



Red Hat JBoss Developer Studio 11.3

Getting Started with Container and Cloud-based Development

Starting Development of Container and Cloud-based Applications Using Red Hat
JBoss Developer Studio

Red Hat JBoss Developer Studio 11.3 Getting Started with Container and Cloud-based Development

Starting Development of Container and Cloud-based Applications Using Red Hat JBoss Developer Studio

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Abstract

This compilation of topics contains information on how to start developing containerized applications and applications for cloud deployment.

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CHAPTER 1. DEVELOPING USING CONTAINERS AND THE CLOUD

1.1. USING RED HAT CONTAINER DEVELOPMENT KIT 3.X TOOLING IN JBOSS DEVELOPER STUDIO 11.X

Red Hat Container Development Kit (CDK) is a pre-built container development environment based on Red Hat Enterprise Linux (RHEL). CDK helps you get started with developing container-based applications quickly. You can easily set up CDK and then use toolings, such as, OpenShift Container Platform and Docker, through JBoss Developer Studio (DevStudio), without spending additional time in setting up and configuring the supplementary tooling.

Once installed, you can use the installed components with the Docker Tooling.

1.1.1. Installing CDK and DevStudio Using the Red Hat Development Suite Installer

Use the Red Hat Development Suite (DevSuite) Installer to install CDK, DevStudio, and other relevant components. The Installer automatically configures these components for use together. This option is currently available for Windows, macOS, and RHEL 7. For instructions about using the DevSuite Installer, see [Red Hat Development Suite Installation Guide](#).

The installation configures CDK tooling (creates the CDK server adapter, passes user credentials for the access.redhat.com domain used in the Installer). This makes the CDK tooling ready for use in the IDE. After the installation is complete, run DevStudio directly from the Installer, open the **Servers** view and start the Container Development Environment server adapter. This will start CDK and create OpenShift Container Platform and Docker connections. Note that if you close the Installer window and then run DevStudio, your user credentials will not be passed automatically and you must enter your user credentials manually.

1.1.2. Installing CDK in DevStudio

You can download and install CDK from within DevStudio. This option requires some additional configuration steps before the two products can be used together.

Prerequisites

- Ensure that hardware virtualization is enabled on your system.
- Ensure that the following are installed on your system:
 - Hypervisor such as VirtualBox, Linux KVM/libvirt, xhyve (macOS) or hyper-V (Windows) is installed and configured
 - DevStudio 11.x
- Ensure that you have a Red Hat Developer account. For a new account, visit <https://developers.redhat.com/>.

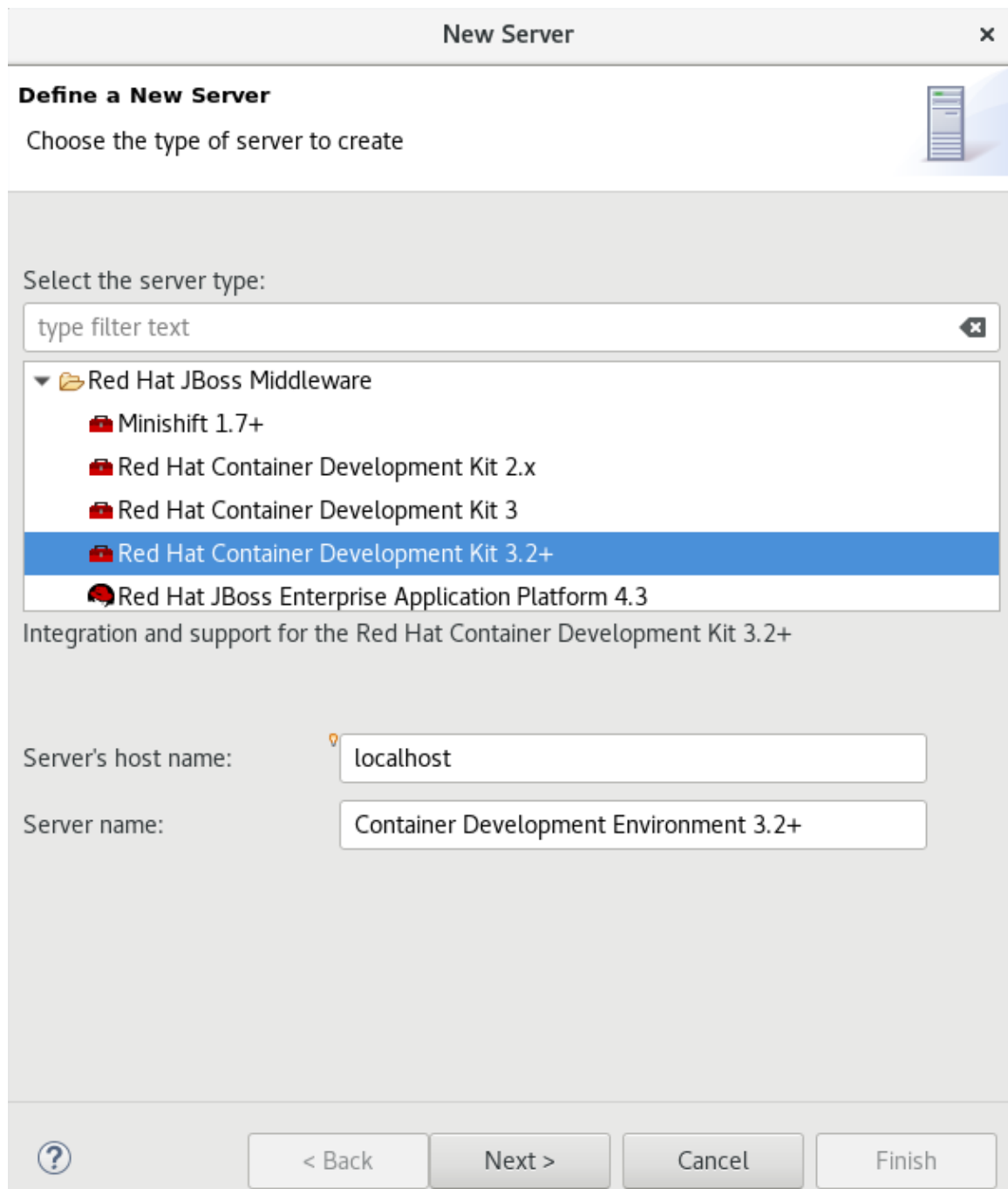
For details about installing these prerequisites, see the [Red Hat Container Development Kit Installation Guide](#).

1.1.2.1. Downloading and Installing CDK in the IDE

To download and install CDK in the IDE:

1. Start the IDE.
2. To open the **Servers** view, click **Windows > Show View > Servers**.
3. Click the **No servers are available. Click this link to create a new server** link (or right-click an existing server and click **New > Server**.)
4. In the **New Server** window:
 - a. Expand **Red Hat JBoss Middleware** and click **Red Hat Container Development Kit 3.2+ .**
 - b. Let the **Server's host name** field be as is because it is not applicable to CDK.
 - c. In the **Server Name** field, if desired, type a different server name (**Container Development Environment 3.2+** is the default server name).
 - d. Click **Next**.

Figure 1.1. Selecting Red Hat Container Development Kit 3.2+



5. In the **New Server - Red Hat Container Development Environment** window:
 - a. In the **Username** list, click your username. If you do not have the credentials set up, add the credentials for the `access.redhat.com` domain. If you do not have your credentials, sign up on `developers.redhat.com`.
 - b. In the **Hypervisor** field, ensure that the relevant virtualization system for your operating system appears.
 - c. In the **Minishift Binary** field, click **Browse** to locate the minishift binary. If you do not have the CDK binary yet, follow the steps to download and install the CDK runtime:
 - i. Click the **Download and install runtime** link to open the **Download Runtimes** window.
 - ii. From the available Runtimes, click the CDK version that you want to download and click **Next**.

Figure 1.2. Selecting the CDK Version for Download

The screenshot shows a window titled "Download Runtimes" with a close button (x) in the top right corner. Below the title bar, the text "Download Runtimes" is displayed, followed by the instruction "Please select a runtime to download and install." Below this is a table with two columns: "Name" and "Version". The table contains two rows: "CDK v3.2.0" with version "3.2.0", and "CDK v3.3.0" with version "3.3.0". The second row is highlighted in blue. Below the table is a section titled "Selected Runtime Details" which contains the following information:

Project URL: <https://developers.redhat.com/products/cdk/download/>
Download URL: <https://www.jboss.org/download-manager/jdf/file/cdk-3.3.0-1-minishift-linux-amd64>
Registration required. Downloads require accepting the terms and conditions of the JBoss Developer Program which provides \$0 subscriptions for development use only.

At the bottom of the window, there is a help icon (question mark in a circle) and four buttons: "< Back", "Next >", "Cancel", and "Finish".

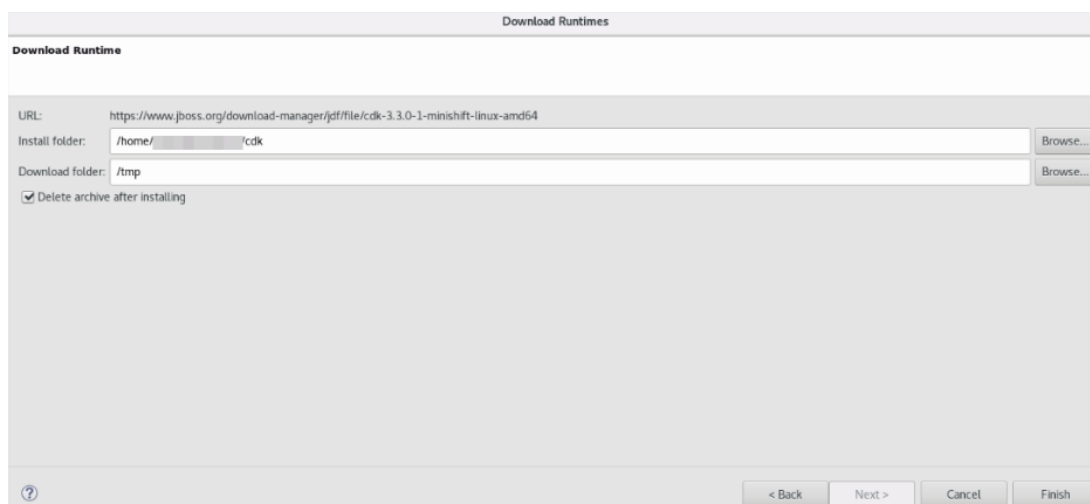
Name	Version
CDK v3.2.0	3.2.0
CDK v3.3.0	3.3.0

Selected Runtime Details

Project URL: <https://developers.redhat.com/products/cdk/download/>
Download URL: <https://www.jboss.org/download-manager/jdf/file/cdk-3.3.0-1-minishift-linux-amd64>
Registration required. Downloads require accepting the terms and conditions of the JBoss Developer Program which provides \$0 subscriptions for development use only.

< Back Next > Cancel Finish

- iii. In the **JBoss.org Credentials** window, in the **Username** list, click your username and in the **Password** field, enter your password. Click **Next**.
- iv. In the next window, click **I accept the terms of the license agreement** and click **Next**.
- v. In the **Download Runtime** window, ensure that the **Install folder** and the **Download folder** fields, show the desired location (or, if desired, change the locations).
- vi. Click **Finish**.

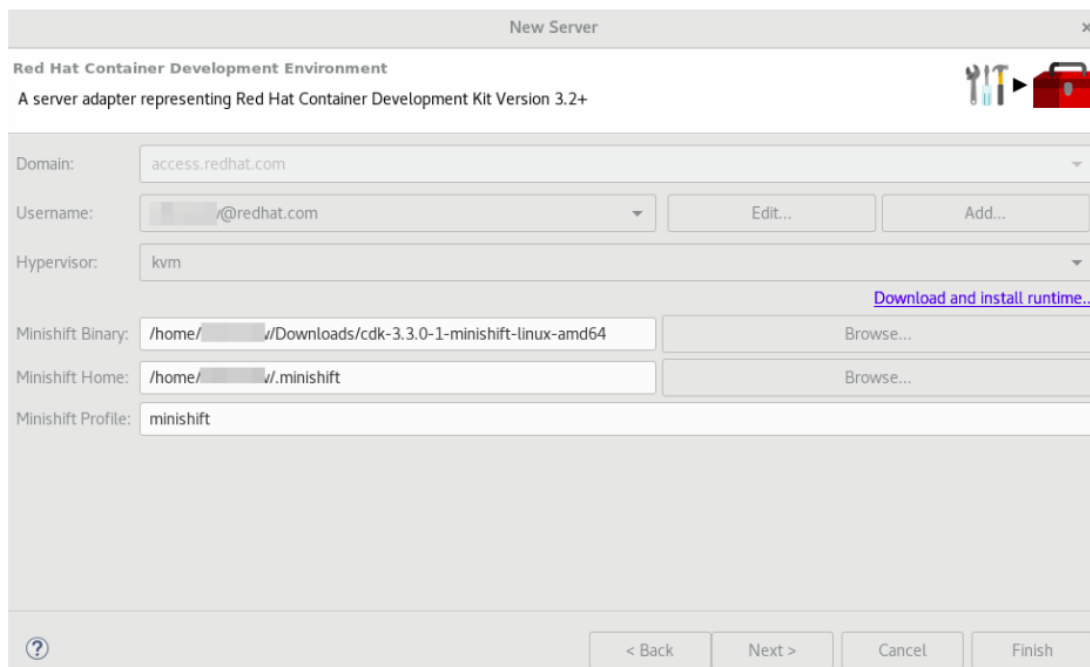
Figure 1.3. Downloading the CDK Runtime

The **New Server** window appears showing the progress of the download. The download takes a few minutes to complete.



IMPORTANT

Do not close the **New Server** window because if you do so the runtime will be downloaded but will not be configured. Once the download is complete, the **Minishift Binary** field shows the path to the downloaded binary.

Figure 1.4. The Minishift Binary Field showing the Path to the Downloaded Binary

- d. The **Minishift Home** field contains path to the folder with the CDK configuration files; default is `.minishift` in the user's home directory; you can change this to the desired location.
- e. The **Minishift Profile** field is set to `minishift` by default; you can change this to the desired value.
- f. Click **Finish**.

6. The **Servers** view will include a new server adapter: **Container Development Environment 3.2+**. Right-click it and click **Start**. The **Console** view shows the progress of starting CDK.



NOTE

In case you did not setup CDK prior to starting the server adapter, you will see a warning dialog: **Warning: CDK has not been properly initialized!**. Confirm the dialog and continue with starting CDK. Note that the Setup CDK command is called in the background. This command will set up files in your Minishift Home directory. If there is any content in this directory you may need to confirm overwriting it. Check the directory content before confirming to avoid losing important data.

Figure 1.5. CDK has not been properly initialized Message



7. When the server adapter is starting, you may be asked to enter your credentials for developers.redhat.com (associated with access.redhat.com). If so, enter the credentials and continue.
8. At the end of starting CDK, if it appears, in the **Untrusted SSL Certificate** dialog box, click **Yes**. The **OpenShift Explorer** view opens showing the IP address and the port of the OpenShift Container Platform that you have connected to: **developer {connection_IP}** (example, **developer <https://10.1.2.2:8443>**). Expand the connection to see the sample projects.
9. You can also open the **Docker Explorer** view to view the Container Development Environment 3.2+ connection and expand the connection to see the Containers and Images.

1.1.3. Using the Docker Tooling

After starting the CDK server in the IDE, you can follow one of the two container development workflows to use the Docker Tooling.

1.1.3.1. Using Docker for Container-based Development

Use Docker for Container-based Development as follows:

1. Create a new project with your Dockerfile. .. Click **File > New > Project**.
 - a. Type *java* in the search field and from the results, select **Java Project** and click **Next** to continue.
 - b. In the **Project name** field, type a name for the new project and click **Finish**. The **Project Explorer** view shows the project that you just created.
 - c. Click **File > New > File**.
 - d. In the **New File** window:

- i. In the **Enter or select the parent folder** field, click the project that you created.
 - ii. In the **File name** field, type *Dockerfile* and click **Finish**.
- e. Edit the Dockerfile as desired and then save it. For example, copy and paste the following content in the dockerfile and then save the file:

```
# Use latest jboss/base-jdk:8 image as the base
FROM jboss/base-jdk:8

# Set the WILDFLY_VERSION env variable
ENV WILDFLY_VERSION 10.1.0.Final
ENV WILDFLY_SHA1 9ee3c0255e2e6007d502223916cefad2a1a5e333
ENV JBOSS_HOME /opt/jboss/wildfly

USER root

# Add the WildFly distribution to /opt, and make wildfly the
owner of the extracted tar content
# Make sure the distribution is available from a well-known place
RUN cd $HOME \
    && curl -O
https://download.jboss.org/wildfly/$WILDFLY_VERSION/wildfly-
$WILDFLY_VERSION.tar.gz \
    && sha1sum wildfly-$WILDFLY_VERSION.tar.gz | grep
$WILDFLY_SHA1 \
    && tar xf wildfly-$WILDFLY_VERSION.tar.gz \
    && mv $HOME/wildfly-$WILDFLY_VERSION $JBOSS_HOME \
    && rm wildfly-$WILDFLY_VERSION.tar.gz \
    && chown -R jboss:0 ${JBOSS_HOME} \
    && chmod -R g+rw ${JBOSS_HOME}

# Ensure signals are forwarded to the JVM process correctly
for graceful shutdown
ENV LAUNCH_JBOSS_IN_BACKGROUND true

USER jboss

# Expose the ports we're interested in
EXPOSE 8080

# Set the default command to run on boot
# This will boot WildFly in the standalone mode and bind to
all interface
CMD ["/opt/jboss/wildfly/bin/standalone.sh", "-b", "0.0.0.0"]
).
```

For additional information about the Dockerfile, see
<https://docs.docker.com/engine/reference/builder>.

1.1.3.2. Building the Docker Image Using the Container Development Environment

To do a Docker image build using the Container Development Environment:

1. In the **Project Explorer** view, expand the project and right-click the Dockerfile and select **Run As > Docker Image Build**.

2. In the **Docker Image Build Configuration** dialog box:

- a. In the **Connection** field, select your Container Development Environment server adapter.
- b. In the **Image Name** field, enter the desired name for the docker image and click **OK**. After the build is done, a new image with the given name is listed in the **Docker Explorer** view under CDK Docker connection under images and in the **Docker Images** view. Also, the **Console** view shows **Successfully built <Docker_image_ID>** message.

3. Run a Docker image using the Container Development Environment:

- a. Open the **Docker Explorer** view by typing Ctrl+3 in the quick access menu or using the **Window > Perspective > Open Perspective > Docker Tooling** menu option.
- b. Navigate to the **Images** node under the Docker connection.
- c. Right-click your image and click **Run**.
- d. In the **Run a Docker Image** window, fill in the necessary details and click **Finish** to run your image. The **Console** view shows the progress of execution of the Docker image. Optionally, give the container a name. This name helps locate the specific container in a list of containers in the future.
- e. In the **Docker Explorer** view, select the container that you named in the preceding step and expand its node and select the 8080 port and click **Show In > Web Browser** to access the application deployed in the Docker container. The application opens in the default web browser.

1.1.3.3. Next Steps for the Docker Tooling

For further information about the basics of Docker Tooling, see [Using Docker Tooling in JBoss Developer Studio](#).

1.1.4. Using the OpenShift Container Platform Tooling

Use OpenShift Container Platform for Container-based Development as follows:

1. Create a new OpenShift Container Platform project. These projects are like namespaces for OpenShift applications. They are different from how Eclipse projects relate to Eclipse applications. Additionally, Eclipse projects can be mapped to OpenShift applications.
 - a. In the **OpenShift Explorer** view, right-click the connection and click **New > Project** to create a new OpenShift Container Platform project.



NOTE

The CDK server adapter creates the OpenShift Container Platform connection when you start the CDK server adapter in the preceding sections.

- b. Add the name and other relevant details for the new project and click **Finish**.
2. Create an application in your OpenShift Container Platform project using the templates:
 - a. Right-click your new project name and click **New > Application**.

- b. In the **New OpenShift Application** window, search box, type the application type required. For example, for a **node.js** application, type *nodejs* and from the displayed list, select the relevant nodejs template and click **Finish**.
- c. Click **OK** to accept the results of the application creation process.
- d. In the **Import OpenShift Application** window, select a **Git Clone Location** and click **Finish**.

For additional tasks that you can do with the OpenShift Container Platform projects and application, refer to [Creating an OpenShift Container Platform Application in Red Hat JBoss Developer Studio](#) .

1.1.4.1. Next Steps for the OpenShift Tooling

For additional tasks to be performed using the OpenShift Container Platform tooling, see [Developing for the Cloud with OpenShift 3](#).

1.1.5. Known Issues

- When the **Docker Explorer** view is first started, attempting to extend the Containers or Images causes the explorer to fail and throw an exception. To work around this issue, restart Eclipse/JBoss Developer Studio. For details, see [JBIDE-21983](#).

CHAPTER 2. DEVELOPING FOR THE CLOUD WITH OPENSIFT

3

2.1. CREATING AN OPENSIFT CONTAINER PLATFORM APPLICATION IN RED HAT JBOSS DEVELOPER STUDIO

Using the OpenShift Container Platform tooling you can create, import, and modify OpenShift Container Platform applications.

2.1.1. Creating a New OpenShift Container Platform Connection

It is imperative that you create an OpenShift Container Platform connection to be able to use the OpenShift Container Platform tooling in the IDE.

To create a new connection:

1. In the **OpenShift Explorer** view, click **New Connection Wizard**. If the **OpenShift Explorer** view is not available, click **Window > Show View > Other** and then search for **OpenShift Explorer** and after you find it, click **OK**.
2. In the **New OpenShift Connection** wizard:
 - a. In the **Connection** list, click **<New Connection>**.
 - b. In the **Server type** list, click **OpenShift 3**.
 - c. In the **Server** field, type the URL for an OpenShift Container Platform server.
 - d. In the **Authentication** section, in the **Protocol** list, click **OAuth** to authenticate using the token or click **Basic** to authenticate using login credentials.
3. Click **Finish**.

Figure 2.1. Set up a New OpenShift Container Platform Connection

New OpenShift Connection [X]

Sign in to OpenShift

Please sign in to your OpenShift server.

OPENSHIFT

New to OpenShift OpenShift 3? Explore the [getting started documentation](#).

Connection: <New Connection> ▼

Server type: OpenShift 3 ▼

☐ Use default server

Server: https://openshift3serverURL.com ▼

Authentication

Protocol: OAuth ▼

Enter a token or [retrieve](#) a new one.

Token * ZEp9Cy-TlCm2S3BkGi9QD45Y-RX3wWMTjW38EmxzH8Q

☐ Save token (could trigger secure storage login)

Advanced >>

[?] [Cancel] [Finish]

2.1.2. Creating a New OpenShift Container Platform Project

Create a project, which essentially is a namespace with additional annotations, to centrally manage the access to resources for regular users.

To create a new OpenShift Container Platform project:

1. In the **OpenShift Explorer** view, right-click the connection and click **New > Project**.

2. In the **Create OpenShift Project** window:
 - a. In the **Project Name** field, type a name for the project. Project names must be alphanumeric and can contain the character “-” but must not begin or end with this character.
 - b. In the **Display Name** field, type a display name for the project. This name is used as the display name for your project in the **OpenShift Explorer** view and on the OpenShift Container Platform web console after the project is created.
 - c. In the **Description** field, type a description of the project.
3. Click **Finish**. The project is listed in the **OpenShift Explorer** view, under the relevant connection.

2.1.3. Creating a New OpenShift Container Platform Application

Use the **New OpenShift Application** wizard to create OpenShift Container Platform applications from default or custom templates. Using a template to create an application is useful because the same template can be used to create multiple similar applications with different or identical configurations for each of them.

To create a new OpenShift Container Platform application:

1. In the **OpenShift Explorer** view, right-click the connection and click **New > Application**.
2. If required, in the **New OpenShift Application** wizard, sign in to your OpenShift Container Platform server using the **Basic** protocol (username and password) or the **OAuth** protocol (token) and click **Next**.
3. In the **Select Template** window, click the **Server application source** tab.

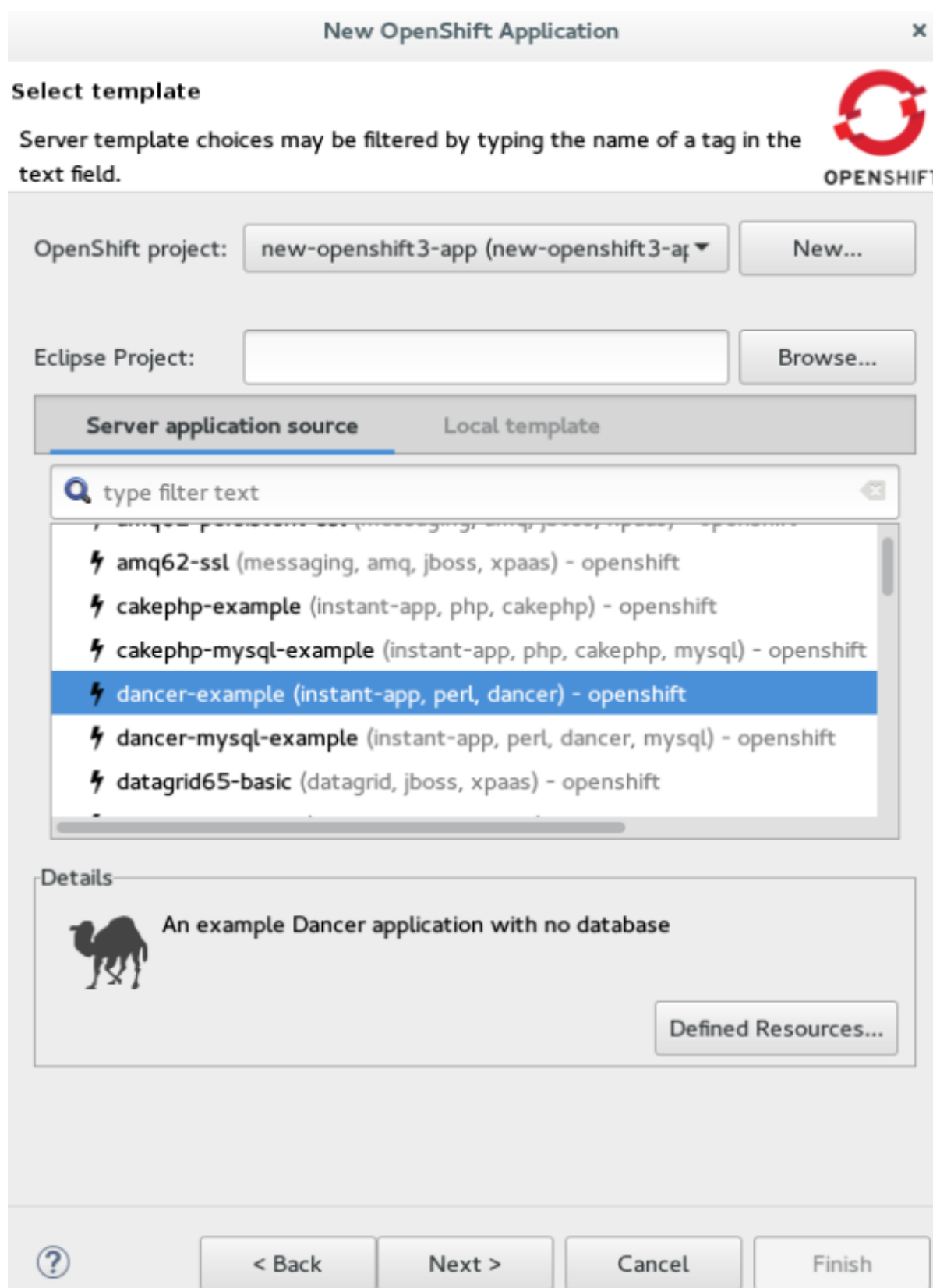


NOTE

To create an application from a local template, click the **Local template** tab and then click **Browse File System** or **Browse Workspace** to locate the template that you want to base the project on.

4. From the list, click the template that you want to base your project on. You can also use the **type filter text** field to search for specific templates.
5. Click **Next**.

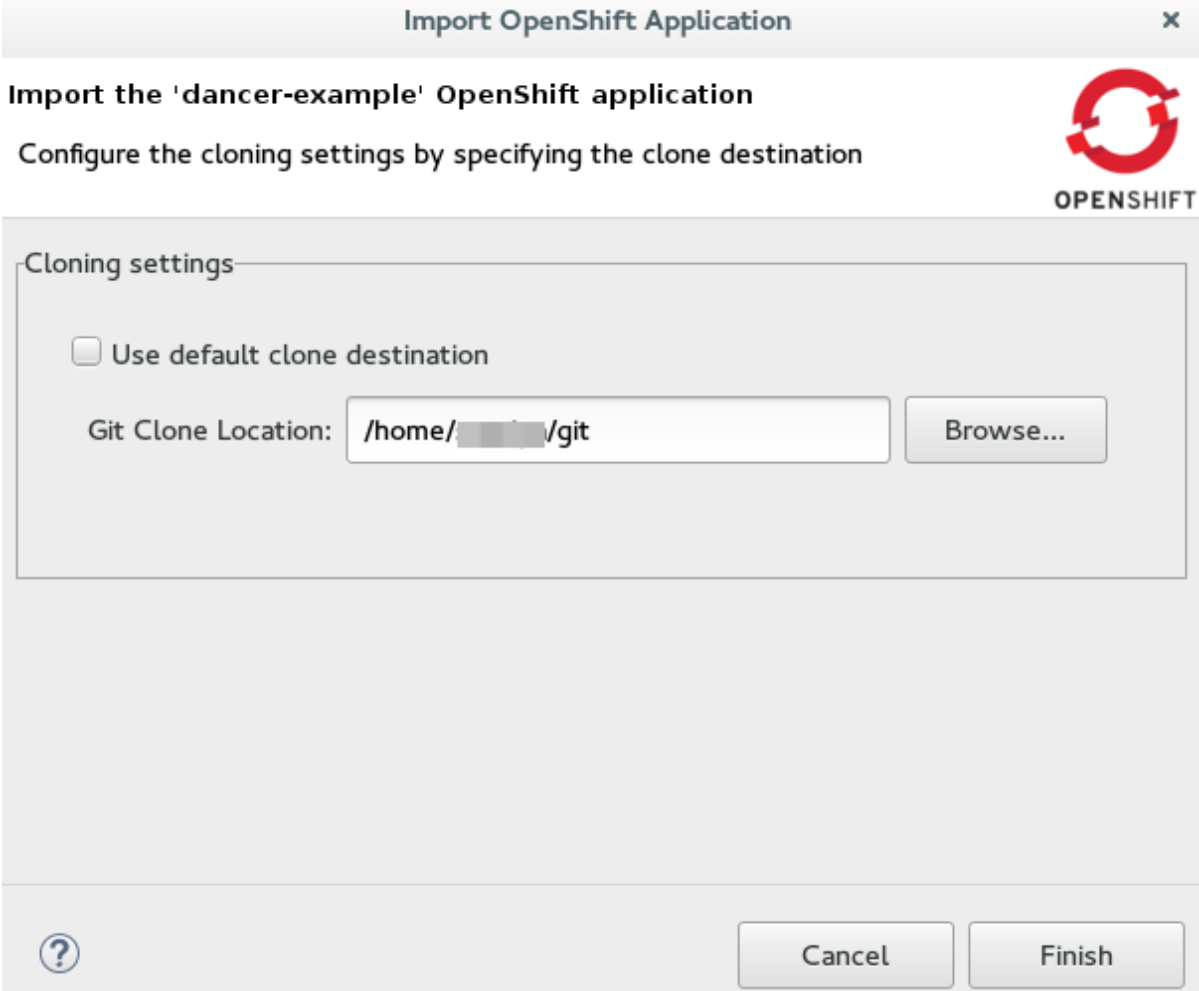
Figure 2.2. Select a Template for Project Creation



6. In the **Template Parameters** window, confirm the parameter values and click **Next**.
7. In the **Resource Labels** window, confirm the labels that you want to add to each resource. You can also click **Add** or **Edit** to add labels or edit the existing ones.
8. Click **Finish**.

9. In the **Results of creating the resources from the** `{template_name}` window, review the details and click **OK**.
10. In the **Import Application** window, click **Use default clone destination** to clone the application at the default location or in the **Git Clone Location** field, type or browse for the location where you want to clone the application and click **Finish**.

Figure 2.3. Selecting a Git Clone Location



Import OpenShift Application [X]

Import the 'dancer-example' OpenShift application

Configure the cloning settings by specifying the clone destination

Cloning settings

☐ Use default clone destination

Git Clone Location:

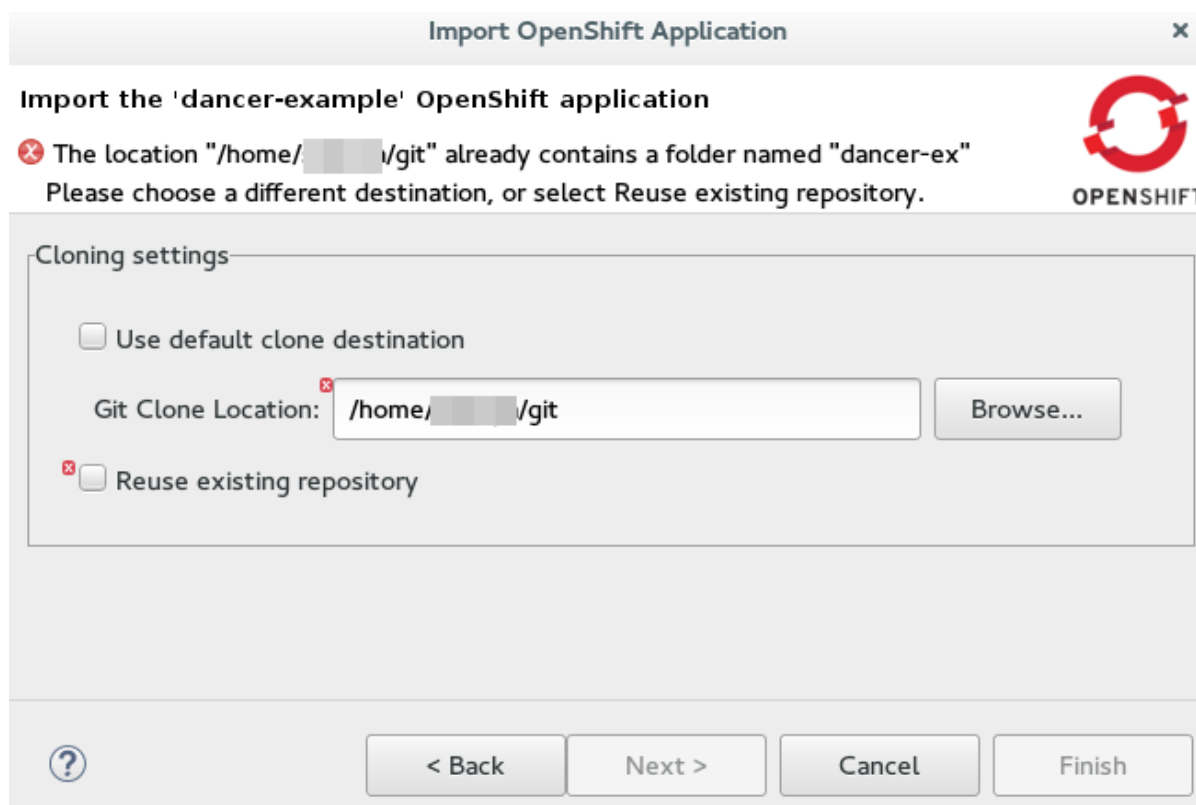
[?]



NOTE

If the Git location chosen to clone the application already contains a folder with the application name that you are trying to import, you must select a new location for the Git clone. If you do not select a new location, the existing repository will be reused with the changes you made being retained but not reflected on the OpenShift Container Platform console.

Figure 2.4. Git Clone Location Reuse



Result: The application appears in the **Project Explorer** view.

Additional Resources

- To learn more about using and creating templates with OpenShift Container Platform, see [Templates](#).

2.1.4. Importing an Existing OpenShift Container Platform Application into the IDE

Only an application that has its source specified in the `build config` file can be imported into the workspace. Applications associated with your OpenShift Container Platform account(s) are listed in the **OpenShift Explorer** view. The source code for these applications can be individually imported into the IDE using the **Import OpenShift Application** wizard. Once imported, the user can easily modify the application source code, as required, build the application, and view it in a web browser.

To import an existing OpenShift Container Platform application as a new project in the existing IDE workspace:

1. If required, sign into your OpenShift Container Platform server using the **Basic** protocol or the **OAuth** protocol.
2. In the **OpenShift Explorer** view, expand the connection to locate the application to import.
3. Right-click the `{project name}` and click **Import Application**.

**NOTE**

To import a particular application from a service, right-click the service and then click **Import Application**. If you right-click a project and click **Import Application**, and if there are more than one build configurations with source code under a project, you will be prompted to select the desired application for import because of existence of several applications under one project.

4. In the **Import OpenShift Application** wizard, **Existing Build Configs** list, click the application that you want to import and click **Next**.
5. Ensure the location in the **Git Clone Destination** field corresponds to where you want to make a local copy of the application Git repository and click **Finish**. The application is listed in the **Project Explorer** view.

2.1.5. Deploying an Application Using the Server Adapter

The server adapter allows incremental deployment of applications directly into the deployed pods on OpenShift Container Platform.

To deploy an application:

1. In the **OpenShift Explorer** view, expand the connection, the project, and then the application.
2. Right-click the *{application name}* and click **Server Adapter**.
3. In the **Server Settings** window, **Resources** section, select the service.

**NOTE**

A workspace project will be selected automatically, if the OpenShift service has a Build Configuration with a git URL matching the git remote URL of one of the workspace projects.

4. Click **Finish**. The **Servers** view is the view in focus with the server showing **[Started, Publishing...]** followed by the **Console** view showing the progress of application publishing.

2.1.6. Viewing an Existing Application in a Web Browser

After an application has been successfully deployed, to view it in the internal web browser, in the **OpenShift Explorer** view, right-click the application, and click **Show In > Web browser**. The application displays in the built-in web browser.

2.1.7. Deleting an OpenShift Container Platform Project

You may choose to delete a project from the workspace to make a fresh start in project development or after you have concluded development in a project. All resources associated with a project get deleted when the project is deleted.

Prerequisites

- Sentence or a bulleted list of pre-requisites that must be in place or done before the user starts this task.
- Delete section title and bullets if the task has no required pre-requisites.

- Text can be a link to a pre-requisite task that the user must do before starting this task.

To delete a project:

1. In the **OpenShift Explorer** view, expand the connection and then the project to locate the application you want to delete.
2. Right-click the *{project name}* and click **Delete Project**.
3. In the **OpenShift resource deletion** window, click **OK**.



NOTE

To delete more than one project (and the containing applications), in the **OpenShift Explorer** view, click the project to select it and while holding the Control key select another project that you want to delete and then press **Delete**.

Additional Resources

- Bulleted list of links to concepts, reference, or other tasks closely related to this task.
- Include only the most relevant items as links, not every possible related item.
- Delete section title and bullets if no related information is needed.

2.2. SETTING UP AND REMOTELY MONITORING AN OPENSIFT CONTAINER PLATFORM APPLICATION

In some scenarios, the user already has a remote instance of OpenShift Container Platform running with various applications on it and may want to monitor it. The IDE allows users to set up a connection to a remote instance of OpenShift Container Platform and then use logs (application logs and build logs) to troubleshoot and monitor running applications.

Prerequisites

2.2.1. Setting up OpenShift Client Binaries

Before setting up port forwarding or streaming application and build logs, it is mandatory to set up OpenShift Client Binaries.

To set up the OpenShift Client Binaries:

1. In the IDE, navigate to **Window** → **Preferences** → **JBoss Tools** → **OpenShift 3**.
2. Click the [here](#) link.
3. In the **Download from GitHub** section, click the **Release page** link.
4. Scroll to the **Assets** section for the relevant version of OpenShift Origin. Click the appropriate link to begin the client tools download for the binary for your operating system.
5. After the download is complete, extract the contents of the file.
6. Navigate to **Window** → **Preferences** → **JBoss Tools** → **OpenShift 3**

7. Click **Browse** and select the location of the OpenShift Client executable file.
8. Click **Apply** and **Close**. OpenShift Client Binaries are now set up for your IDE.

2.2.2. Setting up Port Forwarding

Using the **Application Port Forwarding** window, you can connect the local ports to their remote counterparts to access data or debug the application. Port forwarding automatically stops due to any one of the following reasons:

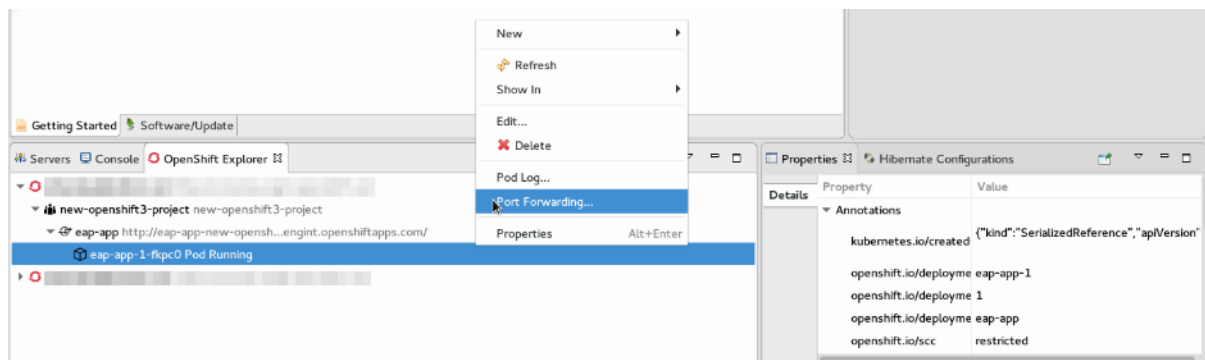
- The OpenShift Container Platform connection terminates
- The IDE shuts down
- The workspace is changed

Port forwarding must be enabled each time to connect to OpenShift Container Platform from the IDE.

To set up port forwarding:

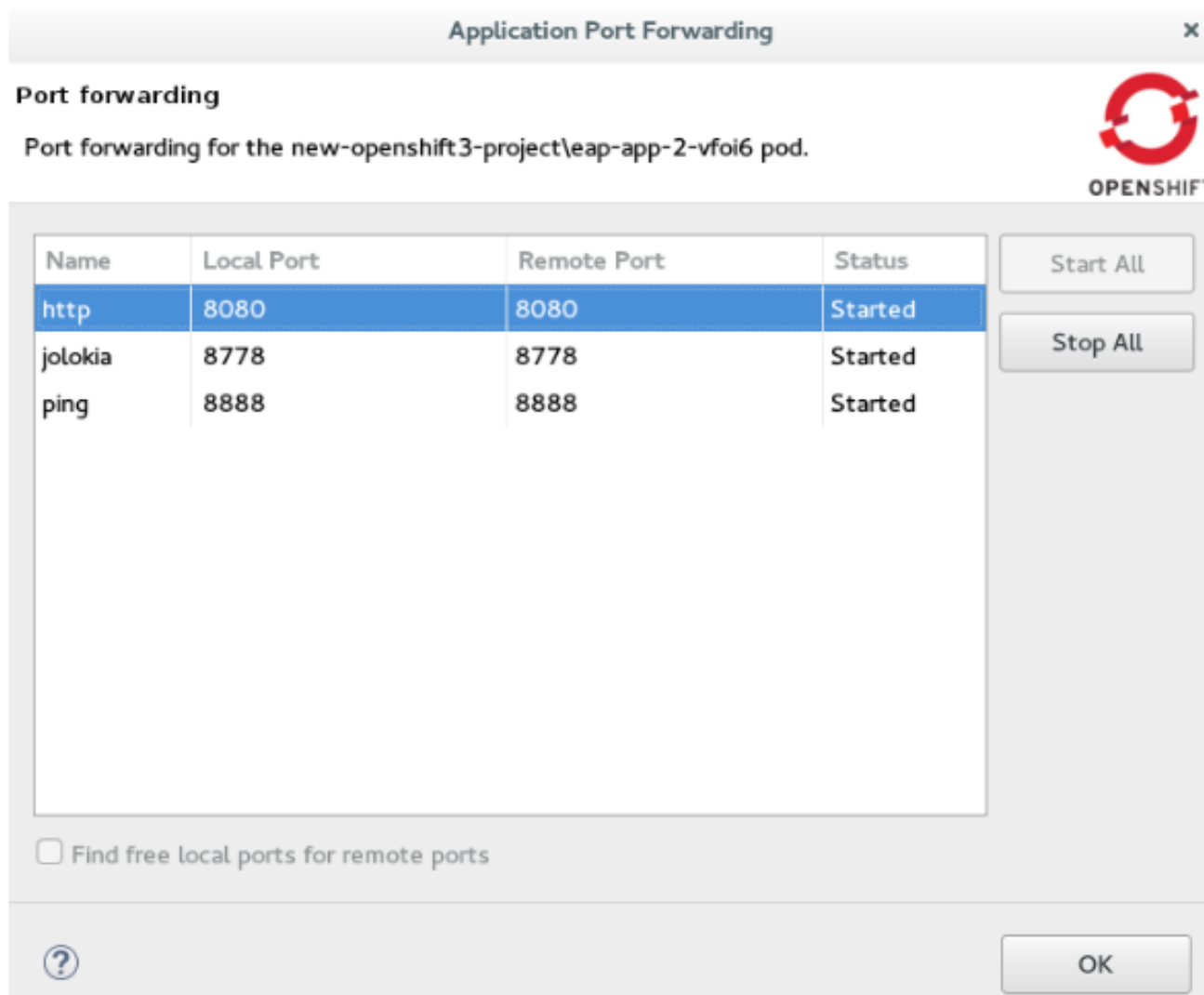
1. In the **OpenShift Explorer** view, expand the connection, the project, the services, and then the Pods.
2. Right-click the relevant pod and then click **Port Forwarding**.

Figure 2.5. Setting up Port Forwarding



3. In the **Application Port Forwarding** window, click the **Find free local ports for remote ports** check box and then click **Start All**. The **Status** column shows **Started**, indicating that port forwarding is now active. Additionally, the **Console** view shows the status of port forwarding for the particular service.

Figure 2.6. Start Port Forwarding



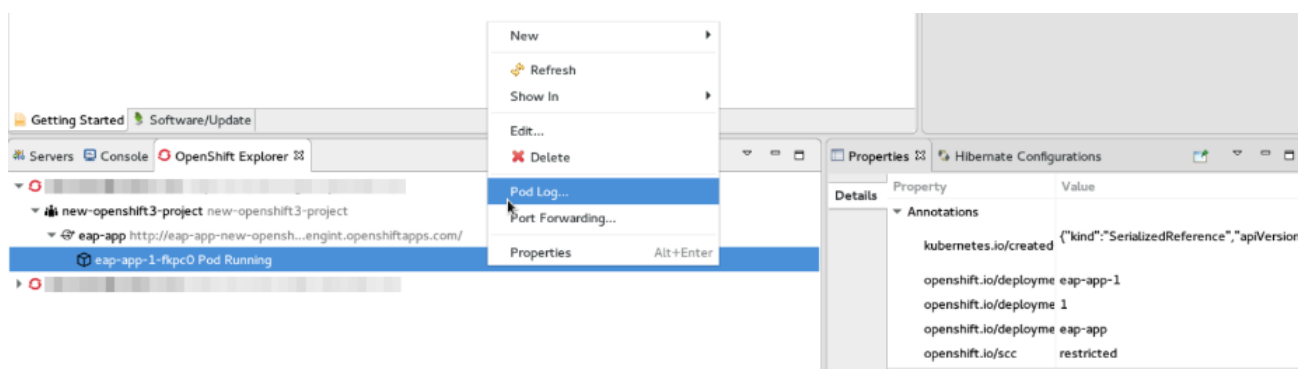
2.2.3. Streaming Pod Logs

Pod logs are general logs for an application running on a remote OpenShift Container Platform instance. The streaming application logs feature in the IDE is used to monitor applications and use the previous pod log to troubleshoot if the application fails or returns errors.

To stream the application logs:

1. In the **OpenShift Explorer** view, expand the project, the services, and then the Pods.
2. Right-click the relevant Pod and then click **Pod Log**.

Figure 2.7. Streaming Pod Log



The **Console** view displays the Pod log.

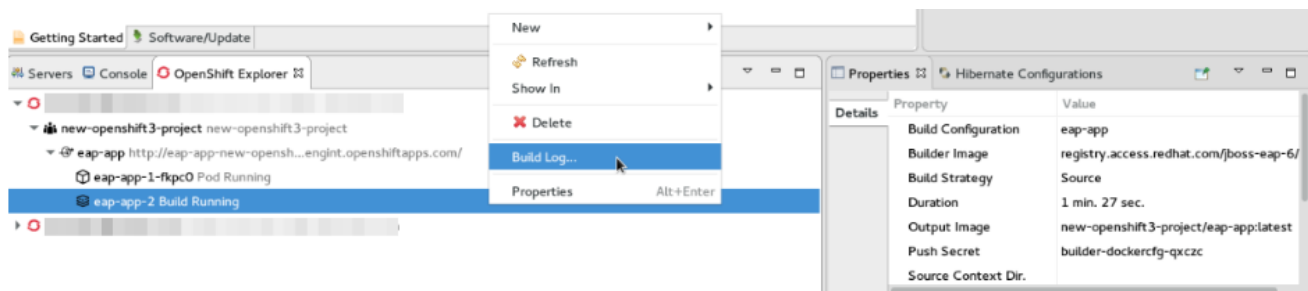
2.2.4. Streaming Build Logs

Build logs are logs that document changes to applications running on a remote OpenShift Container Platform instance. The streaming build logs feature in the IDE is used to view the progress of the application build process and to debug the application.

To stream build logs:

1. In the **OpenShift Explorer** view, expand the project, the services, and then the build.
2. Right-click the relevant build instance and click **Build Log**.

Figure 2.8. Streaming Build Log



The **Console** view is now the view in focus showing the build log.

2.3. BUILDING AND DEPLOYING DOCKER-FORMATTED CONTAINER IMAGE TO CONTAINER DEVELOPMENT KIT OPENSIFT REGISTRY

In this article we deploy the Docker based microservices, **frontend** and **bonjour**, into an OpenShift Container Platform instance running on Red Hat Container Development Kit, in JBoss Developer Studio. We use the Helloworld-MSA tutorial available in GitHub at: <https://github.com/redhat-helloworld-msa/helloworld-msa>.

The article shows how you can easily build a local Docker image, not present on Docker Hub, to Container Development Environment and then deploy that image to an OpenShift Container Platform instance, using JBoss Developer Studio. **frontend** and **bonjour** microservices, used here, are examples of such private images that are not present in Docker Hub.

Prerequisites

1. Install npm: Before running JBoss Developer Studio, install npm on your system. See the npm documentation for instructions for various platforms: <https://docs.npmjs.com/getting-started/what-is-npm>.
2. Download and install JDK 8.
3. Install JBoss Developer Studio and Red Hat Container Development Kit.
 - a. On a Windows system: Install Red Hat Development Suite to automatically install both: JBoss Developer Studio and Red Hat Container Development Kit (for installation instructions, see <https://access.redhat.com/documentation/en/red-hat-development-suite/1.1/paged/installation-guide/>).
 - b. On other operating systems: Install JBoss Developer Studio (for installation instructions,

see: <https://access.redhat.com/documentation/en/red-hat-jboss-developer-studio/10.1/paged/installation-guide/>) and install Red Hat Container Development Kit (for installation instructions, see <https://access.redhat.com/documentation/en/red-hat-container-development-kit/2.2/paged/installation-guide/>).

4. Clone the following projects and then import them into JBoss Developer Studio using the **Import** wizard (from **File > Open Projects from File System**).
 - a. **bonjour** project from: <https://github.com/redhat-helloworld-msa/bonjour>
 - b. **frontend** project from: <https://github.com/redhat-helloworld-msa/frontend>
5. Set up the oc client binaries in the IDE from **Window > Preferences**, expand **JBoss Tools**, and then click **OpenShift 3**.

2.3.1. Installing the javascript Modules

After you complete this section, a new `node_modules` folder gets listed under the project in the **Project Explorer** view, meaning, that the required javascript modules are downloaded and installed.

To download and install all the required javascript modules:

1. In the **Project Explorer** view, expand **frontend** and right-click **package.json**.
2. Click **Run As > npm Install** to download and install the required javascript modules in the project.

2.3.2. Building the frontend Microservice

In this section we build the **frontend** microservice which is the landing page for the application being built. The **frontend** microservice calls other microservices (**bonjour**, in this case) and displays the results from these calls.

To build the Docker-formatted Container image:

1. In the **Project Explorer** view, expand **frontend** and right-click **Dockerfile** and then click **Run As > Docker Image Build**.
2. In the **Docker Image Build Configuration** window:
 - a. In the **Connection** list, select **Container Development Environment**.
 - b. In the **Repository Name** field, type `demo/frontend`.
3. Click **OK**. The Docker-formatted Container image starts building against the Docker Daemon running in the Container Development Environment.

2.3.2.1. Deploying the frontend Microservice

After this microservice is deployed, After the **frontend** microservice is built, the Docker-formatted Container image `demo/frontend` is available in the **Docker Explorer** under **Container Development Environment**.

To deploy the frontend microservice:

1. In the **Docker Explorer** view, **Container Development Environment** > **Images**, right-click **demo/frontend** and click **Deploy to OpenShift**.
2. In the **Deploy an Image** window, click **New**.
3. In the **Create OpenShift Project** window:
 - a. In the **Project Name** field, type the name of the new project, **demo**.
 - b. Optionally, in the **Display Name** and **Description** fields, enter the required details.
 - c. Click **OK**.
4. In the **Deploy an Image** window, click the **Push Image to Registry** check box and click **Next**.
5. In the **Deployment Configuration & Scalability** window, change the following environment variables:
 - a. Click **OS_PROJECT** to open the **Environment Variable** window and in the **Value** field, type *demo* (from step 5) and click **OK**.
6. In the **Deployment Configuration & Scalability** window, click byn:[Next] and then click **Finish**. After the Docker-formatted Container image is pushed to the Docker Registry on OpenShift Container Platform, the Eclipse plugin generates all the required OpenShift Container Platform resources for the application to run.
7. In the **Deploy Image to OpenShift** window, review the details of deploying the image and click **OK**.
8. In the **OpenShift Explorer** view, expand the connection > *{project name}* > **Service** > **Pod** to see the Pod running. Right-click the Pod and click **Pod Log**. The **Console** view shows the **frontend** service running. In the **OpenShift Explorer** view, expand the application and right-click the service and click **Show In** > **Web Browser**. The **frontend** microservice, in the Bonjour Service shows: **Error getting value from service <microservice>** meaning the **bonjour** microservice must be connected.

2.3.3. Connecting the frontend and bonjour Microservices

In this section we build the **bonjour** microservice and then view it on the **frontend** microservice. The **bonjour** microservice is a simple **node.js** application that returns the string **bonjour-de-<pod_ID>**.

To connect the Microservices:

1. In the **Project Explorer** view, expand **bonjour** and right-click **package.json**.
2. Click **Run As** > **npm Install**.
3. In the **Project Explorer** view, expand **bonjour** and right-click **Dockerfile**.
4. Click **Run As** > **Docker Image Build**.
5. In the **Docker Image Build Configuration** window:
 - a. In the **Connectio*n** list, select ***Container Development Environment** .
 - b. In the **Repository Name** field, type *demo/bonjour*.

6. Click **OK**.

2.3.3.1. Deploying the `bonjour` Microservice

You can either deploy the Docker-formatted Container image from the **Docker Explorer** (as done in step 3 of the **Building a Docker-formatted Container Image** section), or in the following way from the **OpenShift Explorer** view:

1. In the **OpenShift Explorer** view, right-click the project (`demo`), and click **Deploy Docker Image**.
2. In the **Deploy an Image** window:
 - a. In the **Docker Connection** list, click the Docker connection.
 - b. In the **Image Name** field, type `demo/bonjour`.
 - c. Click the **Push Image to Registry** check box.
3. Click **Next**.
4. In the **Deployment Configuration & Scalability** window, click **Next**.
5. In the **Services and Routing Settings** window, click **Finish**.
6. In the **Deploy Image to OpenShift** window, click **OK**.

2.3.3.2. Scalling the Pod

To see the `bonjour` service with the Pod running:

1. In the **OpenShift Explorer** view, expand the application name (`demo`).
2. Right-click the pod and click **Pod Log** to check if the pod is running.
3. Navigate to the browser where you have the application running and click **Refresh Results**. You will see a greeting from the `bonjour` service with a hostname that matches the Pod name in the **OpenShift Explorer** view.
4. In the **OpenShift Explorer** view, right-click the service and click **Scale > Up**. You now have two Pods running on OpenShift Container Platform.
5. Navigate to the browser and click **Refresh Results** to see the service balancing between the two Pods.

2.3.4. Editing the `bonjour` Microservice

In this section we edit the `bonjour` microservice and then view the results on the **frontend** microservice.

To edit the `bonjour` microservice:

1. In the **Project Explorer** view, expand `bonjour`, and double-click `bonjour.js` to open it in the default editor.
2. Find

```
function say_bonjour(){
    Return "Bonjour de " + os.hostname();
}
```

3. Change it to:

```
function say_bonjour(){
    Return "Salut de " + os.hostname();
}
```

4. Save the file.

2.3.4.1. Viewing the Edited bonjour Microservice on the frontend Microservice

After you have edited the **bonjour** microservice:

1. In the **Project Explorer** view, expand **bonjour**, and right-click **Dockerfile**.
2. Click **Run As > Docker Image Build**.



NOTE

Here, the Docker run configuration, the connection, and the repository name used earlier are being reused. To edit the configuration, open the **Run Configuration** window.

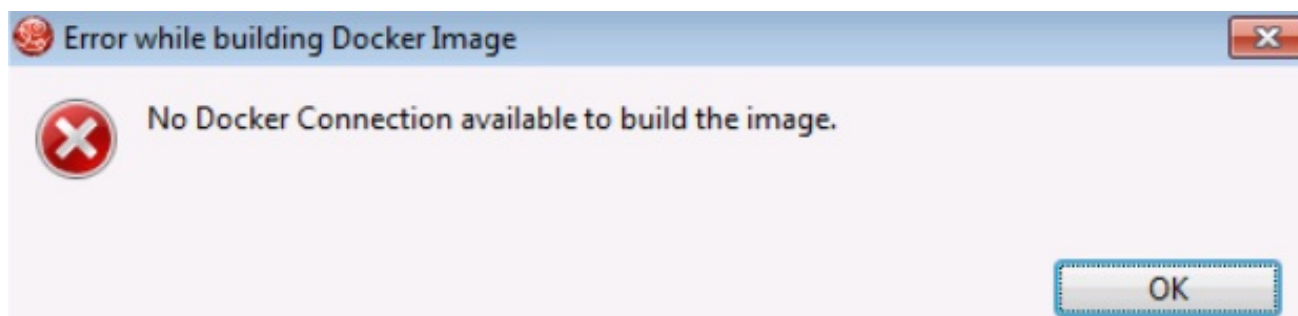
After the **Console** view shows that the Docker-formatted Container image has been successfully pushed to the Docker Daemon:

3. In the **Docker Explorer** view, expand **Container Development Environment > Images**.
4. Right-click the image and click **Deploy to OpenShift**.
5. In the **Deploy an Image** window, click **Push Image to Registry** and then click **Next**.
6. In the **Deployment Configuration & Scalability** window, click **Finish**. The **OpenShift Explorer** view, under **bonjour** shows the Pods being added and then running. Navigate to the browser and click **Refresh Results**. The new greeting appears.

2.3.5. Troubleshooting

No Docker Connection Available

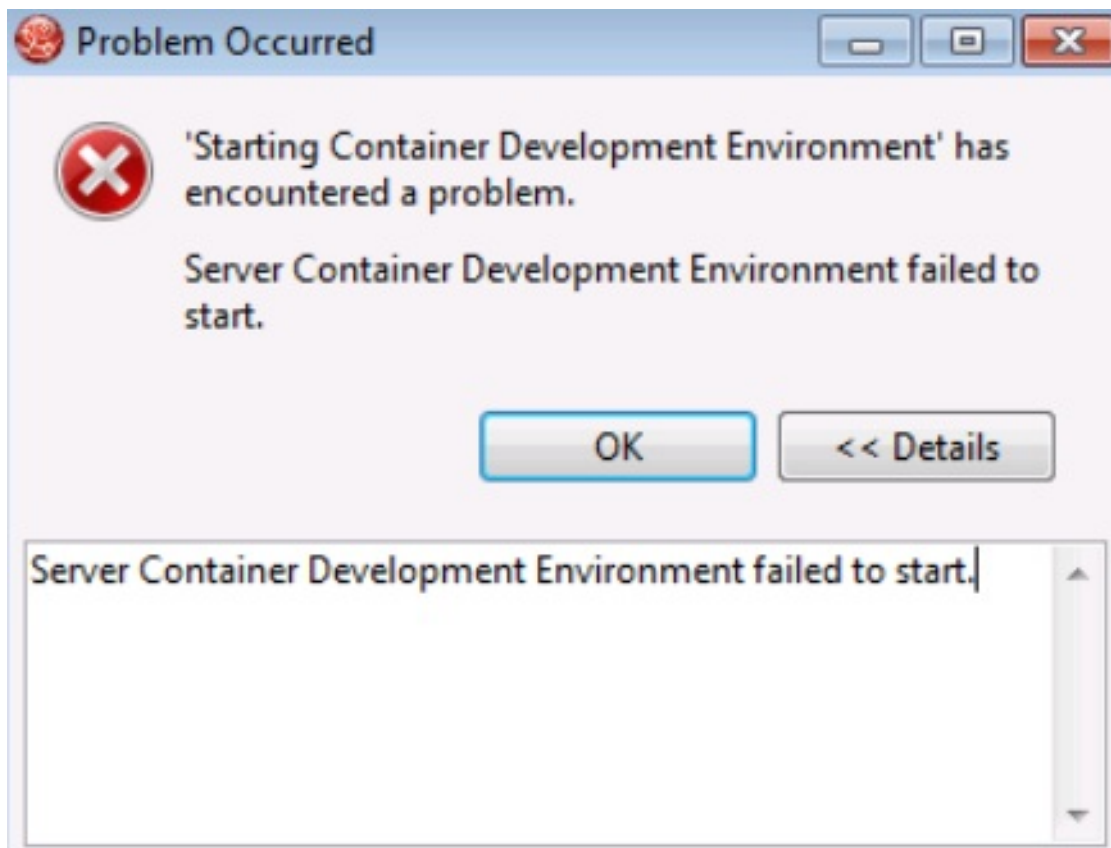
Error message: No Docker Connection available to build the image.



Issue: You have installed JBoss Developer Studio through Red Hat Development Suite and you must start Red Hat Container Development Kit for it to be available. **Resolution:**

1. In the **Servers** view, right-click **Container Development Environment** and click **Start**.
2. Enter your credentials in the box provided.

If, after doing this the Container Development Environment does not start and you get the following error: **Error message: Server Container Development Environment failed to start.**



On the command prompt, cd to `cdk/components/rhel/rhel-ose` and run the **vagrant destroy** command. After it is destroyed, run the **vagrant up** command. In the IDE, in the **Servers** view, right-click **Container Development Environment** and click **Start** once again.

2.4. DEPLOYING THE OPENSIFT CONTAINER PLATFORM 3 RESOURCE

In this article, you use the `s2i-spring-boot-cfx-jaxrs` template in OpenShift Container Platform as an example to define resources for your OpenShift Container Platform application. Use similar steps to define resources for any other OpenShift Container Platform application.

Prerequisites

1. Install Red Hat Container Development Kit (CDK) 3. For detailed instructions to install CDK 3, see https://access.redhat.com/documentation/en-us/red_hat_container_development_kit/3.0/html/installation_guide/.

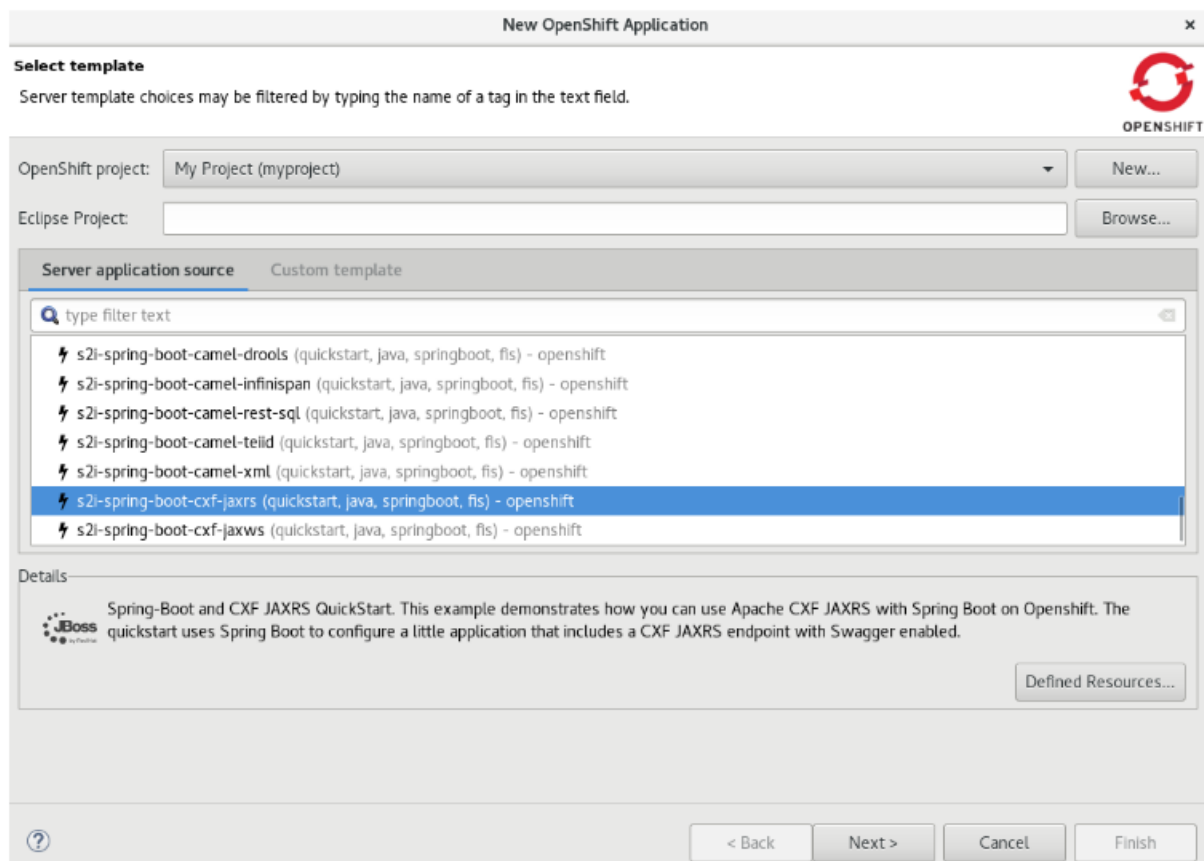
2.4.1. Deploying the s2i-spring-boot-cfx-jaxrs Template

Set up the IDE to work with CDK 3 as described in [Using Container Development Kit 3.x Tooling in JBoss Developer Studio 11.x](#). The new connection for OpenShift Container Platform is listed in the **OpenShift Explorer** view, making the `s2i-spring-boot-cfx-jaxrs` template available for use.

To deploy the template:

1. In the **OpenShift Explorer** view, expand the connection and right-click the `{project name}` and click **New > Application**.
2. In the **New OpenShift Application** window:
 - a. In the **OpenShift project** field, click the project that you want to create the new application in.
 - b. In the **Server application source** tab, scroll through the list and locate and click **s2i-spring-boot-cfx-jaxrs (quickstart, java, springboot, fis) - openshift**.
3. Click **Finish**.
4. In the **Create Application Summary** window, click **OK**.
5. In the **Import OpenShift Application** window in the **Git Clone Location** field, enter the location where you want to clone the template and click **Finish**.

Figure 2.9. Selecting the s2i-spring-boot-cfx-jaxrs Template



6. In the **OpenShift Explorer** view, expand the project, expand the **s2i-spring-boot-cfx-jaxrs** application and then right-click the **s2i-spring-boot-cfx-jaxrs-1** build and click **Build Log**. The **Console** view shows the progress of the build. The **Console** view shows the **latest: digest: sha256:{checksum} size: 9033 Push successful** message.

2.4.2. Viewing the s2i-spring-boot-cfx-jaxrs Application in the Web Console

This section is required optionally if you want to see the application running on the terminal. In absence of a service or route, you can view the application through the **Pod** tab in the web console.

To view the application in the Pod:

1. In the web console, click **Applications > Pod** and then click the **s2i-spring-boot-cfx-jaxrs-1** pod.
2. Click the **Logs** tab.
3. In the logs, locate **Jolokia: Agent started with URL <https://172.17.0.6:8778/jolokia/>** and copy the IP address (172.17.0.6, in this example).
4. Click the **Terminal** tab.
5. In the terminal, type the following command: `curl http://{IP_address}:8080/services/helloservice/sayHello`.
Example: `curl http://172.17.0.6:8080/services/helloservice/sayHello`
6. Press Enter.
7. Append the next line with: `curl http://172.17.0.6:8080/services/helloservice/sayHello/{your_name}` and press Enter.
Example: `curl http://172.17.0.6:8080/services/helloservice/sayHello/John`

The **Hello John, Welcome to CXF RS Spring Boot World!!!** message appears, showing that application is up and running.

Figure 2.10. s2i-spring-boot-cfx-jaxrs Application in the Web Console



2.4.3. Defining Services and Routes Using a JSON File

Use the `services-route.json` file to create the service for the `s2i-spring-boot-cfx-jaxrs` application and then create a route for the service. In this case the target port is 8080 where the route sends the request to the application.

To define the resources:

1. Copy the following content and paste it in a file, name the file `services-routes.json`, and save it.

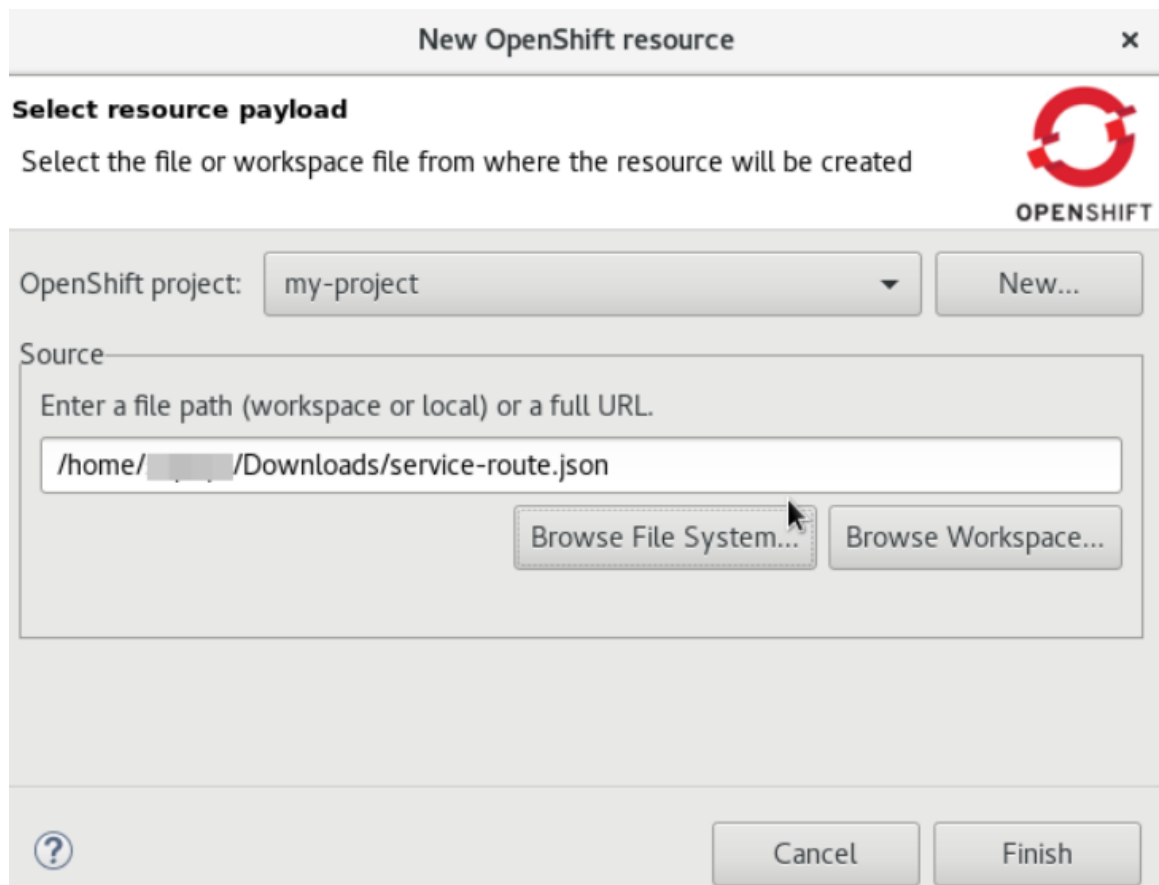
```
{
  "apiVersion": "v1",
  "kind": "List",
  "metadata": {},
  "items": [
    {
      "apiVersion": "v1",
      "kind": "Service",
```

```

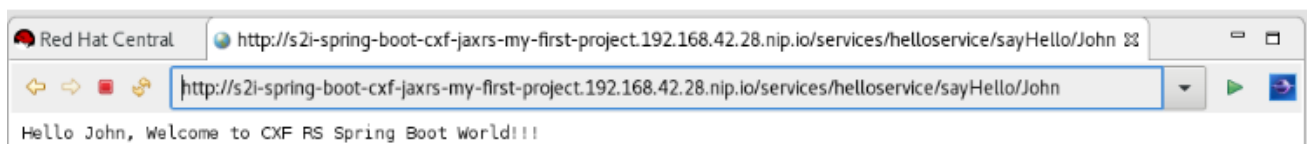
        "metadata": {
          "name": "s2i-spring-boot-cxf-jaxrs"
        },
        "spec": {
          "ports": [
            {
              "name": "8080-tcp",
              "protocol": "TCP",
              "port": 8080,
              "targetPort": 8080
            },
            {
              "name": "8778-tcp",
              "protocol": "TCP",
              "port": 8778,
              "targetPort": 8778
            }
          ],
          "selector": {
            "deploymentconfig": "s2i-spring-boot-cxf-jaxrs"
          }
        }
      },
      {
        "apiVersion": "v1",
        "kind": "Route",
        "metadata": {
          "name": "s2i-spring-boot-cxf-jaxrs"
        },
        "spec": {
          "to": {
            "kind": "Service",
            "name": "s2i-spring-boot-cxf-jaxrs",
            "weight": 100
          },
          "port": {
            "targetPort": "8080-tcp"
          },
          "wildcardPolicy": "None"
        }
      }
    ]
  }
}

```

2. In the **OpenShift Explorer** view, right-click the project and click **New > Resource**.
3. In the **New OpenShift Resource** window:
 - a. In the **OpenShift project** list, click the project that you deployed the application to.
 - b. In the **Source** pane, click **Browse File System** and locate and select the `services-routes.json` file.
 - c. Click **Finish**.

Figure 2.11. Selecting the service-routes.json File

4. The **Create Resource Summary** window shows the details of the created service and route. Click OK.
5. In the **OpenShift Explorer** view, right-click the project and click **Show in > Web browser**. The **Whitelabel Error Page** shows that the application has no explicit mapping.
6. In the address bar, append the URL with `services/hello-service/sayHello/`. The URL should now look like: <http://s2i-spring-boot-cxf-jaxrs-192.168.42.28.nip.io/services/hello-service/sayHello/>.
7. Press Enter. The web browser shows the **Welcome to the CXF RS Spring Boot application**, append `{name}` to call the hello service message.
8. At the end of the URL, append a name, for example: <http://s2i-spring-boot-cxf-jaxrs-192.168.42.28.nip.io/services/hello-service/sayHello/John>. The page displays the message: **Hello John, Welcome to CXF RS Spring Boot World!!!**

Figure 2.12. Viewing the s2i-spring-boot-cxf-jaxrs Application in the Web Browser

CHAPTER 3. DEVELOPING FOR THE CLOUD WITH OPENSIFT 2



IMPORTANT

Starting with JBoss Developer Studio 11.0, development with OpenShift 2 is no longer supported.

CHAPTER 4. DEVELOPING WITH DOCKER

4.1. USING DOCKER TOOLING IN JBOSS DEVELOPER STUDIO

The DevStudio Docker tooling allows you to manage Docker Images and Containers. The Docker tooling functionality is the same as running the docker commands on the CLI. Docker tooling is the GUI-based interface of the Docker commands on the CLI.

4.1.1. Connecting to Docker Daemon

You must have a connection to a Docker daemon before you can work with Docker Images or Containers.

Prerequisites

4.1.1.1. Installing Docker

1. Install Docker on your system. To install it on different platforms:
 - On Windows, use: <https://docs.docker.com/docker-for-windows/install/>
 - On Fedora, use: <https://fedoraproject.org/wiki/Docker> or <https://docs.docker.com/engine/installation/>.
 - On MacOS, use: <https://docs.docker.com/docker-for-mac/install/>
2. After you have installed Docker, grant the user permission to work with Docker by running the following commands as the root user:

```
# groupadd docker && sudo gpasswd -a ${USER} docker && sudo
systemctl restart docker
# usermod -aG docker ${USER}
```

Where, {USER} is your username.

3. Either restart the system or log out and log into the system again for the changes to take effect.

4.1.1.2. Setting Up Account in Docker Tooling

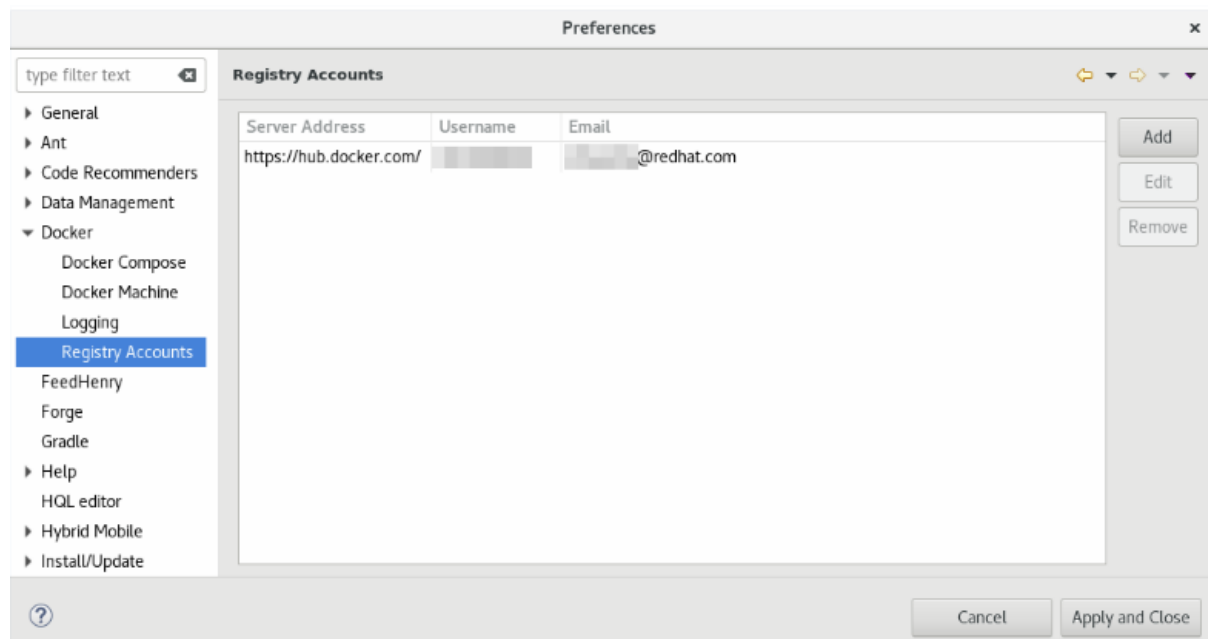


NOTE

You must set up the account in Docker tooling only if you want to push the images to the remote registry. If not, you may skip this section.

You must have an account set up in Docker Tooling. To do that:

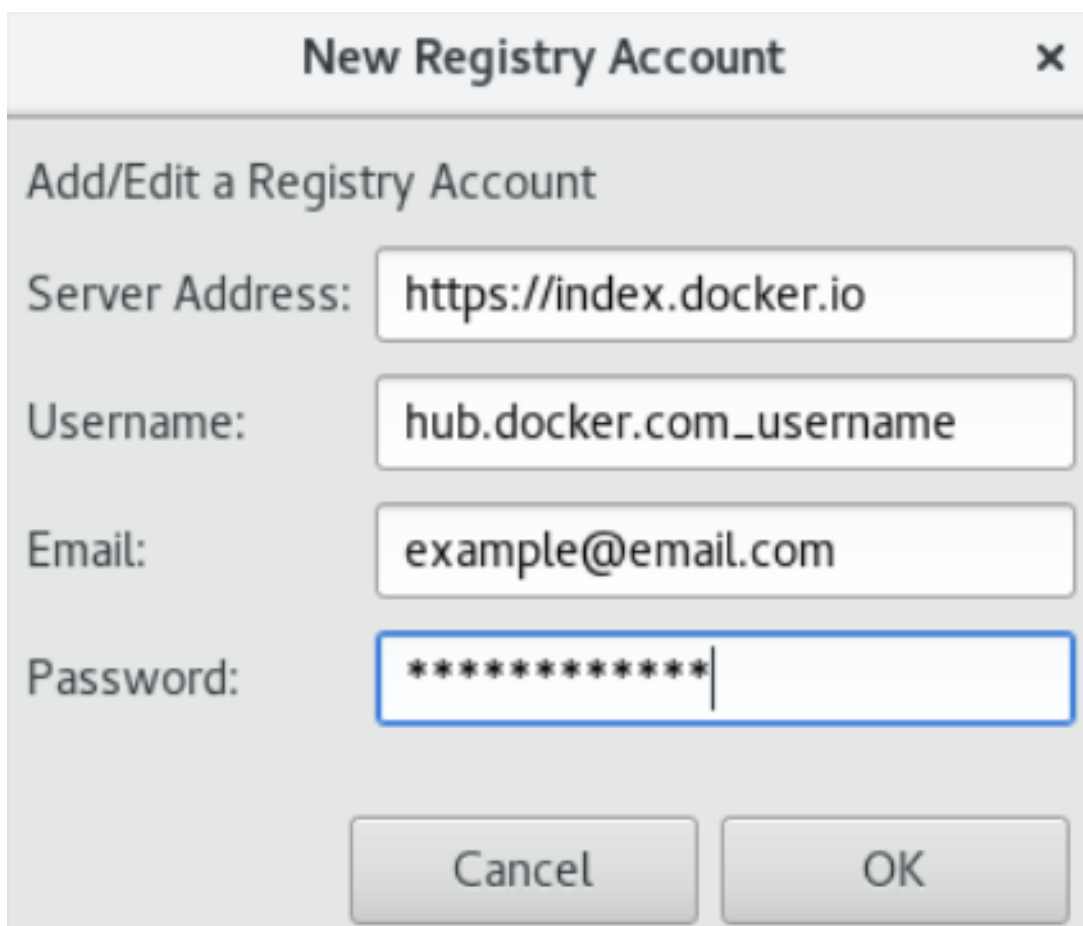
1. In the IDE, click **Window > Preferences > Docker > Registry Accounts**.

Figure 4.1. Creating a New Registry Account

2. Click **Add** to display the **New Registry Account** window.

3. In **New Registry Account** window:

- a. In the **Server Address** field, type <https://hub.docker.com/> (in this example, we are using <https://hub.docker.com/> as the Docker Registry).
- b. In the **Username** field, type the username that you use on hub.docker.com (if you don't already have a Docker ID as yet, navigate to <https://hub.docker.com/> and create one).
- c. In the **Email** field, type the email address that you used on <https://hub.docker.com/>.
- d. In the **Password** field, type the password for <https://hub.docker.com/>.
- e. Click **OK**.

Figure 4.2. Entering Details for the New Registry Account


New Registry Account [X]

Add/Edit a Registry Account

Server Address:

Username:

Email:

Password:

f. The **Preferences** window shows the details that you just entered. Click **Apply** and **Close**.

4.1.1.3. Testing an Existing Docker Connection

You must be connected to a Docker daemon before you can manage Docker images or containers.

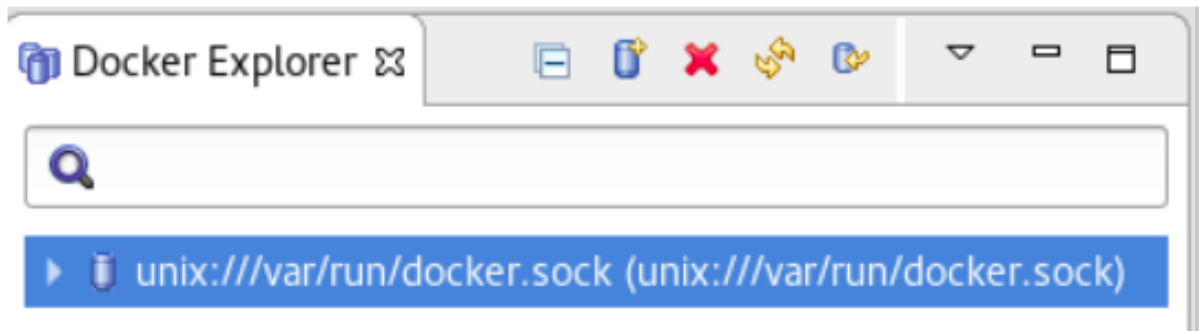
To display the **Docker Explorer** view:

1. Click **Window > Show View > Other** (or click **Window > Perspective > Open Perspective > Other** and then click **Docker Tooling**).
2. In the **type filter** textfield, type **Docker** and from the results click **Docker Explorer**. If you already have Docker installed on your system, the Unix socket location displays in the **Docker Explorer** view.



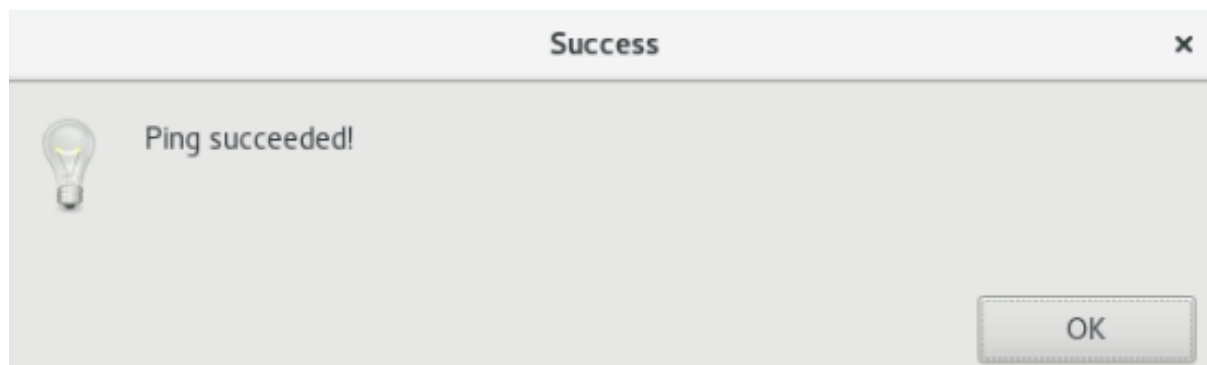
IMPORTANT

In case the Unix socket does not appear, refer to the note in the **Installing Docker** section to grant user the permissions required to work with Docker.

Figure 4.3. Unix Socket Location Displayed in the Docker Explorer View

To test the connection:

3. In the **Docker Explorer** view, right-click `unix:///var/run/docker.sock` and click **Edit** to open the **Edit Docker Connection** window.
4. Click **Test Connection**. The **Ping succeeded!** message confirms the connection.

Figure 4.4. The Ping succeeded! Message Confirming the Connection**NOTE**

In case your connection to the Docker daemon is lost, use the following two commands to restart the Docker daemon:

```
sudo systemctl start docker
sudo systemctl enable docker
```

4.1.1.4. Editing a Docker Connection

To edit a Docker connection:

1. In the **Docker Explorer** view, right-click the connection and click **Edit**. The **Edit Docker Connection** window opens.
2. Click **Browse** next to the **Unix socket Location** field to locate a new location of the Unix socket (or, check the TCP connection and add the URI).
3. After you have selected the new location, click **OK** and then click **Finish**.
To filter the **Docker Explorer** view:
4. In the **Docker Explorer** view, click the **View Menu** arrow and then click **Filters and Customization**.

5. Select the appropriate options to filter out the required images:

- a. Click the **Dangling (untagged) images** checkbox, to filter out images that are no longer referred to.
 - b. Click the **Intermediate images** checkbox, to filter out the images that have no repo tags that are parents of named images.
 - c. Click the **Stopped containers** checkbox, to filter out containers that are stopped but not paused.
 - d. Click the **Top-level images** checkbox, to show the first repo tag for an Image with multiple tags.
- You have performed various management operations on your Docker container.

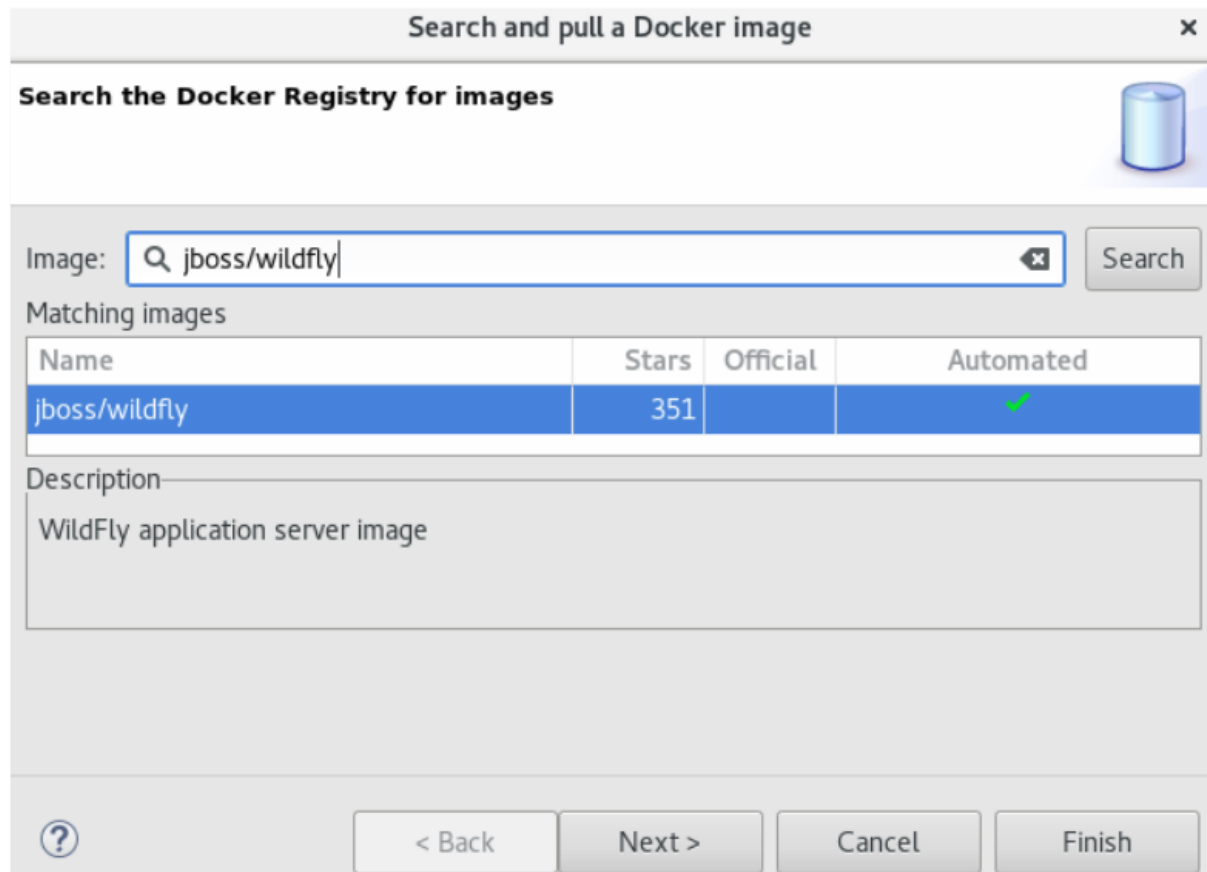
4.1.2. Managing Docker Images

In this section we will work with the `jboss/wildfly:11.0.0.Final` image.

4.1.2.1. Pulling the `jboss/wildfly:11.0.0.Final` Image

To pull the `jboss/wildfly:11.0.0.Final` image:

1. In the **Docker Explorer** view, expand the docker URL **>Images**.
2. Right-click the **Images** folder and click **Pull**. The **Pull Image** window opens.
3. In the **Pull Image** window, the Docker Hub registry is used by default. To specify an additional private registry, click the **Add a registry account** link.
4. Click **Search** to display the **Search and pull a Docker Image** window.
5. In the **Image** field, type `jboss/wildfly` and press **Enter**

Figure 4.5. Searching for the jboss/wildfly Image

6. Select the *jboss/wildfly* image and click **Next**.
7. In the **Choose a tag for the selected image** window, locate and click **11.0.0.Final**.
8. Click **Finish**. The **Pull Image** window, **Image name** field shows *jboss/wildfly:11.0.0.Final*.
9. Click **Finish**. The notification area in the IDE shows the progress of the image being pulled. Wait for the pull task to complete. This may take time because an Image may use several intermediate Images each of which may be several bytes.

In the **Docker Explorer** view, expand the docker URL >**Images**. The *docker.io/jboss/wildfly:11.0.0.Final* image is listed.

4.1.2.2. Pushing Images

After you push an image to the Docker Registry or to your private registry, the image becomes available in the Docker Cloud. This image is then available for use by other developers.

Prerequisites

Before you try to push, an Image it is important that you tag your Image.

To tag the Image:

1. In the **Docker Explorer** view, expand the docker URL >**Images**.
2. Right-click the image name that you want to add a tag to. Click **Add Tag**.
3. In the **Tag Image** window:
 - a. In the **New Tag** field, type `docker_hub/<your_username_on_docker_hub>/<image tag>`:

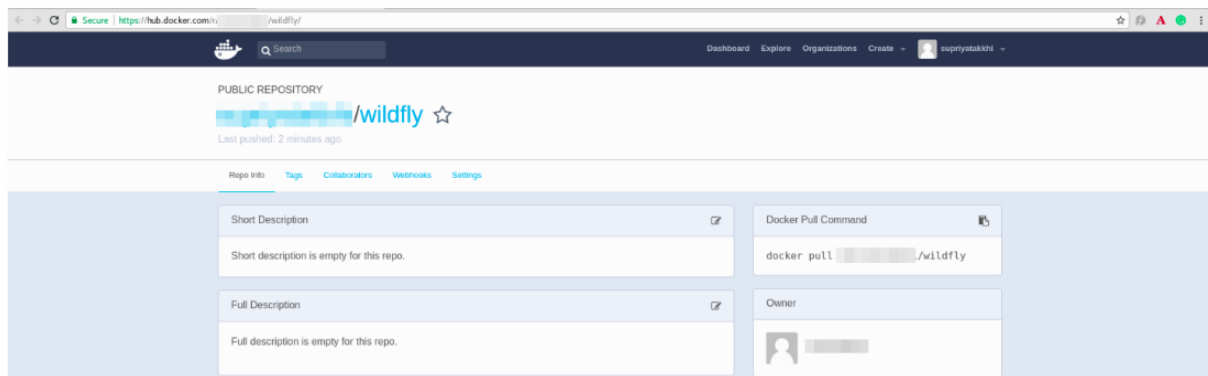
<version> (here: `docker.io/<your_username_on_docker_hub>/wildfly:11.0.0.Final`).

4. Click **Finish**. The new image with the tag appears in the **Images** folder:
`docker.io/<your_username_on_docker_hub>/wildfly:11.0.0.Final`.

To push an Image:

1. In the **Docker Explorer** view, expand the docker URL **>Images**.
2. Right-click the image name that you want to Push. Click **Push**. The **Push Image** window opens.
3. In the **Registry account** list, by default, the `docker.io` account appears. Change this to select the account that shows `<your_dockerhub_username>@<dockerhub URL>`.
4. Ensure that the **Image name** list displays the name of the image that you want to push. If not, select the image name from the list.
5. Click **Finish**. The notification area in the IDE shows the progress of the image being pushed. Wait for the push task to complete. After it is complete, the pushed Image is available in your public repository at <https://hub.docker.com/>.

Figure 4.6. Pushed Image in the Public Repository



4.1.2.3. Running Image Launch Configuration

In this section you will use the **Run Image** wizard to create a Container based on an Image.

To run an Image:

1. In the **Docker Explorer** view, expand the docker URL **>Images**.
2. Right-click the image name that you want to run
(`docker.io/<your_username_on_docker_hub>/wildfly:11.0.0.Final`, in this case). Click **Run**.
3. In the **Run a Docker Image** window:
 - a. The **Image** field, by default, shows the name of the image you are running. To run an Image that is not currently loaded, type the Image name in this field.
 - b. In the **Container Name** field, type a name for the container.
 - c. Clear the **Publish all exposed ports to random ports on the host interfaces** check box.
 - d. Click **Finish**.

Figure 4.7. Running the Image Launch Configuration

Run a Docker Image

Docker Container settings

Image:

docker.io/ /wildfly:11.0.0.Final

Search...

Pull this image...

Container Name:

Container for wildfly:11.0.0.Final

Entrypoint:

Command:

/opt/jboss/wildfly/bin/standalone.sh -b 0.0.0.0

☐ Publish all exposed ports to random ports on the host interfaces

Only publish the selected container ports below to the host:

Container Port	Type	Host Address	Host Port
<input checked="" type="checkbox"/> 8080	/tcp		8080

Add...

Edit...

Remove

Links to other containers:

Container Name	Alias

Add...

Edit...

Remove

☐ Keep STDIN open to Console even if not attached (-i)
☐ Allocate pseudo-TTY from Console (-t)
☐ Automatically remove the container when it exits (--rm)
☐ Give extended privileges to this container (--privileged)
☐ Use unconfined seccomp profile (--securityOpt seccomp=unconfined)
☐ Add basic security (--readonly --tmpfs /run --tmpfs /tmp --cap-drop=all)

?

< Back

Next >

Cancel

Finish

The **Console** view is the view in focus showing the progress of the task. The **WildFly Full 11.0.0.Final (WildFly Core 3.0.8.Final)** started in 3188ms - Started 292 of 553 services (347 services are lazy, passive or on-demand) message indicates that the image is started.

4. In the web browser navigate to <http://localhost:8080/> to see the Image running.

Figure 4.8. Image Running on Localhost



4.1.2.4. Building Images with Dockerfile

You can build an Image or create an Image by modifying an existing image. Typically, this involves installing new packages. The specification of the new Docker Image is done via a special file which must be named **Dockerfile**

Prerequisites

You must have a Dockerfile created on your local machine. Following is an example of a Dockerfile. You may use this sample file or have your own Dockerfile.

```
# Use latest jboss/base-jdk:8 image as the base
FROM jboss/base-jdk:8
# Set the WILDFLY_VERSION env variable
ENV WILDFLY_VERSION 11.0.0.Final
ENV WILDFLY_SHA1 0e89fe0860a87bfd6b09379ee38d743642edfcfb
ENV JBOSS_HOME /opt/jboss/wildfly
USER root
# Add the WildFly distribution to /opt, and make wildfly the owner of the
# extracted tar content
# Make sure the distribution is available from a well-known place
RUN cd $HOME \
  && curl -O https://download.jboss.org/wildfly/$WILDFLY_VERSION/wildfly-
$WILDFLY_VERSION.tar.gz \
  && sha1sum wildfly-$WILDFLY_VERSION.tar.gz | grep $WILDFLY_SHA1 \
  && tar xf wildfly-$WILDFLY_VERSION.tar.gz \
  && mv $HOME/wildfly-$WILDFLY_VERSION $JBOSS_HOME \
  && rm wildfly-$WILDFLY_VERSION.tar.gz \
  && chown -R jboss:0 ${JBOSS_HOME} \
  && chmod -R g+rw ${JBOSS_HOME}
# Ensure signals are forwarded to the JVM process correctly for graceful
# shutdown
ENV LAUNCH_JBOSS_IN_BACKGROUND true
USER jboss
# Expose the ports we're interested in
EXPOSE 8080
```

```
# Set the default command to run on boot
# This will boot WildFly in the standalone mode and bind to all interface
CMD ["/opt/jboss/wildfly/bin/standalone.sh", "-b", "0.0.0.0"]
```

To build an Image:

1. Open the **Docker Images** view by clicking **Window** → **Show View** → **Docker** → **Docker Images**.
2. Click the **Build Image** icon (image::docker_build_image_icon.png[width=25px]).
3. In the **Build a Docker Image** window:
 - a. In the **Image Name** field, type a new name for the Image in the **repo/name:version** format (**mydockerrepo/wildfly:11.0.0.Final**, in this case).
4. Click **Browse** next to the **Directory** field to locate and select the Dockerfile.
5. Click **Finish**. The **Console** view is the view in focus showing the progress of the image being built. The **Successfully built <image_ID>** message shows that the image has been built successfully.

4.1.2.5. Working with Image Tags

Tags are additional names for images. They are usually in the following format:
docker_hub/<your_username_on_docker_hub>/<image tag>:<version>.

4.1.2.5.1. Adding Tags to Images

To add a tag:

1. In the **Docker Explorer** view, right-click the image name that you want to add a tag to and, from the context menu, click **Add Tag**.
2. In the **Tag Image** window:
 - a. In the **New Tag** field, type **docker_hub/<your_username_on_docker_hub>/<image tag>:<version>** (in this case, **docker.io/<your_username_on_docker_hub>/wildfly:11.0.0.Final**).
 - b. Click **Finish**.

4.1.2.5.2. Removing Tags for Images

To remove a tag:

1. In the **Docker Explorer** view, right-click the image name that you want to remove the tag for.
2. From the context menu, click **Remove Tag**.
3. In the **Remove Image Tag** window:
 - a. Ensure that the **Tag** field, shows the name of the image that you want to remove the tag for. If not, select the appropriate image from the list.
 - b. Click **Finish**. The image is no longer listed in the **Docker Explorer** view.

4.1.3. Managing Docker Containers

Docker containers are isolated processes that are based on Docker Images. Once created, users can stop, start, pause, unpause, kill, or remove the containers, or read their logs. To manage the Docker Containers:

1. Click **Window** → **Show View** → **Other**.
2. In the **filter text field**, type **Docker** to view Docker-related options in the list.
3. Expand **Docker** and double-click **Docker Containers**. The **Docker Containers** view appears displaying a list of all containers running on the Docker host.
4. Click the desired container to select it. You can now manage your containers using the buttons in the **Docker Container** view header:
 - a. To pause the container, click **Pause**.
 - b. To start the container, click **Start**.
 - c. To view the container logs, right-click the container name and click **Display Log**.
 - d. To view a list of all containers, click on the right-most icon in the list of icons in the view, which displays a drop-down option to view all containers. Click this option to view all available containers.

4.1.4. Working with docker-compose.yml Files

You can use a docker-compose.yml file and start Docker Compose from the context menu of a project in the Project Explorer view. The docker-compose.yml file contains the configuration that is applied to each container started for a service. Docker compose is a tool for running applications composed from containers.

Prerequisites

1. Install Docker Compose: For instruction, see <https://docs.docker.com/compose/install/>.
2. Set up Docker Compose in DevStudio: Navigate to **Window** → **Preferences** → **Docker** → **Docker Compose**. In the **Docker Compose** field, select the location where Docker Compose is installed (usually, `/usr/local/bin`). Click **Apply** and **Close**.

4.1.4.1. Creating the docker-compose Project

To create the docker-compose project:

1. In the IDE, click **File** → **New** → **Project**.
2. In the **New Project** wizard, click **General** > **Project**. Click **Next**.
3. In the **Project name** field, type `docker-compose` and click **Finish**. The new docker-compose project is listed in the **Project Explorer** view.

4.1.4.2. Creating the Required Files in the docker-compose Project

In this section you will create the files required to run the docker-compose build.

To create the files:

1. In the **Project Explorer** view, right-click `docker-compose` and click **New** > **File**.

2. In the **New File** window, **File name** field, type **Dockerfile** and click **Finish**. The **Dockerfile** opens in the default editor.
3. In the **Dockerfile**, copy and paste the following content and save the file.

```
1FROM python:3.4-alpine
2ADD . /code
3WORKDIR /code
4RUN pip install -r requirements.txt
5CMD ["python", "app.py"]
```

4. In the **Project Explorer** view, right-click **docker-compose** and click **New > File**.
5. In the **New File** window, **File name** field, type **app.py** and click **Finish**. The **app.py** file opens in the default editor.
6. In the **app.py** file, copy and paste the following content and save the file.

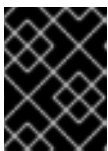
```
from flask import Flask
from redis import Redis

app = Flask(__name__)
redis = Redis(host='redis', port=6379)

@app.route('/')
def hello():
    count = redis.incr('hits')
    return 'Hello World! I have been seen {} times.\n'.format(count)

if __name__ == "__main__":
    app.run(host="0.0.0.0", debug=True)
```

7. In the **Project Explorer** view, right-click **docker-compose** and click **New > File**.
8. In the **New File** window, **File name** field, type **docker-compose.yml** and click **Finish**. The **docker-compose.yml** file opens in the default editor.
9. In the **docker-compose.yml** file, copy and paste the following content and save the file.



IMPORTANT

The indentation for the following file must be retained as shown here. If not retained, the **docker-compose.yml** file will have errors and will not build.

```
version: '3'
services:
  web:
    build: .
    ports:
      - "5000:5000"
  redis:
    image: "redis:alpine"
```

10. In the **Project Explorer** view, right-click **docker-compose** and click **New > File**.

11. In the **New File** window, **File name** field, type `requirements.txt` and click **Finish**. The `requirements.txt` file opens in the default editor.
12. In the `requirements.txt` file, copy and paste the following content and save the file.

```
1 | flask
2 | redis
```

= To build the docker-compose project:

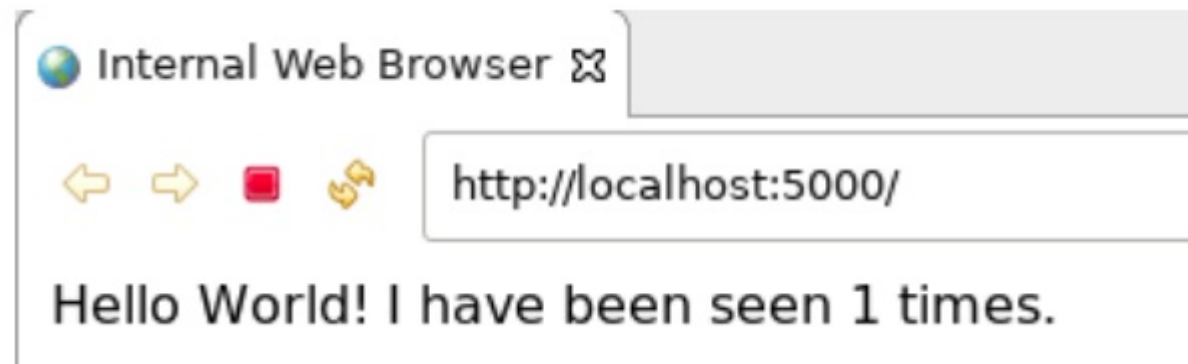
13. In the **Project Explorer** view, expand the **docker-compose** project.
14. Right-click the `docker-compose.yml` file, click **Run As > Docker Compose**. The **Console** view is the view in focus showing the progress of the of the image being pulled.

Figure 4.9. Console View Showing Progress of the Image Being Pulled

```
Status: Downloaded newer image for docker.io/redis:alpine
Creating dockercompose_web_1 ...
Creating dockercompose_redis_1 ...
Creating dockercompose_web_1
Creating dockercompose_redis_1
[1]A[1]2K
Creating dockercompose_web_1 ... done
[1]B[1]4[1]2K
Creating dockercompose_redis_1 ... done
[1]BAttaching to dockercompose_web_1, dockercompose_redis_1
web_1 | * Running on http://0.0.0.0:5000/ (Press CTRL+C to quit)
web_1 | * Restarting with stat
web_1 | * Debugger is active!
web_1 | * Debugger PID: 327.853-737
redis_1 | 1:C 20 Dec 09:35:24.924 # 000000000000 Redis is starting 000000000000
redis_1 | 1:C 20 Dec 09:35:24.924 # Redis version=4.0.6, bits=64, commit=00000000, modified=0, pid=1, just started
redis_1 | 1:C 20 Dec 09:35:24.924 # Warning: no config file specified, using the default config. In order to specify a config file use redis-server /path/to/redis.conf
redis_1 | 1:M 20 Dec 09:35:24.926 # Running mode=standalone, port=6379.
redis_1 | 1:M 20 Dec 09:35:24.926 # WARNING: The TCP backlog setting of 511 cannot be enforced because /proc/sys/net/core/somaxconn is set to the lower value of 128.
redis_1 | 1:M 20 Dec 09:35:24.926 # Server initialized
redis_1 | 1:M 20 Dec 09:35:24.926 # WARNING overcommit memory is set to 0! Background save may fail under low memory condition. To fix this issue add 'vm.overcommit_memory = 1' to /etc/sysctl.conf and then reboot or run the command 'sysctl vm.overcommit_memory=1' for this to take effect.
redis_1 | 1:M 20 Dec 09:35:24.927 # WARNING you have Transparent Huge Pages (THP) support enabled in your kernel. This will create latency and memory usage issues with Redis. To fix this issue run the command 'echo never > /sys/kernel/mm/transparent_hugepage/enabled' as root, and add it to your /etc/rc.local in order to retain the setting after a reboot. Redis must be restarted after THP is disabled.
redis_1 | 1:M 20 Dec 09:35:24.927 # Ready to accept connections.
```

The **Docker Explorer** view shows the containers running. Navigate to `localhost:5000` to see the application running.

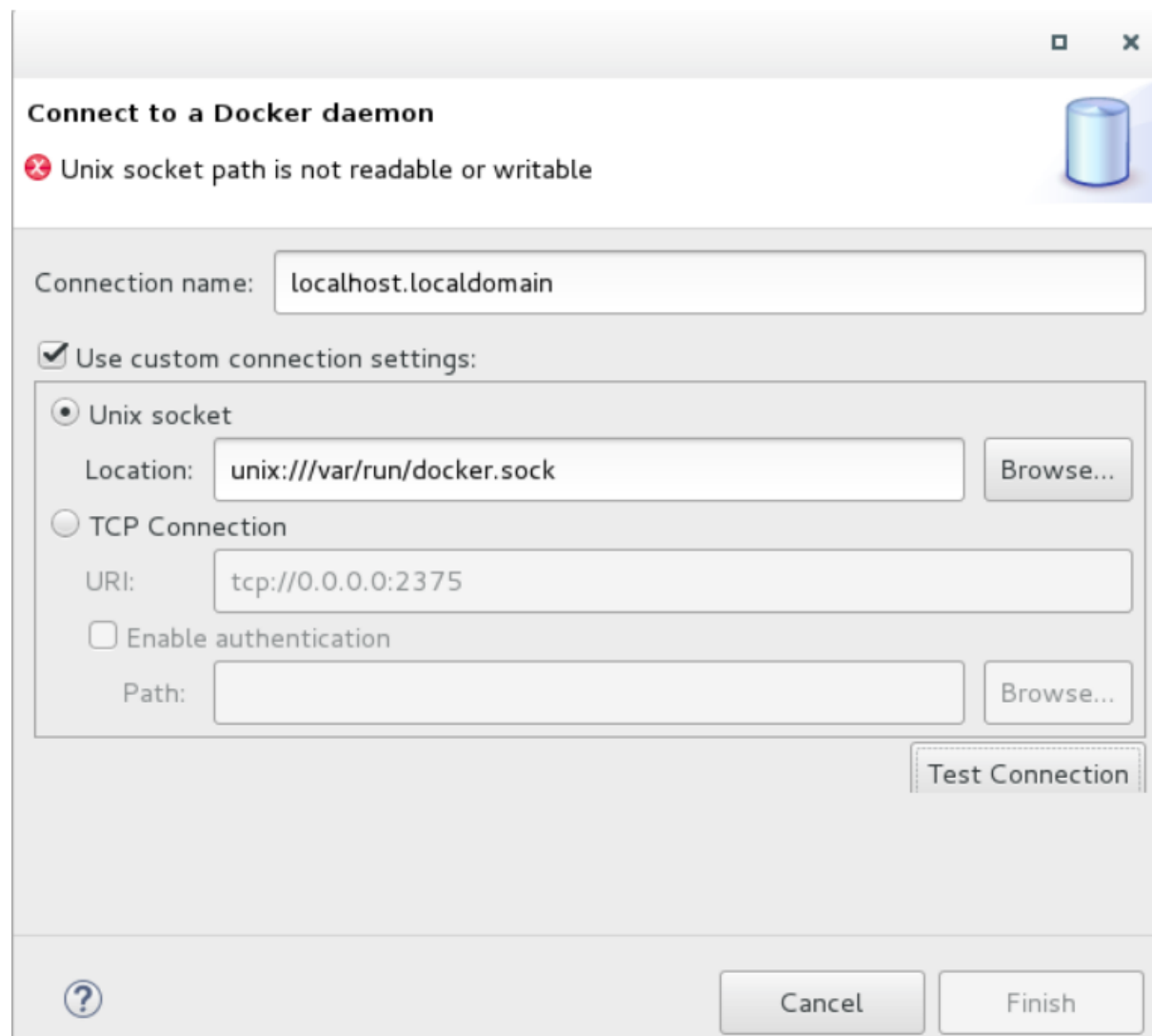
Figure 4.10. Application Running on Localhost



4.1.5. Troubleshooting

Attempting to connect to a running local Docker instance as a non-root user results in errors being logged, but not displayed in the User Interface, which results in the error being non-obvious. The following workarounds are available for this problem:

- Connect to the Docker instance manually. Define a custom configuration file and specify the TCP URL displayed by the `systemctl status docker` service. As an example, you can use a TCP URL such as `tcp://0.0.0.0:2375` to connect to the running Docker instance instead of the default `unix:///var/run/docker.sock` configuration file.

Figure 4.11. Error while Connection to Docker Daemon

- *Run Eclipse as root. This solution avoids the problem but is not the recommended solution.*