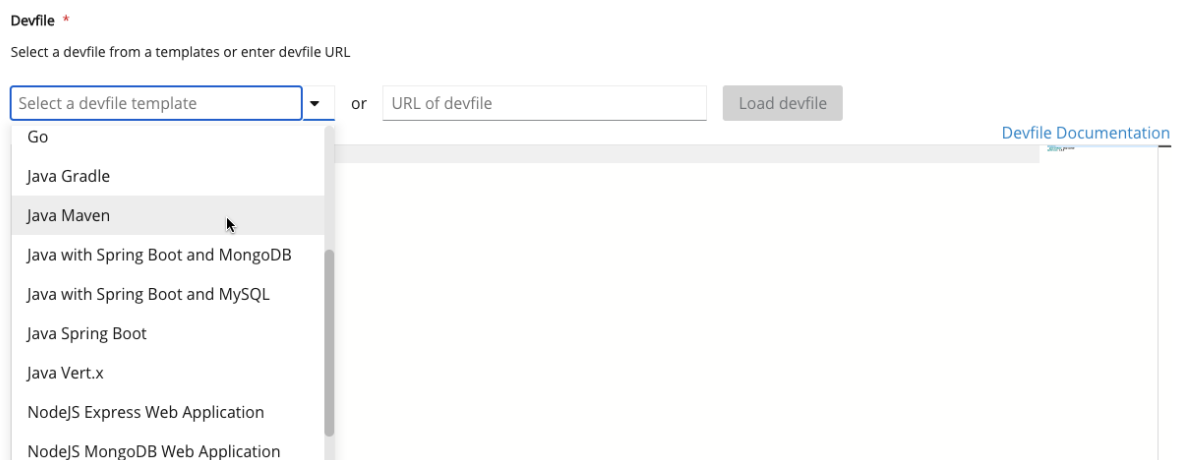
1. Navigate to the CodeReady Workspaces Dashboard. See [Section 1.1, "Navigating CodeReady Workspaces using the Dashboard"](#).
2. In the left navigation panel, go to **Get Started**.
3. Click the **Custom Workspace** tab.
4. Define a **Name** for the workspace.



NEW WORKSPACE NAME

Workspace name can be auto-generated based on the underlying devfile of the stack. Generated names always consist of the devfile **metadata.generateName** property as the prefix and four random characters.

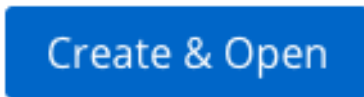
5. In the **Devfile** section, select the devfile template that will be used to build and run projects.



CHANGING RESOURCE LIMITS

Changing the memory requirements is only possible from the devfile. See [Section 3.6.3, "Changing the configuration of an existing workspace"](#).

- Start the workspace: click the **Create & Open** button at the bottom of the form:



3.6.3. Changing the configuration of an existing workspace

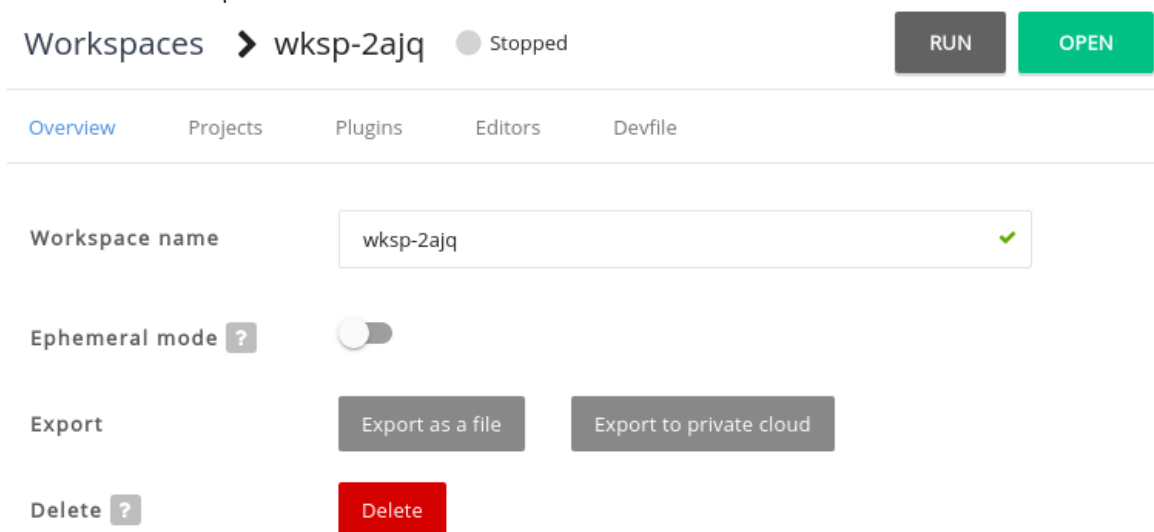
This section describes how to change the configuration of an existing workspace from the User Dashboard.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- An existing workspace defined on this instance of Red Hat CodeReady Workspaces [Section 3.3, “Creating and configuring a new CodeReady Workspaces 2.7 workspace”](#).

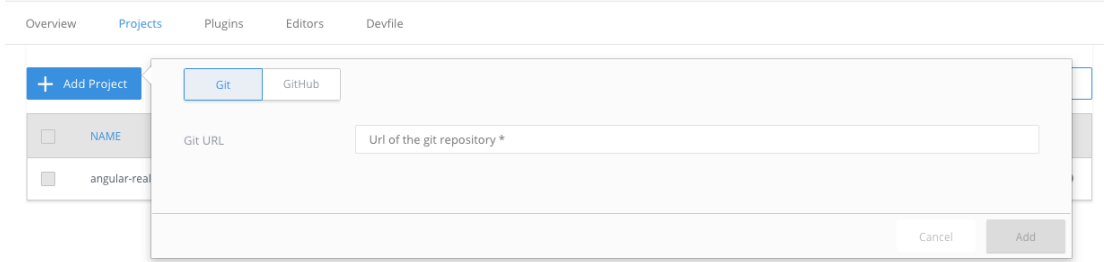
Procedure

- Navigate to the CodeReady Workspaces Dashboard. See [Section 1.1, “Navigating CodeReady Workspaces using the Dashboard”](#).
- In the left navigation panel, go to **Workspaces**.
- Click the name of a workspace to navigate to the configuration overview page.
- Click the **Overview** tab and execute following actions:
 - Change the **Workspace name**.
 - Select **Storage Type**.
 - Export** the workspace configuration to a file or private cloud.
 - Delete** the workspace.

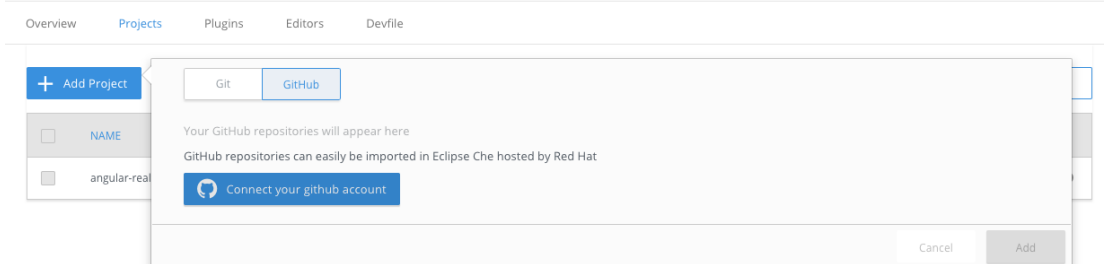


- In the **Projects** section, choose the projects to integrate in the workspace.

- a. Click the **Add Project** button and do one of the following:
 - i. Enter the project Git repository URL to integrate in the workspace:



- ii. Connect your GitHub account and select projects to integrate:



- b. Click the **Add** button.

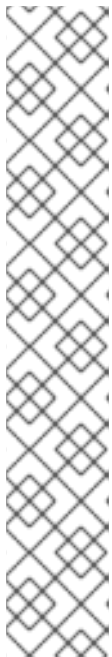
6. In the **Plugins** section, choose the plug-ins to integrate in the workspace.



EXAMPLE

Start with a generic Java-based stack, then add support for Node.js or Python.

7. In the **Editors** section, choose the editors to integrate in the workspace. The CodeReady Workspaces 2.7 editor is based on Che-Theia.
8. From the **Devfile** tab, edit YAML configuration of the workspace. See [Section 3.2, "Making a workspace portable using a devfile"](#).



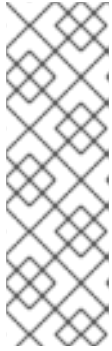
EXAMPLE: ADD COMMANDS

Workspace

```

47     -XX:AdaptiveSizePolicyWeight=90 -Dsun.zip.disableMemoryMapping=true
48     -Xms20m -Djava.security.egd=file:/dev/./urandom
49     name: JAVA_TOOL_OPTIONS
50     - value: '${echo ${0}}\${}'
51     name: PS1
52     - value: /home/user
53     name: HOME
54     apiVersion: 1.0.0
55     commands:
56     - name: build the project
57       actions:
58       - type: exec
59         command: 'cd ${CHE_PROJECTS_ROOT}/fuse-rest-http-booster && mvn clean install'
60       component: maven
61     - name: run the services
62       actions:
63       - type: exec
64         command: >-
65         cd ${CHE_PROJECTS_ROOT}/fuse-rest-http-booster && mvn spring-boot:run
66         -DskipTests
67       component: maven
68     - name: run and debug the services
69       actions:
70       - type: exec
71         command: >-
72         cd ${CHE_PROJECTS_ROOT}/fuse-rest-http-booster && mvn spring-boot:run
73         -DskipTests -Drun.jvmArguments="-Xdebug
74         -Xrunjdpw:transport=dt_socket,server=y,suspend=n,address=5005"
75       component: maven

```



EXAMPLE: ADD A PROJECT

To add a project into the workspace, add or edit the following section:

```
projects:
  - name: che
    source:
      type: git
      location: 'https://github.com/eclipse/che.git'
```

3.6.4. Running an existing workspace from the User Dashboard

This section describes how to run an existing workspace from the User Dashboard.

3.6.4.1. Running an existing workspace from the User Dashboard with the Run button

This section describes how to run an existing workspace from the User Dashboard using the **Run** button.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- An existing workspace defined on this instance of Red Hat CodeReady Workspaces [Section 3.3, “Creating and configuring a new CodeReady Workspaces 2.7 workspace”](#).

Procedure

1. Navigate to the CodeReady Workspaces Dashboard. See [Section 1.1, “Navigating CodeReady Workspaces using the Dashboard”](#).
2. In the left navigation panel, navigate to **Workspaces**.
3. Click on the name of a non-running workspace to navigate to the overview page.
4. Click on the **Run** button in the top right corner of the page.
5. The workspace is started.
6. The browser **does not** navigates to the workspace.

3.6.4.2. Running an existing workspace from the User Dashboard using the Open button

This section describes how to run an existing workspace from the User Dashboard using the **Open** button.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- An existing workspace defined on this instance of Red Hat CodeReady Workspaces [Section 3.3, “Creating and configuring a new CodeReady Workspaces 2.7 workspace”](#).

Procedure

1. Navigate to the CodeReady Workspaces Dashboard. See [Section 1.1, “Navigating CodeReady Workspaces using the Dashboard”](#).
2. In the left navigation panel, navigate to **Workspaces**.
3. Click on the name of a non-running workspace to navigate to the overview page.
4. Click on the **Open** button in the top right corner of the page.
5. The workspace is started.
6. The browser navigates to the workspace.

3.6.4.3. Running an existing workspace from the User Dashboard using the Recent Workspaces

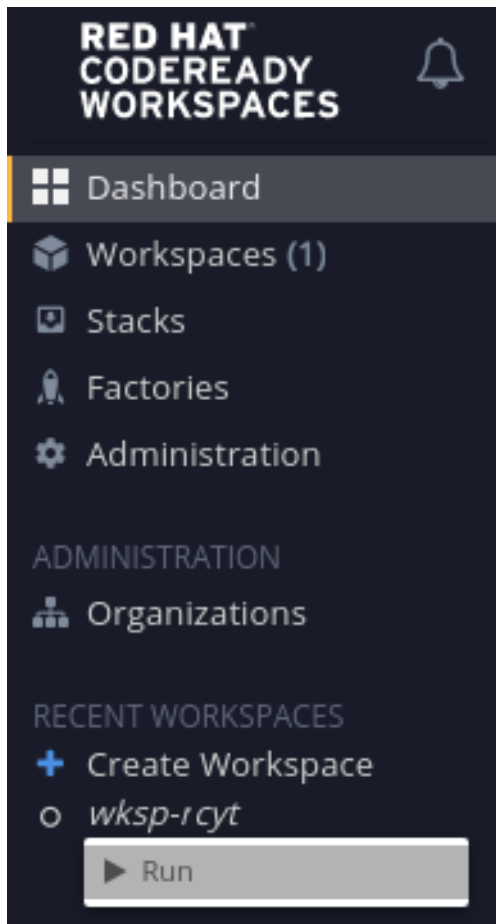
This section describes how to run an existing workspace from the User Dashboard using the Recent Workspaces.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- An existing workspace defined on this instance of Red Hat CodeReady Workspaces [Section 3.3, “Creating and configuring a new CodeReady Workspaces 2.7 workspace”](#).

Procedure

1. Navigate to the CodeReady Workspaces Dashboard. See [Section 1.1, “Navigating CodeReady Workspaces using the Dashboard”](#).
2. In the left navigation panel, in the **Recent Workspaces** section, right-click the name of a non-running workspace and click **Run** in the contextual menu to start it.



3.7. CREATING A WORKSPACE BY IMPORTING THE SOURCE CODE OF A PROJECT

This section describes how to create a new workspace to edit an existing codebase.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- An existing workspace with plug-ins related to your development environment defined on this instance of Red Hat CodeReady Workspaces [Section 3.3, “Creating and configuring a new CodeReady Workspaces 2.7 workspace”](#).

You can do it in two ways **before** starting a workspace:

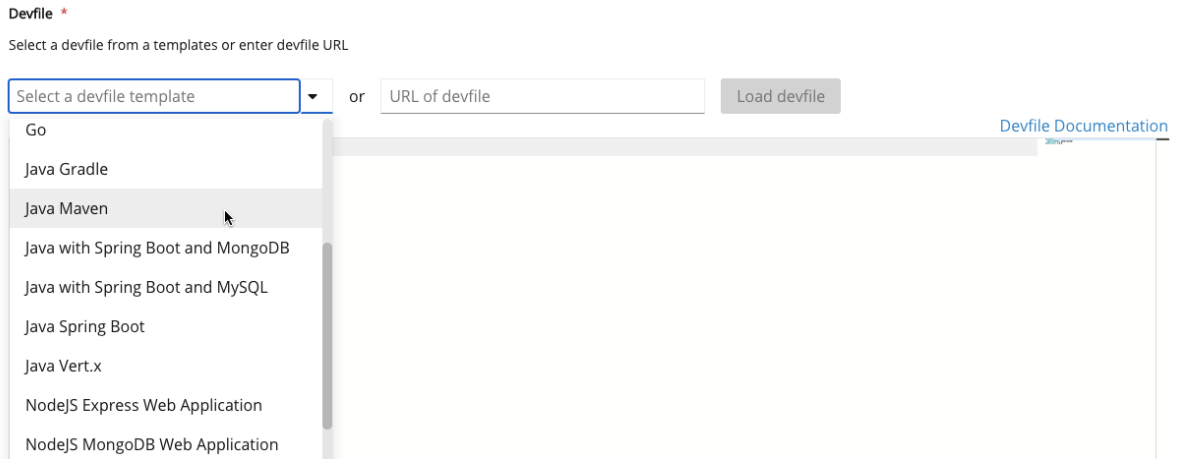
- [Select a sample from the Dashboard, then change the devfile to include your project](#)
- [Section 3.1, “Configuring a workspace using a devfile”](#)

To create a new workspace to edit an existing codebase, use one of the following three methods **after** you have started the workspace:

- [Import from the Dashboard into an existing workspace](#)
- [Import to a running workspace using the `git clone` command](#)
- [Import to a running workspace using `git clone` in a terminal](#)

3.7.1. Select a sample from the Dashboard, then change the devfile to include your project

- In the left navigation panel, go to **Get Started**.
- Click the **Custom Workspace** tab if it's not already selected.
- In the **Devfile** section, select the devfile template that will be used to build and run projects.



- In the **Devfile editor**, update **projects** section:



EXAMPLE: ADD A PROJECT

To add a project into the workspace, add or edit the following section:

```

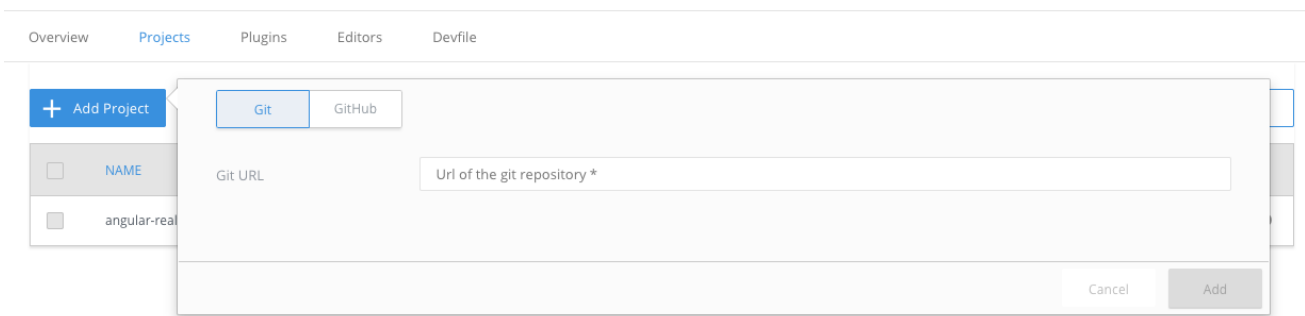
projects:
- name: che
  source:
    type: git
    location: 'https://github.com/eclipse/che.git'
  
```

See the [Section 3.2.4, "Devfile reference"](#).

- To open the workspace, click the **Create & Open** button.

3.7.2. Importing from the Dashboard into an existing workspace

1. Import the project. There are at least two ways to import a project using the **Dashboard**.
 - From the **Dashboard**, select **Workspaces**, then select your workspace by clicking on its name. This will link you to the workspace's **Overview** tab.
 - Or, use the gear icon. This will link to the **Devfile** tab where you can enter your own YAML configuration.
2. Click the **Projects** tab.
3. Click **Add Project**. You can then import project by a repository Git URL or from GitHub.



NOTE

You can add a project to a non-running workspace, but you must start the workspace to delete it.

3.7.2.1. Editing the commands after importing a project

After you have a project in your workspace, you can add commands to it. Adding commands to your projects allows you to run, debug, or launch your application in a browser.

To add commands to the project:

1. Open the workspace configuration in the **Dashboard**, then select the **Devfile** tab.

Workspace

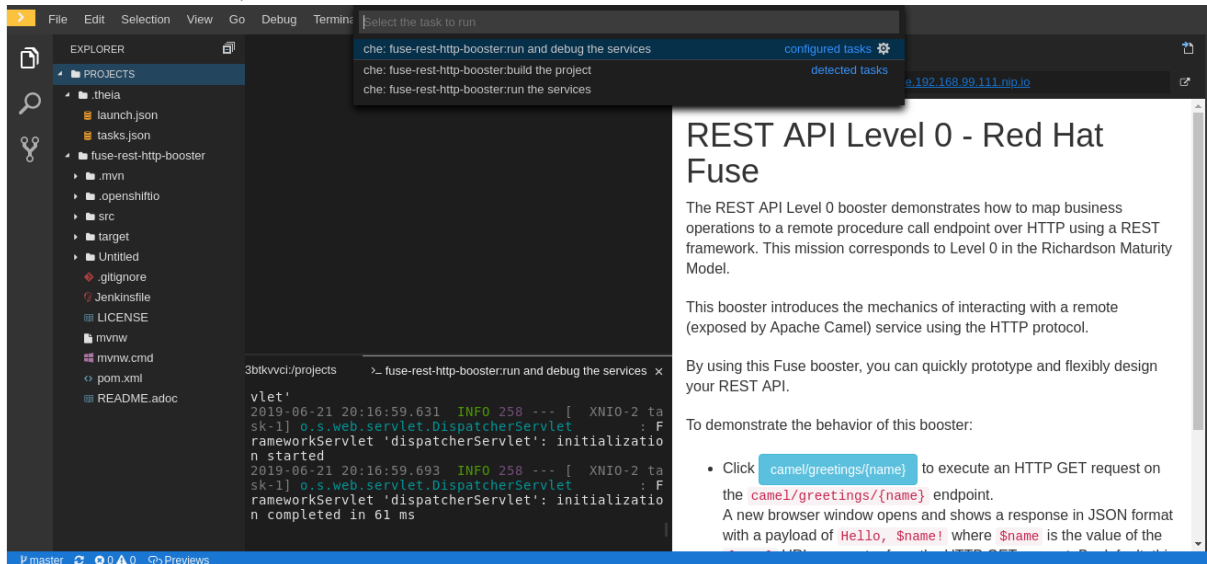
```

47     -XX:AdaptiveSizePolicyWeight=90 -Dsun.zip.disableMemoryMapping=true
48     -Xms20m -Djava.security.egd=file:/dev/./urandom
49     name: JAVA_TOOL_OPTIONS
50     - value: '${echo ${0}}\${'
51     name: PS1
52     - value: /home/user
53     name: HOME
54     apiVersion: 1.0.0
55     commands:
56     - name: build the project
57       actions:
58       - type: exec
59         command: 'cd ${CHE_PROJECTS_ROOT}/fuse-rest-http-booster && mvn clean install'
60         component: maven
61     - name: run the services
62       actions:
63       - type: exec
64         command: >-
65           cd ${CHE_PROJECTS_ROOT}/fuse-rest-http-booster && mvn spring-boot:run
66           -DskipTests
67         component: maven
68     - name: run and debug the services
69       actions:
70       - type: exec
71         command: >-
72           cd ${CHE_PROJECTS_ROOT}/fuse-rest-http-booster && mvn spring-boot:run
73           -DskipTests -Drun.jvmArguments="-Xdebug
74           -Xrunjdpw:transport=dt_socket,server=y,suspend=n,address=5005"
75         component: maven

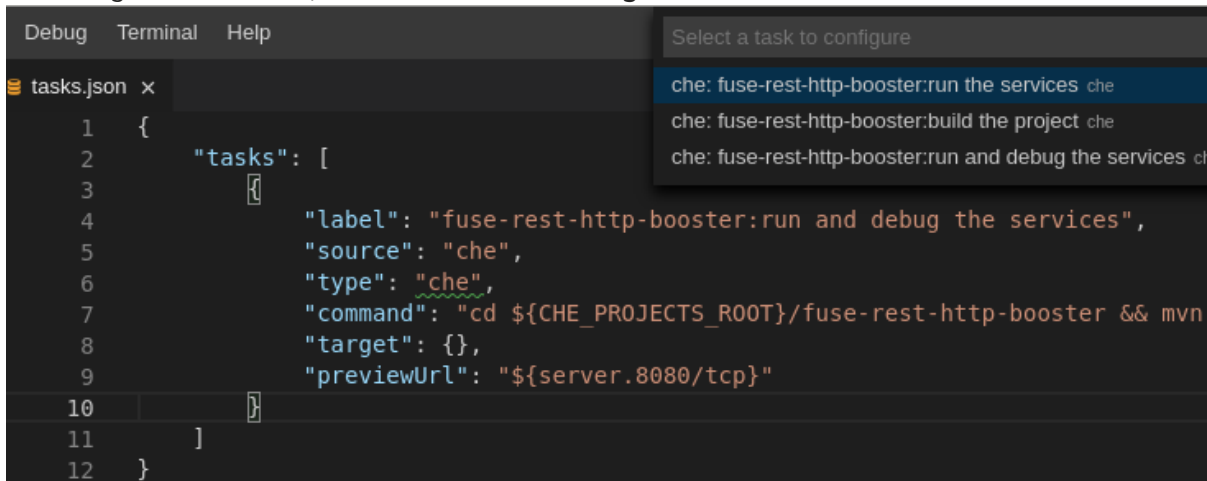
```

2. Open the workspace.

- To run a command, select **Terminal** > **Run Task** from the main menu.



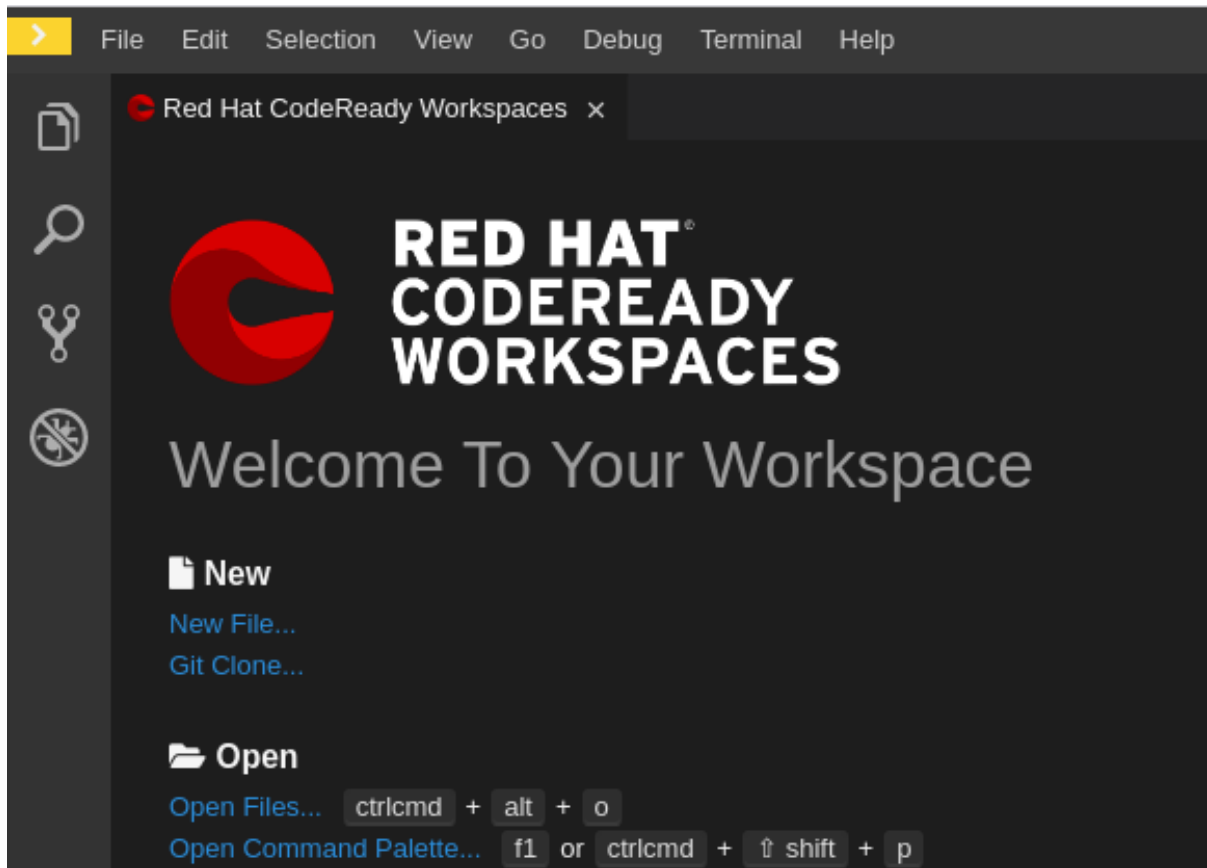
- To configure commands, select **Terminal** > **Configure Tasks** from the main menu.



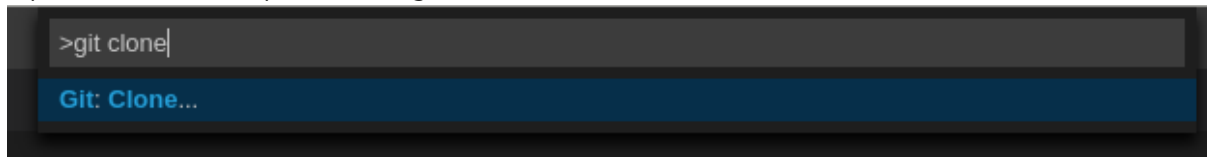
3.7.3. Importing to a running workspace using the Git: Clone command

To import to a running workspace using the **Git: Clone** command:

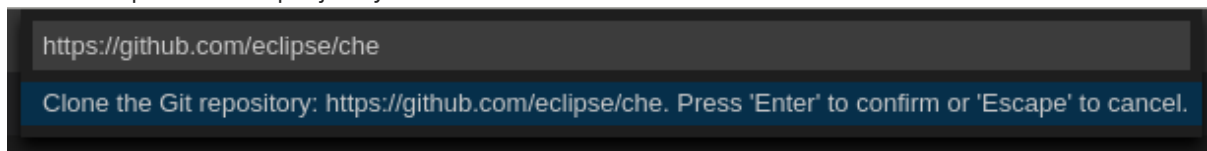
- Start a workspace, then use the **Git: Clone** command from the command palette or the Welcome screen to import a project to a running workspace.



2. Open the command palette using **F1** or **CTRL-SHIFT-P**, or from the link in the Welcome screen.

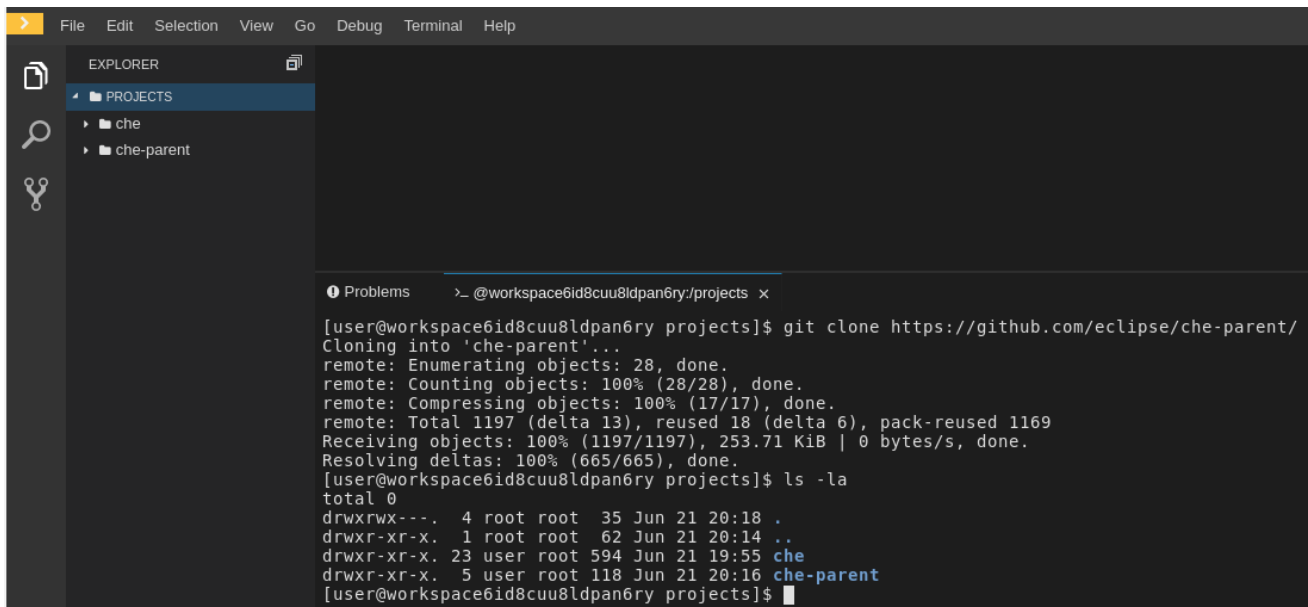


3. Enter the path to the project you want to clone.



3.7.4. Importing to a running workspace with git clone in a terminal

In addition to the approaches above, you can also start a workspace, open a **Terminal**, and type **git clone** to pull code.



```

File Edit Selection View Go Debug Terminal Help
EXPLORER
PROJECTS
├── che
└── che-parent

Problems
>_ @workspace61d8cuu8ldpan6ry/projects x

[user@workspace61d8cuu8ldpan6ry projects]$ git clone https://github.com/eclipse/che-parent/
Cloning into 'che-parent'...
remote: Enumerating objects: 28, done.
remote: Counting objects: 100% (28/28), done.
remote: Compressing objects: 100% (17/17), done.
remote: Total 1197 (delta 13), reused 18 (delta 6), pack-reused 1169
Receiving objects: 100% (1197/1197), 253.71 KiB | 0 bytes/s, done.
Resolving deltas: 100% (665/665), done.
[user@workspace61d8cuu8ldpan6ry projects]$ ls -la
total 0
drwxrwx---. 4 root root 35 Jun 21 20:18 .
drwxr-xr-x. 1 root root 62 Jun 21 20:14 ..
drwxr-xr-x. 23 user root 594 Jun 21 19:55 che
drwxr-xr-x. 5 user root 118 Jun 21 20:16 che-parent
[user@workspace61d8cuu8ldpan6ry projects]$

```



NOTE

Importing or deleting workspace projects in the terminal does not update the workspace configuration, and the change is not reflected in the **Project** and **Devfile** tabs in the dashboard.

Similarly, if you add a project using the **Dashboard**, then delete it with **rm -fr myproject**, it may still appear in the **Projects** or **Devfile** tab.

3.8. MOUNTING A SECRET AS A FILE OR AN ENVIRONMENT VARIABLE INTO A WORKSPACE CONTAINER

Secrets are OpenShift objects that store sensitive data such as user names, passwords, authentication tokens, and configurations in an encrypted form.

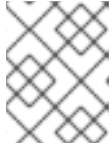
Users can mount a secret that contains sensitive data in a workspace container. This reapplies the stored data from the secret automatically for every newly created workspace. As a result, the user does not have to provide these credentials and configuration settings manually.

The following section describes how to automatically mount a OpenShift secret in a workspace container and create permanent mount points for components such as:

- Maven configuration, the **settings.xml** file
- SSH key pairs
- AWS authorization tokens
- Git credentials store file

A OpenShift secret can be mounted into a workspace container as:

- A file - This creates automatically mounted Maven settings that will be applied to every new workspace with Maven capabilities.
- An environment variable - This uses SSH key pairs and AWS authorization tokens for automatic authentication.

**NOTE**

SSH key pairs can also be mounted as a file, but this format is primarily aimed at the settings of the Maven configuration.

The mounting process uses the standard OpenShift mounting mechanism, but it requires additional annotations and labeling for a proper bound of a secret with the required CodeReady Workspaces workspace container.

3.8.1. Mounting a secret as a file into a workspace container

**WARNING**

On OpenShift 3.11, secrets mounted as file overrides volume mounts defined in the devfile.

This section describes how to mount a secret from the user's project as a file in single-workspace or multiple-workspace containers of CodeReady Workspaces.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).

Procedure

1. Create a new OpenShift secret in the OpenShift project where a CodeReady Workspaces workspace will be created.
 - The labels of the secret that is about to be created must match the set of labels configured in **che.workspace.provision.secret.labels** property of CodeReady Workspaces. The default labels are:
 - **app.kubernetes.io/part-of: che.eclipse.org**
 - **app.kubernetes.io/component: workspace-secret:**

**NOTE**

Note that the following example describes variations in the usage of the **target-container** annotation in versions 2.1 and 2.2 of Red Hat CodeReady Workspaces.

Example:

```
apiVersion: v1
kind: Secret
metadata:
  name: mvn-settings-secret
```

```

labels:
  app.kubernetes.io/part-of: che.eclipse.org
  app.kubernetes.io/component: workspace-secret
...

```

Annotations must indicate the given secret is mounted as a file, provide the mount path, and, optionally, specify the name of the container in which the secret is mounted. If there is no target-container annotation, the secret will be mounted into all user containers of the CodeReady Workspaces workspace, but this is applicable *only for the CodeReady Workspaces version 2.1*.

```

apiVersion: v1
kind: Secret
metadata:
  name: mvn-settings-secret
annotations:
  che.eclipse.org/target-container: maven
  che.eclipse.org/mount-path: {prod-home}/.m2/
  che.eclipse.org/mount-as: file
labels:
...

```

Since the CodeReady Workspaces version 2.2, the **target-container** annotation is deprecated and **automount-workspace-secret** annotation with Boolean values is introduced. Its purpose is to define the default secret mounting behavior, with the ability to be overridden in a devfile. The **true** value enables the automatic mounting into all workspace containers. In contrast, the **false** value disables the mounting process until it is explicitly requested in a devfile component using the **automountWorkspaceSecrets:true** property.

```

apiVersion: v1
kind: Secret
metadata:
  name: mvn-settings-secret
annotations:
  che.eclipse.org/automount-workspace-secret: "true"
  che.eclipse.org/mount-path: {prod-home}/.m2/
  che.eclipse.org/mount-as: file
labels:
...

```

Data of the OpenShift secret may contain several items, whose names must match the desired file name mounted into the container.

```

apiVersion: v1
kind: Secret
metadata:
  name: mvn-settings-secret
labels:
  app.kubernetes.io/part-of: che.eclipse.org
  app.kubernetes.io/component: workspace-secret
annotations:
  che.eclipse.org/automount-workspace-secret: "true"
  che.eclipse.org/mount-path: {prod-home}/.m2/

```

```
che.eclipse.org/mount-as: file
data:
settings.xml: <base64 encoded data content here>
```

This results in a file named **settings.xml** being mounted at the **/home/jboss/.m2/** path of all workspace containers.

The secret-s mount path can be overridden for specific components of the workspace using devfile. To change mount path, an additional volume should be declared in a component of the devfile, with name matching overridden secret name, and desired mount path.

```
apiVersion: 1.0.0
metadata:
...
components:
- type: dockerimage
  alias: maven
  image: maven:3.11
  volumes:
  - name: <secret-name>
    containerPath: /my/new/path
...
```

Note that for this kind of overrides, components must declare an alias to be able to distinguish containers which belong to them and apply override path exclusively for those containers.

3.8.2. Mounting a secret as an environment variable into a workspace container

The following section describes how to mount a OpenShift secret from the user's project as an environment variable, or variables, into single-workspace or multiple-workspace containers of CodeReady Workspaces.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).

Procedure

1. Create a new OpenShift secret in the k8s project where a CodeReady Workspaces workspace will be created.
 - The labels of the secret that is about to be created must match the set of labels configured in **che.workspace.provision.secret.labels** property of CodeReady Workspaces. By default, it is a set of two labels:
 - **app.kubernetes.io/part-of: che.eclipse.org**
 - **app.kubernetes.io/component: workspace-secret:**

**NOTE**

Note that the following example describes variations in the usage of the **target-container** annotation in versions 2.1 and 2.2 of Red Hat CodeReady Workspaces.

Example:

```
apiVersion: v1
kind: Secret
metadata:
  name: mvn-settings-secret
  labels:
    app.kubernetes.io/part-of: che.eclipse.org
    app.kubernetes.io/component: workspace-secret
...
```

Annotations must indicate that the given secret is mounted as an environment variable, provides variable names, and optionally, specifies the container name where this mount will be applied. If there is no **target-container** annotation defined, the secret will be mounted into all user containers of the CodeReady Workspaces workspace, but this is applicable **only for the CodeReady Workspaces version 2.1**.

```
apiVersion: v1
kind: Secret
metadata:
  name: mvn-settings-secret
  annotations:
    che.eclipse.org/target-container: maven
    che.eclipse.org/env-name: FOO_ENV
    che.eclipse.org/mount-as: env
  labels:
    ...
data:
  mykey: myvalue
```

This results in the environment variable named **FOO_ENV** and the value **myvalue** being provisioned into the container named **maven**.

Since the CodeReady Workspaces version 2.2, the **target-container** annotation is deprecated and **automount-workspace-secret** annotation with Boolean values is introduced. Its purpose is to define the default secret mounting behavior, with the ability to be overridden in a devfile. The **true** value enables the automatic mounting into all workspace containers. In contrast, the **false** value disables the mounting process until it is explicitly requested in a devfile component using the **automountWorkspaceSecrets:true** property.

```
apiVersion: v1
kind: Secret
metadata:
  name: mvn-settings-secret
  annotations:
    che.eclipse.org/automount-workspace-secret: "true"
    che.eclipse.org/env-name: FOO_ENV
    che.eclipse.org/mount-as: env
```



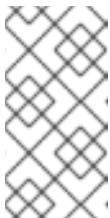
```
labels:
  ...
data:
  mykey: myvalue
```

This results in the environment variable named **FOO_ENV** and the value **myvalue** being provisioned into all workspace containers.

If the secret provides more than one data item, the environment variable name must be provided for each of the data keys as follows:

```
apiVersion: v1
kind: Secret
metadata:
  name: mvn-settings-secret
annotations:
  che.eclipse.org/automount-workspace-secret: "true"
  che.eclipse.org/mount-as: env
  che.eclipse.org/mykey_env-name: FOO_ENV
  che.eclipse.org/otherkey_env-name: OTHER_ENV
labels:
  ...
data:
  mykey: myvalue
  otherkey: othervalue
```

This results in two environment variables with names **FOO_ENV**, **OTHER_ENV**, and values **myvalue** and **othervalue**, being provisioned into all workspace containers.



NOTE

The maximum length of annotation names in a OpenShift secret is 63 characters, where 9 characters are reserved for a prefix that ends with /. This acts as a restriction for the maximum length of the key that can be used for the secret.

3.8.3. Mounting a git credentials store into a workspace container

This section describes how to mount git credentials store as secret from the user's project into the file in single-workspace or multiple-workspace containers of CodeReady Workspaces.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).

Procedure

1. Prepare git credential file in format https://git-scm.com/docs/git-credential-store#_storage_format.
2. Encode content of the file to the base64 format.
3. Create a new OpenShift secret in the OpenShift project where a CodeReady Workspaces workspace will be created.

- The labels of the secret that is about to be created must match the set of labels configured in **che.workspace.provision.secret.labels** property of CodeReady Workspaces. The default labels are:
- **app.kubernetes.io/part-of: che.eclipse.org**
- **app.kubernetes.io/component: workspace-secret:**

3.8.4. The use of annotations in the process of mounting a secret into a workspace container

Kubernetes annotations and labels are tools used by libraries, tools, and other clients, to attach arbitrary non-identifying metadata to OpenShift native objects.

Labels select objects and connect them to a collection that satisfies certain conditions, where annotations are used for non-identifying information that is not used by OpenShift objects internally.

This section describes OpenShift annotation values used in the process of OpenShift secret mounting in a CodeReady Workspaces workspace.

Annotations must contain items that help identify the proper mounting configuration. These items are:

- **che.eclipse.org/target-container:** *Valid till the version 2.1* The name of the mounting container. If the name is not defined, the secret mounts into all user's containers of the CodeReady Workspaces workspace.
- **che.eclipse.org/automount-workspace-secret:** *Introduced in the version 2.2.* The main mount selector. When set to **true**, the secret mounts into all user's containers of the CodeReady Workspaces workspace. When set to **false**, the secret does not mount into containers by default. The value of this attribute can be overridden in devfile components, using the **automountWorkspaceSecrets** boolean property that gives more flexibility to workspace owners. This property requires an **alias** to be defined for the component that uses it.
- **che.eclipse.org/env-name:** The name of the environment variable that is used to mount a secret.
- **che.eclipse.org/mount-as:** This item describes if a secret will be mounted as an environmental variable or a file. Options: **env** or **file**.
- **che.eclipse.org/<mykeyName>-env-name: FOO_ENV:** The name of the environment variable used when data contains multiple items. **mykeyName** is used as an example.

3.9. AUTHENTICATING ON BITBUCKET SERVERS

Red Hat CodeReady Workspaces users may use public or private repositories on Bitbucket SCM (Source Code Management) system as a source of their projects.

The use of private repositories, requires some additional configuration described below.

Bitbucket authentication is based on using personal access tokens. Each Bitbucket user is able to request some amount of personal access tokens with different names, permissions, expiration times, and so on. Those tokens can be used to sign Bitbucket REST API calls and perform Git repository operations.

To allow Bitbucket authentication on Red Hat CodeReady Workspaces side, personal tokens must be stored in user's namespace in a form of secret. The secret must look as follows:

```

apiVersion: v1
kind: Secret
metadata:
  name: bitbucket-personal-access-token-secret
labels:
  app.kubernetes.io/part-of: che.eclipse.org
  app.kubernetes.io/component: scm-personal-access-token
annotations:
  che.eclipse.org/expired-after: '-1'
  che.eclipse.org/che-userid: '355d1ce5-990e-401e-9a8c-094bca10b5b3'
  che.eclipse.org/scm-userid: '2'
  che.eclipse.org/scm-username: 'user-foo'
  che.eclipse.org/scm-url: 'https://bitbucket.apps.cluster-example.com'
data:
  token: TIRnNE1UazRORFI5TWpNeU9sMTI1aDFFFT2dRbXBITUYvbmhiLzNQUC9hT08=

```

The main parts of the secret are:

Label	app.kubernetes.io/component	Indicates it is a SCM personal token secret.
Annotation	che.eclipse.org/che-userid	Red Hat CodeReady Workspaces id of the user token belongs to
Annotation	che.eclipse.org/scm-userid	Bitbucket user id to which token belongs
Annotation	che.eclipse.org/scm-username	Bitbucket user name to which token belongs
Annotation	che.eclipse.org/scm-url	Bitbucket server URL to which this token belong
Annotation	che.eclipse.org/expired-after	Personal access token expiration time
Data entry	token	Base-64 encoded value of the personal access token



NOTE

Encoding a string into the base64 format using the **base64** tool on Linux machines leads to adding the newline character to the end of the source string and causing a value to be unusable as the authentication header value after decoding. Avoid this by using **base64 -w0**, which removes newly added lines, or strip newlines explicitly using `tr -d '\n'`.

1. To obtain a user ID from a secret using a call to a REST API URL:

- For Bitbucket:

```
https://<bitbucket-hostname>/rest/api/1.0/users/<username>
```

- For CodeReady Workspaces

```
\https://codeready-<openshift_deployment_name>.<domain_name>/api/user
```

- With the token credentials obtained from a secret, another secret is automatically created, allowing authorization to Git operations. This secret is mounted into a workspace container as a Git credentials file, and any additional configurations are not required to work with private Git repositories.
- When a remote Git repository uses a self-signed certificate, add an additional server configuration. See: https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#deploying-codeready-workspaces-with-support-for-git-repositories-with-self-signed-certificates_crw.

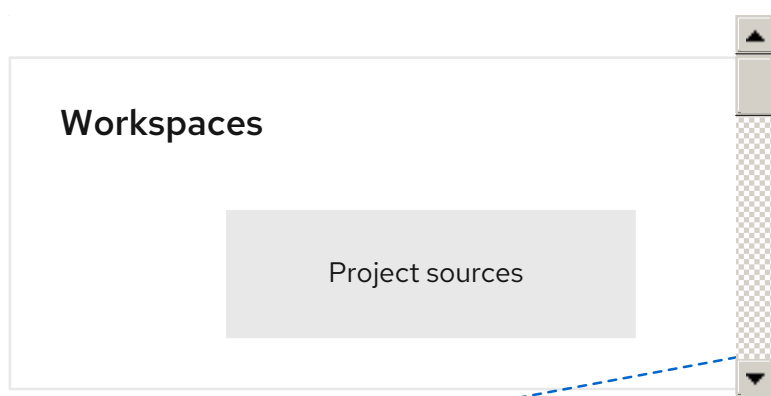
CHAPTER 4. CUSTOMIZING DEVELOPER ENVIRONMENTS

Red Hat CodeReady Workspaces is an extensible and customizable developer-workspaces platform.

You can extend Red Hat CodeReady Workspaces in three different ways:

- **Alternative IDEs** provide specialized tools for Red Hat CodeReady Workspaces. For example, a Jupyter notebook for data analysis. Alternate IDEs can be based on Eclipse Theia or any other IDE (web or desktop based). The default IDE in Red Hat CodeReady Workspaces is Che-Theia.
- **Che-Theia plug-ins** add capabilities to the Che-Theia IDE. They rely on plug-in APIs that are compatible with Visual Studio Code. The plug-ins are isolated from the IDE itself. They can be packaged as files or as containers to provide their own dependencies.
- **Stacks** are pre-configured CodeReady Workspaces workspaces with a dedicated set of tools, which cover different developer personas. For example, it is possible to pre-configure a workbench for a tester with only the tools needed for their purposes.

Figure 4.1. CodeReady Workspaces extensibility



A user can extend CodeReady Workspaces by using **self-hosted** mode, which CodeReady Workspaces provides by default.

- [Section 4.1, “What is a Che-Theia plug-in”](#)
- [Section 4.5, “Using alternative IDEs in CodeReady Workspaces”](#)
- [Section 4.2, “Adding a VS Code extension to a workspace”](#)

4.1. WHAT IS A CHE-THEIA PLUG-IN

A Che-Theia plug-in is an extension of the development environment isolated from the IDE. Plug-ins can be packaged as files or containers to provide their own dependencies.

Extending Che-Theia using plug-ins can enable the following capabilities:

- **Language support:** Extend the supported languages by relying on the [Language Server Protocol](#).
- **Debuggers:** Extend debugging capabilities with the [Debug Adapter Protocol](#).
- **Development Tools:** Integrate your favorite linters, and as testing and performance tools.
- **Menus, panels, and commands:** Add your own items to the IDE components.

- **Themes:** Build custom themes, extend the UI, or customize icon themes.
- **Snippets, formatters, and syntax highlighting:** Enhance comfort of use with supported programming languages.
- **Keybindings:** Add new keymaps and popular keybindings to make the environment feel natural.

4.1.1. Features and benefits of Che-Theia plug-ins

Features	Description	Benefits
Fast Loading	Plug-ins are loaded at runtime and are already compiled. IDE is loading the plug-in code.	Avoid any compilation time. Avoid post-installation steps.
Secure Loading	Plug-ins are loaded separately from the IDE. The IDE stays always in a usable state.	Plug-ins do not break the whole IDE if it has bugs. Handle network issue.
Tools Dependencies	Dependencies for the plug-in are packaged with the plug-in in its own container.	No-installation for tools. Dependencies running into container.
Code Isolation	Guarantee that plug-ins cannot block the main functions of the IDE like opening a file or typing	Plug-ins are running into separate threads. Avoid dependencies mismatch.
VS Code Extension Compatibility	Extend the capabilities of the IDE with existing VS Code Extensions.	Target multiple platform. Allow easy discovery of Visual Studio Code Extension with required installation.

4.1.2. Che-Theia plug-in concept in detail

Red Hat CodeReady Workspaces provides a default web IDE for workspaces: Che-Theia. It is based on Eclipse Theia. It is a slightly different version than the plain Eclipse Theia one because there are functionalities that have been added based on the nature of the Red Hat CodeReady Workspaces workspaces. This version of Eclipse Theia for CodeReady Workspaces is called **Che-Theia**.

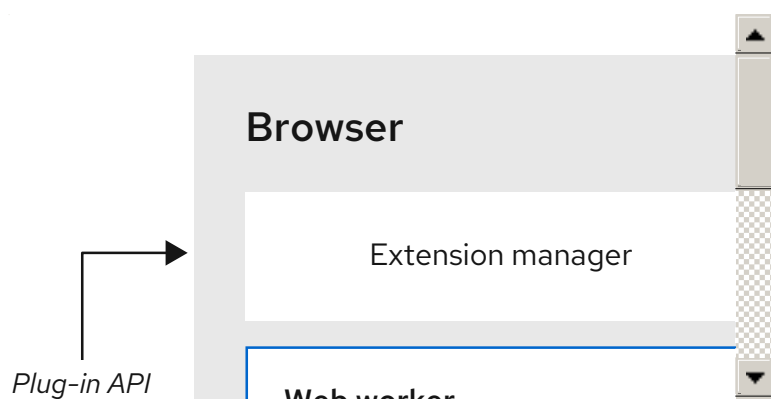
You can extend the IDE provided with Red Hat CodeReady Workspaces by building a **Che-Theia plug-in**. Che-Theia plug-ins are compatible with any other Eclipse Theia-based IDE.

4.1.2.1. Client-side and server-side Che-Theia plug-ins

The Che-Theia editor plug-ins let you add languages, debuggers, and tools to your installation to support your development workflow. Plug-ins run when the editor completes loading. If a Che-Theia plug-in fails, the main Che-Theia editor continues to work.

Che-Theia plug-ins run either on the client side or on the server side. This is a scheme of the client and server-side plug-in concept:

Figure 4.2. Client and server-side Che-Theia plug-ins



The same Che-Theia plug-in API is exposed to plug-ins running on the client side (Web Worker) or the server side (Node.js).

4.1.2.2. Che-Theia plug-in APIs

For the purpose of providing tool isolation and easy extensibility in Red Hat CodeReady Workspaces, the Che-Theia IDE has a set of plug-in APIs. The APIs are compatible with Visual Studio Code extension APIs. In most cases, Che-Theia can run VS Code extensions as its own plug-ins.

When developing a plug-in that depends on or interacts with components of CodeReady Workspaces workspaces (containers, preferences, factories), use the CodeReady Workspaces APIs embedded in Che-Theia.

4.1.2.3. Che-Theia plug-in capabilities

Che-Theia plug-ins have the following capabilities:

Plug-in	Description	Repository
CodeReady Workspaces Extended Tasks	Handles the CodeReady Workspaces commands and provides the ability to start those into a specific container of the workspace.	Task plug-in
CodeReady Workspaces Extended Terminal	Allows to provide terminal for any of the containers of the workspace.	Extended Terminal extension
CodeReady Workspaces Factory	Handles the Red Hat CodeReady Workspaces Factories	Workspace plug-in
CodeReady Workspaces Container	Provides a container view that shows all the containers that are running in the workspace and allows to interact with them.	Containers plug-in

Plug-in	Description	Repository
Dashboard	Integrates the IDE with the Dashboard and facilitate the navigation.	Che-Theia Dashbord extension
CodeReady Workspaces APIs	Extends the IDE APIs to allow interacting with CodeReady Workspaces-specific components (workspaces, preferences).	Che-Theia API extension

4.1.2.4. VS Code extensions and Eclipse Theia plug-ins

A Che-Theia plug-in can be based on a VS Code extension or an Eclipse Theia plug-in.

A Visual Studio Code extension

To repackage a VS Code extension as a Che-Theia plug-in with its own set of dependencies, package the dependencies into a container. This ensures that Red Hat CodeReady Workspaces users do not need to install the dependencies when using the extension. See [Section 4.2, "Adding a VS Code extension to a workspace"](#).

An Eclipse Theia plug-in

You can build a Che-Theia plug-in by implementing an Eclipse Theia plug-in and packaging it to Red Hat CodeReady Workspaces.

Additional resources

- [Section 4.1.5, "Embedded and remote Che-Theia plug-ins"](#)

4.1.3. Che-Theia plug-in metadata

Che-Theia plug-in metadata is information about individual plug-ins for the plug-in registry.

The Che-Theia plug-in metadata, for each specific plug-in, is defined in a **meta.yaml** file.

Here is an overview of all fields that can be available in plugin meta YAML files. This document represents the [Plugin meta YAML structure version 3](#).

The [che-plugin-registry repository](#) contains:

Table 4.1. meta.yml

apiVersion	Version 2 and higher where version is 1 supported for backwards compatibility
category	Available: Category must be set to one of the followings: Editor, Debugger, Formatter, Language, Linter, Snippet, Theme, Other
description	Short description of plugin's purpose
displayName	Name shown in user dashboard

deprecate	Optional; section for deprecating plugins in favor of others * autoMigrate - boolean * migrateTo - new org/plugin-id/version, for example redhat/vscode-apache-camel/latest
firstPublicationDate	Not required to be present in YAML, as if not present, it will be generated during Plugin Registry dockerimage build
latestUpdateDate	Not required to be present in YAML, as if not present, it will be generated during Plugin Registry dockerimage build
icon	URL of an SVG or PNG icon
name	Name (no spaces allowed), must match [-a-z0-9]
publisher	Name of the publisher, must match [-a-z0-9]
repository	URL for plugin repository, for example, GitHub
title	Plugin title (long)
type	Che Plugin, VS Code extension
version	Version information, for example: 7.5.1, [-a-z0-9]
spec	Specifications (see below)

Table 4.2. spec attributes

endpoints	Optional; plugin endpoint. See Section 3.2.4.2.19, "Endpoints"
containers	Optional; sidecar containers for the plug-in. Che Plugin and VS Code extension supports only one container
initContainers	Optional; sidecar init containers for the plug-in
workspaceEnv	Optional; environment variables for the workspace
extensions	Optional; Attribute that is required for VS Code and Che-Theia plug-ins in a form list of URLs to plug-in artefacts, such as .vsix or .theia files

Table 4.3. `spec.containers`. Notice: `spec.initContainers` has absolutely the same container definition.

name	Sidecar container name
image	Absolute or relative container image URL
memoryLimit	OpenShift memory limit string, for example 512Mi
memoryRequest	OpenShift memory request string, for example 512Mi
cpuLimit	OpenShift CPU limit string, for example 2500m
cpuRequest	OpenShift CPU request string, for example 125m
env	List of environment variables to set in the sidecar
command	String array definition of the root process command in the container
args	String array arguments for the root process command in the container
volumes	Volumes required by the plug-in
ports	Ports exposed by the plug-in (on the container)
commands	Development commands available to the plug-in container
mountSources	Boolean flag to bound volume with source code /projects to the plug-in container
initContainers	Optional; init containers for sidecar plugin
Lifecycle	Container lifecycle hooks. See lifecycle description

Table 4.4. `spec.containers.env` and `spec.initContainers.env` attributes. Notice: `workspaceEnv` has absolutely the same attributes

name	Environment variable name
value	Environment variable value

Table 4.5. `spec.containers.volumes` and `spec.initContainers.volumes` attributes

mountPath	Path to the volume in the container
------------------	-------------------------------------

name	Volume name
ephemeral	If true, the volume is ephemeral, otherwise the volume is persisted

Table 4.6. `spec.containers.ports` and `spec.initContainers.ports` attributes

exposedPort	Exposed port
--------------------	--------------

Table 4.7. `spec.containers.commands` and `spec.initContainers.commands` attributes

name	Command name
workingDir	Command working directory
command	String array that defines the development command

Table 4.8. `spec.endpoints` attributes

name	Name (no spaces allowed), must match <code>[-a-z0-9]</code>
public	true, false
targetPort	Target port
attributes	Endpoint attributes

Table 4.9. `spec.endpoints.attributes` attributes

protocol	Protocol, example: ws
type	ide, ide-dev
discoverable	true, false
secure	true, false . If true , then the endpoint is assumed to listen solely on 127.0.0.1 and is exposed using a JWT proxy
cookiesAuthEnabled	true, false
requireSubdomain	true, false . If true , the endpoint is exposed on subdomain in single-host mode.

Table 4.10. `spec.containers.lifecycle` and `spec.initContainers.lifecycle` attributes

<p>postStart</p>	<p>The postStart event that runs immediately after a Container is started. See postStart and preStop handlers</p> <p>* exec: Executes a specific command, resources consumed by the command are counted against the Container</p> <p>* command: ["/bin/sh", "-c", "/bin/post-start.sh"]</p>
<p>preStop</p>	<p>The preStop event that runs before a Container is terminated. See postStart and preStop handlers</p> <p>* exec: Executes a specific command, resources consumed by the command are counted against the Container</p> <p>* command: ["/bin/sh", "-c", "/bin/post-start.sh"]</p>

Example meta.yaml for a Che-Theia plug-in: the CodeReady Workspaces machine-exec Service

```

apiVersion: v2
publisher: eclipse
name: che-machine-exec-plugin
version: 7.9.2
type: Che Plugin
displayName: CodeReady Workspaces machine-exec Service
title: Che machine-exec Service Plugin
description: CodeReady Workspaces Plug-in with che-machine-exec service to provide creation
terminal
  or tasks for Eclipse CHE workspace containers.
icon: https://www.eclipse.org/che/images/logo-eclipseche.svg
repository: https://github.com/eclipse/che-machine-exec/
firstPublicationDate: "2020-03-18"
category: Other
spec:
  endpoints:
    - name: "che-machine-exec"
      public: true
      targetPort: 4444
      attributes:
        protocol: ws
        type: terminal
        discoverable: false
        secure: true
        cookiesAuthEnabled: true
  containers:
    - name: che-machine-exec
      image: "quay.io/eclipse/che-machine-exec:7.9.2"
      ports:
        - exposedPort: 4444
      command: ['/go/bin/che-machine-exec', '--static', '/cloud-shell', '--url', '127.0.0.1:4444']

```

Example meta.yaml for a VisualStudio Code extension: the AsciiDoc support extension

```

apiVersion: v2
category: Language
description: This extension provides a live preview, syntax highlighting and snippets for the AsciiDoc
format using AsciiDoctor flavor
displayName: AsciiDoc support
firstPublicationDate: "2019-12-02"
icon: https://www.eclipse.org/che/images/logo-eclipseche.svg
name: vscode-asciidoctor
publisher: joaompinto
repository: https://github.com/asciidoctor/asciidoctor-vscode
title: AsciiDoctor Plug-in
type: VS Code extension
version: 2.7.7
spec:
  extensions:
    - https://github.com/asciidoctor/asciidoctor-vscode/releases/download/v2.7.7/asciidoctor-vscode-
      2.7.7.vsix

```

4.1.4. Che-Theia plug-in lifecycle

Every time a user starts a Che workspace, a Che-Theia plug-in life cycle process starts. The steps of this process are as follows:

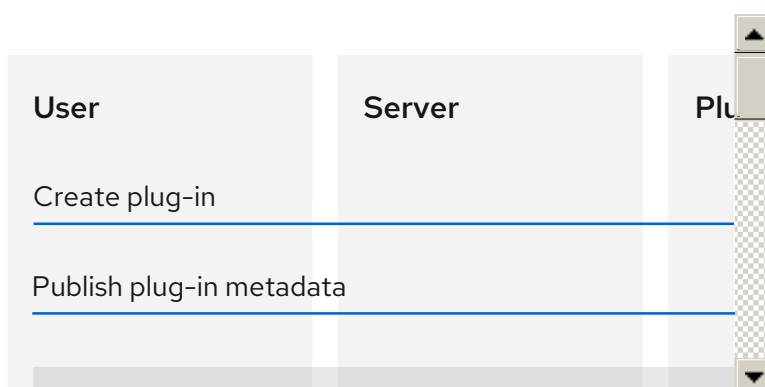
1. CodeReady Workspaces server checks for plug-ins to start from the workspace definition.
2. CodeReady Workspaces server retrieves plug-in metadata, recognizes each plug-in type, and stores them in memory.
3. CodeReady Workspaces server selects a broker according to the plug-in type.
4. The broker processes the installation and deployment of the plug-in. The installation process of the plug-in differs for each specific broker.



NOTE

Plug-ins exist in various types. A broker ensures the success of a plug-in deployment by meeting all installation requirements.

Figure 4.3. Che-Theia plug-in lifecycle



Before a CodeReady Workspaces workspace is launched, CodeReady Workspaces server starts the workspace containers:

1. The Che-Theia plug-in broker extracts the information about sidecar containers that a particular plug-in needs from the **.theia** file.
2. The broker sends the appropriate container information to CodeReady Workspaces server.
3. The broker copies the Che-Theia plug-in to a volume to have it available for the Che-Theia editor container.
4. CodeReady Workspaces server then starts all the containers of the workspace.
5. Che-Theia starts in its container and checks the correct folder to load the plug-ins.

A user experience with Che-Theia plug-in lifecycle

1. When a user opens a browser tab with Che-Theia, Che-Theia starts a new plug-in session with:
 - Web Worker for frontend
 - Node.js for backend
2. Che-Theia notifies all Che-Theia plug-ins with the start of the new session by calling the **start()** function for each triggered plug-in.
3. A Che-Theia plug-in session runs and interacts with the Che-Theia backend and frontend.
4. When the user closes the Che-Theia browser tab, or the session ended on a timeout limit, Che-Theia notifies all plug-ins with the **stop()** function for each triggered plug-in.

4.1.5. Embedded and remote Che-Theia plug-ins

Developer workspaces in Red Hat CodeReady Workspaces provide all dependencies needed to work on a project. The application includes the dependencies needed by all the tools and plug-ins used.

Based on the required dependencies, Che-Theia plug-in can run as:

- Embedded, also know as local
- Remote

4.1.5.1. Embedded (local) plug-ins

The Embedded plug-ins are plug-ins without specific dependencies that are injected into the Che-Theia IDE. These plug-ins use the Node.js runtime, which runs in the IDE container.

Examples:

- Code linting
- New set of commands
- New UI components

To include a Che-Theia plug-in or VS Code extension, define a URL to the plug-in **.theia** archive binary in the **meta.yaml** file. See [Section 4.2, "Adding a VS Code extension to a workspace"](#)

When starting a workspace, CodeReady Workspaces downloads and unpacks the plug-in binaries and includes them in the Che-Theia editor container. The Che-Theia editor initializes the plug-ins when it starts.

4.1.5.2. Remote plug-ins

The plug-in relies on dependencies or it has a back end. It runs in its own sidecar container, and all dependencies are packaged in the container.

A remote Che-Theia plug-in consist of two parts:

- Che-Theia plug-in or VS Code extension binaries. The definition in the **meta.yaml** file is the same as for embedded plug-ins.
- Container image definition, for example, **eclipse/che-theia-dev:nightly**. From this image, CodeReady Workspaces creates a separate container inside a workspace.

Examples:

- Java Language Server
- Python Language Server

When starting a workspace, CodeReady Workspaces creates a container from the plug-in image, downloads and unpacks the plug-in binaries, and includes them in the created container. The Che-Theia editor connects to the remote plug-ins when it starts.

4.1.5.3. Comparison matrix

- Embedded plug-ins are those Che-Theia plug-ins or VS Code extensions that do not require extra dependencies inside its container.
- Remote plug-ins are containers that contain a plug-in with all required dependencies.

Table 4.11. Che-Theia plug-in comparison matrix: embedded vs remote

	Configure RAM per plug-in	Environment dependencies	Create separated container
Remote	TRUE	Plug-in uses dependencies defined in the remote container.	TRUE
Embedded	FALSE (users can configure RAM for the whole editor container, but not per plug-in)	Plug-in uses dependencies from the editor container; if container does not include these dependencies, the plug-in fails or does not function as expected.	FALSE

Depending on your use case and the capabilities provided by your plug-in, select one of the described running modes.

4.1.6. Remote plug-in endpoint

Red Hat CodeReady Workspaces has a remote plug-in endpoint service to start VS Code Extensions and Che-Theia plug-ins in separate containers. Red Hat CodeReady Workspaces injects the remote plug-in endpoint binaries into each remote plug-in container. This service starts remote extensions and plug-ins defined in the plug-in **meta.yaml** file and connects them to the Che-Theia editor container.

The remote plug-in endpoint creates a plug-in API proxy between the remote plug-in container and the Che-Theia editor container. The remote plug-in endpoint is also an interceptor for some plug-in API parts, which it launches inside a remote sidecar container rather than an editor container. Examples: terminal API, debug API.

The remote plug-in endpoint executable command is stored in the environment variable of the remote plug-in container: **PLUGIN_REMOTE_ENDPOINT_EXECUTABLE**.

Red Hat CodeReady Workspaces provides two ways to start the remote plug-in endpoint with a sidecar image:

- Defining a launch remote plug-in endpoint using a Dockerfile. To use this method, patch an original image and rebuild it.
- Defining a launch remote plug-in endpoint in the plug-in **meta.yaml** file. Use this method to avoid patching an original image.

4.1.6.1. Defining a launch remote plug-in endpoint using Dockerfile

To start a remote plug-in endpoint, set the **PLUGIN_REMOTE_ENDPOINT_EXECUTABLE** environment variable in the Dockerfile.

Procedure

- Start a remote plug-in endpoint using the **CMD** command in the Dockerfile:

Dockerfile example

```
FROM fedora:30

RUN dnf update -y && dnf install -y nodejs htop && node -v

RUN mkdir /home/jboss

ENV HOME=/home/jboss

RUN mkdir /projects \
  && chmod -R g+rwX /projects \
  && chmod -R g+rwX "${HOME}"

CMD ${PLUGIN_REMOTE_ENDPOINT_EXECUTABLE}
```

- Start a remote plug-in endpoint using the **ENTRYPOINT** command in the Dockerfile:

Dockerfile example

```
FROM fedora:30
```



```

RUN dnf update -y && dnf install -y nodejs httpd && node -v

RUN mkdir /home/jboss

ENV HOME=/home/jboss

RUN mkdir /projects \
  && chmod -R g+rwX /projects \
  && chmod -R g+rwX "${HOME}"

ENTRYPOINT ${PLUGIN_REMOTE_ENDPOINT_EXECUTABLE}

```

4.1.6.1.1. Using a wrapper script

Some images use a wrapper script to configure permissions inside the container. The Dockerfile **ENTRYPOINT** command defines this script, which executes the main process defined in the **CMD** command of the Dockerfile.

CodeReady Workspaces uses images with a wrapper script to provide permission configurations to different infrastructures protected by advanced security. OpenShift Container Platform is an example of such an infrastructure.

- Example of a wrapper script:

```

#!/bin/sh

set -e

export USER_ID=$(id -u)
export GROUP_ID=$(id -g)

if ! whoami >/dev/null 2>&1; then
  echo "${USER_NAME:-user}:x:${USER_ID}:0:${USER_NAME:-user}
  user:${HOME}:/bin/sh" >> /etc/passwd
fi

# Grant access to projects volume in case of non root user with sudo rights
if [ "${USER_ID}" -ne 0 ] && command -v sudo >/dev/null 2>&1 && sudo -n true > /dev/null
2>&1; then
  sudo chown "${USER_ID}:${GROUP_ID}" /projects
fi

exec "$@"

```

- Example of a Dockerfile with a wrapper script:

Dockerfile example

```

FROM alpine:3.10.2

ENV HOME=/home/theia

RUN mkdir /projects ${HOME} && \
  # Change permissions to let any arbitrary user
  for f in "${HOME}" "/etc/passwd" "/projects"; do \

```

```

    echo "Changing permissions on ${f}" && chgrp -R 0 ${f} && \
    chmod -R g+rwX ${f}; \
done

ADD entrypoint.sh /entrypoint.sh

ENTRYPOINT [ "/entrypoint.sh" ]
CMD ${PLUGIN_REMOTE_ENDPOINT_EXECUTABLE}

```

Explanation:

- The container launches the `/entrypoint.sh` script defined in the **ENTRYPOINT** command of the Dockerfile.
- The script configures the permissions and executes the command using **exec \$@**.
- **CMD** is the argument for **ENTRYPOINT**, and the **exec \$@** command calls **\${PLUGIN_REMOTE_ENDPOINT_EXECUTABLE}**.
- The remote plug-in endpoint then starts in the container after permission configuration.

4.1.6.2. Defining a launch remote plug-in endpoint in a meta.yaml file

Use this method to re-use images for starting a remote plug-in endpoint without any modifications.

Procedure

Modify the plug-in **meta.yaml** file properties **command** and **args**:

- **command** - CodeReady Workspaces uses the **command** properties to override the **Dockerfile#ENTRYPOINT** value.
- **args** - CodeReady Workspaces uses the **args** properties to override the **Dockerfile#CMD** value.
- Example of a YAML file with the **command** and **args** properties modified:

```

apiVersion: v2
category: Language
description: "Typescript language features"
displayName: Typescript
firstPublicationDate: "2019-10-28"
icon: "https://www.eclipse.org/che/images/logo-eclipseche.svg"
name: typescript
publisher: che-incubator
repository: "https://github.com/Microsoft/vscode"
title: "Typescript language features"
type: "VS Code extension"
version: remote-bin-with-override-entrypoint
spec:
  containers:
    - image: "example/fedora-for-ts-remote-plugin-without-endpoint:latest"
      memoryLimit: 512Mi
      name: vscode-typescript
      command:
        - sh

```

```

    - -c
  args:
    - ${PLUGIN_REMOTE_ENDPOINT_EXECUTABLE}
  extensions:
    - "https://github.com/che-incubator/ms-code.typescript/releases/download/v1.35.1/che-
      typescript-language-1.35.1.vsix"

```

- Modify **args** instead of **command** to use an image with a wrapper script pattern and to keep a call of the **entrypoint.sh** script:

```

apiVersion: v2
category: Language
description: "Typescript language features"
displayName: Typescript
firstPublicationDate: "2019-10-28"
icon: "https://www.eclipse.org/che/images/logo-eclipseche.svg"
name: typescript
publisher: che-incubator
repository: "https://github.com/Microsoft/vscode"
title: "Typescript language features"
type: "VS Code extension"
version: remote-bin-with-override-entrypoint
spec:
  containers:
    - image: "example/fedora-for-ts-remote-plugin-without-endpoint:latest"
      memoryLimit: 512Mi
      name: vscode-typescript
      args:
        - sh
        - -c
        - ${PLUGIN_REMOTE_ENDPOINT_EXECUTABLE}
  extensions:
    - "https://github.com/che-incubator/ms-code.typescript/releases/download/v1.35.1/che-
      typescript-language-1.35.1.vsix"

```

Red Hat CodeReady Workspaces calls the **entrypoint.sh** wrapper script defined in the **ENTRYPOINT** command of the Dockerfile. The script executes [**'sh', '-c', '\${PLUGIN_REMOTE_ENDPOINT_EXECUTABLE}'**] using the **exec "\$@"** command.

NOTE

By modifying the **command** and **args** properties of the **meta.yaml** file, a user can:

- Execute a service at a container start
- Start a remote plug-in endpoint

To make these actions run at the same time:

1. Start the service.
2. Detach the process.
3. Start the remote plug-in endpoint.



4.2. ADDING A VS CODE EXTENSION TO A WORKSPACE

This section describes how to add a VS Code extension to a workspace using the **CodeReady Workspaces Plugins** panel or the workspace configuration.

Prerequisites

- The VS Code extension is available in the CodeReady Workspaces plug-in registry, or metadata for the VS Code extension are available. See [Section 4.3, “Publishing metadata for a VS Code extension”](#).

4.2.1. Adding a VS Code extension using the CodeReady Workspaces Plugins panel

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- The VS Code extension is available in the CodeReady Workspaces plug-in registry, or metadata for the VS Code extension are available. See [Section 4.3, “Publishing metadata for a VS Code extension”](#).

Procedure

To add a VS Code extension using the **CodeReady Workspaces Plugins** panel:

1. Open the **CodeReady Workspaces Plugins** panel by pressing **CTRL+SHIFT+J** or navigate to **View/Plugins**.
2. Change the current registry to the registry in which the VS Code extension was added.
3. In the search bar, click the **Menu** button and then click **Change Registry** to choose the registry from the list. If the required registry is not in the list, add it using the **Add Registry** menu option. The registry link points to the **plugins** segment of the registry, for example: **https://my-registry.com/v3/plugins/index.json**.
4. To update the list of plug-ins after adding a new registry link, use **Refresh** command from the search bar menu.
5. Search for the required plug-in using the filter, and then click the **Install** button.
6. Restart the workspace for the changes to take effect.

4.2.2. Adding a VS Code extension using the workspace configuration

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- An existing workspace defined on this instance of Red Hat CodeReady Workspaces [Section 3.3, “Creating and configuring a new CodeReady Workspaces 2.7 workspace”](#).

- The VS Code extension is available in the CodeReady Workspaces plug-in registry, or metadata for the VS Code extension are available. See [Section 4.3, “Publishing metadata for a VS Code extension”](#).

Procedure

To add a VS Code extension using the workspace configuration:

1. Click the **Workspaces** tab on the **Dashboard** and select the workspace in which you want to add the plug-in. The **Workspace <workspace-name>** window is opened showing the details of the workspace.
2. Click the **devfile** tab.
3. Locate the **components** section, and add a new entry with the following structure:

```
- type: chePlugin
  id: 1
```

- 1 ID format: `<publisher>/<plug-inName>/<plug-inVersion>`

CodeReady Workspaces automatically adds the other fields to the new component.

Alternatively, you can link to a **meta.yaml** file hosted on GitHub, using the dedicated reference field.

```
- type: chePlugin
  reference: 1
```

- 1 **`https://raw.githubusercontent.com/<username>/<registryRepository>/v3/plugins/<publisher>/<plug-inName>/<plug-inVersion>/meta.yaml`**

4. Restart the workspace for the changes to take effect.

4.3. PUBLISHING METADATA FOR A VS CODE EXTENSION

To use a VS Code extension in a CodeReady Workspaces workspace, CodeReady Workspaces need to consume metadata describing the extension. The CodeReady Workspaces plugin registry is a static website publishing metadata for common VS Code extensions.

How to publish metadata for an additional extension, not available in the CodeReady Workspaces plugin registry using the extension configuration. **meta.yaml** file.

Prerequisite

- If the VS Code extension requires it, the required associated container image is available.

Procedure

1. Create a **meta.yaml** file.
2. Edit the **meta.yaml** file and provide the necessary information. The file must have the following structure:

■

```

apiVersion: v2
publisher: myorg
name: my-vscode-ext
version: 1.7.2
type: value
displayName:
title:
description:
icon: https://www.eclipse.org/che/images/logo-eclipseche.svg
repository:
category:
spec:
  containers:
    - image:
        memoryLimit:
        memoryRequest:
        cpuLimit:
        cpuRequest:
    extensions:
      - https://github.com/redhat-developer/vscode-
yaml/releases/download/0.4.0/redhat.vscode-yaml-0.4.0.vsix
      - https://github.com/SonarSource/sonarlint-vscode/releases/download/1.16.0/sonarlint-
vscode-1.16.0.vsix

```

- 1 Version of the file structure.
- 2 Name of the plug-in publisher. Must be the same as the publisher in the path.
- 3 Name of the plug-in. Must be the same as in path.
- 4 Version of the plug-in. Must be the same as in path.
- 5 Type of the plug-in. Possible values: **Che Plugin**, **Che Editor**, **Theia plugin**, **VS Code extension**.
- 6 A short name of the plug-in.
- 7 Title of the plug-in.
- 8 A brief explanation of the plug-in and what it does.
- 9 The link to the plug-in logo.
- 10 Optional. The link to the source-code repository of the plug-in.
- 11 Defines the category that this plug-in belongs to. Should be one of the following: **Editor**, **Debugger**, **Formatter**, **Language**, **Linters**, **Snippet**, **Theme**, or **Other**.
- 12 If this section is omitted, the VS Code extension is added into the Che-Theia IDE container.
- 13 The Docker image from which the sidecar container will be started. Example: **theia-endpoint-image**.

- 14 The maximum RAM which is available for the sidecar container. Example: "512Mi". This value might be overridden by the user in the component configuration.
 - 15 The RAM which is given for the sidecar container by default. Example: "256Mi". This value might be overridden by the user in the component configuration.
 - 16 The maximum CPU amount in cores or millicores (suffixed with "m") which is available for the sidecar container. Examples: "500m", "2". This value might be overridden by the user in the component configuration.
 - 17 The CPU amount in cores or millicores (suffixed with "m") which is given for the sidecar container by default. Example: "125m". This value might be overridden by the user in the component configuration.
 - 18 A list of VS Code extensions run in this sidecar container.
3. Publish the **meta.yaml** file as an HTTP resource by creating a gist on GitHub or GitLab with a file content published there.

4.4. TESTING A VISUAL STUDIO CODE EXTENSION IN CODEREADY WORKSPACES

Visual Studio Code (VS Code) extensions work in a workspace. VS Code extensions can run in the Che-Theia editor container, or in their own isolated and preconfigured containers with their prerequisites.

This section describes how to test a VS Code extension in CodeReady Workspaces with workspaces and how to review the compatibility of VS Code extensions to check whether a specific API is available.



NOTE

The extension-hosting sidecar container and the use of the extension in a devfile are optional.

4.4.1. Testing a VS Code extension using GitHub gist

Each workspace can have its own set of plug-ins. The list of plug-ins and the list of projects to clone are defined in the **devfile.yaml** file.

For example, to enable an AsciiDoc plug-in from the Red Hat CodeReady Workspaces dashboard, add the following snippet to the devfile:

```
components:
- id: joapinto/vscode-asciidoc/latest
  type: chePlugin
```

To add a plug-in that is not in the default plug-in registry, build a custom plug-in registry. See https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/administration_guide/index#customizing-the-registries_crw, or, alternatively, use GitHub and the gist service.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- A GitHub account.

Procedure

1. Go to the [gist](#) webpage and create a **README.md** file with the following description: **Try Bracket Pair Colorizer extension in Red Hat CodeReady Workspaces** and content: **Example VS Code extension**. ([Bracket Pair Colorizer](#) is a popular VS Code extension.)
2. Click the **Create secret gist** button.
3. Clone the gist repository by using the URL from the navigation bar of the browser:

```
$ git clone https://gist.github.com/<your-github-username>/<gist-id>
```

Example of the output of the git clone command

```
git clone https://gist.github.com/benoitf/85c60c8c439177ac50141d527729b9d9 1  
Cloning into '85c60c8c439177ac50141d527729b9d9'...  
remote: Enumerating objects: 3, done.  
remote: Counting objects: 100% (3/3), done.  
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0  
Unpacking objects: 100% (3/3), done.
```

- 1** Each gist has a unique ID.

4. Change the directory:

```
$ cd <gist-directory-name> 1
```

- 1** Directory name matching the gist ID.

5. Download the plug-in from the [VS Code marketplace](#) or from its [GitHub page](#), and store the plug-in file in the cloned directory.
6. Create a **plugin.yaml** file in the cloned directory to add the definition of this plug-in.

Example of the plugin.yaml file referencing the .vsix binary file extension

```
apiVersion: v2  
publisher: CoenraadS  
name: bracket-pair-colorizer  
version: 1.0.61  
type: VS Code extension  
displayName: Bracket Pair Colorizer  
title: Bracket Pair Colorizer  
description: Bracket Pair Colorizer  
icon: https://raw.githubusercontent.com/redhat-developer/codeready-workspaces/master/dependencies/che-plugin-registry/resources/images/default.svg?  
sanitize=true  
repository: https://github.com/CoenraadS/BracketPair
```



```

category: Language
firstPublicationDate: '2020-07-30'
spec:
  extensions:
    - "{{REPOSITORY}}/CoenraadS.bracket-pair-colorizer-1.0.61.vsix"
latestUpdateDate: "2020-07-30"

```

- 1 This extension requires a basic Node.js runtime, so it is not necessary to add a custom runtime image in **plugin.yaml**.
- 2 **{{REPOSITORY}}** is a macro for a pre-commit hook.

7. Define a memory limit and volumes:

```

spec:
  containers:
    - image: "quay.io/eclipse/che-sidecar-java:8-0cfbacb"
      name: vscode-java
      memoryLimit: "1500Mi"
      volumes:
        - mountPath: "/home/theia/.m2"
          name: m2

```

8. Create a **devfile.yaml** that references the **plugin.yaml** file:

```

apiVersion: 1.0.0
metadata:
  generateName: java-maven-
projects:
  -
    name: console-java-simple
    source:
      type: git
      location: "https://github.com/che-samples/console-java-simple.git"
      branch: java1.11
components:
  -
    type: chePlugin
    id: redhat/java11/latest
  -
    type: chePlugin
    reference: "{{REPOSITORY}}/plugin.yaml"
  -
    type: dockerimage
    alias: maven
    image: quay.io/eclipse/che-java11-maven:nightly
    memoryLimit: 512Mi
    mountSources: true
    volumes:
      - name: m2
        containerPath: /home/user/.m2
commands:
  -
    name: maven build

```

```

actions:
-
  type: exec
  component: maven
  command: "mvn clean install"
  workdir: ${CHE_PROJECTS_ROOT}/console-java-simple
-
name: maven build and run
actions:
-
  type: exec
  component: maven
  command: "mvn clean install && java -jar ./target/*.jar"
  workdir: ${CHE_PROJECTS_ROOT}/console-java-simple

```

- 1 Any other devfile definition is also accepted. The important information in this devfile are the lines defining this external component. It means that an external reference defines the plug-in (instead of an ID pointing to a definition in the default plug-in registry).

9. Verify there are 4 files in the current Git directory:

```

$ ls -la
.git
CoenraadS.bracket-pair-colorizer-1.0.61.vsix
README.md
devfile.yaml
plugin.yaml

```

10. Before committing the files, add a pre-commit hook to update the **{{REPOSITORY}}** variable to the public external raw gist link:

- a. Create a **.git/hooks/pre-commit** file with this content:

```

#!/bin/sh

# get modified files
FILES=$(git diff --cached --name-only --diff-filter=ACMR "*.yaml" | sed 's| |\ |g')

# exit fast if no files found
[ -z "$FILES" ] && exit 0

# grab remote origin
origin=$(git config --get remote.origin.url)
url="${origin}/raw"

# iterate on files and add the good prefix pattern
for FILE in ${FILES}; do
  sed -e "s#{{REPOSITORY}}#${url}#g" "${FILE}" > "${FILE}.back"
  mv "${FILE}.back" "${FILE}"
done

# Add back to staging
echo "$FILES" | xargs git add

exit 0

```

The hook replaces the `{{REPOSITORY}}` macro and adds the external raw link to the gist.

- b. Make the script executable:

```
$ chmod u+x .git/hooks/pre-commit
```

11. Commit and push the files:

```
# Add files
$ git add *

# Commit
$ git commit -m "Initial Commit for the test of our extension"
[master 98dd370] Initial Commit for the test of our extension
3 files changed, 61 insertions(+)
create mode 100644 CoenraadS.bracket-pair-colorizer-1.0.61.vsix
create mode 100644 devfile.yaml
create mode 100644 plugin.yaml

# and push the files to the main branch
$ git push origin
```

12. Visit the gist website and verify that all links have the correct public URL and do not contain any `{{REPOSITORY}}` variables. To reach the devfile:

```
$ echo "$(git config --get remote.origin.url)/raw/devfile.yaml"
```

or:

```
$ echo "https://<che-server>/f?url=$(git config --get remote.origin.url)/raw/devfile.yaml"
```

4.4.2. Verifying the VS Code extension API compatibility level

Che-Theia does not fully support the VS Code extensions API. The [vscode-theia-comparator](#) is used to analyze the compatibility between the Che-Theia plug-in API and the VS Code extension API. This tool runs nightly, and the results are published on the [vscode-theia-comparator](#) GitHub page.

Prerequisites

- Personal GitHub access token. See [Creating a personal access token for the command line](#). A GitHub access token is required to increase the GitHub download limit for your IP address.

Procedure

To run the `vscode-theia-comparator` manually:

1. Clone the [vscode-theia-comparator](#) repository, and build it using the `yarn` command.
2. Set the `GITHUB_TOKEN` environment variable to your token.
3. Execute the `yarn run generate` command to generate a report.
4. Open the `out/status.html` file to view the report.

4.5. USING ALTERNATIVE IDES IN CODEREADY WORKSPACES

Extending Red Hat CodeReady Workspaces developer workspaces using different IDEs (integrated development environments) enables:

- Re-purposing the environment for different use cases.
- Providing a dedicated custom IDE for specific tools.
- Providing different perspectives for individual users or groups of users.

Red Hat CodeReady Workspaces provides a default web IDE to be used with the developer workspaces. This IDE is completely decoupled. You can bring your own custom IDE for Red Hat CodeReady Workspaces:

- **Built from Eclipse Theia**, which is a framework to build web IDEs. Example: [Sirius on the web](#).
- **Completely different web IDEs**, such as Jupyter, Eclipse Dirigible, or others. Example: [Jupyter in Red Hat CodeReady Workspaces workspaces](#).

Bringing custom IDE built from Eclipse Theia

- Creating your own custom IDE based on Eclipse Theia.
- Adding CodeReady Workspaces-specific tools to your custom IDE.
- Packaging your custom IDE into the available editors for CodeReady Workspaces.

Bringing your completely different web IDE into CodeReady Workspaces

- Packaging your custom IDE into the available editors for CodeReady Workspaces.

4.6. SUPPORT FOR JETBRAINS IDES

This section contains information about supported JetBrains IDEs that can be used in Red Hat CodeReady Workspaces workspaces.

Red Hat CodeReady Workspaces supports running a workspace with the following list of JetBrains IDEs:

- IntelliJ Idea Community Edition
- IntelliJ Idea Ultimate Edition
- WebStorm

List of JetBrains IDEs that are planned to be supported:

- GoLand
- PhpStorm
- PyCharm Professional Edition
- PyCharm Community Edition

**NOTE**

The version of supported JetBrains products should be 2018.1 or higher.

The following sections describe how to create an image with a specific IDE and workspace based on the built image:

- [Section 4.6.1, “Using IntelliJ Idea Community Edition”](#)
- [Section 4.6.2, “Using IntelliJ Idea Ultimate Edition”](#)
- [Section 4.6.3, “Using WebStorm”](#)

4.6.1. Using IntelliJ Idea Community Edition

Procedure

1. Clone the [che-editor-intellij-community](#) repository, which is needed to build IntelliJ Idea Community Edition located under the *che-incubator* organization.
2. Build IntelliJ Idea Community Edition by calling the following command inside the repository folder:

```
$ podman build -t idea-ic --build-arg PRODUCT_NAME=ideaIC .
```

This command builds an image with a **2020.2.3** version by default.

3. Tag and push the built image to a user repository:

```
$ podman tag idea-ic:latest <username>/idea-ic:latest
$ podman push <username>/idea-ic:latest
```

4. Use this image as the CodeReady Workspaces editor. To achieve this, create two YAML configuration files:

- **workspace.yaml** – workspace configuration. Do not forget to provide a correct URL to the **meta.yaml** file:

```
metadata:
  name: che-ideaic
components:
  - type: cheEditor
    reference: '<URL to the meta.yaml>'
    alias: ideaic-editor
  apiVersion: 1.0.0
```

- **meta.yaml** – CodeReady Workspaces editor configuration. Do not forget to replace **<username>** with the user name of the repository to which the image is pushed:

```
apiVersion: v2
publisher: <username>
name: ideaic-NOVNC
version: 2020.2.3
type: Che Editor
```

```

displayName: IntelliJ IDEA Community Edition
title: IntelliJ IDEA Community Edition (in browser using noVNC) as editor for Red Hat
CodeReady Workspaces
description: IntelliJ IDEA Community Edition running on the Web with noVNC
icon: https://resources.jetbrains.com/storage/products/intellij-idea/img/meta/intellij-
idea_logo_300x300.png
category: Editor
repository: https://github.com/che-incubator/che-editor-intellij-community
firstPublicationDate: "2020-10-27"
spec:
  endpoints:
    - name: "intellij"
      public: true
      targetPort: 8080
      attributes:
        protocol: http
        type: ide
        path: /vnc.html?resize=remote&autoconnect=true&reconnect=true
  containers:
    - name: ideaic-novnc
      image: "<username>/idea-ic:latest"
      mountSources: true
      volumes:
        - mountPath: "/JetBrains/ideaIC"
          name: ideaic-configuration
      ports:
        - exposedPort: 8080
      memoryLimit: "2048M"

```

4.6.2. Using IntelliJ Idea Ultimate Edition

Procedure

1. Clone the [che-editor-intellij-community](https://github.com/che-incubator/che-editor-intellij-community) repository, which is needed to build IntelliJ Idea Community Edition located under the *che-incubator* organization.
2. Build IntelliJ Idea Ultimate Edition by calling the following command inside the repository folder:

```
$ podman build -t idea-iu --build-arg PRODUCT_NAME=ideaIU .
```

This command builds an image with a **2020.2.3** version by default.

3. Tag and push the built image to a user repository:

```
$ podman tag idea-iu:latest <username>/idea-iu:latest
$ podman push <username>/idea-iu:latest
```

4. Provision the activation code for offline use to be able to use WebStorm with a registered license. See section [Section 4.6.4, "Provisioning JetBrains activation code for offline use"](#).
5. Create a workspace with the following **workspace.yaml** and **meta.yaml** files:
 - **workspace.yaml** – workspace configuration. Do not forget to provide a correct URL to the **meta.yaml** file:

```

metadata:
  name: che-ideaiu
components:
  - type: cheEditor
    reference: '<URL to the meta.yaml>'
    alias: ideaiu-editor
    automountWorkspaceSecrets: true
  apiVersion: 1.0.0

```



NOTE

In the current workspace definition, there is a new property: **automountWorkspaceSecrets: true**. This property instructs Red Hat CodeReady Workspaces to provision secrets into a specific component. In this case, it provisions it into the CodeReady Workspaces editor based on IntelliJ Idea Ultimate Edition. This parameter is **mandatory** to successfully register the IDE with an activation code for offline use.

- **meta.yaml** – CodeReady Workspaces editor configuration. Do not forget to replace **<username>** with the user name of the repository to which the image is pushed:

```

apiVersion: v2
publisher: <username>
name: idealU-NOVNC
version: 2020.2.3
type: Che Editor
displayName: IntelliJ IDEA Ultimate Edition
title: IntelliJ IDEA Ultimate Edition (in browser using noVNC) as editor for Red Hat CodeReady Workspaces
description: IntelliJ IDEA Ultimate Edition running on the Web with noVNC
icon: https://resources.jetbrains.com/storage/products/intellij-idea/img/meta/intellij-idea_logo_300x300.png
category: Editor
repository: https://github.com/che-incubator/che-editor-intellij-community
firstPublicationDate: "2020-10-27"
spec:
  endpoints:
    - name: "intellij"
      public: true
      targetPort: 8080
      attributes:
        protocol: http
        type: ide
        path: /vnc.html?resize=remote&autoconnect=true&reconnect=true
  containers:
    - name: ideaiu-novnc
      image: "<username>/idea-iu:latest"
      mountSources: true
      volumes:
        - mountPath: "/JetBrains/idealU"
          name: ideaiu-configuration
      ports:
        - exposedPort: 8080
      memoryLimit: "2048M"

```

4.6.3. Using WebStorm

Procedure

1. Clone the [che-editor-intellij-community](#) repository, which is needed to build IntelliJ Idea Community Edition located under the *che-incubator* organization.

2. Build the image:

```
$ podman build -t webstorm --build-arg PRODUCT_NAME=WebStorm .
```

This command builds an image with a **2020.2.3** version by default.

3. Tag and push the built image to a user repository:

```
$ podman tag webstorm:latest <username>/webstorm:latest
$ podman push <username>/webstorm:latest
```

4. Provision the activation code for offline use to be able to use WebStorm with a registered license. See section [Section 4.6.4, "Provisioning JetBrains activation code for offline use"](#).

5. Create a workspace with the following **workspace.yaml** and **meta.yaml** files:

- **workspace.yaml** – workspace configuration. Do not forget to provide a correct URL to the **meta.yaml** file:

```
metadata:
  name: che-webstorm
components:
  - type: cheEditor
    reference: '<URL to meta.yaml>'
    alias: webstorm-editor
    automountWorkspaceSecrets: true
  apiVersion: 1.0.0
```



NOTE

In the current workspace definition, there is a new property: **automountWorkspaceSecrets: true**. This property instructs Red Hat CodeReady Workspaces to provision secrets into a specific component. In this case, it provisions it into the CodeReady Workspaces editor based on IntelliJ Idea Ultimate Edition. This parameter is **mandatory** to successfully register the IDE with an activation code for offline use.

- **meta.yaml** – CodeReady Workspaces editor configuration. Do not forget to replace **<username>** with the user name of the repository to which the image is pushed:

```
apiVersion: v2
publisher: <username>
name: webstorm-NOVNC
version: 2020.2.3
type: Che Editor
displayName: WebStorm
title: WebStorm (in browser using noVNC) as editor for Red Hat CodeReady
```



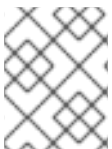
```

Workspaces
description: WebStorm running on the Web with noVNC
icon:
https://resources.jetbrains.com/storage/products/webstorm/img/meta/webstorm_logo_300x
300.png
category: Editor
repository: https://github.com/che-incubator/che-editor-intellij-community
firstPublicationDate: "2020-10-27"
spec:
  endpoints:
    - name: "intellij"
      public: true
      targetPort: 8080
      attributes:
        protocol: http
        type: ide
        path: /vnc.html?resize=remote&autoconnect=true&reconnect=true
  containers:
    - name: webstorm-novnc
      image: "<username>/webstorm:latest"
      mountSources: true
      volumes:
        - mountPath: "/JetBrains/WebStorm"
          name: webstorm-configuration
      ports:
        - exposedPort: 8080
      memoryLimit: "2048M"

```

4.6.4. Provisioning JetBrains activation code for offline use

An activation code for offline use is a file with a license code that can be retrieved from the license management section of your JetBrains account for the license that is assigned to you. When you purchase a personal subscription or are assigned a commercial subscription by your organization, you receive an email prompting you to create a JetBrains account that becomes connected with the license.



NOTE

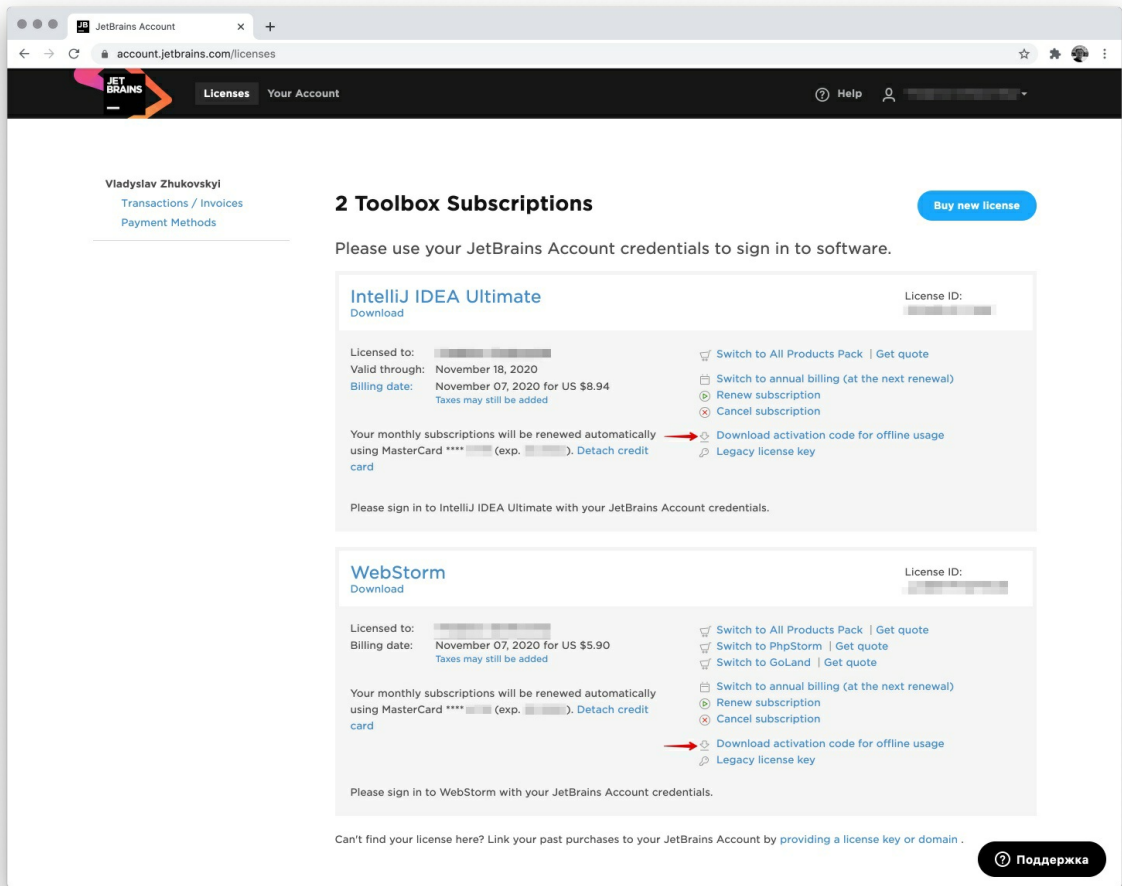
When using an activation code to activate a product, you need to generate a new activation code and apply it to your product each time the subscription is renewed.

Prerequisites

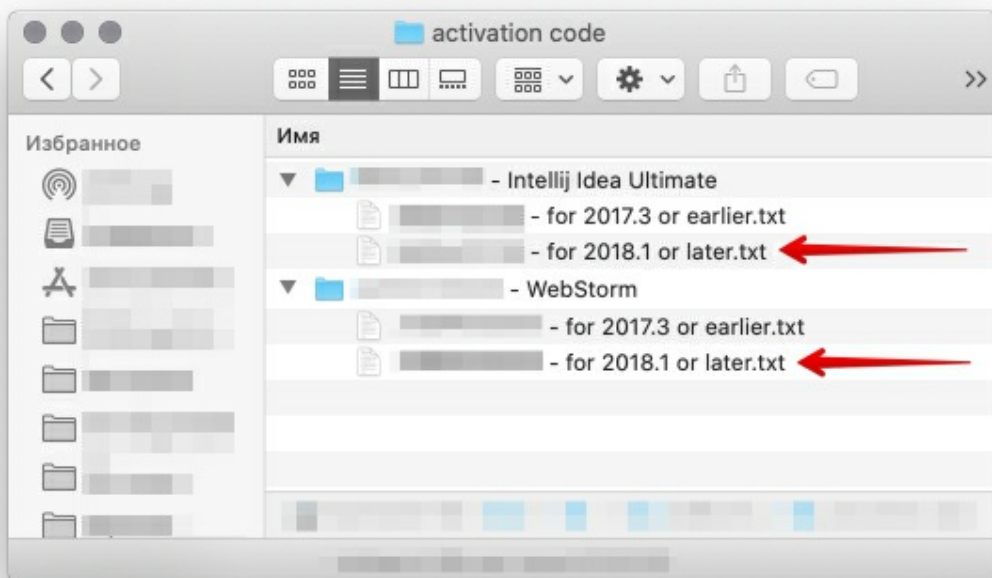
- JetBrains account
- Personal or organization subscription

Procedure

1. Retrieve the activation code from the JetBrains account:



JetBrains provides a ZIP archive with two types of the activation code. Use the **<License ID> - for 2018.1 or later.txt** file:



2. Provision the activation code for offline use with Che. This procedure is performed through the OpenShift Secrets.

3. Create a OpenShift Secret to instruct CodeReady Workspaces to mount the activation code into a container based on JetBrains specific product:

```

apiVersion: v1
kind: Secret
metadata:
  name: <secret name> 1
  labels:
    app.kubernetes.io/component: workspace-secret
    app.kubernetes.io/part-of: che.eclipse.org
  annotations:
    che.eclipse.org/automount-workspace-secret: 'false'
    che.eclipse.org/mount-path: /tmp/
    che.eclipse.org/mount-as: file
data:
  <product name (idealU or WebStorm)>.key: <base64-encoded data content> 2

```

- 1 **<secret name>** – The section that specifies the secret name. It may have a different name, for example, **ideaiu-offline-activation-code**. Provide the secret name in lowercase.
- 2 Product name and activation code:
 - **<product name (idealU or WebStorm)>** – Replace with the JetBrains product name. See section [Section 4.6.4.1, "JetBrains product-name mapping"](#).
 - **<base64-encoded data content>** – The activation code content encoded in base64.

Use the **automount-workspace-secret** option set to **false** to disable the mounting process until it is explicitly requested in a devfile component using the **automountWorkspaceSecrets:true** property. See the **workspace.yaml** example file above. This is the default behavior to avoid mounting the activation code into every container except specific ones that have to work with it.

As a result, in the Che Editor, the file with the activation code for offline use is mounted to the **/tmp/idealU.key** or **/tmp/WebStorm.key** path (or similar - based on the type of the build).

IntelliJ Idea Community Edition does not require this procedure. This has to be done for JetBrains products that need to be registered.

4.6.4.1. JetBrains product-name mapping

This section provides mapping used internally between JetBrains products and the product name during image build.

JetBrains Product	PRODUCT_NAME
IntelliJ Idea Community Edition	idealC
IntelliJ Idea Ultimate Edition	idealU
WebStorm	WebStorm

4.7. ADDING TOOLS TO CODEREADY WORKSPACES AFTER CREATING A WORKSPACE

When installed in a workspace, CodeReady Workspaces plug-ins bring new capabilities to CodeReady Workspaces. Plug-ins consist of a Che-Theia plug-in, metadata, and a hosting container. These plug-ins may provide the following capabilities:

- Integrating with other systems, including OpenShift.
- Automating some developer tasks, such as formatting, refactoring, and running automated tests.
- Communicating with multiple databases directly from the IDE.
- Enhanced code navigation, auto-completion and error highlighting.

This chapter provides basic information about installing, enabling, and using CodeReady Workspaces plug-ins in workspaces.

- [Section 4.7.1, “Additional tools in the CodeReady Workspaces workspace”](#)
- [Section 4.7.2, “Adding a language support plug-in to a CodeReady Workspaces workspace”](#)

4.7.1. Additional tools in the CodeReady Workspaces workspace

CodeReady Workspaces plug-ins are extensions to the Che-Theia IDE that come bundled with container images. These images contain the native prerequisites of their respective extensions. For example, the `oc` command-line tool is bundled with a command to install it, which ensures the proper functionality of the OpenShift Connector plug-in, all available in the dedicated image.

Plug-ins can also include metadata to define a description, categorization tags, and an icon. CodeReady Workspaces provides a registry of plug-ins available for installation into the user’s workspace.

The Che-Theia IDE is generally compatible with the VS Code extensions API and VS Code extensions are automatically compatible with Che-Theia. These extensions are possible to package as CodeReady Workspaces plug-ins by combining them with their dependencies. By default, CodeReady Workspaces includes a plug-in registry containing common plug-ins.

Adding a plug-in

- Using the Dashboard:
 - Add a plug-in from the plug-in registry using the **Plugins** tab in the **Workspace details** page.
 - Add a plug-in directly into a devfile using the **Devfile** tab.
The devfile can also further the plug-in configuration, such as defining memory or CPU usage.
- Using the Che-Theia IDE:
 - By pressing **Ctrl+Shift+J** or by navigating to **View → Plugins**.

Additional resources

- [Section 3.2.4.2, “Adding components to a devfile”](#)

4.7.2. Adding a language support plug-in to a CodeReady Workspaces workspace

This procedure describes adding a tool to an existing workspace by enabling a dedicated plug-in from the Dashboard.

To add tools that are available as plug-ins into a CodeReady Workspaces workspace, use one of the following methods:

- [Enable the plug-in from the Dashboard **Plugins** tab.](#)
- [Edit the workspace devfile from the Dashboard **Devfile** tab.](#)

This procedure uses the Language Support for Java plug-in as an example.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- An existing workspace defined in this instance of Red Hat CodeReady Workspaces; see:
 - [Section 3.3, “Creating and configuring a new CodeReady Workspaces 2.7 workspace”](#)
 - [Section 3.6.2, “Creating a workspace from Custom Workspace view of User Dashboard”](#)
- The workspace must be in a **stopped** state. To stop a workspace,
 - a. Navigate to the CodeReady Workspaces Dashboard. See [Section 1.1, “Navigating CodeReady Workspaces using the Dashboard”](#).
 - b. In the **Dashboard**, click the **Workspaces** menu to open the workspaces list and locate the workspace.
 - c. On the same row with the displayed workspace, on the right side of the screen, click the square **Stop** button to stop the workspace.
 - d. Wait a few seconds for the workspace to stop (the workspace’s icon on the list will turn grey), then configure the workspace by clicking on it.

Procedure

To add the plug-in from the Plug-in registry to an existing CodeReady Workspaces workspace, use one of the following methods:

- Installing the plug-in from the **Plugins** tab.
 1. Navigate to the **Plugins** tab. The list of available plug-ins is displayed.
 2. Enable the desired plug-in, for example, the Language Support for Java 11, by using the **Enable** slide-toggle. This will add the plug-in’s ID to the workspace’s devfile, enabling the plug-in.
 3. On the bottom right side of the screen, save the changes by clicking the **Save** button. After changes are saved, the workspace can be restarted and will include the new plug-in.
- Installing the plug-in by adding content to the devfile.
 1. Navigate to the **Devfile** tab. The devfile YAML is displayed.

2. Locate the **components** section of the devfile and add the following lines to add the Java language plugin with Java 8 to the workspace:

```
- id: redhat/java8/latest  
  type: chePlugin
```

An example of the final result:

```
components:  
- id: redhat/php/latest  
  memoryLimit: 1Gi  
  type: chePlugin  
- id: redhat/php-debugger/latest  
  memoryLimit: 256Mi  
  type: chePlugin  
- mountSources: true  
  endpoints:  
    - name: 8080/tcp  
      port: 8080  
  memoryLimit: 512Mi  
  type: dockerimage  
  volumes:  
    - name: composer  
      containerPath: {prod-home}/.composer  
    - name: symfony  
      containerPath: {prod-home}/.symfony  
  alias: php  
  image: 'quay.io/eclipse/che-php-7:nightly'  
- id: redhat/java8/latest  
  type: chePlugin
```

3. On the bottom right side of the screen, save the changes by clicking the **Save** button. After changes are saved, the workspace can be restarted and will include the new plug-in.

Additional resources

- [Devfile specifications](#)

CHAPTER 5. USING ARTIFACT REPOSITORIES IN A RESTRICTED ENVIRONMENT

This section describes how to manually configure various technology stacks to work with artifacts from in-house repositories using self-signed certificates.

- [Section 5.1, “Using Maven artifact repositories”](#)
- [Section 5.2, “Using Gradle artifact repositories”](#)
- [Section 5.3, “Using Python artifact repositories”](#)
- [Section 5.4, “Using Go artifact repositories”](#)
- [Section 5.5, “Using NuGet artifact repositories”](#)
- [Section 5.6, “Using npm artifact repositories”](#)

5.1. USING MAVEN ARTIFACT REPOSITORIES

Maven downloads artifacts that are defined in two locations:

- Artifact repositories defined in a **pom.xml** file of the project. Configuring repositories in **pom.xml** is not specific to Red Hat CodeReady Workspaces. For more information, see [the Maven documentation about the POM](#).
- Artifact repositories defined in a **settings.xml** file. By default, **settings.xml** is located at `~/m2/settings.xml`.

5.1.1. Defining repositories in settings.xml

To specify your own artifact repositories at **example.server.org**, use the **settings.xml** file. To do that, ensure, that **settings.xml** is present in all the containers that use Maven tools, in particular the Maven container and the Java plug-in container.

By default, **settings.xml** is located at the `<home dir>/m2` directory which is already on persistent volume in Maven and Java plug-in containers and you don't need to re-create the file each time you restart the workspace if it isn't in ephemeral mode.

In case you have another container that uses Maven tools and you want to share `<home dir>/m2` folder with this container, you have to specify the custom volume for this specific component in the devfile:

```
apiVersion: 1.0.0
metadata:
  name: MyDevfile
components:
  - type: chePlugin
    alias: maven-tool
    id: plugin/id
    volumes:
      - name: m2
        containerPath: <home dir>/m2
```

Procedure

1. Configure your **settings.xml** file to use artifact repositories at **example.server.org**:

```
<settings>
  <profiles>
    <profile>
      <id>my-nexus</id>
      <pluginRepositories>
        <pluginRepository>
          <id>my-nexus-snapshots</id>
          <releases>
            <enabled>>false</enabled>
          </releases>
          <snapshots>
            <enabled>>true</enabled>
          </snapshots>
          <url>http://example.server.org/repository/maven-snapshots/</url>
        </pluginRepository>
        <pluginRepository>
          <id>my-nexus-releases</id>
          <releases>
            <enabled>>true</enabled>
          </releases>
          <snapshots>
            <enabled>>false</enabled>
          </snapshots>
          <url>http://example.server.org/repository/maven-releases/</url>
        </pluginRepository>
      </pluginRepositories>
      <repositories>
        <repository>
          <id>my-nexus-snapshots</id>
          <releases>
            <enabled>>false</enabled>
          </releases>
          <snapshots>
            <enabled>>true</enabled>
          </snapshots>
          <url>http://example.server.org/repository/maven-snapshots/</url>
        </repository>
        <repository>
          <id>my-nexus-releases</id>
          <releases>
            <enabled>>true</enabled>
          </releases>
          <snapshots>
            <enabled>>false</enabled>
          </snapshots>
          <url>http://example.server.org/repository/maven-releases/</url>
        </repository>
      </repositories>
    </profile>
  </profiles>
  <activeProfiles>
    <activeProfile>my-nexus</activeProfile>
  </activeProfiles>
</settings>
```



```
CAglGh0dHBzOi8vbWF2ZW4uYXBhY2hLm9yZy94c2Qvc2V0dGluZ3MtMS4wLjAueHNklj4KIC
A8c2VydmVycz4KICAgIDxzZXJ2ZXI+CiAgICAgIDxpZD5yZXBvc2l0b3J5LWlkPC9pZD4KICAgI
CAgPHVzZXJuYW1lPnVzZXJuYW1lPC91c2VybmFtZT4KICAgICAgPHBhc3N3b3JkPnBhc3N3
b3JkMTIzPC9wYXNzd29yZD4KICAgIDwvc2VydmVyPgogIDwvc2VydmVycz4KPC9zZXR0aW5
ncz4K
```

3. Create this secret in the cluster:

```
$ oc apply -f secret.yaml
```

4. Start a new workspace. You will see `/home/jboss/.m2/settings.xml` with your original content in the **maven** container.

5.1.2.1. Openshift 3.11 and OpenShift <1.13

On OpenShift 3.11, it's impossible to have multiple VolumeMounts at same path so having devfile with volume `/home/jboss/.m2` and secret at `/home/jboss/.m2/settings.xml` would resolve into the conflict. On these clusters use `/home/jboss/.m2/repository` as a volume for maven repository in the devfile:

```
apiVersion: 1.0.0
metadata:
  ...
components:
  - type: dockerimage
    alias: maven
    image: maven:3.11
  volumes:
    - name: m2
      containerPath: /home/jboss/.m2/repository
  ...
```

5.1.3. Using self-signed certificates in Maven projects

Internal artifact repositories often do not have a certificate signed by an authority that is trusted by default in Java. They are usually signed by an internal company authority or are self-signed. Configure your tools to accept these certificates by adding them to the Java truststore.

Procedure

1. Obtain a server certificate file from the repository server. It is customary for administrators to provide certificates of internal artifact servers as OpenShift secrets (see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#importing-untrusted-tls-certificates_crw). The relevant server certificates will be mounted in **/public-certs** in every container in the workspace.
 - a. Copy the original Java truststore file:

```
$ mkdir /projects/maven
$ cp $JAVA_HOME/lib/security/cacerts /projects/maven/truststore.jks
$ chmod +w /projects/maven/truststore.jks
```

- b. Import the certificate into the Java truststore file

```
$ keytool -import -noprompt -file /public-certs/nexus.cer -alias nexus -keystore
/projects/maven/truststore.jks -storepass changeit
Certificate was added to keystore
```

2. Add the truststore file.

- In the Maven container:
 - a. Add the **javax.net.ssl** system property to the **MAVEN_OPTS** environment variable:

```
- mountSources: true
alias: maven
type: dockerimage
...
env:
  -name: MAVEN_OPTS
  value: >-
    -Duser.home=/projects/maven -
    -Djavax.net.ssl.trustStore=/projects/maven/truststore.jks -
    -Djavax.net.ssl.trustStorePassword=changeit
```

b. Restart the workspace.

- In the Java plug-in container:

In the devfile, add the **javax.net.ssl** system property for the Java language server:

```
components:
  - id: redhat/java11/latest
    type: chePlugin
  preferences:
    java.jdt.ls.vmargs: >-
      -noverify -Xmx1G -XX:+UseG1GC -XX:+UseStringDeduplication
      -Duser.home=/projects/maven
      -Djavax.net.ssl.trustStore=/projects/maven/truststore.jks
      -Djavax.net.ssl.trustStorePassword=changeit
  [...]
```

5.2. USING GRADLE ARTIFACT REPOSITORIES

5.2.1. Downloading different versions of Gradle

The recommended way to download any version of Gradle is by using the Gradle Wrapper script. If your project does not have a **gradle/wrapper** directory, run **\$ gradle wrapper** to configure the Wrapper.

Prerequisites

- The Gradle Wrapper is present in your project.

Procedure

To download a Gradle version from a non-standard location, change your Wrapper settings in **/projects/<your_project>/gradle/wrapper/gradle-wrapper.properties**:

- Change the **distributionUrl** property to point to a URL of the Gradle distribution ZIP file:

```
properties
distributionUrl=http://<url_to_gradle>/gradle-6.1-bin.zip
```

Alternatively, you may place a Gradle distribution zip file locally in **/project/gradle** in your workspace.

- Change the **distributionUrl** property to point to a local address of the Gradle distribution zip file:

```
properties
distributionUrl=file\:/projects/gradle/gradle-6.1-bin.zip
```

5.2.2. Configuring global Gradle repositories

Use an initialization script to configure global repositories for the workspace. Gradle performs extra configuration before projects are evaluated, and this configuration is used in each Gradle project from the workspace.

Procedure

To set global repositories for Gradle that could be used in each Gradle project in the workspace, create an **init.gradle** script in the **~/.gradle/** directory:

```
allprojects {
  repositories {
    mavenLocal ()
    maven {
      url "http://repo.mycompany.com/maven"
      credentials {
        username "admin"
        password "my_password"
      }
    }
  }
}
```

This file configures Gradle to use a local Maven repository with the given credentials.



NOTE

The **~/.gradle** directory does not persist in the current Java plug-in versions, so you must create the **init.gradle** script at each workspace start in the Java plug-in sidecar container.

5.2.3. Using self-signed certificates in Gradle projects

Internal artifact repositories often do not have a certificate signed by an authority that is trusted by default in Java. They are usually signed by an internal company authority or are self-signed. Configure your tools to accept these certificates by adding them to the Java truststore.

Procedure

1. Obtain a server certificate file from the repository server. It is customary for administrators to provide certificates of internal artifact servers as OpenShift secrets (see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-

[single/installation_guide/index#importing-untrusted-tls-certificates_crw](#)). The relevant server certificates will be mounted in **/public-certs** in every container in the workspace.

- a. Copy the original Java truststore file:

```
$ mkdir /projects/maven
$ cp $JAVA_HOME/lib/security/cacerts /projects/maven/truststore.jks
$ chmod +w /projects/maven/truststore.jks
```

- b. Import the certificate into the Java truststore file

```
$ keytool -import -noprompt -file /public-certs/nexus.cer -alias nexus -keystore
/projects/maven/truststore.jks -storepass changeit
Certificate was added to keystore
```

- c. Upload the truststore file to **/projects/gradle/truststore.jks** to make it available for all containers.

2. Add the truststore file in the Gradle container.

- a. Add the **javax.net.ssl** system property to the **JAVA_OPTS** environment variable:

```
- mountSources: true
alias: maven
type: dockerimage
...
env:
  -name: JAVA_OPTS
  value: >-
    -Duser.home=/projects/gradle
    -Djavax.net.ssl.trustStore=/projects/maven/truststore.jks
    -Djavax.net.ssl.trustStorePassword=changeit
```

Additional resources

- [Gradle documentation about initialization scripts](#)
- [The Gradle Wrapper documentation](#)

5.3. USING PYTHON ARTIFACT REPOSITORIES

5.3.1. Configuring Python to use a non-standard registry

To specify a non-standard repository for use by the Python pip tool, set the **PIP_INDEX_URL** environment variable.

Procedure

- In your devfile, configure the **PIP_INDEX_URL** environment variable for the language support and for the development container components:

```
- id: ms-python/python/latest
memoryLimit: 512Mi
type: chePlugin
```

```

env:
  - name: 'PIP_INDEX_URL'
    value: 'https://<username>:<password>@pypi.company.com/simple'
- mountSources: true
memoryLimit: 512Mi
type: dockerimage
alias: python
image: 'registry.redhat.io/codeready-workspaces/plugin-java8-rhel8:2.5'
env:
  - name: 'PIP_INDEX_URL'
    value: 'https://<username>:<password>@pypi.company.com/simple'

```

5.3.2. Using self-signed certificates in Python projects

Internal artifact repositories often do not have a self-signed TLS certificate signed by an authority that is trusted by default. They are usually signed by an internal company authority or are self-signed. Configure your tools to accept these certificates.

Python uses certificates from a file defined in the **PIP_CERT** environment variable.

Procedure

1. Obtain the certificate used by the pip server in the Privacy-Enhanced Mail (PEM) format. It is customary for administrators to provide certificates of internal artifact servers as OpenShift secrets (see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#importing-untrusted-tls-certificates_crw). The relevant server certificates will be mounted in **/public-certs** in every container in the workspace.



NOTE

pip accepts certificates in the Privacy-Enhanced Mail (PEM) format only. Convert the certificate to the PEM format using OpenSSL if necessary.

2. Configure the devfile:

```

- id: ms-python/python/latest
memoryLimit: 512Mi
type: chePlugin
env:
  - name: 'PIP_INDEX_URL'
    value: 'https://<username>:<password>@pypi.company.com/simple'
  - value: '/projects/tls/rootCA.pem'
    name: 'PIP_CERT'
- mountSources: true
memoryLimit: 512Mi
type: dockerimage
alias: python
image: 'registry.redhat.io/codeready-workspaces/plugin-java8-rhel8:2.5'
env:
  - name: 'PIP_INDEX_URL'
    value: 'https://<username>:<password>@pypi.company.com/simple'
  - value: '/projects/tls/rootCA.pem'
    name: 'PIP_CERT'

```

5.4. USING GO ARTIFACT REPOSITORIES

To configure Go in a restricted environment, use the **GOPROXY** environment variable and the [Athens](#) module datastore and proxy.

5.4.1. Configuring Go to use a non-standard-registry

Athens is a Go module datastore and proxy with many configuration options. It can be configured to act only as a module datastore and not as a proxy. An administrator can upload their Go modules to the Athens datastore and have them available across their Go projects. If a project tries to access a Go module that is not in the Athens datastore, the Go build fails.

- To work with Athens, configure the **GOPROXY** environment variable in the devfile of your CLI container:

```
components:
- mountSources: true
  type: dockerimage
  alias: go-cli
  image: 'quay.io/eclipse/che-golang-1.12:7.7.0'
...
- value: /tmp/.cache
  name: GOCACHE
- value: 'http://your.athens.host'
  name: GOPROXY
```

5.4.2. Using self-signed certificates in Go projects

Internal artifact repositories often do not have a self-signed TLS certificate signed by an authority that is trusted by default. They are usually signed by an internal company authority or are self-signed. Configure your tools to accept these certificates.

Go uses certificates from a file defined in the **SSL_CERT_FILE** environment variable.

Procedure

1. Obtain the certificate used by the Athens server in the Privacy-Enhanced Mail (PEM) format. It is customary for administrators to provide certificates of internal artifact servers as OpenShift secrets (see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#importing-untrusted-tls-certificates_crw). The relevant server certificates will be mounted in **/public-certs** in every container in the workspace.
2. Add the appropriate environment variables to your devfile:

```
components:
- mountSources: true
  type: dockerimage
  alias: go-cli
  image: 'registry.redhat.io/codeready-workspaces/stacks-golang-rhel8:2.5'
...
- value: /tmp/.cache
  name: GOCACHE
- value: 'http://your.athens.host'
```

```
name: GOPROXY
- value: '/projects/tls/rootCA.crt'
name: SSL_CERT_FILE
```

Additional resources

- [GitHub - gomods/athens: A Go module datastore and proxy](#)

5.5. USING NUGET ARTIFACT REPOSITORIES

To configure NuGet in a restricted environment, modify the **nuget.config** file and use the **SSL_CERT_FILE** environment variable in the devfile to add self-signed certificates.

5.5.1. Configuring NuGet to use a non-standard artifact repository

NuGet searches for configuration files anywhere between the solution directory and the driver root directory. If you put the **nuget.config** file in the **/projects** directory, the **nuget.config** file defines NuGet behavior for all projects in **/projects**.

Procedure

- Create and place the **nuget.config** file in the **/projects** directory.

Example nuget.config with a Nexus repository hosted at `nexus.example.org`:

```
<?xml version="1.0" encoding="UTF-8"?>
<configuration>
  <packageSources>
    <add key="nexus2" value="https://nexus.example.org/repository/nuget-hosted/" />
  </packageSources>
  <packageSourceCredentials>
    <nexus2>
      <add key="Username" value="user" />
      <add key="Password" value="..." />
    </nexus2>
  </packageSourceCredentials>
</configuration>
```

5.5.2. Using self-signed certificates in NuGet projects

Internal artifact repositories often do not have a self-signed TLS certificate signed by an authority that is trusted by default. They are usually signed by an internal company authority or are self-signed. Configure your tools to accept these certificates.

Procedure

1. Obtain the certificate used by the .NET server in the Privacy-Enhanced Mail (PEM) format. It is customary for administrators to provide certificates of internal artifact servers as OpenShift secrets (see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#importing-untrusted-tls-certificates_crw). The relevant server certificates will be mounted in **/public-certs** in every container in the workspace.

- Specify the location of the certificate file in the **SSL_CERT_FILE** environment variable in your devfile for the OmniSharp plug-in and for the .NET container.

Example of the devfile:

```

components:
- id: redhat-developer/che-omnisharp-plugin/latest
  memoryLimit: 1024Mi
  type: chePlugin
  alias: omnisharp
  env:
  - value: /public-certs/nuget.cer
    name: SSL_CERT_FILE
- mountSources: true
  endpoints:
  - name: 5000/tcp
    port: 5000
  memoryLimit: 512Mi
  type: dockerimage
  volumes:
  - name: dotnet
    containerPath: /home/jboss
  alias: dotnet
  image: 'quay.io/eclipse/che-dotnet-2.2:7.7.1'
  env:
  - value: /projects/tls/rootCA.crt
    name: SSL_CERT_FILE

```

5.6. USING NPM ARTIFACT REPOSITORIES

npm is usually configured using the **npm config** command, writing values to the **.npmrc** files. However, configuration values can also be set using the environment variables beginning with **NPM_CONFIG_**.

The Javascript/Typescript plug-in used in Red Hat CodeReady Workspaces does not download any artifacts. It is enough to configure npm in the dev-machine component.

Use the following environment variables for configuration:

- The URL for the artifact repository: **NPM_CONFIG_REGISTRY**
- For using a certificate from a file: **NODE_EXTRA_CA_CERTS**

Obtain a server certificate file from the repository server. It is customary for administrators to provide certificates of internal artifact servers as OpenShift secrets (see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#importing-untrusted-tls-certificates_crw). The relevant server certificates will be mounted in **/public-certs** in every container in the workspace.

- An example configuration for the use of an internal repository with a self-signed certificate:

```

- mountSources: true
  endpoints:
  - name: nodejs
    port: 3000
  memoryLimit: '512Mi'

```

```
type: 'dockerimage'  
alias: 'nodejs'  
image: 'quay.io/eclipse/che-nodejs10-ubi:nightly'  
env:  
  - name: NODE_EXTRA_CA_CERTS  
    value: '/public-certs/nexus.cer'  
  - name: NPM_CONFIG_REGISTRY  
    value: 'https://snexus-airgap.apps.acme.com/repository/npm-proxy/'
```

CHAPTER 6. TROUBLESHOOTING CODEREADY WORKSPACES

This section provides troubleshooting procedures for the most frequent issues a user can come in conflict with.

Additional resources

- [Section 6.1, "Viewing CodeReady Workspaces workspaces logs"](#)
- [Section 6.2, "Troubleshooting slow workspaces"](#)
- [Section 6.3, "Troubleshooting network problems"](#)
- [Section 6.4, "Starting a CodeReady Workspaces workspace in debug mode"](#)
- [Section 6.5, "Restarting a CodeReady Workspaces workspace in debug mode after start failure"](#)

6.1. VIEWING CODEREADY WORKSPACES WORKSPACES LOGS

This section describes how to view CodeReady Workspaces workspaces logs.

6.1.1. Viewing logs from language servers and debug adapters

6.1.1.1. Checking important logs

This section describes how to check important logs.

Procedure

1. In the OpenShift web console, click **Applications** → **Pods** to see a list of all the active workspaces.
2. Click on the name of the running Pod where the workspace is running. The Pod screen contains the list of all containers with additional information.
3. Choose a container and click the container name.



NOTE

The most important logs are the **theia-ide** container and the plug-ins container logs.

4. On the container screen, navigate to the **Logs** section.

6.1.1.2. Detecting memory problems

This section describes how to detect memory problems related to a plug-in running out of memory. The following are the two most common problems related to a plug-in running out of memory:

The plug-in container runs out of memory

This can happen during plug-in initialization when the container does not have enough RAM to

execute the entrypoint of the image. The user can detect this in the logs of the plug-in container. In this case, the logs contain **OOMKilled**, which implies that the processes in the container requested more memory than is available in the container.

A process inside the container runs out of memory without the container noticing this

For example, the Java language server (Eclipse JDT Language Server, started by the `vscode-java` extension) throws an **OutOfMemoryException**. This can happen any time after the container is initialized, for example, when a plug-in starts a language server or when a process runs out of memory because of the size of the project it has to handle.

To detect this problem, check the logs of the primary process running in the container. For example, to check the log file of Eclipse JDT Language Server for details, see the relevant plug-in-specific sections.

6.1.1.3. Logging the client-server traffic for debug adapters

This section describes how to log the exchange between Che-Theia and a debug adapter into the **Output** view.

Prerequisites

- A debug session must be started for the **Debug adapters** option to appear in the list.

Procedure

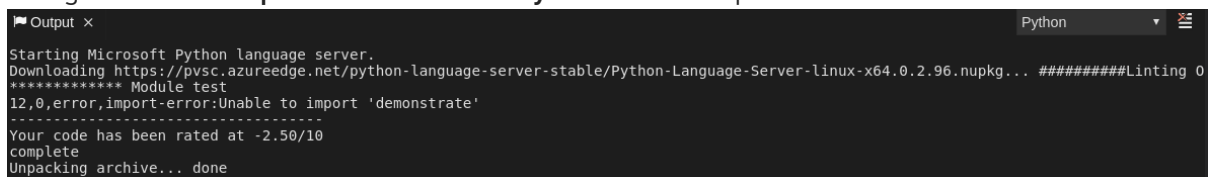
1. Click **File** → **Settings** and then **open Preferences**.
2. Expand the **Debug** section in the **Preferences** view.
3. Set the **trace** preference value to **true** (default is **false**).
4. All the communication events are now logged.
5. To watch these events, click **View** → **Output** and select **Debug adapters** from the drop-down list at the upper right corner of the **Output** view.

6.1.1.4. Viewing logs for Python

This section describes how to view logs for the Python language server.

Procedure

- Navigate to the **Output** view and select **Python** in the drop-down list.



```

Output x Python
Starting Microsoft Python language server.
Downloading https://pvsc.azureedge.net/python-language-server-stable/Python-Language-Server-linux-x64.0.2.96.nupkg... #####Linting 0
***** Module test
12,0,error,import-error:Unable to import 'demonstrate'
-----
Your code has been rated at -2.50/10
complete
Unpacking archive... done

```

6.1.1.5. Viewing logs for Go

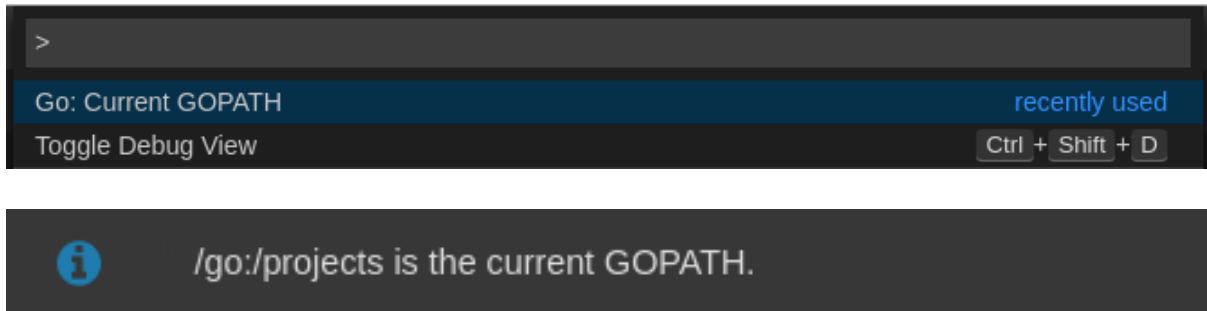
This section describes how to view logs for the Go language server.

6.1.1.5.1. Finding the GOPATH

This section describes how to find where the **GOPATH** variable points to.

Procedure

- Execute the **Go: Current GOPATH** command.



6.1.15.2. Viewing the Debug Console log for Go

This section describes how to view the log output from the Go debugger.

Procedure

1. Set the **showLog** attribute to **true** in the debug configuration.

```
{
  "version": "0.2.0",
  "configurations": [
    {
      "type": "go",
      "showLog": true
      ....
    }
  ]
}
```

2. To enable debugging output for a component, add the package to the comma-separated list value of the **logOutput** attribute:

```
{
  "version": "0.2.0",
  "configurations": [
    {
      "type": "go",
      "showLog": true,
      "logOutput": "debugger,rpc,gdbwire,lldbout,debuglineerr"
      ....
    }
  ]
}
```

3. The debug console prints the additional information in the debug console.

```

Debug Console x
API server listening at: 127.0.0.1:22841
2019-06-18T18:51:06Z info layer=debugger launching process with args: [/projects/__debug_bin]
2019-06-18T18:51:07Z debug layer=rpc <- RPCServer.GetVersion(api.GetVersionIn{})
2019-06-18T18:51:07Z debug layer=rpc -> *api.GetVersionOut{"DelveVersion":{"Version: 1.2.0\nBuild: $Id:
068e2451004e95d0b042e5257e34f0f08ce01466 $"},"APIVersion":2} error: ""
2019-06-18T18:51:07Z debug layer=rpc (async 2) <-
RPCServer.Command(api.DebuggerCommand{"name":"continue","ReturnInfoLoadConfig":null})
2019-06-18T18:51:07Z debug layer=debugger continuing
2019-06-18T18:51:07Z debug layer=rpc (async 2) -> rpc2.CommandOut{"State":
{"Running":false,"Threads":null,"NextInProgress":false,"Exited":true,"ExitStatus":0,"When":""}} error: ""
2019-06-18T18:51:07Z debug layer=rpc (async 3) <-
RPCServer.Command(api.DebuggerCommand{"name":"halt","ReturnInfoLoadConfig":null})
2019-06-18T18:51:07Z debug layer=debugger halting
2019-06-18T18:51:07Z debug layer=rpc (async 3) -> null error: "Process 1219 has exited with status 0"
2019-06-18T18:51:07Z debug layer=rpc <- RPCServer.Detach(rpc2.DetachIn{"Kill":true})
2019-06-18T18:51:07Z debug layer=rpc -> *rpc2.DetachOut{} error: ""
Process exiting with code: 0

```

6.1.1.5.3. Viewing the Go logs output in the Output panel

This section describes how to view the Go logs output in the **Output** panel.

Procedure

1. Navigate to the **Output** view.
2. Select **Go** in the drop-down list.

```

Output x
Starting linting the current package at /projects
Starting "go vet" under the folder /projects
Starting building the current package at /projects
Not able to determine import path of current package by using cwd: /projects and Go workspace:
/projects>Finished running tool: /go/bin/golint
/projects>Finished running tool: /usr/local/go/bin/go vet ./...
/projects>Finished running tool: /usr/local/go/bin/go build -i -o /tmp/vscode-go6JoFlE/go-code-check .

```

6.1.1.6. Viewing logs for the NodeDebug NodeDebug2 adapter



NOTE

No specific diagnostics exist other than the general ones.

6.1.1.7. Viewing logs for Typescript

6.1.1.7.1. Enabling the label switched protocol (LSP) tracing

Procedure


1. To enable the tracing of messages sent to the Typescript (TS) server, in the **Preferences** view, set the **typescript.tsserver.trace** attribute to **verbose**. Use this to diagnose the TS server issues.
2. To enable logging of the TS server to a file, set the **typescript.tsserver.log** attribute to **verbose**. Use this log to diagnose the TS server issues. The log contains the file paths.

6.1.1.7.2. Viewing the Typescript language server log

This section describes how to view the Typescript language server log.

Procedure

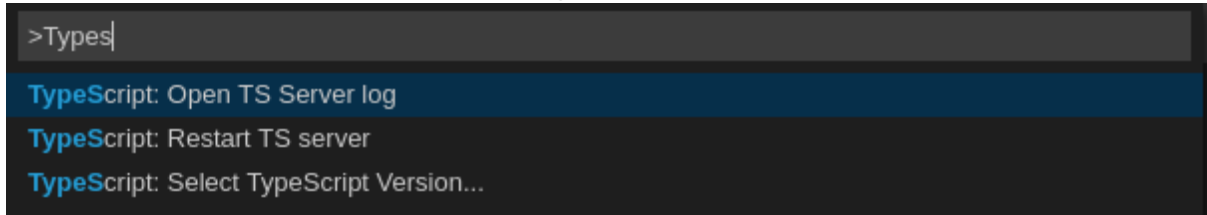
1. To get the path to the log file, see the Typescript **Output** console:



```

0 Problems  Output x
TypeScript
Info - 11:14:26 AM] Using tsserver from: /tmp/vscode-unpacked/che-incubator.typescript.latest.dvuojoyht.che-typescript-language-1.35.1.vsix/extension/node_modules/typescript/Lib
Info - 11:14:26 AM] TSServer log file: /home/theia/.theia/logs/20190621T111312/host/vscode.typescript-language-features/tsserver-log-cdBAj1/tsserver.log
Info - 11:14:26 AM] Forking TSServer
Info - 11:14:26 AM] Started TSServer
  
```

2. To open log file, use the **Open TS Server log** command.



```

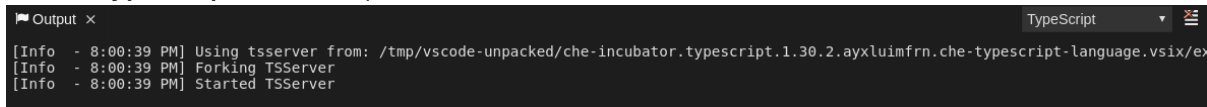
>TypeS|
TypeScript: Open TS Server log
TypeScript: Restart TS server
TypeScript: Select TypeScript Version...
  
```

6.1.1.7.3. Viewing the Typescript logs output in the Output panel

This section describes how to view the Typescript logs output in the **Output** panel.

Procedure

1. Navigate to the **Output** view
2. Select **TypeScript** in the drop-down list.



```

Output x
TypeScript
[Info - 8:00:39 PM] Using tsserver from: /tmp/vscode-unpacked/che-incubator.typescript.1.30.2.ayxluimfrn.che-typescript-language.vsix/ex
[Info - 8:00:39 PM] Forking TSServer
[Info - 8:00:39 PM] Started TSServer
  
```

6.1.1.8. Viewing logs for Java

Other than the general diagnostics, there are [Language Support for Java \(Eclipse JDT Language Server\)](#) plug-in actions that the user can perform.

6.1.1.8.1. Verifying the state of the Eclipse JDT Language Server

Procedure

Check if the container that is running the Eclipse JDT Language Server plug-in is running the Eclipse JDT Language Server main process.

1. Open a terminal in the container that is running the Eclipse JDT Language Server plug-in (an example name for the container: **vscode-javaxxx**).
2. Inside the terminal, run the **ps aux | grep jdt** command to check if the Eclipse JDT Language Server process is running in the container. If the process is running, the output is:

```
usr/lib/jvm/default-jvm/bin/java --add-modules=ALL-SYSTEM --add-opens java.base/java.util
```

This message also shows the VSCode Java extension used. If it is not running, the language server has not been started inside the container.

3. Check all logs described in [Checking important logs](#)

6.1.1.8.2. Verifying the Eclipse JDT Language Server features

Procedure

If the Eclipse JDT Language Server process is running, check if the language server features are working:

1. Open a Java file and use the hover or autocomplete functionality. In case of an erroneous file, the user sees Java in the **Outline** view or in the **Problems** view.

6.1.1.8.3. Viewing the Java language server log

Procedure

The Eclipse JDT Language Server has its own workspace where it logs errors, information about executed commands, and events.

1. To open this log file, open a terminal in the container that is running the Eclipse JDT Language Server plug-in. You can also view the log file by running the **Java: Open Java Language Server log file** command.
2. Run **cat <PATH_TO_LOG_FILE>** where **PATH_TO_LOG_FILE** is **/home/theia/.theia/workspace-storage/<workspace_name>/redhat.java/jdt_ws/.metadata/.log**.

6.1.1.8.4. Logging the Java language server protocol (LSP) messages

Procedure

To log the LSP messages to the VS Code **Output** view, enable tracing by setting the **java.trace.server** attribute to **verbose**.

Additional resources

For troubleshooting instructions, see the [VS Code Java Github repository](#).

6.1.1.9. Viewing logs for Intelephense

6.1.1.9.1. Logging the Intelephense client-server communication

Procedure

To configure the PHP Intelephense language support to log the client-server interexchange in the **Output** view:

1. Click **File** → **Settings**.
2. Open the **Preferences** view.
3. Expand the **Intelephense** section and set the **trace.server.verbose** preference value to **verbose** to see all the communication events (the default value is **off**).

6.1.1.9.2. Viewing Intelephense events in the Output panel

This procedure describes how to view Intelephense events in the **Output** panel.

Procedure

1. Click **View → Output**
2. Select **Intelephense** in the drop-down list for the **Output** view.

6.1.1.10. Viewing logs for PHP-Debug

This procedure describes how to configure the PHP Debug plug-in to log the PHP Debug plug-in diagnostic messages into the **Debug Console** view. Configure this before the start of the debug session.

Procedure

1. In the **launch.json** file, add the **"log": true** attribute to the selected launch configuration.
2. Start the debug session.
3. The diagnostic messages are printed into the **Debug Console** view along with the application output.

6.1.1.11. Viewing logs for XML

Other than the general diagnostics, there are XML plug-in specific actions that the user can perform.

6.1.1.11.1. Verifying the state of the XML language server

Procedure

1. Open a terminal in the container named **vscode-xml-<xxx>**.
2. Run **ps aux | grep java** to verify that the XML language server has started. If the process is running, the output is:

```
java ***/org.eclipse.ls4xml-uber.jar`
```

If is not, see the [Checking important logs](#) chapter.

6.1.1.11.2. Checking XML language server feature flags

Procedure

1. Check if the features are enabled. The XML plug-in provides multiple settings that can enable and disable features:
 - **xml.format.enabled**: Enable the formatter
 - **xml.validation.enabled**: Enable the validation
 - **xml.documentSymbols.enabled**: Enable the document symbols
2. To diagnose whether the XML language server is working, create a simple XML element, such as **<hello></hello>**, and confirm that it appears in the **Outline** panel on the right.
3. If the document symbols do not show, ensure that the **xml.documentSymbols.enabled** attribute is set to **true**. If it is **true**, and there are no symbols, the language server may not be hooked to the editor. If there are document symbols, then the language server is connected to

the editor.

4. Ensure that the features that the user needs, are set to **true** in the settings (they are set to **true** by default). If any of the features are not working, or not working as expected, file an issue against the [Language Server](#).

6.1.11.3. Enabling XML Language Server Protocol (LSP) tracing

Procedure

To log LSP messages to the VS Code **Output** view, enable tracing by setting the **xml.trace.server** attribute to **verbose**.

6.1.11.4. Viewing the XML language server log

Procedure

The log from the language server can be found in the plug-in sidecar at **/home/theia/.theia/workspace-storage/<workspace_name>/redhat.vscode-xml/lsp4xml.log**.

6.1.11.12. Viewing logs for YAML

This section describes the YAML plug-in specific actions that the user can perform, in addition to the general diagnostics ones.

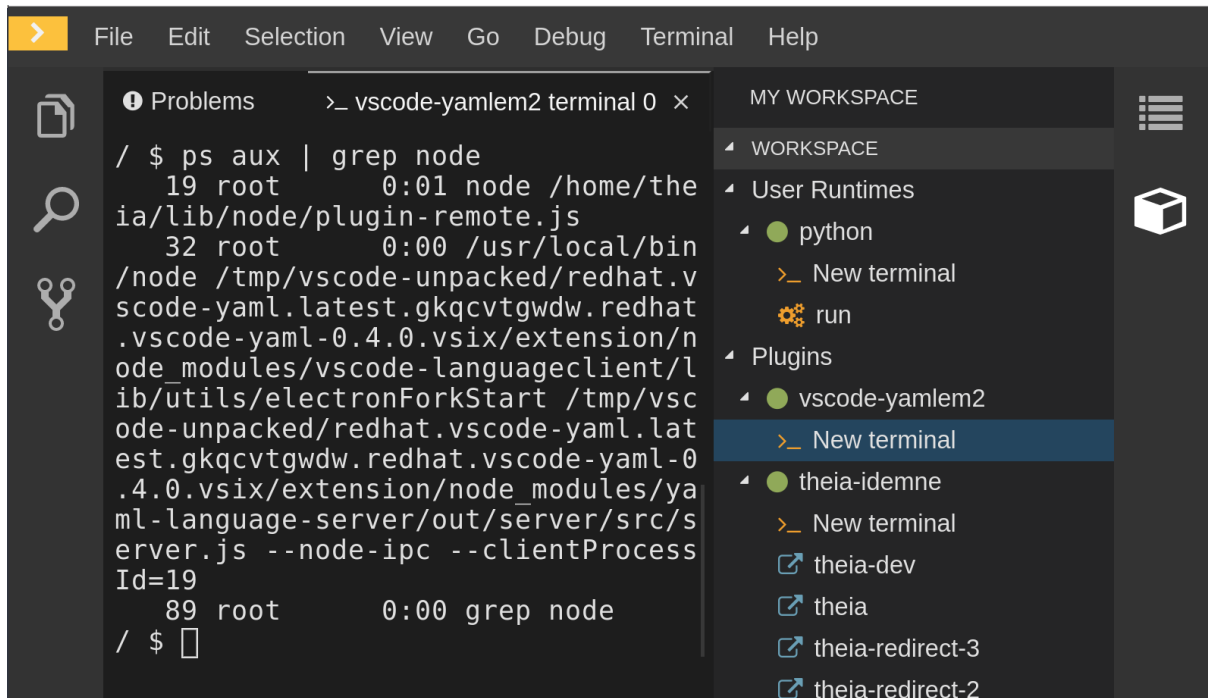
6.1.11.12.1. Verifying the state of the YAML language server

This section describes how to verify the state of the YAML language server.

Procedure

Check if the container running the YAML plug-in is running the YAML language server.

1. In the editor, open a terminal in the container that is running the YAML plug-in (an example name of the container: **vscode-yaml-<xxx>**).
2. In the terminal, run the **ps aux | grep node** command. This command searches all the node processes running in the current container.
3. Verify that a command **node **/server.js** is running.



The `node **/server.js` running in the container indicates that the language server is running. If it is not running, the language server has not started inside the container. In this case, see [Checking important logs](#).

6.1.1.12.2. Checking the YAML language server feature flags

Procedure

To check the feature flags:

1. Check if the features are enabled. The YAML plug-in provides multiple settings that can enable and disable features, such as:
 - `yaml.format.enable`: Enables the formatter
 - `yaml.validate`: Enables validation
 - `yaml.hover`: Enables the hover function
 - `yaml.completion`: Enables the completion function
2. To check if the plug-in is working, type the simplest YAML, such as `hello: world`, and then open the Outline panel on the right side of the editor.
3. Verify if there are any document symbols. If yes, the language server is connected to the editor.
4. If any feature is not working, make sure that the settings listed above are set to `true` (they are set to `true` by default). If a feature is not working, file an issue against the [Language Server](#).

6.1.1.12.3. Enabling YAML Language Server Protocol (LSP) tracing

Procedure

1. Open the terminal window in the code editor.

To log LSP messages to the VS Code Output view, enable tracing by setting the `yaml.trace.server` attribute to `verbose`.

6.1.1.13. Viewing logs for Dotnet with Omnisharp-Theia plug-in

6.1.1.13.1. Omnisharp-Theia plug-in

CodeReady Workspaces uses the Omnisharp-Theia plug-in as a remote plug-in. It is located at github.com/redhat-developer/omnisharp-theia-plugin. In case of an issue, report it, or contribute your fix in the repository.

This plug-in registers `omnisharp-roslyn` as a language server and provides project dependencies and language syntax for C# applications.

The language server runs on .NET SDK 2.2.105.

6.1.1.13.2. Verifying the state of the Omnisharp-Theia plug-in language server

Procedure

To check if the container running the Omnisharp-Theia plug-in is running OmniSharp, execute the `ps aux | grep OmniSharp.exe` command. If the process is running, the following is an example output:

```
/tmp/theia-unpacked/redhat-developer.che-omnisharp-  
plugin.0.0.1.zcpaqpczwb.omnisharp_theia_plugin.theia/server/bin/mono  
/tmp/theia-unpacked/redhat-developer.che-omnisharp-  
plugin.0.0.1.zcpaqpczwb.omnisharp_theia_plugin.theia/server/omnisharp/OmniSharp.exe
```

If the output is different, the language server has not started inside the container. Check the logs described in [Checking important logs](#).

6.1.1.13.3. Checking Omnisharp Che-Theia plug-in language server features

Procedure

- If the `OmniSharp.exe` process is running, check if the language server features are working by opening a `.cs` file and trying the hover or completion features, or opening the `Problems` or `Outline` view.

6.1.1.13.4. Viewing Omnisharp-Theia plug-in logs in the Output panel

Procedure

If `Omnisharp.exe` is running, it logs all information in the `Output` panel. To view the logs, open the `Output` view and select `C#` from the drop-down list.

6.1.1.14. Viewing logs for Dotnet with NetcoredebugOutput plug-in

6.1.1.14.1. NetcoredebugOutput plug-in

The `NetcoredebugOutput` plug-in provides the `netcoredbg` tool. This tool implements the VS Code Debug Adapter protocol and allows users to debug .NET applications under the .NET Core runtime.

The container where the NetcoredebugOutput plug-in is running contains Dotnet SDK v.2.2.105.

6.1.1.14.2. Verifying the state of the NetcoredebugOutput plug-in

Procedure

To test the plug-in initialization:

1. Check if there is a netcoredbg debug configuration in the `launch.json` file. The following is an example debug configuration:

```
{
  "type": "netcoredbg",
  "request": "launch",
  "program": "${workspaceFolder}/bin/Debug/<target-framework>/<project-name.dll>",
  "args": [],
  "name": ".NET Core Launch (console)",
  "stopAtEntry": false,
  "console": "internalConsole"
}
```

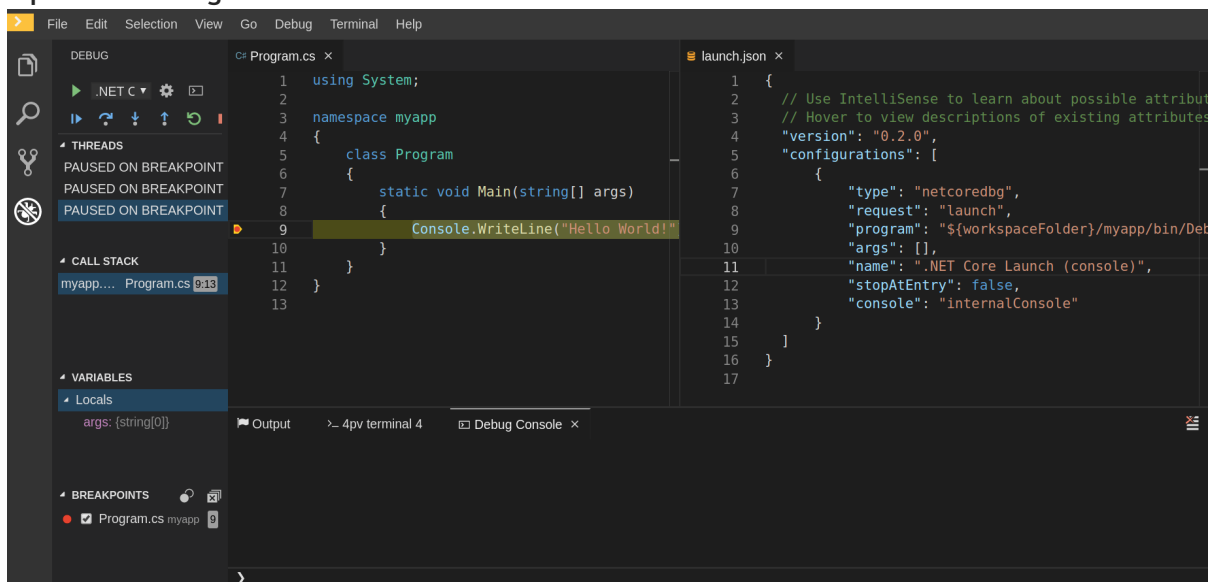
2. To test if it exists, test the autocompletion feature within the braces of the `configuration` section of the `launch.json` file. If you can find `netcoredbg`, the Che-Theia plug-in is correctly initialized. If not, see [Checking important logs](#).

6.1.1.14.3. Viewing NetcoredebugOutput plug-in logs in the Output panel

This section describes how to view NetcoredebugOutput plug-in logs in the Output panel.

Procedure

- Open the Debug console.



6.1.1.15. Viewing logs for Camel

6.1.1.15.1. Verifying the state of the Camel language server

Procedure

The user can inspect the log output of the sidecar container using the Camel language tools that are stored in the `vscode-apache-camel<xxx>` Camel container.

To verify the state of the language server:

1. Open a terminal inside the `vscode-apache-camel<xxx>` container.
2. Run the `ps aux | grep java` command. The following is an example language server process:

```
java -jar /tmp/vscode-unpacked/camel-tooling.vscode-apache-camel.latest.euqhbmeplx.camel-tooling.vscode-apache-camel-0.0.14.vsix/extension/jars/language-server.jar
```

3. If you cannot find it, see [Checking important logs](#).

6.1.1.15.2. Viewing Camel logs in the Output panel

The Camel language server is a SpringBoot application that writes its log to the `/${java.io.tmpdir}/log-camel-lsp.out` file. Typically, `/${java.io.tmpdir}` points to the `/tmp` directory, so the filename is `/tmp/log-camel-lsp.out`.

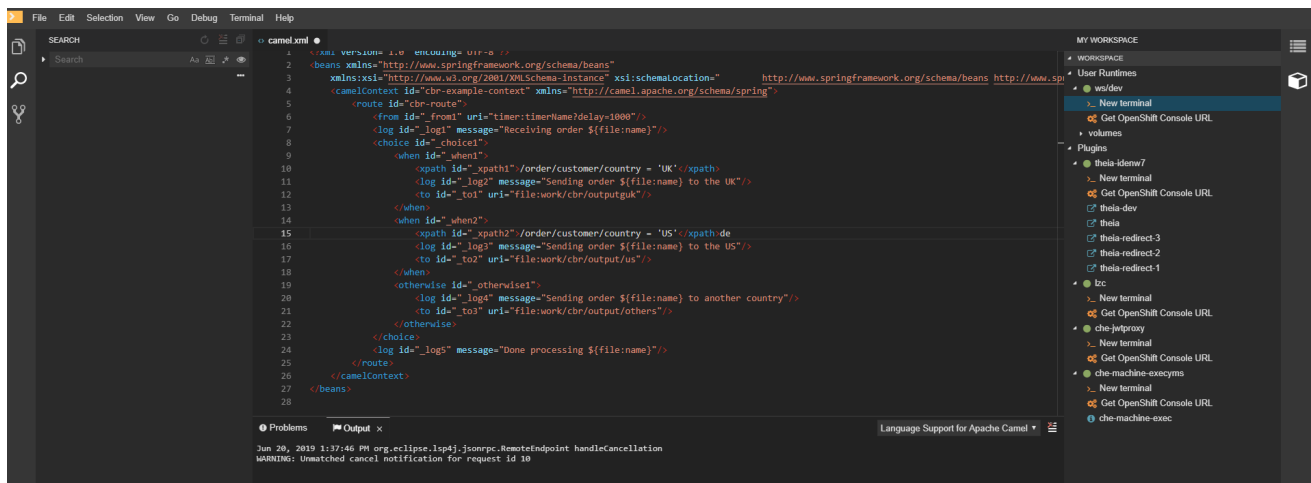
Procedure

The Camel language server logs are printed in the Output channel named `Language Support for Apache Camel`.



NOTE

The output channel is created only at the first created log entry on the client side. It may be absent when everything is going well.



6.1.2. Viewing Che-Theia IDE logs

This section describes how to view Che-Theia IDE logs.

6.1.2.1. Viewing Che-Theia editor logs using the OpenShift CLI

Observing Che-Theia editor logs helps to get a better understanding and insight over the plug-ins loaded by the editor. This section describes how to access the Che-Theia editor logs using the OpenShift CLI (command-line interface).

Prerequisites

- CodeReady Workspaces is deployed in an OpenShift cluster.
- A workspace is created.
- User is located in a CodeReady Workspaces installation project.

Procedure

1. Obtain the list of the available Pods:

```
$ oc get pods
```

Example

```
$ oc get pods
NAME                                READY STATUS RESTARTS AGE
codeready-9-xz6g8                    1/1   Running 1    15h
workspace0zqb2ew3py4srthh.go-cli-549cdcf69-9n4w2 4/4   Running 0    1h
```

2. Obtain the list of the available containers in the particular Pod:

```
$ oc get pods <name-of-pod> --output jsonpath='{.spec.containers[*].name}'
```

Example:

```
$ oc get pods workspace0zqb2ew3py4srthh.go-cli-549cdcf69-9n4w2 -o
jsonpath='{.spec.containers[*].name}'
> go-cli che-machine-exechr7 theia-idexzb vscode-gox3r
```

3. Get logs from the **theia/ide** container:

```
$ oc logs --follow <name-of-pod> --container <name-of-container>
```

Example:

```
$ oc logs --follow workspace0zqb2ew3py4srthh.go-cli-549cdcf69-9n4w2 -container
theia-idexzb
>root INFO unzipping the plug-in 'task_plugin.theia' to directory: /tmp/theia-
unpacked/task_plugin.theia
root INFO unzipping the plug-in 'theia_yeoman_plugin.theia' to directory: /tmp/theia-
unpacked/theia_yeoman_plugin.theia
root WARN A handler with prefix term is already registered.
root INFO [nsfw-watcher: 75] Started watching: /home/theia/.theia
root WARN e.onStart is slow, took: 367.4600000013015 ms
root INFO [nsfw-watcher: 75] Started watching: /projects
root INFO [nsfw-watcher: 75] Started watching: /projects/.theia/tasks.json
root INFO [4f9590c5-e1c5-40d1-b9f8-ec31ec3bdac5] Sync of 9 plugins took:
62.260000000242493 ms
root INFO [nsfw-watcher: 75] Started watching: /projects
root INFO [hosted-plugin: 88] PLUGIN_HOST(88) starting instance
```

6.2. TROUBLESHOOTING SLOW WORKSPACES

Sometimes, workspaces can take a long time to start. Tuning can reduce this start time. Depending on the options, administrators or users can do the tuning.

This section includes several tuning options for starting workspaces faster or improving workspace runtime performance.

6.2.1. Improving workspace start time

Caching images with Image Puller

Role: Administrator

When starting a workspace, OpenShift pulls the images from the registry. A workspace can include many containers meaning that OpenShift pulls Pod's images (one per container). Depending on the size of the image and the bandwidth, it can take a long time.

Image Puller is a tool that can cache images on each of OpenShift nodes. As such, pre-pulling images can improve start times. See https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/administration_guide/index#caching-images-for-faster-workspace-start_crw.

Choosing better storage type

Role: Administrator and user

Every workspace has a shared volume attached. This volume stores the project files, so that when restarting a workspace, changes are still available. Depending on the storage, attach time can take up to a few minutes, and I/O can be slow.

To avoid this problem, use ephemeral or asynchronous storage. See https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#configuring-storage-types_crw.

Installing offline

Role: Administrator

Components of CodeReady Workspaces are OCI images. Setup Red Hat CodeReady Workspaces in offline mode (air-gap scenario) to allow for reducing any extra download at runtime as everything needs to be present from the beginning. See https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#installing-codeready-workspaces-in-a-restricted-environment_crw.

Optimizing workspace plug-ins

Role: User

When selecting various plug-ins, each plug-in can bring its own sidecar container, which is an OCI image. OpenShift pulls the images of these sidecar containers.

Reduce the number of plug-ins, or disable them to see if start time is faster. See also https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/administration_guide/index#caching-images-for-faster-workspace-start_crw.

Reducing the number of public endpoints

Role: Administrator

For each endpoint, OpenShift is creating OpenShift Route objects. Depending on the underlying configuration, this creation can be slow.

To avoid this problem, reduce the exposure. For example, to automatically detect a new port listening inside containers and redirect traffic for the processes using a local IP address (127.0.0.1), the Che-Theia IDE plug-in has three optional routes.

By reducing the number of endpoints and checking endpoints of all plug-ins, workspace start can be faster.

CDN configuration

The IDE editor uses a CDN (Content Delivery Network) to serve content. Check that the content uses a CDN to the client (or a local route for offline setup).

To check that, open Developer Tools in the browser and check for **vendors** in the Network tab. **vendors.<random-id>.js** or **editor.main.*** should come from CDN URLs.

6.2.2. Improving workspace runtime performance

Providing enough CPU resources

Plug-ins consume CPU resources. For example, when a plug-in provides IntelliSense features, adding more CPU resources may lead to better performance.

Ensure the CPU settings in the devfile definition, **devfile.yaml**, are correct:

```
apiVersion: 1.0.0

components:
-
  type: chePlugin
  id: id/of/plugin
  cpuLimit: 1360Mi 1
  cpuRequest: 100m 2
```

- 1** Specifies the CPU limit for the plug-in.
- 2** Specifies the CPU request for the plug-in.

Providing enough memory

Plug-ins consume CPU and memory resources. For example, when a plug-in provides IntelliSense features, collecting data can consume all the memory allocated to the container. Providing more memory to the plug-in can increase performance. Ensure about the correctness of memory settings:

- in the plug-in definition - **meta.yaml** file
- in the devfile definition - **devfile.yaml** file

```
apiVersion: v2

spec:
  containers:
  - image: "quay.io/my-image"
    name: "vscode-plugin"
```

```
memoryLimit: "512Mi" 1
extensions:
- https://link.to/vsix
```

- 1** Specifies the memory limit for the plug-in.

In the devfile definition (devfile.yaml):

```
apiVersion: 1.0.0
components:
-
  type: chePlugin
  id: id/of/plugin
  memoryLimit: 1048M 1
  memoryRequest: 256M
```

- 1** Specifies the memory limit for this plug-in.

Choosing better storage type

Use ephemeral or asynchronous storage for faster I/O. See https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#configuring-storage-types_crw.

6.3. TROUBLESHOOTING NETWORK PROBLEMS

This section describes how to prevent or resolve issues related to network policies. CodeReady Workspaces requires the availability of the WebSocket Secure (WSS) connections. Secure WebSocket connections improve confidentiality and also reliability because they reduce the risk of interference by bad proxies.

Prerequisites

- The WebSocket Secure (WSS) connections on port 443 must be available on the network. Firewall and proxy may need additional configuration.
- Use a supported web browser:
 - Chrome
 - Firefox

Procedure

1. Verify the browser supports the WebSocket protocol. See: [Searching a websocket test](#)
2. Verify firewalls settings: WebSocket Secure (WSS) connections on port 443 must be available.
3. Verify proxy servers settings: The proxy transmits and intercepts WebSocket Secure (WSS) connections on port 443.

6.4. STARTING A CODEREADY WORKSPACES WORKSPACE IN DEBUG MODE

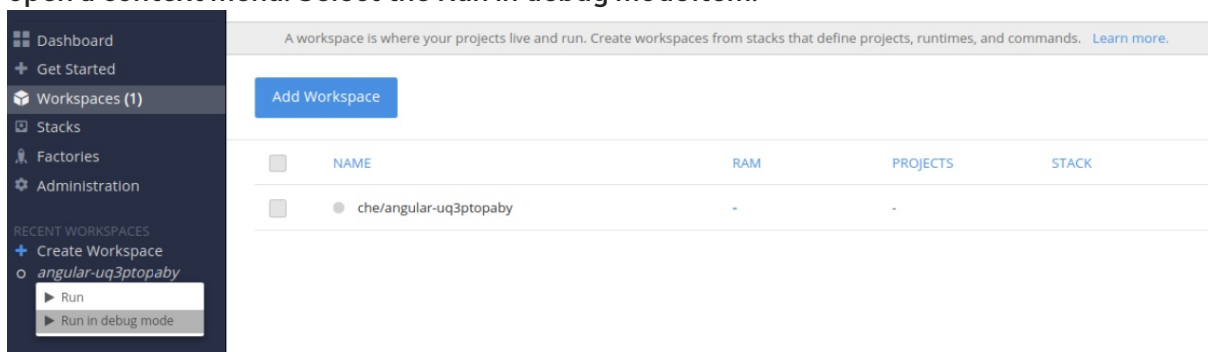
This section describes how to start the Red Hat CodeReady Workspaces workspace in debug mode.

Prerequisites

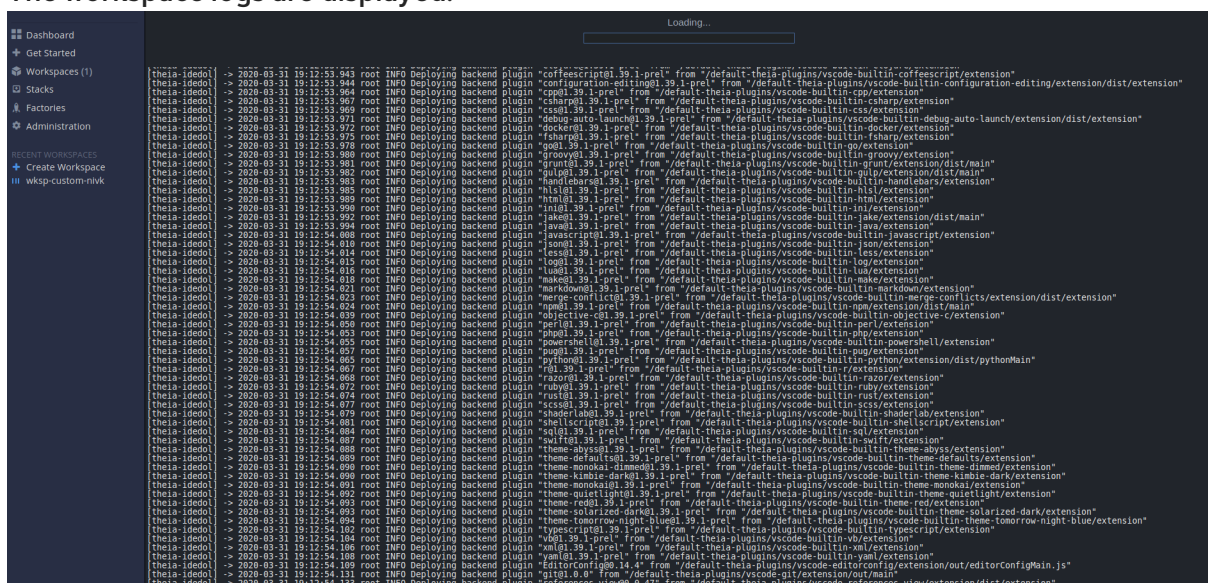
- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#installing-codeready-workspaces_crw.
- An existing workspace defined on this instance of Red Hat CodeReady Workspaces. See [Section 3.3, “Creating and configuring a new CodeReady Workspaces 2.7 workspace”](#).

Procedure

1. Find the target workspace from the recent workspaces. Right-click the workspace name to open a context menu. Select the Run in debug mode item:



2. Click the target workspace to see the logs.
3. The workspace logs are displayed:



6.5. RESTARTING A CODEREADY WORKSPACES WORKSPACE IN DEBUG MODE AFTER START FAILURE

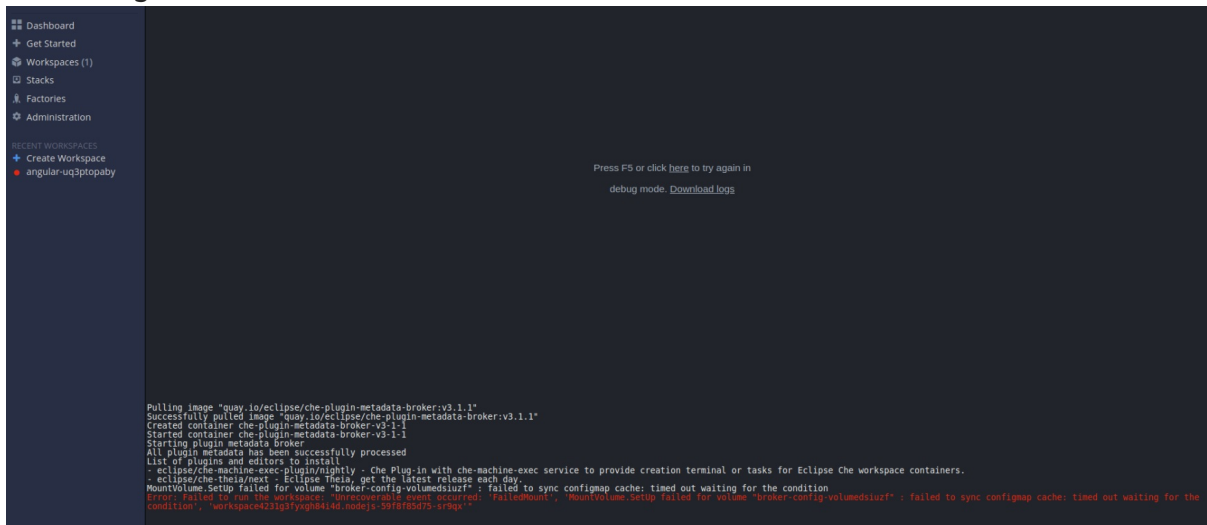
This section describes how to restart the Red Hat CodeReady Workspaces workspace in debug mode after a failure during workspace start.

Prerequisites

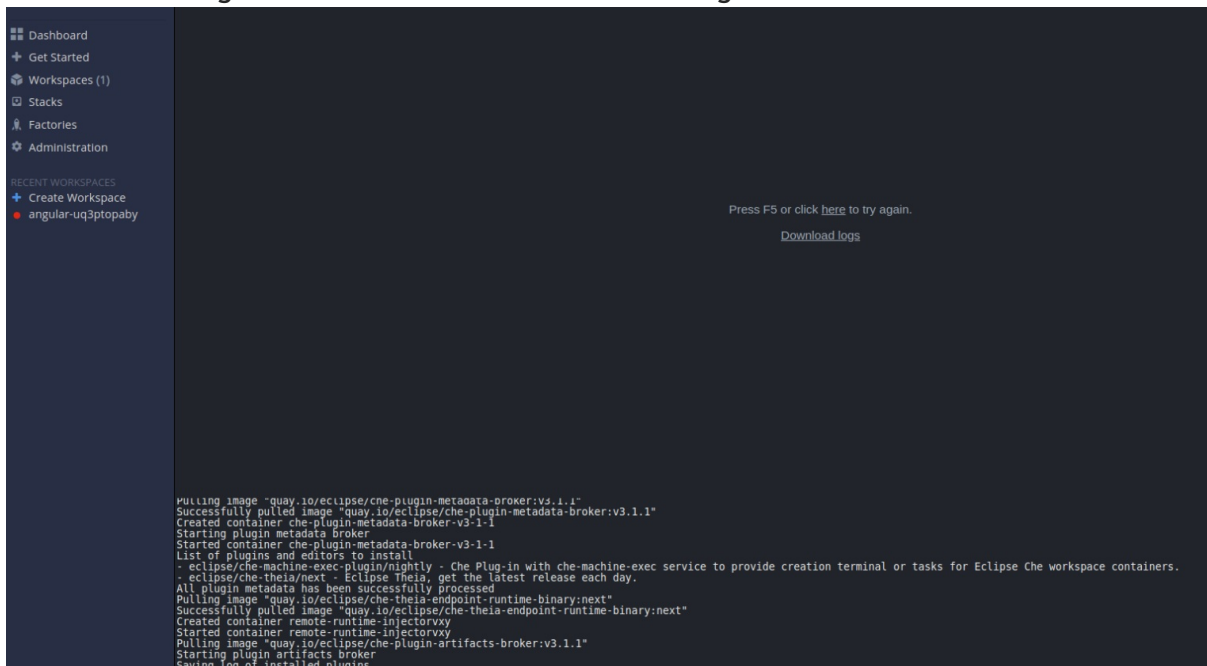
- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see [Installing CodeReady Workspaces](#).
- An existing workspace that failed to start.

Procedure

1. Find the target workspace from the recent workspaces. Click on the target workspace to see the logs:



2. Click the link for restarting in debug mode.
3. Download full logs after start fail with the Download logs link:



CHAPTER 7. OPENSIFT CONNECTOR OVERVIEW

OpenShift Connector, also referred to as Visual Studio Code OpenShift Connector for Red Hat OpenShift, is a plug-in for CodeReady Workspaces that provides a method for interacting with Red Hat OpenShift 3 or 4 clusters.

OpenShift Connector makes it possible to create, build, and debug applications in the CodeReady Workspaces IDE and then deploy the applications directly to a running OpenShift cluster.

OpenShift Connector is a GUI for the OpenShift Do (`odo`) utility, which aggregates OpenShift CLI (`oc`) commands into compact units. As such, OpenShift Connector helps new developers who do not have OpenShift background with creating applications and running them on the cloud. Instead of using several `oc` commands, the user creates a new component or service by selecting a preconfigured template, such as a Project, an Application, or a Service, and then deploys it as an OpenShift Component to their cluster.

This section provides information about installing, enabling, and basic use of the OpenShift Connector plug-in.

- [Section 7.1, “Features of OpenShift Connector”](#)
- [Section 7.2, “Installing OpenShift Connector in CodeReady Workspaces”](#)
- [Section 7.3, “Authenticating with OpenShift Connector from CodeReady Workspaces when the OpenShift OAuth service does not authenticate the CodeReady Workspaces instance”](#)
- [Section 7.4, “Creating Components with OpenShift Connector in CodeReady Workspaces”](#)
- [Section 7.5, “Connecting source code from GitHub to an OpenShift Component using OpenShift Connector”](#)

7.1. FEATURES OF OPENSIFT CONNECTOR

The OpenShift Connector plug-in enables the user create, deploy, and push OpenShift Components to an OpenShift Cluster in a GUI.

When used in CodeReady Workspaces, the OpenShift Connector GUI provides the following benefits to its users:

Cluster management

- Logging in to clusters using:
 - Authentication tokens
 - Username and password
 - Auto-login feature when CodeReady Workspaces is authenticated with the OpenShift OAuth service
- Switching contexts between different `.kube/config` entries directly from the extension view.
- Viewing and managing OpenShift resources as build and deployment. configurations from the Explorer view.

Development

- Connecting to a local or hosted OpenShift cluster directly from CodeReady Workspaces.
- Quickly updating the cluster with your changes.
- Creating Components, Services, and Routes on the connected cluster.
- Adding storage directly to a component from the extension itself.

Deployment

- Deploying to OpenShift clusters with a single click directly from CodeReady Workspaces.
- Navigating to the multiple Routes, created to access the deployed application.
- Deploying multiple interlinked Components and Services directly on the cluster.
- Pushing and watching component changes from the CodeReady Workspaces IDE.
- Streaming logs directly on the integrated terminal view of CodeReady Workspaces.

Monitoring

- Working with OpenShift resources directly from the CodeReady Workspaces IDE.
- Starting and resuming build and deployment configurations.
- Viewing and following logs for deployments, pods, and containers.

7.2. INSTALLING OPENSIFT CONNECTOR IN CODEREADY WORKSPACES

OpenShift Connector is a plug-in designed to create basic OpenShift Components, using CodeReady Workspaces as the editor, and to deploy the Component to an OpenShift cluster. To visually verify that the plug-in is available in your instance, see whether the OpenShift icon is displayed in the CodeReady Workspaces left menu.

To install and enable OpenShift Connector in a CodeReady Workspaces instance, use instructions in this section.

Prerequisites

- A running instance of Red Hat CodeReady Workspaces. To install an instance of Red Hat CodeReady Workspaces, see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#installing-codeready-workspaces_crw.

Procedure

Install OpenShift Connector in CodeReady Workspaces by adding it as an extension in the CodeReady Workspaces Plugins panel.

1. Open the CodeReady Workspaces Plugins panel by pressing **Ctrl+Shift+J** or by navigating to **View → Plugins**.
2. Search for `vscode-openshift-connector`, and click the **Install** button.

3. Restart the workspace for the changes to take effect.
4. The dedicated OpenShift Application Explorer icon is added to the left panel.

7.3. AUTHENTICATING WITH OPENSIFT CONNECTOR FROM CODEREADY WORKSPACES WHEN THE OPENSIFT OAUTH SERVICE DOES NOT AUTHENTICATE THE CODEREADY WORKSPACES INSTANCE

This section describes how to authenticate with an OpenShift cluster when the OpenShift OAuth service does not authenticate the CodeReady Workspaces instance. It enables the user to develop and push Components from CodeReady Workspaces to the OpenShift instance that contains CodeReady Workspaces.



NOTE

When the OpenShift OAuth service authenticates the CodeReady Workspaces instance, the OpenShift Connector plug-in automatically establishes the authentication with the OpenShift instance containing CodeReady Workspaces.

OpenShift Connector offers the following methods for logging in to the OpenShift Cluster from the CodeReady Workspaces instance:

- Using the notification asking to log in to the OpenShift instance containing CodeReady Workspaces.
- Using the **Log in to the cluster** button.
- Using the Command Palette.



NOTE

OpenShift Connector plug-in requires manual connecting to the target cluster.

The OpenShift Connector plug-in logs in to the cluster as **inClusterUser**. If this user does not have manage project permission, this error message appears when creating a project using OpenShift Application Explorer:

```
Failed to create Project with error 'Error: Command failed:
"/tmp/vscode-unpacked/redhat.vscode-openshift -
connector.latest.qvkozqtka.openshift-connector-0.1.4-
523.vsix/extension/out/tools/linux/odo" project create test-project
X projectrequests.project.openshift.io is forbidden
```

To work around this issue:

1. Log out from the local cluster.
2. Log in to OpenShift cluster using the OpenShift user's credentials.

Prerequisites

- A running instance of CodeReady Workspaces. See <https://access.redhat.com/documentation/en->

[us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#installing-codeready-workspaces_crw](https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#installing-codeready-workspaces_crw).

- A CodeReady Workspaces workspace is available. See [Chapter 3, Developer workspaces](#).
- The OpenShift Connector plug-in is available. See [Section 7.2, “Installing OpenShift Connector in CodeReady Workspaces”](#).
- The OpenShift OAuth provider is available only for the auto-login to the OpenShift instance containing CodeReady Workspaces. See https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/administration_guide/index#configuring-openshift-oauth_crw.

Procedure

1. In the left panel, click the OpenShift Application Explorer icon.
2. In the OpenShift Connector panel, log in using the OpenShift Application Explorer. Use one of the following methods:
 - Click the **Log in to cluster** button in the top left corner of the pane.
 - Press **F1** to open the Command Palette, or navigate to **View > Find Command** in the top menu. Search for **OpenShift: Log in to cluster** and press **Enter**.
3. If a **You are already logged in a cluster** message appears, click **Yes**.
4. Select the method to log in to the cluster: **Credentials** or **Token**, and follow the login instructions.



NOTE

To authenticate with a token, the required token information is in the upper right corner of the main OpenShift Container Platform screen, under **<User name>> Copy Login Command**

7.4. CREATING COMPONENTS WITH OPENSIFT CONNECTOR IN CODEREADY WORKSPACES

In the context of OpenShift, Components and Services are basic structures that need to be stored in Application, which is a part of the OpenShift project that organizes deployables into virtual folders for better readability.

This chapter describes how to create OpenShift Components in the CodeReady Workspaces using the OpenShift Connector plug-in and push them to an OpenShift cluster.

Prerequisites

- A running instance of CodeReady Workspaces. To install an instance of CodeReady Workspaces, see https://access.redhat.com/documentation/en-us/red_hat_codeready_workspaces/2.7/html-single/installation_guide/index#installing-codeready-workspaces_crw.

- The user is logged in to an OpenShift cluster using the OpenShift Connector plug-in.

Procedure

1. In the OpenShift Connector panel, right-click the row with the red OpenShift icon and select New Project.
2. Enter a name for your project.
3. Right-click the created project and select New Component.
4. When prompted, enter the name for a new OpenShift Application in which the component can be stored.
The following options of source for your component are displayed:
 - a. **Git Repository**
This prompts you to specify a Git repository URL and select the intended revision of the runtime.
 - b. **Binary File**
This prompts you to select a file from the file explorer.
 - c. **Workspace Directory**
This prompts you to select a folder from the file explorer.
5. Enter the name for the component.
6. Select the component type.
7. Select the component type version.
8. The component is created. Right-click the component, select New URL, and enter a name of your choice.
9. The component is ready to be pushed to the OpenShift cluster. To do so, right-click the component and select Push.
The component is now deployed to the cluster. Right-click for selecting additional actions, such as debugging and opening in a browser (requires port **8080** to be exposed).

7.5. CONNECTING SOURCE CODE FROM GITHUB TO AN OPENSIFT COMPONENT USING OPENSIFT CONNECTOR

When the user has a Git-stored source code that is wanted for further development, it is more efficient to deploy it directly from the Git repository into the OpenShift Connector Component.

This chapter describes how to obtain the content from the Git repository and connect it with a CodeReady Workspaces-developed OpenShift Component.

Prerequisites

- Have a running CodeReady Workspaces workspace.
- Be logged in to the OpenShift cluster using the OpenShift Connector.

Procedure

To make changes to your GitHub component, clone the repository into CodeReady Workspaces to obtain this source code:

1. In the CodeReady Workspaces main screen, open the Command Palette by pressing **F1**.
2. Type the **Git Clone** command in the Command Palette and press **Enter**.
3. Provide the GitHub URL and select the destination for the deployment.
4. Add source-code files to your Project by clicking the **Add to workspace** button.

For additional information about cloning Git repository, see: [Section 2.2.2, "Accessing a Git repository using HTTPS"](#).

CHAPTER 8. TELEMETRY OVERVIEW

Telemetry is the transparent and ethical collection of usage data. By default, telemetry is not available in Red Hat CodeReady Workspaces, but there is an abstract API that allows enabling telemetry using the plug-in mechanism. This approach is used in the [Hosted Che](#) service where telemetry is enabled for every workspace.

This documentation includes a guide describing how to make your own telemetry client for Red Hat CodeReady Workspaces, followed by an overview of the [Red Hat CodeReady Workspaces Woopra Telemetry Plugin](#).

8.1. USE CASES

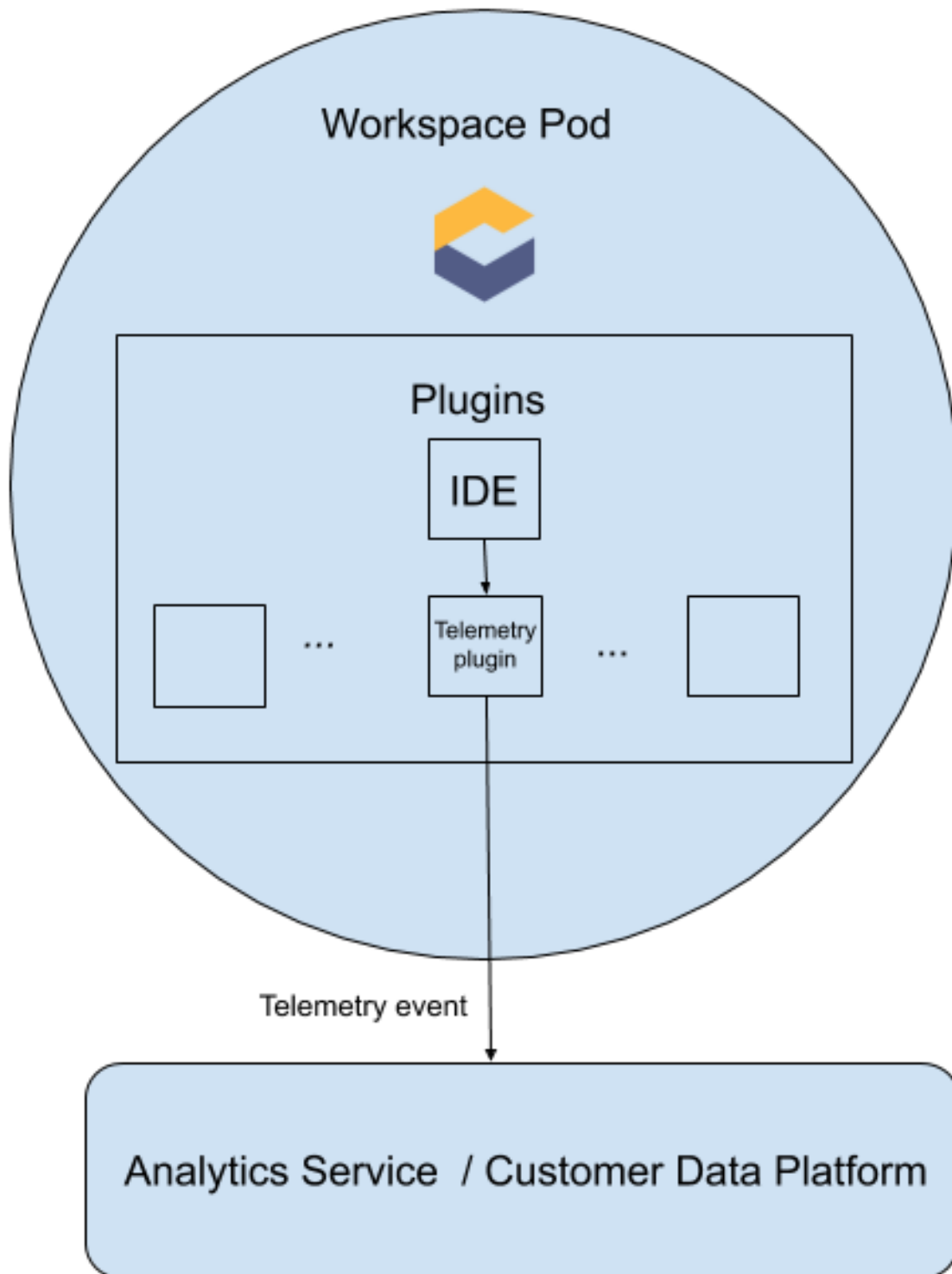
Red Hat CodeReady Workspaces telemetry API allows tracking:

- Duration of workspace usage
- User-driven actions like file editing, committing, and pushing to remote repositories
- The list of plug-ins enabled in a workspace
- Programming languages and devfiles used in workspaces

8.2. HOW IT WORKS

When a CodeReady Workspaces workspace starts, the `che-theia` container starts the telemetry plug-in, which is responsible for sending telemetry events to a back-end. If the `$CHE_WORKSPACE_TELEMETRY_BACKEND_PORT` environment variable was set in the workspace Pod, the telemetry plug-in will send events to a back-end listening at that port.

If the CodeReady Workspaces workspace has a telemetry back-end container running, and it is listening on `$CHE_WORKSPACE_TELEMETRY_BACKEND_PORT`, it takes the events sent from the telemetry plug-in, turns them into the back-end-specific representation of events, and sends them to the configured analytics back-end (for example, Segment or Woopra).



8.3. CREATING A TELEMETRY PLUG-IN

This section shows how to create an `AnalyticsManager` class that extends `AbstractAnalyticsManager` and implements the following methods:

- **isEnabled()** - determines whether or not the telemetry back-end is functioning correctly. This could mean always returning `true`, or have more complex checks, for example, returning `false` when a connection property is missing.
- **destroy()** - cleanup method that is run before shutting down the telemetry back-end. This method sends the `WORKSPACE_STOPPED` event.

- `onActivity()` - notifies that some activity is still happening for a given user. This is mainly used to send `WORKSPACE_INACTIVE` events.
- `onEvent()` - submits telemetry events to the telemetry server, such as `WORKSPACE_USED` or `WORKSPACE_STARTED`.
- `increaseDuration()` - increases the duration of a current event rather than sending multiple events in a small frame of time.

The following sections cover:

- Creation of a telemetry server to echo events to standard output.
- Extending the CodeReady Workspaces telemetry client and implementing a user's custom back-end.
- Creating a `meta.yaml` file representing a CodeReady Workspaces workspace plug-in for a user's custom back-end.
- Specifying of a location of a custom plug-in to CodeReady Workspaces by setting the `CHE_WORKSPACE_DEVFILE_DEFAULT__EDITOR_PLUGINS` environment variable.

8.3.1. Getting Started

This document describes the steps required to extend the CodeReady Workspaces telemetry system to connect to a custom back-end:

1. Creating a server process that receives events
2. Extending CodeReady Workspaces libraries to create a back-end that send events to the server
3. Packaging the telemetry back-end in a container and deploying it to an image registry
4. Adding a plug-in for your back-end and instructing CodeReady Workspaces to load the plug-in in your workspaces

Optional: creating a server that receives events

This example shows how to create a server that receives events from CodeReady Workspaces and writes them to standard output.

For production use cases, consider integrating with a third-party telemetry system (for example, Segment, Woopra) rather than creating your own telemetry server. In this case, use your provider's APIs to send events from your custom back-end to their system.

The following Go code starts a server on port 8080 and writes events to standard output:

main.go

```
package main

import (
    "io/ioutil"
    "net/http"

    "go.uber.org/zap"
)
```

```
var logger *zap.SugaredLogger

func event(w http.ResponseWriter, req *http.Request) {
    switch req.Method {
    case "GET":
        logger.Info("GET /event")
    case "POST":
        logger.Info("POST /event")
    }
    body, err := req.GetBody()
    if err != nil {
        logger.With("err", err).Info("error getting body")
        return
    }
    responseBody, err := ioutil.ReadAll(body)
    if err != nil {
        logger.With("error", err).Info("error reading response body")
        return
    }
    logger.With("body", string(responseBody)).Info("got event")
}

func activity(w http.ResponseWriter, req *http.Request) {
    switch req.Method {
    case "GET":
        logger.Info("GET /activity, doing nothing")
    case "POST":
        logger.Info("POST /activity")
        body, err := req.GetBody()
        if err != nil {
            logger.With("error", err).Info("error getting body")
            return
        }
        responseBody, err := ioutil.ReadAll(body)
        if err != nil {
            logger.With("error", err).Info("error reading response body")
            return
        }
        logger.With("body", string(responseBody)).Info("got activity")
    }
}

func main() {

    log, _ := zap.NewProduction()
    logger = log.Sugar()

    http.HandleFunc("/event", event)
    http.HandleFunc("/activity", activity)
    logger.Info("Added Handlers")

    logger.Info("Starting to serve")
    http.ListenAndServe(":8080", nil)
}
```

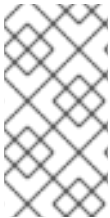
Create a container image based on this code and expose it as a deployment in OpenShift in the `openshift-workspaces` project. The code for the example telemetry server is available at [che-workspace-telemetry-example](#). To deploy the telemetry server, clone the repository and build the container:

```
$ git clone https://github.com/che-incubator/che-workspace-telemetry-example
$ cd che-workspace-telemetry-example
$ docker build -t registry/organization/che-workspace-telemetry-example:latest
$ docker push registry/organization/che-workspace-telemetry-example:latest
```

In `manifest.yaml`, replace the `image` and `host` fields to match the image you pushed, and the public hostname of your OpenShift cluster. Then run:

```
$ oc apply -f manifest.yaml -n {prod-namespace}
```

8.3.2. Creating a new Maven project



NOTE

For fast feedback when developing, it is recommended to do development inside a CodeReady Workspaces workspace. This way, you can run the application in a cluster and connect to the workspaces front-end telemetry plug-in to send events to your custom back-end.

1. Create a new Maven Quarkus project scaffolding:

```
$ mvn io.quarkus:quarkus-maven-plugin:1.2.1.Final:create \
  -DprojectId=mygroup -DprojectArtifactId=telemetryback-end \
  -DprojectVersion=my-version -DclassName="org.my.group.MyResource"
```

2. Add a dependency to `org.eclipse.che.incubator.workspace-telemetry.back-end-base` in your `pom.xml`:

`pom.xml`

```
<dependency>
  <groupId>org.eclipse.che.incubator.workspace-telemetry</groupId>
  <artifactId>backend-base</artifactId>
  <version>0.0.11</version>
</dependency>
<dependency>
  <groupId>org.apache.httpcomponents</groupId>
  <artifactId>httpClient</artifactId>
  <version>4.5.12</version>
</dependency>
```

3. Add the Apache HTTP components library to send HTTP requests.
4. Consult the [GitHub packages](#) for the latest version and Maven coordinates of `back-end-base`. [GitHub packages](#) require a personal access token with `read:packages` permissions to download the CodeReady Workspaces telemetry libraries. Create a personal access token and copy the token value.

5. Create a **settings.xml** file in the repository root and add the coordinates and token to the **che-incubator** packages:

settings.xml

```
<settings xmlns="http://maven.apache.org/SETTINGS/1.0.0"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://maven.apache.org/SETTINGS/1.0.0
http://maven.apache.org/xsd/settings-1.0.0.xsd">
  <servers>
    <server>
      <id>che-incubator</id>
      <username>${env.GITHUB_USERNAME}</username>
      <password>${env.GITHUB_TOKEN}</password>
    </server>
  </servers>

  <profiles>
    <profile>
      <id>github</id>
      <activation>
        <activeByDefault>true</activeByDefault>
      </activation>
      <repositories>
        <repository>
          <id>central</id>
          <url>https://repo1.maven.org/maven2</url>
          <releases><enabled>true</enabled></releases>
          <snapshots><enabled>false</enabled></snapshots>
        </repository>
        <repository>
          <id>che-incubator</id>
          <name>GitHub navikt Apache Maven Packages</name>
          <url>https://maven.pkg.github.com/che-incubator/che-workspace-telemetry-
client</url>
        </repository>
      </repositories>
    </profile>
  </profiles>
</settings>
```

This file is used when packaging the application in a container. When running locally, add the information to your personal **settings.xml** file.

8.3.3. Running the application

Run and test the application in a CodeReady Workspaces workspace:

```
$ mvn quarkus:dev -Dquarkus.http.port=${CHE_WORKSPACE_TELEMETRY_BACKEND_PORT}
```

If CodeReady Workspaces is secured using a self-signed certificate, add the certificate to a trust store and mount it into the workspace. Also add the Java system property, **-Djavax.net.ssl.trustStore=/path/to/trustStore**, to the **mvn** command. For example, assuming the trust store is located in **\$JAVA_HOME/jre/lib/security/cacerts**:


```
$ keytool -import -alias self-signed-certificate \
-file <path/to/self-signed-certificate> -keystore $JAVA_HOME/jre/lib/security/cacerts
```

Followed by:

```
$ mvn quarkus:dev -Dquarkus.http.port=${CHE_WORKSPACE_TELEMETRY_BACKEND_PORT} \
-Djavax.net.ssl.trustStore=$JAVA_HOME/jre/lib/security/cacerts
```

8.3.4. Creating a concrete implementation of AnalyticsManager and adding specialized logic

Create two new files in your project:

- **AnalyticsManager.java** - contains the logic specific to our telemetry system.
- **MainConfiguration.java** - is the main entrypoint that creates an instance of **AnalyticsManager** and starts listening for events.

AnalyticsManager.java

```
package org.my.group;

import java.util.Map;

import org.eclipse.che.api.core.rest.HttpJsonRequestFactory;
import org.eclipse.che.incubator.workspace.telemetry.base.AbstractAnalyticsManager;
import org.eclipse.che.incubator.workspace.telemetry.base.AnalyticsEvent;

public class AnalyticsManager extends AbstractAnalyticsManager {

    public AnalyticsManager(String apiEndpoint, String workspaceId, String machineToken,
        HttpJsonRequestFactory requestFactory) {
        super(apiEndpoint, workspaceId, machineToken, requestFactory);
    }

    @Override
    public boolean isEnabled() {
        // TODO Auto-generated method stub
        return true;
    }

    @Override
    public void destroy() {
        // TODO Auto-generated method stub
    }

    @Override
    public void onEvent(AnalyticsEvent event, String ownerId, String ip, String userAgent,
        String resolution,
        Map<String, Object> properties) {
        // TODO Auto-generated method stub
    }

    @Override
```

```

public void increaseDuration(AnalyticsEvent event, Map<String, Object> properties) {
    // TODO Auto-generated method stub
}

@Override
public void onActivity() {
    // TODO Auto-generated method stub
}
}

```

MainConfiguration.java

```

package org.my.group;

import javax.enterprise.context.Dependent;
import javax.enterprise.inject.Produces;

import org.eclipse.che.incubator.workspace.telemetry.base.AbstractAnalyticsManager;
import org.eclipse.che.incubator.workspace.telemetry.base.BaseConfiguration;

@Dependent
public class MainConfiguration extends BaseConfiguration {
    @Produces
    public AbstractAnalyticsManager analyticsManager() {
        return new AnalyticsManager(apiEndpoint, workspaceId, machineToken,
requestFactory());
    }
}

```

8.3.5. Implementing isEnabled()

For the purposes of the example, this method just returns `true` whenever it is called. Whenever the server is running, it is enabled and operational.

AnalyticsManager.java

```

@Override
public boolean isEnabled() {
    return true;
}

```

It is possible to put more a complex login in `isEnabled()`. For example, the service should not be considered operational in certain cases. The [hosted CodeReady Workspaces woopra back-end](#) checks that a configuration property exists before determining if the back-end is enabled.

8.3.6. Implementing onEvent()

`onEvent()` sends the event passed to the back-end to the telemetry system. For the example application, it sends an HTTP POST payload to our server. The example telemetry server application is deployed to OpenShift at the following URL: <http://little-telemetry-back-end-che.apps-crc.testing>.

AnalyticsManager.java

```

@Override
public void onEvent(AnalyticsEvent event, String ownerId, String ip, String userAgent, String
resolution, Map<String, Object> properties) {
    HttpClient httpClient = HttpClients.createDefault();
    HttpPost httpPost = new HttpPost("http://little-telemetry-backend-che.apps-
crc.testing/event");
    HashMap<String, Object> eventPayload = new HashMap<String, Object>(properties);
    eventPayload.put("event", event);
    StringEntity requestEntity = new StringEntity(new JSONObject(eventPayload).toString(),
        ContentType.APPLICATION_JSON);
    httpPost.setEntity(requestEntity);
    try {
        HttpResponse response = httpClient.execute(httpPost);
    } catch (IOException e) {
        e.printStackTrace();
    }
}

```

This sends an HTTP request to the telemetry server and automatically debounces identical events in a small time period, where the default value is 1500 milliseconds. It is possible to modify this period by setting subclasses.

8.3.7. Implementing increaseDuration()

Many telemetry systems recognize event duration. The **AbstractAnalyticsManager** merges similar events that happen in the same frame of time into one event, so that a user does not get several identical events sent to the server in a small time frame. This implementation of **increaseDuration()** is a no-op. This method uses the APIs of a user's telemetry provider to alter the event or event properties to reflect an event's increased duration.

AnalyticsManager.java

```

@Override
public void increaseDuration(AnalyticsEvent event, Map<String, Object> properties) {}

```

8.3.8. Implementing onActivity()

Set an inactive timeout limit, and use **onActivity()** to send a **WORKSPACE_INACTIVE** event if the last event time is longer than the inactivity timeout.

AnalyticsManager.java

```

public class AnalyticsManager extends AbstractAnalyticsManager {
    ...
    private long inactiveTimeLimt = 60000 * 3;
    ...

    @Override
    public void onActivity() {
        if (System.currentTimeMillis() - lastEventTime >= inactiveTimeLimt) {

```

```

        onEvent(WORKSPACE_INACTIVE, lastOwnerId, lastIp, lastUserAgent, lastResolution,
commonProperties);
    }
}

```

8.3.9. Implementing destroy()

When `destroy()` is called, send a `WORKSPACE_STOPPED` event and shutdown any resources, such as connection pools.

`AnalyticsManager.java`

```

@Override
public void destroy() {
    onEvent(WORKSPACE_STOPPED, lastOwnerId, lastIp, lastUserAgent, lastResolution,
commonProperties);
}

```

Now when you run `mvn quarkus:dev` as described in [Section 8.3.3, "Running the application"](#), you should see a `WORKSPACE_STOPPED` event sent to the server when you kill the Quarkus application.

8.3.10. Packaging the Quarkus application

See [the quarkus documentation](#) for the best instructions to package the application in a container. Build and push the container to a container registry of your choice.

8.3.11. Creating a meta.yaml for your plug-in.

Create a `meta.yaml` definition representing a CodeReady Workspaces plug-in that runs your custom back-end in a workspace Pod. For more information on `meta.yaml`, see [Section 4.1, "What is a Che-Theia plug-in"](#).

`meta.yaml`

```

apiVersion: v2
publisher: demo-publisher
name: little-telemetry-backend
version: 0.0.1
type: Che Plugin
displayName: Little Telemetry Backend
description: A Demo telemetry backend
title: Little Telemetry Backend
category: Other
spec:
  workspaceEnv:
    - name: CHE_WORKSPACE_TELEMETRY_BACKEND_PORT
      value: '4167'
  containers:
    - name: YOUR_BACKEND_NAME
      image: YOUR_IMAGE_NAME
      env:
        - name: CHE_API
          value: $(CHE_API_INTERNAL)

```

Usually, a user would deploy this file to a corporate web server. For this guide, we create an Apache web server on OpenShift and host the plug-in there.

Create a configMap referencing the new `meta.yaml` file.

```
$ oc create configmap --from-file=meta.yaml -n openshift-workspaces telemetry-plugin-meta
```

Create a deployment, a service, and a route to expose the web server. The deployment references this configMap and places it in the `/var/www/html` directory.

manifests.yaml

```
kind: Deployment
apiVersion: apps/v1
metadata:
  name: apache
  namespace: <openshift-workspaces>
spec:
  replicas: 1
  selector:
    matchLabels:
      app: apache
  template:
    metadata:
      labels:
        app: apache
    spec:
      volumes:
        - name: plugin-meta-yaml
          configMap:
            name: telemetry-plugin-meta
            defaultMode: 420
      containers:
        - name: apache
          image: 'registry.redhat.io/rhsc1/httpd-24-rhel7:latest'
          ports:
            - containerPort: 8080
              protocol: TCP
          resources: {}
          volumeMounts:
            - name: plugin-meta-yaml
              mountPath: /var/www/html
      strategy:
        type: RollingUpdate
        rollingUpdate:
          maxUnavailable: 25%
          maxSurge: 25%
        revisionHistoryLimit: 10
        progressDeadlineSeconds: 600
---
kind: Service
apiVersion: v1
metadata:
  name: apache
```

```

namespace: <openshift-workspaces>
spec:
  ports:
    - protocol: TCP
      port: 8080
      targetPort: 8080
  selector:
    app: apache
  type: ClusterIP
---
kind: Route
apiVersion: route.openshift.io/v1
metadata:
  name: apache
  namespace: <openshift-workspaces>
spec:
  host: apache-che.apps-crc.testing
  to:
    kind: Service
    name: apache
    weight: 100
  port:
    targetPort: 8080
  wildcardPolicy: None

```

```
$ oc apply -f manifests.yaml
```

Wait a few minutes for the image to pull and the deployment to start, and then confirm that `meta.yaml` is available in the web server:

```
$ curl apache-che.apps-crc.testing/meta.yaml
```

This command should return the `meta.yaml` file.

8.3.12. Updating CodeReady Workspaces to reference your telemetry plug-in

Update the `CheCluster` Custom Resource, and add the `CHE_WORKSPACE_DEVFILE_DEFAULT__EDITOR_PLUGINS` environment variable to `spec.server.customCheProperties`. The value of the environment variable should be the URL of the location of the `meta.yaml` file on your web server. This can be accomplished by running `oc edit checluster -n openshift-workspaces` and typing in the change at the terminal, or by editing the CR in the OpenShift console (Installed Operators → Red Hat CodeReady Workspaces → Red Hat CodeReady Workspaces Cluster → `codeready-workspaces` → `YAML`).

```

apiVersion: org.eclipse.che/v1
kind: CheCluster
metadata:
  creationTimestamp: '2020-05-14T13:21:51Z'
  finalizers:
    - oauthclients.finalizers.che.eclipse.org
  generation: 18
  name: codeready-workspaces
  namespace: <openshift-workspaces>
  resourceVersion: '5108404'

```

```

selfLink: /apis/org.eclipse.che/v1/namespaces/che/checlusters/eclipse-che
uid: bae08db2-104d-4e44-a001-c9affc07528d
spec:
  auth:
    identityProviderURL: 'https://keycloak-che.apps-crc.testing'
    identityProviderRealm: che
    updateAdminPassword: false
    oAuthSecret: ZMmNPRbgOJJQ
    oAuthClientName: eclipse-che-openshift-identity-provider-yr1cxs
    identityProviderClientId: che-public
    identityProviderPostgresSecret: che-identity-postgres-secret
    externalIdentityProvider: false
    identityProviderSecret: che-identity-secret
    openShiftoAuth: true
  database:
    chePostgresDb: dbche
    chePostgresHostName: postgres
    chePostgresPort: '5432'
    chePostgresSecret: che-postgres-secret
    externalDb: false
  k8s: {}
  metrics:
    enable: false
  server:
    cheLogLevel: INFO
    customCheProperties:
      CHE_WORKSPACE_DEVFILE_DEFAULT__EDITOR_PLUGINS: 'http://apache-che.apps-
crc.testing/meta.yaml'
    externalDevfileRegistry: false
    cheHost: che-che.apps-crc.testing
    selfSignedCert: true
    cheDebug: 'false'
    tlsSupport: true
    allowUserDefinedWorkspaceNamespaces: false
    externalPluginRegistry: false
    gitSelfSignedCert: false
    cheFlavor: che
  storage:
    preCreateSubPaths: true
    pvcClaimSize: 1Gi
    pvcStrategy: per-workspace
  status:
    devfileRegistryURL: 'https://devfile-registry-che.apps-crc.testing'
    keycloakProvisioned: true
    cheClusterRunning: Available
    cheURL: 'https://che-che.apps-crc.testing'
    openShiftoAuthProvisioned: true
    dbProvisioned: true
    cheVersion: 7.13.1
    keycloakURL: 'https://keycloak-che.apps-crc.testing'
    pluginRegistryURL: 'https://plugin-registry-che.apps-crc.testing/v3'

```

Wait for the CodeReady Workspaces server to restart, and create a new workspace. See a new message stating that the plug-in is being installed into the workspace.

```

Pulling image "quay.io/eclipse/che-plugin-metadata-broker:v3.2.0"
Successfully pulled image "quay.io/eclipse/che-plugin-metadata-broker:v3.2.0"
Created container che-plugin-metadata-broker-v3-2-0
Started container che-plugin-metadata-broker-v3-2-0
Starting plugin metadata broker
List of plugins and editors to install
- ms-vscode/go/latest - This extension adds rich language support for the Go language
- demo-publisher/little-telemetry-backend/0.0.1 - A Demo telemetry backend
- eclipse/che-theia/7.13.1 - Eclipse Theia

```

Perform any operations in the started workspace and observe their events in the example telemetry server logs.

8.4. THE WOOPRA TELEMETRY PLUGIN

The [Woopra Telemetry Plugin](#) is a plugin built to send telemetry from a Red Hat CodeReady Workspaces installation to Segment and Woopra. This plugin is used by [Hosted Che](#), but any Red Hat CodeReady Workspaces deployment can take advantage of this plugin. There are no dependencies other than a valid Woopra domain and Segment Write key. The link: <https://raw.githubusercontent.com/che-incubator/che-workspace-telemetry-woopra-plugin/master/meta.yaml> [plugin's meta.yaml] file has 5 environment variables that can be passed to the plugin:

- **WOOPRA_DOMAIN** - The Woopra domain to send events to.
- **SEGMENT_WRITE_KEY** - The write key to send events to Segment and Woopra.
- **WOOPRA_DOMAIN_ENDPOINT** - If you prefer not to pass in the Woopra domain directly, the plugin will get it from a supplied HTTP endpoint that returns the Woopra Domain.
- **SEGMENT_WRITE_KEY_ENDPOINT** - If you prefer not to pass in the Segment write key directly, the plugin will get it from a supplied HTTP endpoint that returns the Segment write key.

To enable the Woopra plugin on your Red Hat CodeReady Workspaces installation, deploy the `meta.yaml` file to an HTTP server with the environment variables set correctly. Then, edit the `CheCluster` Custom Resource, and set the `spec.server.customCheProperties.CHE_WORKSPACE_DEVFILE_DEFAULT__EDITOR_PLUGINS` field:

```

spec:
  server:
    customCheProperties:
      CHE_WORKSPACE_DEVFILE_DEFAULT__EDITOR_PLUGINS: 'eclipse/che-machine-exec-
plugin/7.20.0,https://your-web-server/meta.yaml'

```