



Red Hat Decision Manager 7.9

Managing Red Hat Decision Manager and KIE Server settings

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Abstract

This document describes how to modify Red Hat Decision Manager and KIE Server settings and properties to meet your business needs.

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PREFACE

As a developer or system administrator, you can modify Red Hat Decision Manager and KIE Server settings and properties to meet your business needs. You can modify the behavior of the Red Hat Decision Manager runtime, the Business Central interface, or the KIE Server.

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](#).

PART I. MANAGING AND MONITORING KIE SERVER

As a system administrator, you can install, configure, and upgrade Red Hat Decision Manager for production environments, quickly and easily troubleshoot system failures, and ensure that systems are running optimally.

Prerequisites

- Red Hat JBoss Enterprise Application Platform 7.3 is installed. For more information, see [Red Hat JBoss Enterprise Application Platform 7.3 Installation Guide](#).
- Red Hat Decision Manager is installed. For more information, see [Planning a Red Hat Decision Manager installation](#).
- Red Hat Decision Manager is running and you can log in to Business Central with the **admin** role. For more information, see [Planning a Red Hat Decision Manager installation](#).

CHAPTER 1. RED HAT DECISION MANAGER COMPONENTS

Red Hat Decision Manager is made up of Business Central and KIE Server.

- Business Central is the graphical user interface where you create and manage business rules. You can install Business Central in a Red Hat JBoss EAP instance or on the Red Hat OpenShift Container Platform (OpenShift).
Business Central is also available as a standalone JAR file. You can use the Business Central standalone JAR file to run Business Central without needing to deploy it to an application server.
- KIE Server is the server where rules and other artifacts are executed. It is used to instantiate and execute rules and solve planning problems. You can install KIE Server in a Red Hat JBoss EAP instance, on OpenShift, in an Oracle WebLogic server instance, in an IBM WebSphere Application Server instance, or as a part of Spring Boot application.
You can configure KIE Server to run in managed or unmanaged mode. If KIE Server is unmanaged, you must manually create and maintain KIE containers (deployment units). A KIE container is a specific version of a project. If KIE Server is managed, the Decision Manager controller manages the KIE Server configuration and you interact with the Decision Manager controller to create and maintain KIE containers.

CHAPTER 2. SYSTEM INTEGRATION WITH MAVEN

Red Hat Decision Manager is designed to be used with [Red Hat JBoss Middleware Maven Repository](#) and Maven Central repository as dependency sources. Ensure that both the dependencies are available for projects builds.

Ensure that your project depends on specific versions of an artifact. **LATEST** or **RELEASE** are commonly used to specify and manage dependency versions in your application.

- **LATEST** refers to the latest deployed (snapshot) version of an artifact.
- **RELEASE** refers to the last non-snapshot version release in the repository.

By using **LATEST** or **RELEASE**, you do not have to update version numbers when a new release of a third-party library is released, however, you lose control over your build being affected by a software release.

2.1. PREEMPTIVE AUTHENTICATION FOR LOCAL PROJECTS

If your environment does not have access to the internet, set up an in-house Nexus and use it instead of Maven Central or other public repositories. To import JARs from the remote Maven repository of Red Hat Decision Manager server to a local Maven project, turn on pre-emptive authentication for the repository server. You can do this by configuring authentication for **guvnor-m2-repo** in the **pom.xml** file as shown below:

```
<server>
  <id>guvnor-m2-repo</id>
  <username>admin</username>
  <password>admin</password>
  <configuration>
    <wagonProvider>httpclient</wagonProvider>
    <httpConfiguration>
      <all>
        <usePreemptive>true</usePreemptive>
      </all>
    </httpConfiguration>
  </configuration>
</server>
```

Alternatively, you can set Authorization HTTP header with Base64 encoded credentials:

```
<server>
  <id>guvnor-m2-repo</id>
  <configuration>
    <httpHeaders>
      <property>
        <name>Authorization</name>
        <!-- Base64-encoded "admin:admin" -->
        <value>Basic YWRtaW46YWRtaW4=</value>
      </property>
    </httpHeaders>
  </configuration>
</server>
```

2.2. DUPLICATE GAV DETECTION IN BUSINESS CENTRAL

In Business Central, all Maven repositories are checked for any duplicated **GroupId**, **ArtifactId**, and **Version** (GAV) values in a project. If a GAV duplicate exists, the performed operation is canceled.



NOTE

Duplicate GAV detection is disabled for projects in **Development Mode**. To enable duplicate GAV detection in Business Central, go to project **Settings** → **General Settings** → **Version** and toggle the **Development Mode** option to **OFF** (if applicable).

Duplicate GAV detection is executed every time you perform the following operations:

- Save a project definition for the project.
- Save the **pom.xml** file.
- Install, build, or deploy a project.

The following Maven repositories are checked for duplicate GAVs:

- Repositories specified in the **<repositories>** and **<distributionManagement>** elements of the **pom.xml** file.
- Repositories specified in the Maven **settings.xml** configuration file.

2.3. MANAGING DUPLICATE GAV DETECTION SETTINGS IN BUSINESS CENTRAL

Business Central users with the **admin** role can modify the list of repositories that are checked for duplicate **GroupId**, **ArtifactId**, and **Version** (GAV) values for a project.



NOTE

Duplicate GAV detection is disabled for projects in **Development Mode**. To enable duplicate GAV detection in Business Central, go to project **Settings** → **General Settings** → **Version** and toggle the **Development Mode** option to **OFF** (if applicable).

Procedure

1. In Business Central, go to **Menu** → **Design** → **Projects** and click the project name.
2. Click the project **Settings** tab and then click **Validation** to open the list of repositories.
3. Select or clear any of the listed repository options to enable or disable duplicate GAV detection. In the future, duplicate GAVs will be reported for only the repositories you have enabled for validation.



NOTE

To disable this feature, set the **org.guvnor.project.gav.check.disabled** system property to **true** for Business Central at system startup:

```
$ ~/EAP_HOME/bin/standalone.sh -c standalone-full.xml  
-Dorg.guvnor.project.gav.check.disabled=true
```


CHAPTER 3. APPLYING PATCH UPDATES AND MINOR RELEASE UPGRADES TO RED HAT DECISION MANAGER

Automated update tools are often provided with both patch updates and new minor versions of Red Hat Decision Manager to facilitate updating certain components of Red Hat Decision Manager, such as Business Central, KIE Server, and the headless Decision Manager controller. Other Red Hat Decision Manager artifacts, such as the decision engine and standalone Business Central, are released as new artifacts with each minor release and you must re-install them to apply the update.

You can use the same automated update tool to apply both patch updates and minor release upgrades to Red Hat Decision Manager 7.9. Patch updates of Red Hat Decision Manager, such as an update from version 7.9 to 7.9.1, include the latest security updates and bug fixes. Minor release upgrades of Red Hat Decision Manager, such as an upgrade from version 7.8.x to 7.9, include enhancements, security updates, and bug fixes.



NOTE

Only updates for Red Hat Decision Manager are included in Red Hat Decision Manager update tools. Updates to Red Hat JBoss EAP must be applied using Red Hat JBoss EAP patch distributions. For more information about Red Hat JBoss EAP patching, see the [Red Hat JBoss EAP patching and upgrading guide](#).

Prerequisites

- Your Red Hat Decision Manager and KIE Server instances are not running. Do not apply updates while you are running an instance of Red Hat Decision Manager or KIE Server.

Procedure

1. Navigate to the [Software Downloads](#) page in the Red Hat Customer Portal (login required), and select the product and version from the drop-down options.
If you are upgrading to a new minor release of Red Hat Decision Manager, such as an upgrade from version 7.8.x to 7.9, first apply the latest patch update to your current version of Red Hat Decision Manager and then follow this procedure again to upgrade to the new minor release.
2. Click **Patches**, download the **Red Hat Decision Manager [VERSION] Update Tool** and extract the downloaded **rhdm-\$VERSION-update.zip** file to a temporary directory.
This update tool automates the update of certain components of Red Hat Decision Manager, such as Business Central, KIE Server, and the headless Decision Manager controller. Use this update tool first to apply updates and then install any other updates or new release artifacts that are relevant to your Red Hat Decision Manager distribution.
3. If you want to preserve any files from being updated by the update tool, navigate to the extracted **rhdm-\$VERSION-update** folder, open the **blacklist.txt** file, and add the relative paths to the files that you do not want to be updated.
When a file is listed in the **blacklist.txt** file, the update script does not replace the file with the new version but instead leaves the file in place and in the same location adds the new version with a **.new** suffix. If you blacklist files that are no longer being distributed, the update tool creates an empty marker file with a **.removed** suffix. You can then choose to retain, merge, or delete these new files manually.

Example files to be excluded in **blacklist.txt** file:

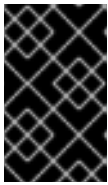
```
WEB-INF/web.xml // Custom file
styles/base.css // Obsolete custom file kept for record
```

The contents of the blacklisted file directories after the update:

```
$ ls WEB-INF
web.xml web.xml.new
```

```
$ ls styles
base.css base.css.removed
```

4. In your command terminal, navigate to the temporary directory where you extracted the **rhdm-\$VERSION-update.zip** file and run the **apply-updates** script in the following format:



IMPORTANT

Make sure that your Red Hat Decision Manager and KIE Server instances are not running before you apply updates. Do not apply updates while you are running an instance of Red Hat Decision Manager or KIE Server.

On Linux or Unix-based systems:

```
$ ./apply-updates.sh $DISTRO_PATH $DISTRO_TYPE
```

On Windows:

```
$ .\apply-updates.bat $DISTRO_PATH $DISTRO_TYPE
```

The **\$DISTRO_PATH** portion is the path to the relevant distribution directory and the **\$DISTRO_TYPE** portion is the type of distribution that you are updating with this update.

The following distribution types are supported in Red Hat Decision Manager update tool:

- **rhdm-decision-central-eap7-deployable**: Updates Business Central (**decision-central.war**)
- **rhdm-kie-server-ee8**: Updates KIE Server (**kie-server.war**)



NOTE

The update tool will update Red Hat JBoss EAP EE7 to Red Hat JBoss EAP EE8.

- **rhdm-kie-server-jws**: Updates KIE Server on Red Hat JBoss Web Server (**kie-server.war**)
- **rhdm-controller-ee7**: Updates the headless Decision Manager controller (**controller.war**)
- **rhdm-controller-jws**: Updates the headless Decision Manager controller on Red Hat JBoss Web Server (**controller.war**)

Example update to Business Central and KIE Server for a full Red Hat Decision Manager distribution on Red Hat JBoss EAP:

```
./apply-updates.sh ~EAP_HOME/standalone/deployments/decision-central.war rhdm-  
decision-central-eap7-deployable
```

```
./apply-updates.sh ~EAP_HOME/standalone/deployments/kie-server.war rhdm-kie-  
server-ee8
```

Example update to headless Decision Manager controller, if used:

```
./apply-updates.sh ~EAP_HOME/standalone/deployments/controller.war rhdm-controller-  
ee7
```

The update script creates a **backup** folder in the extracted **rhdm-\$VERSION-update** folder with a copy of the specified distribution, and then proceeds with the update.

- After the update tool completes, return to the **Software Downloads** page of the Red Hat Customer Portal where you downloaded the update tool and install any other updates or new release artifacts that are relevant to your Red Hat Decision Manager distribution.
For files that already exist in your Red Hat Decision Manager distribution, such as **.jar** files for the decision engine or other add-ons, replace the existing version of the file with the new version from the Red Hat Customer Portal.

- If you use the standalone **Red Hat Decision Manager 7.9.1 Maven Repository** artifact (**rhdm-7.9.1-maven-repository.zip**), such as in air-gap environments, download **Red Hat Decision Manager 7.9.x Maven Repository** and extract the downloaded **rhdm-7.9.x-maven-repository.zip** file to your existing **~/maven-repository** directory to update the relevant contents.

Example Maven repository update:

```
$ unzip -o rhdm-7.9.x-maven-repository.zip 'rhba-7.9.1.GA-maven-repository/maven-  
repository/' -d /tmp/rhbaMavenRepoUpdate
```

```
$ mv /tmp/rhbaMavenRepoUpdate/rhba-7.9.1.GA-maven-repository/maven-repository/  
$REPO_PATH/
```



NOTE

You can remove the **/tmp/rhbaMavenRepoUpdate** folder after you complete the update.

- After you finish applying all relevant updates, start Red Hat Decision Manager and KIE Server and log in to Business Central.
- Verify that all project data is present and accurate in Business Central, and in the top-right corner of the Business Central window, click your profile name and click **About** to verify the updated product version number.
If you encounter errors or notice any missing data in Business Central, you can restore the contents in the **backup** folder within the **rhdm-\$VERSION-update** folder to revert the update tool changes. You can also re-install the relevant release artifacts from your previous version of Red Hat Decision Manager in the Red Hat Customer Portal. After restoring your previous distribution, you can try again to run the update.

CHAPTER 4. CONFIGURING AND STARTING KIE SERVER

You can configure your KIE Server location, user name, password, and other related properties by defining the necessary configurations when you start KIE Server.

Procedure

Navigate to the Red Hat Decision Manager 7.9 **bin** directory and start the new KIE Server with the following properties. Adjust the specific properties according to your environment.

```
$ ~/EAP_HOME/bin/standalone.sh --server-config=standalone-full.xml ❶
-Dorg.kie.server.id=myserver ❷
-Dorg.kie.server.user=kie_server_username ❸
-Dorg.kie.server.pwd=kie_server_password ❹
-Dorg.kie.server.controller=http://localhost:8080/decision-central/rest/controller ❺
-Dorg.kie.server.controller.user=controller_username ❻
-Dorg.kie.server.controller.pwd=controller_password ❼
-Dorg.kie.server.location=http://localhost:8080/kie-server/services/rest/server ❽
```

- ❶ Start command with **standalone-full.xml** server profile
- ❷ Server ID that must match the server configuration name defined in Business Central
- ❸ User name to connect with KIE Server from the Decision Manager controller
- ❹ Password to connect with KIE Server from the Decision Manager controller
- ❺ Decision Manager controller location, Business Central URL with **/rest/controller** suffix
- ❻ User name to connect to the Decision Manager controller REST API
- ❼ Password to connect to the Decision Manager controller REST API
- ❽ KIE Server location (on the same instance as Business Central in this example)

NOTE

If Business Central and KIE Server are installed on separate application server instances (Red Hat JBoss EAP or other), use a separate port for the KIE Server location to avoid port conflicts with Business Central. If a separate KIE Server port has not already been configured, you can add a port offset and adjust the KIE Server port value accordingly in the KIE Server properties.

Example:

```
-Djboss.socket.binding.port-offset=150
-Dorg.kie.server.location=http://localhost:8230/kie-server/services/rest/server
```

If the Business Central port is 8080, as in this example, then the KIE Server port, with a defined offset of 150, is 8230.

KIE Server connects to the new Business Central and collects the list of deployment units (KIE containers) to be deployed.

NOTE

When you use a class inside a dependency JAR file to access KIE Server from KIE Server client, you get the **ConversionException** and **ForbiddenClassException** in Business Central. To avoid generating these exceptions in Business Central, do one of the following:

- If the exceptions are generated on the client-side, add following system property to the kie-server client:

```
System.setProperty("org.kie.server.xstream.enabled.packages", "org.example.**");
```

- If the exceptions are generated on the server-side, open **standalone-full.xml** from the Red Hat Decision Manager installation directory, set the following property under the <system-properties> tag:

```
<property name="org.kie.server.xstream.enabled.packages" value="org.example.**"/>
```

- Set the following JVM property:

```
-Dorg.kie.server.xstream.enabled.packages=org.example.**
```

It is expected that you do not configure the classes that exists in KJAR using these system property. Ensure that only known classes are used in the system property to avoid any vulnerabilities.

The **org.example** is an example package, you can define any package that you want to use. You can specify multiple packages separated by comma , for example, **org.example1.**** , **org.example2.**** , **org.example3.**** .

You can also add specific classes , for example, **org.example1.Mydata1** , **org.example2.Mydata2** .

CHAPTER 5. MANAGED KIE SERVER

A managed instance requires an available Decision Manager controller to start the KIE Server.

A Decision Manager controller manages the KIE Server configuration in a centralized way. Each Decision Manager controller can manage multiple configurations at once, and there can be multiple Decision Manager controllers in the environment. Managed KIE Server can be configured with a list of Decision Manager controllers, but will only connect to one at a time.



IMPORTANT

All Decision Manager controllers should be synchronized to ensure that the same set of configuration is provided to the server, regardless of the Decision Manager controller to which it connects.

When the KIE Server is configured with a list of Decision Manager controllers, it will attempt to connect to each of them at startup until a connection is successfully established with one of them. If a connection cannot be established, the server will not start, even if there is a local storage available with configuration. This ensures consistency and prevents the server from running with redundant configuration.



NOTE

To run the KIE Server in standalone mode without connecting to Decision Manager controllers, see [Chapter 6, *Unmanaged KIE Server*](#).

CHAPTER 6. UNMANAGED KIE SERVER

An unmanaged KIE Server is a standalone instance, and therefore must be configured individually using REST/JMS API from the KIE Server itself. The configuration is automatically persisted by the server into a file and that is used as the internal server state, in case of restarts.

The configuration is updated during the following operations:

- Deploy KIE container
- Undeploy KIE container
- Start KIE container
- Stop KIE container



NOTE

If the KIE Server is restarted, it will attempt to re-establish the same state that was persisted before shutdown. Therefore, KIE containers (deployment units) that were running will be started, but the ones that were stopped will not.

CHAPTER 7. CONFIGURING THE ENVIRONMENT MODE IN KIE SERVER AND BUSINESS CENTRAL

You can set KIE Server to run in **production** mode or in **development** mode. Development mode provides a flexible deployment policy that enables you to update existing deployment units (KIE containers) while maintaining active process instances for small changes. It also enables you to reset the deployment unit state before updating active process instances for larger changes. Production mode is optimal for production environments, where each deployment creates a new deployment unit.

In a development environment, you can click **Deploy** in Business Central to deploy the built KJAR file to a KIE Server without stopping any running instances (if applicable), or click **Redeploy** to deploy the built KJAR file and replace all instances. The next time you deploy or redeploy the built KJAR, the previous deployment unit (KIE container) is automatically updated in the same target KIE Server.

In a production environment, the **Redeploy** option in Business Central is disabled and you can click only **Deploy** to deploy the built KJAR file to a new deployment unit (KIE container) on a KIE Server.

Procedure

1. To configure the KIE Server environment mode, set the **org.kie.server.mode** system property to **org.kie.server.mode=development** or **org.kie.server.mode=production**.
2. To configure the deployment behavior for a project in Business Central, go to project **Settings** → **General Settings** → **Version** and toggle the **Development Mode** option.



NOTE

By default, KIE Server and all new projects in Business Central are in development mode.

You cannot deploy a project with **Development Mode** turned on or with a manually added **SNAPSHOT** version suffix to a KIE Server that is in production mode.

CHAPTER 8. CONFIGURING KIE SERVER TO CONNECT TO BUSINESS CENTRAL



WARNING

This section provides a sample setup that you can use for testing purposes. Some of the values are unsuitable for a production environment, and are marked as such.

If a KIE Server is not configured in your Red Hat Decision Manager environment, or if you require additional KIE Servers in your Red Hat Decision Manager environment, you must configure a KIE Server to connect to Business Central.



NOTE

If you are deploying KIE Server on Red Hat OpenShift Container Platform, see the [Deploying a Red Hat Decision Manager environment on Red Hat OpenShift Container Platform using Operators](#) document for instructions about configuring it to connect to Business Central.

KIE Server can be managed or unmanaged. If KIE Server is unmanaged, you must manually create and maintain KIE containers (deployment units). If KIE Server is managed, the Decision Manager controller manages the KIE Server configuration and you interact with the Decision Manager controller to create and maintain the KIE containers.



NOTE

Make the changes described in this section if KIE Server is managed by Business Central and you have installed Red Hat Decision Manager from the ZIP files. If you have installed Business Central, you can use the headless Decision Manager controller to manage KIE Server, as described in [Chapter 9, Installing and running the headless Decision Manager controller](#).

Prerequisites

- Business Central and KIE Server are installed in the base directory of the Red Hat JBoss EAP installation (**EAP_HOME**).



NOTE

You must install Business Central and KIE Server on different servers in production environments. In this sample situation, we use only one user named **controllerUser**, containing both **rest-all** and the **kie-server** roles. However, if you install KIE Server and Business Central on the same server, for example in a development environment, make the changes in the shared **standalone-full.xml** file as described in this section.

- Users with the following roles exist:
 - In Business Central, a user with the role **rest-all**

- On the KIE Server, a user with the role **kie-server**

Procedure

- In your Red Hat Decision Manager installation directory, navigate to the **standalone-full.xml** file. For example, if you use a Red Hat JBoss EAP installation for Red Hat Decision Manager, go to **\$EAP_HOME/standalone/configuration/standalone-full.xml**.
- Open **standalone-full.xml** file and under the **<system-properties>** tag, set the following JVM properties:

Table 8.1. JVM Properties for Managed KIE Server Instance

Property	Value	Note
org.kie.server.id	default-kie-server	The KIE Server ID.
org.kie.server.controller	http://localhost:8080/decision-central/rest/controller	The location of Business Central. The URL for connecting to the API of Business Central.
org.kie.server.controller.user	controllerUser	The user name with the role rest-all who can log in to the Business Central.
org.kie.server.controller.pwd	controllerUser1234;	The password of the user who can log in to the Business Central.
org.kie.server.location	http://localhost:8080/kie-server/services/rest/server	The location of the KIE Server. The URL for connecting to the API of KIE Server.

Table 8.2. JVM Properties for Business Central Instance

Property	Value	Note
org.kie.server.user	controllerUser	The user name with the role kie-server .
org.kie.server.pwd	controllerUser1234;	The password of the user.

Example for KIE Server Instance:

```
<property name="org.kie.server.id" value="default-kie-server"/>
<property name="org.kie.server.controller" value="http://localhost:8080/decision-
central/rest/controller"/>
<property name="org.kie.server.controller.user" value="controllerUser"/>
```

```
<property name="org.kie.server.controller.pwd" value="controllerUser1234;"/>
<property name="org.kie.server.location" value="http://localhost:8080/kie-
server/services/rest/server"/>
```

Example for Business Central Instance:

```
<property name="org.kie.server.user" value="controllerUser"/>
<property name="org.kie.server.pwd" value="controllerUser1234;"/>
```

3. To verify that KIE Server starts successfully, send a GET request to **http://*SERVER:PORT*/kie-server/services/rest/server/** when KIE Server is running. For more information about running Red Hat Decision Manager on KIE Server, see [Running Red Hat Decision Manager](#). After successful authentication, you receive an XML response similar to the following example:

```
<response type="SUCCESS" msg="Kie Server info">
  <kie-server-info>
    <capabilities>KieServer</capabilities>
    <capabilities>BRM</capabilities>
    <capabilities>BPM</capabilities>
    <capabilities>CaseMgmt</capabilities>
    <capabilities>BPM-UI</capabilities>
    <capabilities>BRP </capabilities>
    <capabilities>DMN</capabilities>
    <capabilities>Swagger</capabilities>
    <location>http://localhost:8230/kie-server/services/rest/server</location>
    <messages>
      <content>Server KieServerInfo{serverId='first-kie-server', version='7.5.1.Final-redhat-
1', location='http://localhost:8230/kie-server/services/rest/server', capabilities=[KieServer,
BRM, BPM, CaseMgmt, BPM-UI, BRP, DMN, Swagger]}started successfully at Mon Feb 05
15:44:35 AEST 2018</content>
      <severity>INFO</severity>
      <timestamp>2018-02-05T15:44:35.355+10:00</timestamp>
    </messages>
    <name>first-kie-server</name>
    <id>first-kie-server</id>
    <version>7.5.1.Final-redhat-1</version>
  </kie-server-info>
</response>
```

4. Verify the successful registration:
 - a. Log in to Business Central.
 - b. Click **Menu → Deploy → Execution Servers**.
If registration is successful, you can see the registered server ID.

CHAPTER 9. INSTALLING AND RUNNING THE HEADLESS DECISION MANAGER CONTROLLER

You can configure KIE Server to run in managed or unmanaged mode. If KIE Server is unmanaged, you must manually create and maintain KIE containers (deployment units). If KIE Server is managed, the Decision Manager controller manages the KIE Server configuration and you interact with the Decision Manager controller to create and maintain KIE containers.

Business Central has an embedded Decision Manager controller. If you install Business Central, use the **Execution Server** page to create and maintain KIE containers. If you want to automate KIE Server management without Business Central, you can use the headless Decision Manager controller.

9.1. USING THE INSTALLER TO CONFIGURE KIE SERVER WITH THE DECISION MANAGER CONTROLLER

KIE Server can be managed by the Decision Manager controller or it can be unmanaged. If KIE Server is unmanaged, you must manually create and maintain KIE containers (deployment units). If KIE Server is managed, the Decision Manager controller manages the KIE Server configuration and you interact with the Decision Manager controller to create and maintain KIE containers.

The Decision Manager controller is integrated with Business Central. If you install Business Central, you can use the **Execution Server** page in Business Central to interact with the Decision Manager controller.

You can use the installer in interactive or CLI mode to install Business Central and KIE Server, and then configure KIE Server with the Decision Manager controller.

Prerequisites

- Two computers with backed-up Red Hat JBoss EAP 7.3 server installations are available.
- Sufficient user permissions to complete the installation are granted.

Procedure

1. On the first computer, run the installer in interactive mode or CLI mode. See [Installing and configuring Red Hat Decision Manager on Red Hat JBoss EAP 7.3](#) for more information.
2. On the **Component Selection** page, clear the **KIE Server** box.
3. Complete the Business Central installation.
4. On the second computer, run the installer in interactive mode or CLI mode.
5. On the **Component Selection** page, clear the **Business Central** box.
6. On the **Configure Runtime Environment** page, select **Perform Advanced Configuration**.
7. Select **Customize KIE Server properties** and click **Next**.
8. Enter the controller URL for Business Central and configure additional properties for KIE Server. The controller URL has the following form where **<HOST:PORT>** is the address of Business Central on the second computer:

<HOST:PORT>/business-central/rest/controller

9. Complete the installation.
10. To verify that the Decision Manager controller is now integrated with Business Central, go to the **Execution Servers** page in Business Central and confirm that the KIE Server that you configured appears under **REMOTE SERVERS**.

9.2. INSTALLING THE HEADLESS DECISION MANAGER CONTROLLER

You can install the headless Decision Manager controller and use the REST API or the KIE Server Java Client API to interact with it.

Prerequisites

- A backed-up Red Hat JBoss EAP installation version 7.3 is available. The base directory of the Red Hat JBoss EAP installation is referred to as **EAP_HOME**.
- Sufficient user permissions to complete the installation are granted.

Procedure

1. Navigate to the [Software Downloads](#) page in the Red Hat Customer Portal (login required), and select the product and version from the drop-down options:
 - **Product:** Decision Manager
 - **Version:** 7.9
2. Download **Red Hat Decision Manager 7.9.1 Add Ons**(the **rhdm-7.9.1-add-ons.zip** file).
3. Unzip the **rhdm-7.9.1-add-ons.zip** file. The **rhdm-7.9.1-controller-ee7.zip** file is in the unzipped directory.
4. Extract the **rhdm-7.9.1-controller-ee7** archive to a temporary directory. In the following examples this directory is called **TEMP_DIR**.
5. Copy the **TEMP_DIR/rhdm-7.9.1-controller-ee7/controller.war** directory to **EAP_HOME/standalone/deployments/**.



WARNING

Ensure that the names of the headless Decision Manager controller deployments you copy do not conflict with your existing deployments in the Red Hat JBoss EAP instance.

6. Copy the contents of the **TEMP_DIR/rhdm-7.9.1-controller-ee7/SecurityPolicy/** directory to **EAP_HOME/bin**. When asked to overwrite files, select **Yes**.

7. In the ***EAP_HOME/standalone/deployments/*** directory, create an empty file named ***controller.war.dodeploy***. This file ensures that the headless Decision Manager controller is automatically deployed when the server starts.

9.2.1. Creating a headless Decision Manager controller user

Before you can use the headless Decision Manager controller, you must create a user that has the **kie-server** role.

Prerequisites

- The headless Decision Manager controller is installed in the base directory of the Red Hat JBoss EAP installation (***EAP_HOME***).

Procedure

1. In a terminal application, navigate to the ***EAP_HOME/bin*** directory.
2. Enter the following command and replace **<USER_NAME>** and **<PASSWORD>** with the user name and password of your choice.

```
$ ./add-user.sh -a --user <username> --password <password> --role kie-server
```



NOTE

Make sure that the specified user name is not the same as an existing user, role, or group. For example, do not create a user with the user name **admin**.

The password must have at least eight characters and must contain at least one number and one non-alphanumeric character, but not & (ampersand).

3. Make a note of your user name and password.

9.2.2. Configuring KIE Server and the headless Decision Manager controller

If KIE Server will be managed by the headless Decision Manager controller, you must edit the **standalone-full.xml** file in KIE Server installation and the **standalone.xml** file in the headless Decision Manager controller installation, as described in this section.

Prerequisites

- KIE Server is installed in the base directory of the Red Hat JBoss EAP installation (***EAP_HOME***).
- The headless Decision Manager controller is installed in an ***EAP_HOME***.



NOTE

You should install KIE Server and the headless Decision Manager controller on different servers in production environments. However, if you install KIE Server and the headless Decision Manager controller on the same server, for example in a development environment, make these changes in the shared **standalone-full.xml** file.

- On KIE Server nodes, a user with the **kie-server** role exists.
- On the server nodes, a user with the **kie-server** role exists.

Procedure

1. In the **EAP_HOME/standalone/configuration/standalone-full.xml** file, add the following properties to the **<system-properties>** section and replace **<USERNAME>** and **<USER_PWD>** with the credentials of a user with the **kie-server** role:

```
<property name="org.kie.server.user" value="<USERNAME>"/>
<property name="org.kie.server.pwd" value="<USER_PWD>"/>
```

2. In the KIE Server **EAP_HOME/standalone/configuration/standalone-full.xml** file, add the following properties to the **<system-properties>** section:

```
<property name="org.kie.server.controller.user" value="<CONTROLLER_USER>"/>
<property name="org.kie.server.controller.pwd" value="<CONTROLLER_PWD>"/>
<property name="org.kie.server.id" value="<KIE_SERVER_ID>"/>
<property name="org.kie.server.location" value="http://<HOST>:<PORT>/kie-
server/services/rest/server"/>
<property name="org.kie.server.controller" value="<CONTROLLER_URL>"/>
```

3. In this file, replace the following values:

- Replace **<CONTROLLER_USER>** and **<CONTROLLER_PWD>** with the credentials of a user with the **kie-server** role.
- Replace **<KIE_SERVER_ID>** with the ID or name of the KIE Server installation, for example, **rhdm-7.9.1-kie-server-1**.
- Replace **<HOST>** with the ID or name of the KIE Server host, for example, **localhost** or **192.7.8.9**.
- Replace **<PORT>** with the port of the KIE Server host, for example, **8080**.



NOTE

The **org.kie.server.location** property specifies the location of KIE Server.

- Replace **<CONTROLLER_URL>** with the URL of the headless Decision Manager controller.
 1. KIE Server connects to this URL during startup.

9.3. RUNNING THE HEADLESS DECISION MANAGER CONTROLLER

After you have installed the headless Decision Manager controller on Red Hat JBoss EAP, use this procedure to run the headless Decision Manager controller.

Prerequisites

- The headless Decision Manager controller is installed and configured in the base directory of the Red Hat JBoss EAP installation (**EAP_HOME**).

Procedure

1. In a terminal application, navigate to **EAP_HOME/bin**.
2. If you installed the headless Decision Manager controller on the same Red Hat JBoss EAP instance as the Red Hat JBoss EAP instance where you installed the KIE Server, enter one of the following commands:

- On Linux or UNIX-based systems:

```
$ ./standalone.sh -c standalone-full.xml
```

- On Windows:

```
standalone.bat -c standalone-full.xml
```

3. If you installed the headless Decision Manager controller on a separate Red Hat JBoss EAP instance from the Red Hat JBoss EAP instance where you installed the KIE Server, you can start the headless Decision Manager controller with the **standalone.sh** script:



NOTE

In this case, ensure that you made all required configuration changes to the **standalone.xml** file.

- On Linux or UNIX-based systems:

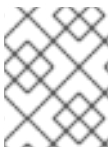
```
$ ./standalone.sh
```

- On Windows:

```
standalone.bat
```

4. To verify that the headless Decision Manager controller is working on Red Hat JBoss EAP, enter the following command where **<CONTROLLER>** and **<CONTROLLER_PWD>** is the user name and password. The output of this command provides information about the KIE Server instance.

```
curl -X GET "http://<HOST>:<PORT>/controller/rest/controller/management/servers" -H "accept: application/xml" -u '<CONTROLLER>:<CONTROLLER_PWD>'
```



NOTE

Alternatively, you can use the KIE Server Java API Client to access the headless Decision Manager controller.

9.4. CLUSTERING KIE SERVERS WITH THE HEADLESS DECISION MANAGER CONTROLLER

The Decision Manager controller is integrated with Business Central. However, if you do not install Business Central, you can install the headless Decision Manager controller and use the REST API or the KIE Server Java Client API to interact with it.

Prerequisites

Prerequisites

- A backed-up Red Hat JBoss EAP installation version 7.3 or later is available. The base directory of the Red Hat JBoss EAP installation is referred to as **EAP_HOME**.
- Sufficient user permissions to complete the installation are granted.
- An NFS server with a shared folder is available as described in [Installing and configuring Red Hat Decision Manager in a Red Hat JBoss EAP clustered environment](#).

Procedure

1. Navigate to the [Software Downloads](#) page in the Red Hat Customer Portal (login required), and select the product and version from the drop-down options:
 - **Product: Decision Manager**
 - **Version: 7.9**
2. Download **Red Hat Decision Manager 7.9.1 Add Ons**(the **rhdm-7.9.1-add-ons.zip** file).
3. Unzip the **rhdm-7.9.1-add-ons.zip** file. The **rhdm-7.9.1-controller-ee7.zip** file is in the unzipped directory.
4. Extract the **rhdm-7.9.1-controller-ee7** archive to a temporary directory. In the following examples this directory is called **TEMP_DIR**.
5. Copy the **TEMP_DIR/rhdm-7.9.1-controller-ee7/controller.war** directory to **EAP_HOME/standalone/deployments/**.



WARNING

Ensure that the names of the headless Decision Manager controller deployments you copy do not conflict with your existing deployments in the Red Hat JBoss EAP instance.

6. Copy the contents of the **TEMP_DIR/rhdm-7.9.1-controller-ee7/SecurityPolicy/** directory to **EAP_HOME/bin**. When asked to overwrite files, select **Yes**.
7. In the **EAP_HOME/standalone/deployments/** directory, create an empty file named **controller.war.dodeploy**. This file ensures that the headless Decision Manager controller is automatically deployed when the server starts.
8. Open the **EAP_HOME/standalone/configuration/standalone.xml** file in a text editor.
9. Add the following properties to the **<system-properties>** element and replace **<NFS_STORAGE>** with the absolute path to the NFS storage where the template configuration is stored:

```
<system-properties>
  <property name="org.kie.server.controller.templatefile.watcher.enabled" value="true"/>
  <property name="org.kie.server.controller.templatefile" value="<NFS_STORAGE>"/>
</system-properties>
```

```
</system-properties>
```

Template files contain default configurations for specific deployment scenarios.

If the value of the **org.kie.server.controller.templatefile.watcher.enabled** property is set to true, a separate thread is started to watch for modifications of the template file. The default interval for these checks is 30000 milliseconds and can be further controlled by the **org.kie.server.controller.templatefile.watcher.interval** system property. If the value of this property is set to false, changes to the template file are detected only when the server restarts.

10. To start the headless Decision Manager controller, navigate to **EAP_HOME/bin** and enter the following command:

- On Linux or UNIX-based systems:

```
$ ./standalone.sh
```

- On Windows:

```
standalone.bat
```

For more information about running Red Hat Decision Manager in a Red Hat JBoss Enterprise Application Platform clustered environment, see [Installing and configuring Red Hat Decision Manager in a Red Hat JBoss EAP clustered environment](#).

CHAPTER 10. DEPLOYMENT DESCRIPTORS

Processes and rules are stored in Apache Maven based packaging and are known as knowledge archives, or KJAR. The rules, processes, assets, and other project artifacts are part of a JAR file built and managed by Maven. A file kept inside the **META-INF** directory of the KJAR called **kmodule.xml** can be used to define the KIE bases and sessions. This **kmodule.xml** file, by default, is empty.

Whenever a runtime component such as KIE Server is about to process the KJAR, it looks up **kmodule.xml** to build the runtime representation.

Deployment descriptors supplement the **kmodule.xml** file and provide granular control over your deployment. The presence of these descriptors is optional and your deployment will proceed successfully without them. You can set purely technical properties using these descriptors, including meta values such as persistence, auditing, and runtime strategy.

These descriptors allow you to configure the KIE Server on multiple levels, including server level default, different deployment descriptor per KJAR, and other server configurations. You can use descriptors to make simple customizations to the default KIE Server configuration, possibly per KJAR.

You can define these descriptors in a file called **kie-deployment-descriptor.xml** and place this file next to your **kmodule.xml** file in the **META-INF** folder. You can change this default location and the file name by specifying it as a system parameter:

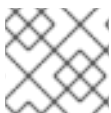
```
-Dorg.kie.deployment.desc.location=file:/path/to/file/company-deployment-descriptor.xml
```

10.1. DEPLOYMENT DESCRIPTOR CONFIGURATION

Deployment descriptors allow the user to configure the execution server on multiple levels:

- *Server level*: The main level and the one that applies to all KJARs deployed on the server.
- *KJAR level*: This enables you to configure descriptors on a per KJAR basis.
- *Deploy time level*: Descriptors that apply while a KJAR is being deployed.

The granular configuration items specified by the deployment descriptors take precedence over the server level ones, except in case of configuration items that are collection based, which are merged. The hierarchy works like this: *deploy time configuration* > *KJAR configuration* > *server configuration*.



NOTE

The deploy time configuration applies to deployments done via the REST API.

For example, if the persistence mode (one of the items you can configure) defined at the server level is **NONE** but the same mode is specified as **JPA** at the KJAR level, the actual mode will be **JPA** for that KJAR. If nothing is specified for the persistence mode in the deployment descriptor for that KJAR (or if there is no deployment descriptor), it will fall back to the server level configuration, which in this case is **NONE** (or to **JPA** if there is no server level deployment descriptor).

What Can You Configure?

High level technical configuration details can be configured via deployment descriptors. The following table lists these along with the permissible and default values for each.

Table 10.1. Deployment Descriptors

Configuration	XML Entry	Permissible Values	Default Value
Persistence unit name for runtime data	persistence-unit	Any valid persistence package name	org.jbpm.domain
Persistence unit name for audit data	audit-persistence-unit	Any valid persistence package name	org.jbpm.domain
Persistence mode	persistence-mode	JPA, NONE	JPA
Audit mode	audit-mode	JPA, JMS or NONE	JPA
Runtime Strategy	runtime-strategy	SINGLETON, PER_REQUEST or PER_PROCESS_INSTANCE	SINGLETON
List of Event Listeners to be registered	event-listeners	Valid listener class names as ObjectModel	No default value
List of Task Event Listeners to be registered	task-event-listeners	Valid listener class names as ObjectModel	No default value
List of Work Item Handlers to be registered	work-item-handlers	Valid Work Item Handler classes given as NamedObjectHandler	No default value
List of Globals to be registered	globals	Valid Global variables given as NamedObjectModel	No default value
Marshalling strategies to be registered (for pluggable variable persistence)	marshalling-strategies	Valid ObjectModel classes	No default value
Required Roles to be granted access to the resources of the KJAR	required-roles	String role names	No default value
Additional Environment Entries for KIE session	environment-entries	Valid NamedObjectModel	No default value
Additional configuration options of KIE session	configurations	Valid NamedObjectModel	No default value

Configuration	XML Entry	Permissible Values	Default Value
Classes used for serialization in the remote services	remoteable-class	Valid CustomClass	No default value



WARNING

Do not use the Singleton runtime strategy with the EJB Timer Scheduler (the default scheduler in KIE Server) in a production environment. This combination can result in Hibernate problems under load. Per process instance runtime strategy is recommended if there is no specific reason to use other strategies. For more information about this limitation, see [Hibernate issues with Singleton strategy and EJBTimerScheduler](#).

10.2. MANAGING DEPLOYMENT DESCRIPTORS

Deployment descriptors can be configured in Business Central in **Menu → Design → \$PROJECT_NAME → Settings → Deployments**.

Every time a project is created, a stock **kie-deployment-descriptor.xml** file is generated with default values.

It is not necessary to provide a full deployment descriptor for all KJARs. Providing partial deployment descriptors is possible and recommended. For example, if you need to use a different audit mode, you can specify that for the KJAR only, all other properties will have the default value defined at the server level.

When using **OVERRIDE_ALL** merge mode, all configuration items must be specified, because the relevant KJAR will always use specified configuration and will not merge with any other deployment descriptor in the hierarchy.

10.3. RESTRICTING ACCESS TO THE RUNTIME ENGINE

The **required-roles** configuration item can be edited in the deployment descriptors. This property restricts access to the runtime engine on a per-KJAR or per-server level by ensuring that access to certain processes is only granted to users that belong to groups defined by this property.

The security role can be used to restrict access to process definitions or restrict access at run time.

The default behavior is to add required roles to this property based on repository restrictions. You can edit these properties manually if required by providing roles that match actual roles defined in the security realm.

Procedure

1. To open the project deployment descriptors configuration in Business Central, open **Menu → Design → \$PROJECT_NAME → Settings → Deployments**.

2. From the list of configuration settings, click **Required Roles**, then click **Add Required Role**.
3. In the **Add Required Role** window, type the name of the role that you want to have permission to access this deployment, then click **Add**.
4. To add more roles with permission to access the deployment, repeat the previous steps.
5. When you have finished adding all required roles, click **Save**.

CHAPTER 11. PROMETHEUS METRICS MONITORING IN RED HAT DECISION MANAGER

Prometheus is an open-source systems monitoring toolkit that you can use with Red Hat Decision Manager to collect and store metrics related to the execution of business rules, processes, Decision Model and Notation (DMN) models, and other Red Hat Decision Manager assets. You can access the stored metrics through a REST API call to the KIE Server, through the Prometheus expression browser, or using a data-graphing tool such as Grafana.

You can configure Prometheus metrics monitoring for an on-premise KIE Server instance, for KIE Server on Spring Boot, or for a KIE Server deployment on Red Hat OpenShift Container Platform.

For the list of available metrics that KIE Server exposes with Prometheus, download the **Red Hat Decision Manager 7.9.1 Source Distribution** from the [Red Hat Customer Portal](#) and navigate to `~/rhdm-7.9.1-sources/src/droolsjbpm-integration-$VERSION/kie-server-parent/kie-server-services/kie-server-services-prometheus/src/main/java/org/kie/server/services/prometheus`.



IMPORTANT

Red Hat support for Prometheus is limited to the setup and configuration recommendations provided in Red Hat product documentation.

11.1. CONFIGURING PROMETHEUS METRICS MONITORING FOR KIE SERVER

You can configure your KIE Server instances to use Prometheus to collect and store metrics related to your business asset activity in Red Hat Decision Manager. For the list of available metrics that KIE Server exposes with Prometheus, download the **Red Hat Decision Manager 7.9.1 Source Distribution** from the [Red Hat Customer Portal](#) and navigate to `~/rhdm-7.9.1-sources/src/droolsjbpm-integration-$VERSION/kie-server-parent/kie-server-services/kie-server-services-prometheus/src/main/java/org/kie/server/services/prometheus`.

Prerequisites

- KIE Server is installed.
- You have **kie-server** user role access to KIE Server.
- Prometheus is installed. For information about downloading and using Prometheus, see the [Prometheus documentation page](#).

Procedure

1. In your KIE Server instance, set the **org.kie.prometheus.server.ext.disabled** system property to **false** to enable the Prometheus extension. You can define this property when you start KIE Server or in the **standalone.xml** or **standalone-full.xml** file of Red Hat Decision Manager distribution.
2. If you are running Red Hat Decision Manager on Spring Boot, configure the required key in the **application.properties** system property:

Spring Boot application.properties key for Red Hat Decision Manager and Prometheus

■

```
kieserver.drools.enabled=true
kieserver.dmn.enabled=true
kieserver.prometheus.enabled=true
```

3. In the **prometheus.yaml** file of your Prometheus distribution, add the following settings in the **scrape_configs** section to configure Prometheus to scrape metrics from KIE Server:

Scrape configurations in prometheus.yaml file

```
scrape_configs:
  - job_name: 'kie-server'
    metrics_path: /SERVER_PATH/services/rest/metrics
    basicAuth:
      username: USER_NAME
      password: PASSWORD
    static_configs:
      - targets: ["HOST:PORT"]
```

Scrape configurations in prometheus.yaml file for Spring Boot (if applicable)

```
scrape_configs:
  - job_name: 'kie'
    metrics_path: /rest/metrics
    static_configs:
      - targets: ["HOST:PORT"]
```

Replace the values according to your KIE Server location and settings.

4. Start the KIE Server instance.

Example start command for Red Hat Decision Manager on Red Hat JBoss EAP

```
$ cd ~/EAP_HOME/bin
$ ./standalone.sh --c standalone-full.xml
```

After you start the configured KIE Server instance, Prometheus begins collecting metrics and KIE Server publishes the metrics to the REST API endpoint

http://HOST:PORT/SERVER/services/rest/metrics (or on Spring Boot, to

http://HOST:PORT/rest/metrics).

5. In a REST client or curl utility, send a REST API request with the following components to verify that KIE Server is publishing the metrics:

For REST client:

- **Authentication:** Enter the user name and password of the KIE Server user with the **kie-server** role.
- **HTTP Headers:** Set the following header:
 - **Accept:** **application/json**
- **HTTP method:** Set to **GET**.

- **URL:** Enter the KIE Server REST API base URL and metrics endpoint, such as **http://localhost:8080/kie-server/services/rest/metrics** (or on Spring Boot, **http://localhost:8080/rest/metrics**).

For curl utility:

- **-u:** Enter the user name and password of the KIE Server user with the **kie-server** role.
- **-H:** Set the following header:
 - **accept: application/json**
- **-X:** Set to **GET**.
- **URL:** Enter the KIE Server REST API base URL and metrics endpoint, such as **http://localhost:8080/kie-server/services/rest/metrics** (or on Spring Boot, **http://localhost:8080/rest/metrics**).

Example curl command for Red Hat Decision Manager on Red Hat JBoss EAP

```
curl -u 'baAdmin:password@1' -X GET "http://localhost:8080/kie-server/services/rest/metrics"
```

Example curl command for Red Hat Decision Manager on Spring Boot

```
curl -u 'baAdmin:password@1' -X GET "http://localhost:8080/rest/metrics"
```

Example server response

```
# HELP kie_server_container_started_total Kie Server Started Containers
# TYPE kie_server_container_started_total counter
kie_server_container_started_total{container_id="task-assignment-kjar-1.0",} 1.0
# HELP solvers_running Number of solvers currently running
# TYPE solvers_running gauge
solvers_running 0.0
# HELP dmn_evaluate_decision_nanosecond DMN Evaluation Time
# TYPE dmn_evaluate_decision_nanosecond histogram
# HELP solver_duration_seconds Time in seconds it took solver to solve the constraint
problem
# TYPE solver_duration_seconds summary
solver_duration_seconds_count{solver_id="100tasks-5employees.xml",} 1.0
solver_duration_seconds_sum{solver_id="100tasks-5employees.xml",} 179.828255925
solver_duration_seconds_count{solver_id="24tasks-8employees.xml",} 1.0
solver_duration_seconds_sum{solver_id="24tasks-8employees.xml",} 179.995759653
# HELP drl_match_fired_nanosecond Drools Firing Time
# TYPE drl_match_fired_nanosecond histogram
# HELP dmn_evaluate_failed_count DMN Evaluation Failed
# TYPE dmn_evaluate_failed_count counter
# HELP kie_server_start_time Kie Server Start Time
# TYPE kie_server_start_time gauge
kie_server_start_time{name="myapp-kieserver",server_id="myapp-
kieserver",location="http://myapp-kieserver-demo-
monitoring.127.0.0.1.nip.io:80/services/rest/server",version="7.4.0.redhat-20190428",}
1.557221271502E12
# HELP kie_server_container_running_total Kie Server Running Containers
# TYPE kie_server_container_running_total gauge
```

```

kie_server_container_running_total{container_id="task-assignment-kjar-1.0"},} 1.0
# HELP solver_score_calculation_speed Number of moves per second for a particular solver
solving the constraint problem
# TYPE solver_score_calculation_speed summary
solver_score_calculation_speed_count{solver_id="100tasks-5employees.xml"},} 1.0
solver_score_calculation_speed_sum{solver_id="100tasks-5employees.xml"},} 6997.0
solver_score_calculation_speed_count{solver_id="24tasks-8employees.xml"},} 1.0
solver_score_calculation_speed_sum{solver_id="24tasks-8employees.xml"},} 19772.0

```

If the metrics are not available in KIE Server, review and verify the KIE Server and Prometheus configurations described in this section.

You can also interact with your collected metrics in the Prometheus expression browser at **<http://HOST:PORT/graph>**, or integrate your Prometheus data source with a data-graphing tool such as Grafana:

Figure 11.1. Prometheus expression browser with KIE Server metrics

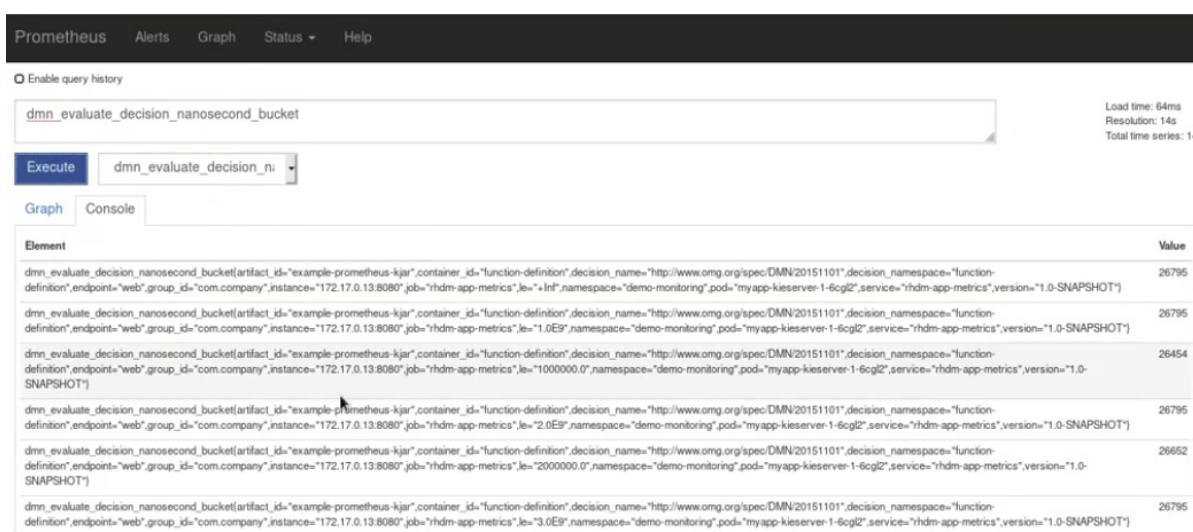


Figure 11.2. Prometheus expression browser with KIE Server target

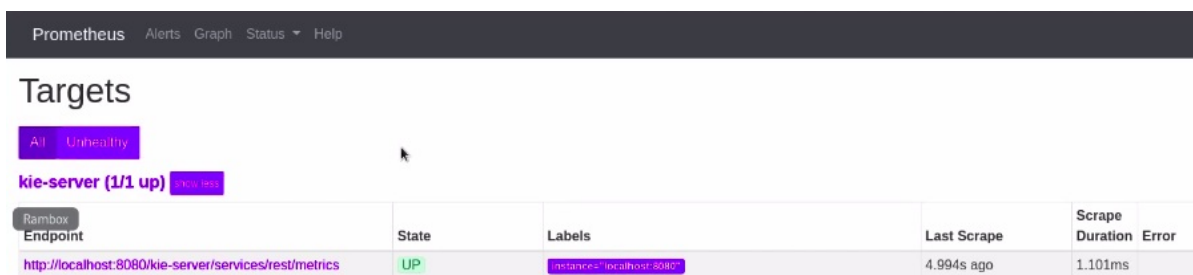
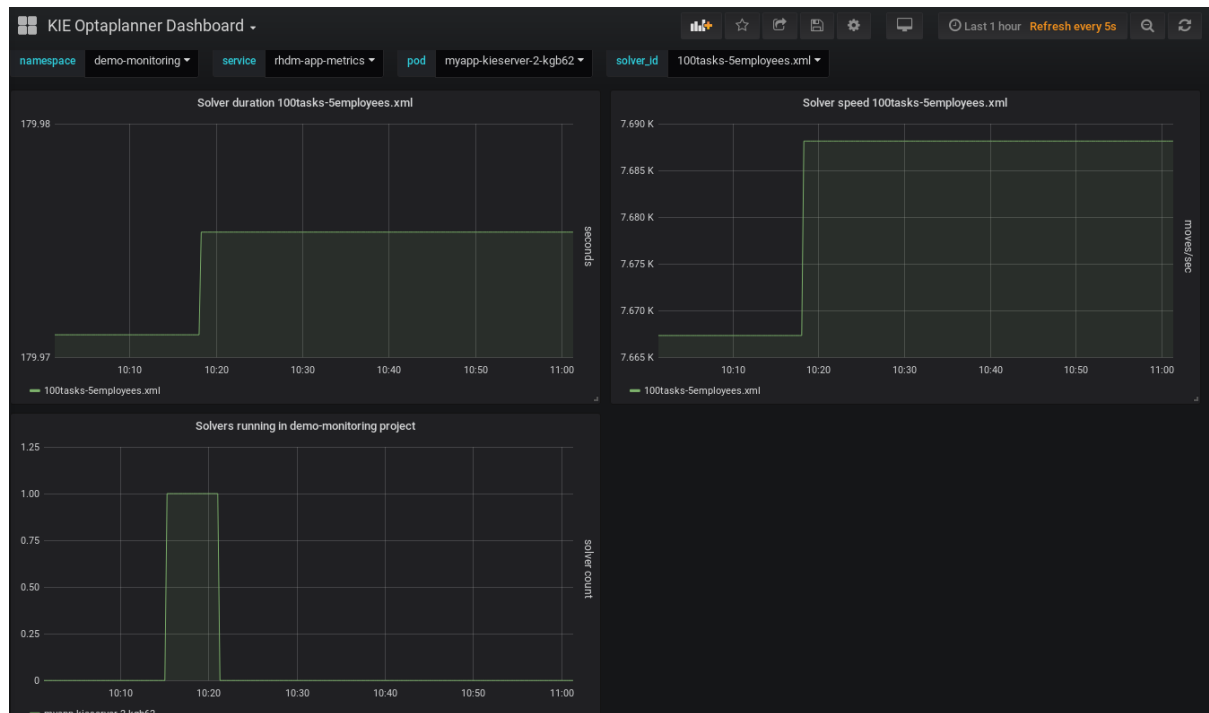


Figure 11.3. Grafana dashboard with KIE Server metrics for DMN models



Figure 11.4. Grafana dashboard with KIE Server metrics for solvers



Additional resources

- [Getting Started with Prometheus](#)
- [Grafana Support for Prometheus](#)
- [Using Prometheus in Grafana](#)

11.2. CONFIGURING PROMETHEUS METRICS MONITORING FOR KIE SERVER ON RED HAT OPENSIFT CONTAINER PLATFORM

You can configure your KIE Server deployment on Red Hat OpenShift Container Platform to use Prometheus to collect and store metrics related to your business asset activity in Red Hat Decision Manager. For the list of available metrics that KIE Server exposes with Prometheus, download the **Red Hat Decision Manager 7.9.1 Source Distribution** from the [Red Hat Customer Portal](#) and navigate to `~/rhdm-7.9.1-sources/src/droolsjbpm-integration-$VERSION/kie-server-parent/kie-server-services/kie-server-services-prometheus/src/main/java/org/kie/server/services/prometheus`.

Prerequisites

Prerequisites

- KIE Server is installed and deployed on Red Hat OpenShift Container Platform. For more information about KIE Server on OpenShift, see the relevant OpenShift deployment option in the [Product documentation for Red Hat Decision Manager 7.9](#).
- You have **kie-server** user role access to KIE Server.
- Prometheus Operator is installed. For information about downloading and using Prometheus Operator, see the [Prometheus Operator](#) project in GitHub.

Procedure

1. In the **DeploymentConfig** object of your KIE Server deployment on OpenShift, set the **PROMETHEUS_SERVER_EXT_DISABLED** environment variable to **false** to enable the Prometheus extension. You can set this variable in the OpenShift web console or use the **oc** command in a command terminal:

```
oc set env dc/<dc_name> PROMETHEUS_SERVER_EXT_DISABLED=false -n
<namespace>
```

If you have not yet deployed your KIE Server on OpenShift, then in the OpenShift template that you plan to use for your OpenShift deployment (for example, **rhdm79-prod-immutable-kieserver.yaml**), you can set the **PROMETHEUS_SERVER_EXT_DISABLED** template parameter to **false** to enable the Prometheus extension.

If you are using the OpenShift Operator to deploy KIE Server on OpenShift, then in your KIE Server configuration, set the **PROMETHEUS_SERVER_EXT_DISABLED** environment variable to **false** to enable the Prometheus extension:

```
apiVersion: app.kiegroup.org/v1
kind: KieApp
metadata:
  name: enable-prometheus
spec:
  environment: rhpam-trial
  objects:
    servers:
      - env:
          - name: PROMETHEUS_SERVER_EXT_DISABLED
            value: "false"
```

2. Create a **service-metrics.yaml** file to add a service that exposes the metrics from KIE Server to Prometheus:

```
apiVersion: v1
kind: Service
metadata:
  annotations:
    description: RHDM Prometheus metrics exposed
  labels:
    app: myapp-kieserver
    application: myapp-kieserver
    template: myapp-kieserver
    metrics: rhdm
  name: rhdm-app-metrics
```

```
spec:
  ports:
    - name: web
      port: 8080
      protocol: TCP
      targetPort: 8080
  selector:
    deploymentConfig: myapp-kieserver
  sessionAffinity: None
  type: ClusterIP
```

3. In a command terminal, use the **oc** command to apply the **service-metrics.yaml** file to your OpenShift deployment:

```
oc apply -f service-metrics.yaml
```

4. Create an OpenShift secret, such as **metrics-secret**, to access the Prometheus metrics on KIE Server. The secret must contain the "username" and "password" elements with KIE Server user credentials. For information about OpenShift secrets, see the [Secrets](#) chapter in the OpenShift *Developer Guide*.
5. Create a **service-monitor.yaml** file that defines the **ServiceMonitor** object. A service monitor enables Prometheus to connect to the KIE Server metrics service.

```
apiVersion: monitoring.coreos.com/v1
kind: ServiceMonitor
metadata:
  name: rhdm-service-monitor
  labels:
    team: frontend
spec:
  selector:
    matchLabels:
      metrics: rhdm
  endpoints:
    - port: web
      path: /services/rest/metrics
      basicAuth:
        password:
          name: metrics-secret
          key: password
        username:
          name: metrics-secret
          key: username
```

6. In a command terminal, use the **oc** command to apply the **service-monitor.yaml** file to your OpenShift deployment:

```
oc apply -f service-monitor.yaml
```

After you complete these configurations, Prometheus begins collecting metrics and KIE Server publishes the metrics to the REST API endpoint **http://HOST:PORT/kie-server/services/rest/metrics**.

You can interact with your collected metrics in the Prometheus expression browser at **http://HOST:PORT/graph**, or integrate your Prometheus data source with a data-graphing tool such as Grafana.

The host and port for the Prometheus expression browser location **http://HOST:PORT/graph** was defined in the route where you exposed the Prometheus web console when you installed the Prometheus Operator. For information about OpenShift routes, see the [Routes](#) chapter in the OpenShift *Architecture* documentation.

Figure 11.5. Prometheus expression browser with KIE Server metrics

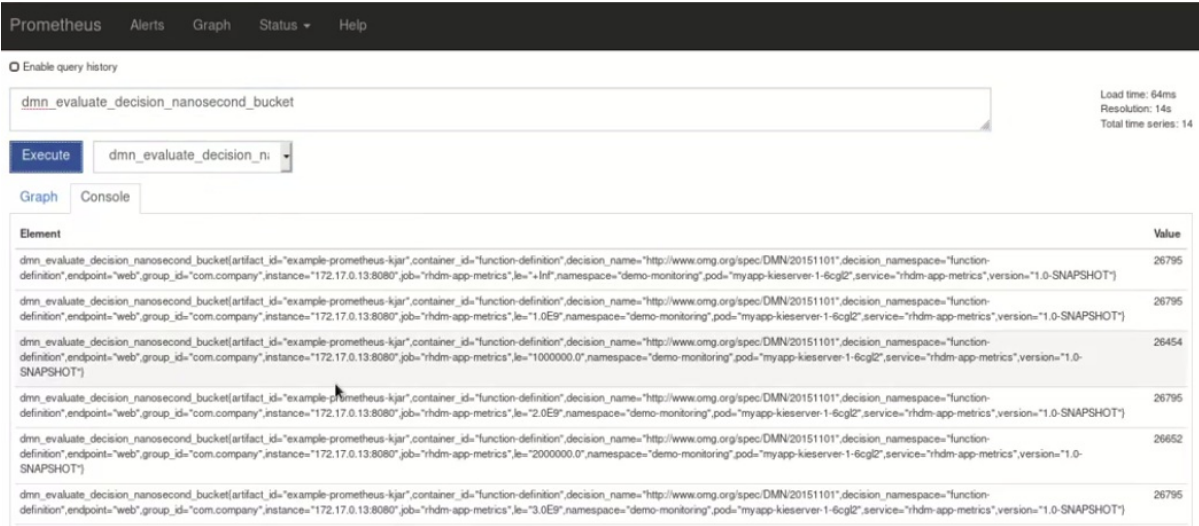


Figure 11.6. Prometheus expression browser with KIE Server target

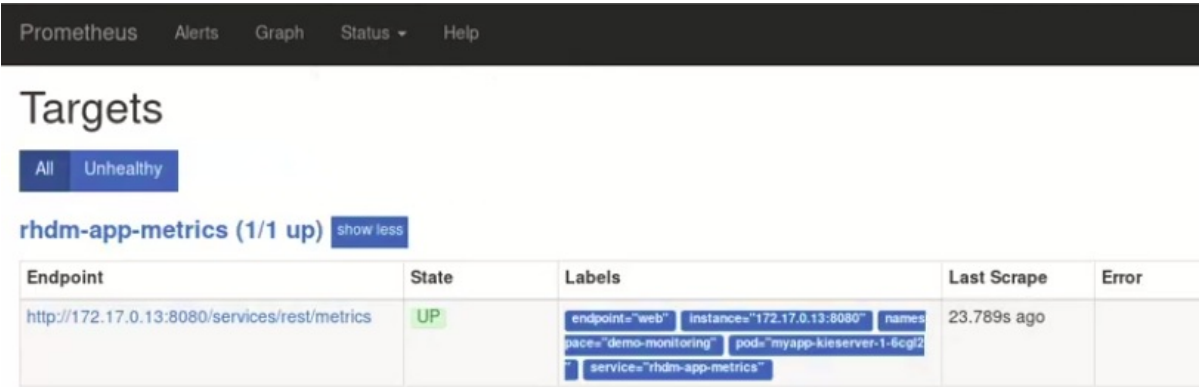
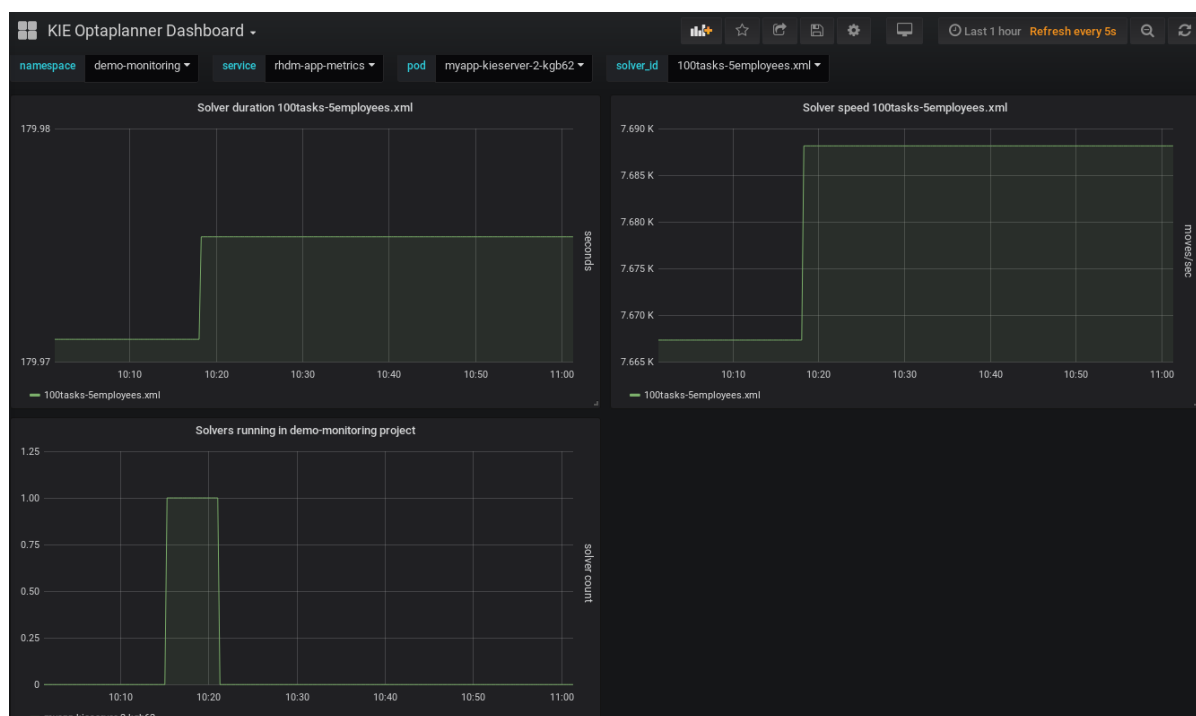


Figure 11.7. Grafana dashboard with KIE Server metrics for DMN models



Figure 11.8. Grafana dashboard with KIE Server metrics for solvers



Additional resources

- [Prometheus Operator](#)
- [Getting started with the Prometheus Operator](#)
- [Prometheus RBAC](#)
- [Grafana Support for Prometheus](#)
- [Using Prometheus in Grafana](#)
- OpenShift deployment options in [Product documentation for Red Hat Decision Manager 7.9](#)

11.3. EXTENDING PROMETHEUS METRICS MONITORING IN KIE SERVER WITH CUSTOM METRICS

After you configure your KIE Server instance to use Prometheus metrics monitoring, you can extend the Prometheus functionality in KIE Server to use custom metrics according to your business needs. Prometheus then collects and stores your custom metrics along with the default metrics that KIE Server exposes with Prometheus.

As an example, this procedure defines custom Decision Model and Notation (DMN) metrics to be collected and stored by Prometheus.

Prerequisites

- Prometheus metrics monitoring is configured for your KIE Server instance. For information about Prometheus configuration with KIE Server on-premise, see [Section 11.1, “Configuring Prometheus metrics monitoring for KIE Server”](#). For information about Prometheus configuration with KIE Server on Red Hat OpenShift Container Platform, see [Section 11.2, “Configuring Prometheus metrics monitoring for KIE Server on Red Hat OpenShift Container Platform”](#).

Procedure

1. Create an empty Maven project and define the following packaging type and dependencies in the **pom.xml** file for the project:

Example pom.xml file in the sample project

```
<packaging>jar</packaging>

<properties>
  <version.org.kie>7.44.0.Final-redhat-00006</version.org.kie>
</properties>

<dependencies>
  <dependency>
    <groupId>org.kie</groupId>
    <artifactId>kie-api</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.kie.server</groupId>
    <artifactId>kie-server-api</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.kie.server</groupId>
    <artifactId>kie-server-services-common</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.kie.server</groupId>
    <artifactId>kie-server-services-drools</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.kie.server</groupId>
    <artifactId>kie-server-services-prometheus</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.kie</groupId>
    <artifactId>kie-dmn-api</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.kie</groupId>
    <artifactId>kie-dmn-core</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.jbpm</groupId>
    <artifactId>jbpm-services-api</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.jbpm</groupId>
```



```

    <artifactId>jbpm-executor</artifactId>
    <version>${version.org.kie}</version>
</dependency>
<dependency>
    <groupId>org.optaplanner</groupId>
    <artifactId>optaplanner-core</artifactId>
    <version>${version.org.kie}</version>
</dependency>
<dependency>
    <groupId>io.prometheus</groupId>
    <artifactId>simpleclient</artifactId>
    <version>0.5.0</version>
</dependency>
</dependencies>

```

2. Implement the relevant listener from the **org.kie.server.services.prometheus.PrometheusMetricsProvider** interface as part of the custom listener class that defines your custom Prometheus metrics, as shown in the following example:

Sample implementation of the **DMNRuntimeEventListener** listener in a custom listener class

```

package org.kie.server.ext.prometheus;

import io.prometheus.client.Gauge;
import org.kie.dmn.api.core.ast.DecisionNode;
import org.kie.dmn.api.core.event.AfterEvaluateBKMEvent;
import org.kie.dmn.api.core.event.AfterEvaluateContextEntryEvent;
import org.kie.dmn.api.core.event.AfterEvaluateDecisionEvent;
import org.kie.dmn.api.core.event.AfterEvaluateDecisionServiceEvent;
import org.kie.dmn.api.core.event.AfterEvaluateDecisionTableEvent;
import org.kie.dmn.api.core.event.BeforeEvaluateBKMEvent;
import org.kie.dmn.api.core.event.BeforeEvaluateContextEntryEvent;
import org.kie.dmn.api.core.event.BeforeEvaluateDecisionEvent;
import org.kie.dmn.api.core.event.BeforeEvaluateDecisionServiceEvent;
import org.kie.dmn.api.core.event.BeforeEvaluateDecisionTableEvent;
import org.kie.dmn.api.core.event.DMNRuntimeEventListener;
import org.kie.server.api.model.ReleaseId;
import org.kie.server.services.api.KieContainerInstance;

public class ExampleCustomPrometheusMetricListener implements
    DMNRuntimeEventListener {

    private final KieContainerInstance kieContainer;

    private final Gauge randomGauge = Gauge.build()
        .name("random_gauge_nanosecond")
        .help("Random gauge as an example of custom KIE Prometheus metric")
        .labelNames("container_id", "group_id", "artifact_id", "version",
            "decision_namespace", "decision_name")
        .register();

    public ExampleCustomPrometheusMetricListener(KieContainerInstance
        containerInstance) {

```

```

        kieContainer = containerInstance;
    }

    public void beforeEvaluateDecision(BeforeEvaluateDecisionEvent e) {
    }

    public void afterEvaluateDecision(AfterEvaluateDecisionEvent e) {
        DecisionNode decisionNode = e.getDecision();
        ReleaseId releaseId = kieContainer.getResource().getReleaseId();
        randomGauge.labels(kieContainer.getContainerId(), releaseId.getGroupId(),
            releaseId.getArtifactId(), releaseId.getVersion(),
            decisionNode.getModelName(), decisionNode.getModelNamespace())
            .set((int) (Math.random() * 100));
    }

    public void beforeEvaluateBKM(BeforeEvaluateBKMEvent event) {
    }

    public void afterEvaluateBKM(AfterEvaluateBKMEvent event) {
    }

    public void beforeEvaluateContextEntry(BeforeEvaluateContextEntryEvent event) {
    }

    public void afterEvaluateContextEntry(AfterEvaluateContextEntryEvent event) {
    }

    public void beforeEvaluateDecisionTable(BeforeEvaluateDecisionTableEvent event) {
    }

    public void afterEvaluateDecisionTable(AfterEvaluateDecisionTableEvent event) {
    }

    public void beforeEvaluateDecisionService(BeforeEvaluateDecisionServiceEvent event) {
    }

    public void afterEvaluateDecisionService(AfterEvaluateDecisionServiceEvent event) {
    }
}

```

The **PrometheusMetricsProvider** interface contains the required listeners for collecting Prometheus metrics. The interface is incorporated by the **kie-server-services-prometheus** dependency that you declared in your project **pom.xml** file.

In this example, the **ExampleCustomPrometheusMetricListener** class implements the **DMNRuntimeEventListener** listener (from the **PrometheusMetricsProvider** interface) and defines the custom DMN metrics to be collected and stored by Prometheus.

3. Implement the **PrometheusMetricsProvider** interface as part of a custom metrics provider class that associates your custom listener with the **PrometheusMetricsProvider** interface, as shown in the following example:

Sample implementation of the **PrometheusMetricsProvider interface in a custom metrics provider class**

```

package org.kie.server.ext.prometheus;

```

```

import org.jbpm.executor.AsynchronousJobListener;
import org.jbpm.services.api.DeploymentEventListener;
import org.kie.api.event.rule.AgendaEventListener;
import org.kie.api.event.rule.DefaultAgendaEventListener;
import org.kie.dmn.api.core.event.DMNRuntimeEventListener;
import org.kie.server.services.api.KieContainerInstance;
import org.kie.server.services.prometheus.PrometheusMetricsProvider;
import org.optaplanner.core.impl.phase.event.PhaseLifecycleListener;
import org.optaplanner.core.impl.phase.event.PhaseLifecycleListenerAdapter;

public class MyPrometheusMetricsProvider implements PrometheusMetricsProvider {

    public DMNRuntimeEventListener createDMNRuntimeEventListener(KieContainerInstance
kContainer) {
        return new ExampleCustomPrometheusMetricListener(kContainer);
    }

    public AgendaEventListener createAgendaEventListener(String kieSessionId,
KieContainerInstance kContainer) {
        return new DefaultAgendaEventListener();
    }

    public PhaseLifecycleListener createPhaseLifecycleListener(String solverId) {
        return new PhaseLifecycleListenerAdapter() {
        };
    }

    public AsynchronousJobListener createAsynchronousJobListener() {
        return null;
    }

    public DeploymentEventListener createDeploymentEventListener() {
        return null;
    }
}

```

In this example, the **MyPrometheusMetricsProvider** class implements the **PrometheusMetricsProvider** interface and includes your custom **ExampleCustomPrometheusMetricListener** listener class.

4. To make the new metrics provider discoverable for KIE Server, create a **META-INF/services/org.kie.server.services.prometheus.PrometheusMetricsProvider** file in your Maven project and add the fully qualified class name of the **PrometheusMetricsProvider** implementation class within the file. For this example, the file contains the single line **org.kie.server.ext.prometheus.MyPrometheusMetricsProvider**.
5. Build your project and copy the resulting JAR file into the **~/kie-server.war/WEB-INF/lib** directory of your project. For example, on Red Hat JBoss EAP, the path to this directory is **EAP_HOME/standalone/deployments/kie-server.war/WEB-INF/lib**.
If you are deploying Red Hat Decision Manager on Red Hat OpenShift Container Platform, create a custom KIE Server image and add this JAR file to the image. For more information about creating a custom KIE Server image with an additional JAR file, see [Deploying a Red Hat Decision Manager environment on Red Hat OpenShift Container Platform using Operators](#).

6. Start the KIE Server and deploy the built project to the running KIE Server. You can deploy the project using the Business Central interface or the KIE Server REST API (a **PUT** request to **`http://SERVER:PORT/kie-server/services/rest/server/containers/{containerId}`**). After your project is deployed on a running KIE Server, Prometheus begins collecting metrics and KIE Server publishes the metrics to the REST API endpoint **`http://HOST:PORT/SERVER/services/rest/metrics`** (or on Spring Boot, to **`http://HOST:PORT/rest/metrics`**).

CHAPTER 12. CONFIGURING OPENSIFT CONNECTION TIMEOUT

By default, the OpenShift route is configured to time out HTTP requests that are longer than 30 seconds. This may cause session timeout issues in Business Central resulting in the following behaviors:

- "Unable to complete your request. The following exception occurred: (TypeError) : Cannot read property 'indexOf' of null."
- "Unable to complete your request. The following exception occurred: (TypeError) : b is null."
- A blank page is displayed when clicking the **Project** or **Server** links in Business Central.

All Business Central templates already include extended timeout configuration.

To configure longer timeout on Business Central OpenShift routes, add the **haproxy.router.openshift.io/timeout: 60s** annotation on the target route:

```
- kind: Route
  apiVersion: v1
  id: "$APPLICATION_NAME-rhdmcentr-http"
  metadata:
    name: "$APPLICATION_NAME-rhdmcentr"
  labels:
    application: "$APPLICATION_NAME"
  annotations:
    description: Route for Business Central's http service.
    haproxy.router.openshift.io/timeout: 60s
  spec:
    host: "$DECISION_CENTRAL_HOSTNAME_HTTP"
    to:
      name: "$APPLICATION_NAME-rhdmcentr"
```

For a full list of global route-specific timeout annotations, see the [OpenShift Documentation](#).

CHAPTER 13. DEFINE THE LDAP LOGIN DOMAIN

When you are setting up Red Hat Decision Manager to use LDAP for authentication and authorization, define the LDAP login domain because the Git SSH authentication may use another security domain.

To define the LDAP login domain, use the **org.uberfire.domain** system property. For example, on Red Hat JBoss Enterprise Application Platform, add this property in the **standalone.xml** file as shown:

```
<system-properties>
  <!-- other system properties -->
  <property name="org.uberfire.domain" value="LDAPAuth"/>
</system-properties>
```

Ensure that the authenticated user has appropriate roles (**admin,analyst,reviewer**) associated with it in LDAP.

CHAPTER 14. AUTHENTICATING THIRD-PARTY CLIENTS THROUGH RH-SSO

To use the different remote services provided by Business Central or by KIE Server, your client, such as curl, wget, web browser, or a custom REST client, must authenticate through the RH-SSO server and have a valid token to perform the requests. To use the remote services, the authenticated user must have the following roles:

- **rest-all** for using Business Central remote services.
- **kie-server** for using the KIE Server remote services.

Use the RH-SSO Admin Console to create these roles and assign them to the users that will consume the remote services.

Your client can authenticate through RH-SSO using one of these options:

- Basic authentication, if it is supported by the client
- Token-based authentication

14.1. BASIC AUTHENTICATION

If you enabled basic authentication in the RH-SSO client adapter configuration for both Business Central and KIE Server, you can avoid the token grant and refresh calls and call the services as shown in the following examples:

- For web based remote repositories endpoint:

```
curl http://admin:password@localhost:8080/decision-central/rest/repositories
```

- For KIE Server:

```
curl http://admin:password@localhost:8080/kie-server/services/rest/server/
```

CHAPTER 15. KIE SERVER SYSTEM PROPERTIES

The KIE Server accepts the following system properties (bootstrap switches) to configure the behavior of the server:

Table 15.1. System properties for disabling KIE Server extensions

Property	Values	Default	Description
org.drools.server.ext.disabled	true, false	false	If set to true , disables the Business Rule Management (BRM) support (for example, rules support).
org.optaplanner.server.ext.disabled	true, false	false	If set to true , disables the Red Hat Business Optimizer support.
org.kie.prometheus.server.ext.disabled	true, false	true	If set to true , disables the Prometheus Server extension.
org.kie.scenariosimulation.server.ext.disabled	true, false	true	If set to true , disables the Test scenario Server extension.
org.kie.dmn.server.ext.disabled	true, false	false	If set to true , disables the KIE Server DMN support.
org.kie.swagger.server.ext.disabled	true, false	false	If set to true , disables the KIE Server swagger documentation support



NOTE

Some Decision Manager controller properties listed in the following table are marked as required. Set these properties when you create or remove KIE Server containers in Business Central. If you use the KIE Server separately without any interaction with Business Central, you do not need to set the required properties.

Table 15.2. System properties required for Decision Manager controller

Property	Values	Default	Description
org.kie.server.id	String	N/A	An arbitrary ID to be assigned to the server. If a headless Decision Manager controller is configured outside of Business Central, this is the ID under which the server connects to the headless Decision Manager controller to fetch the KIE container configurations. If not provided, the ID is automatically generated.

Property	Values	Default	Description
org.kie.server.user	String	kieserver	The user name used to connect with the KIE Server from the Decision Manager controller, required when running in managed mode. Set this property in Business Central system properties. Set this property when using a Decision Manager controller.
org.kie.server.pwd	String	kieserver!	The password used to connect with the KIE Server from the Decision Manager controller, required when running in managed mode. Set this property in Business Central system properties. Set this property when using a Decision Manager controller.
org.kie.server.token	String	N/A	A property that enables you to use token-based authentication between the Decision Manager controller and the KIE Server instead of the basic user name and password authentication. The Decision Manager controller sends the token as a parameter in the request header. The server requires long-lived access tokens because the tokens are not refreshed.
org.kie.server.location	URL	N/A	The URL of the KIE Server instance used by the Decision Manager controller to call back on this server, for example, http://localhost:8230/kie-server/services/rest/server . Setting this property is required when using a Decision Manager controller.
org.kie.server.controller	Comma-separated list	N/A	A comma-separated list of URLs to the Decision Manager controller REST endpoints, for example, http://localhost:8080/decision-central/rest/controller . Setting this property is required when using a Decision Manager controller.
org.kie.server.controller.user	String	kieserver	The user name to connect to the Decision Manager controller REST API. Setting this property is required when using a Decision Manager controller.
org.kie.server.controller.pwd	String	kieserver!	The password to connect to the Decision Manager controller REST API. Setting this property is required when using a Decision Manager controller.

Property	Values	Default	Description
org.kie.server.controller.token	String	N/A	A property that enables you to use token-based authentication between the KIE Server and the Decision Manager controller instead of the basic user name and password authentication. The server sends the token as a parameter in the request header. The server requires long-lived access tokens because the tokens are not refreshed.
org.kie.server.controller.connect	Long	10000	The waiting time in milliseconds between repeated attempts to connect the KIE Server to the Decision Manager controller when the server starts.

Table 15.3. System properties for loading keystore

Property	Values	Default	Description
kie.keystore.keyStoreURL	URL	N/A	The URL is used to load a Java Cryptography Extension KeyStore (JCEKS). For example, file:///home/kie/keystores/keystore.jceks .
kie.keystore.keyStorePwd	String	N/A	The password is used for the JCEKS.
kie.keystore.key.server.alias	String	N/A	The alias name of the key for REST services where the password is stored.
kie.keystore.key.server.pwd	String	N/A	The password of an alias for REST services.
kie.keystore.key.ctrl.alias	String	N/A	The alias of the key for default REST Decision Manager controller.
kie.keystore.key.ctrl.pwd	String	N/A	The password of an alias for default REST Decision Manager controller.

Table 15.4. Other system properties

Property	Values	Default	Description
kie.maven.settings.custom	Path	N/A	The location of a custom settings.xml file for Maven configuration.

Property	Values	Default	Description
kie.server.jms.queues.response	String	queue/KIE.SERVER.RESPONSE	The response queue JNDI name for JMS.
org.drools.server.filter.classes	true, false	false	When set to true , the Drools KIE Server extension accepts custom classes annotated by the XmlRootElement or Remotable annotations only.
org.kie.server.domain	String	N/A	The JAAS LoginContext domain used to authenticate users when using JMS.
org.kie.server.repo	Path	.	The location where KIE Server state files are stored.
org.kie.server.sync.deploy	true, false	false	<p>A property that instructs the KIE Server to hold the deployment until the Decision Manager controller provides the container deployment configuration. This property only affects servers running in managed mode. The following options are available:</p> <p>* false: The connection to the Decision Manager controller is asynchronous. The application starts, connects to the Decision Manager controller, and once successful, deploys the containers. The application accepts requests even before the containers are available. * true: The deployment of the server application joins the Decision Manager controller connection thread with the main deployment and awaits its completion. This option can lead to a potential deadlock in case more applications are on the same server. Use only one application on one server instance.</p>

Property	Values	Default	Description
org.kie.server.startup.strategy	ControllerBasedStartupStrategy, LocalContainersStartupStrategy	ControllerBasedStartupStrategy	The Startup strategy of KIE Server used to control the KIE containers that are deployed and the order in which they are deployed.
org.kie.server.mgmt.api.disabled	true, false	false	When set to true , disables KIE Server management API.
org.kie.server.xstream.enabled.packages	Java packages like org.kie.example . You can also specify wildcard expressions like org.kie.example.* .	N/A	A property that specifies additional packages to whitelist for marshalling using XStream.
org.kie.store.services.classes	String	org.drools.persistence.jpa.KnowledgeStoreServiceImpl	Fully qualified name of the class that implements KieStoreServices that are responsible for bootstrapping KieSession instances.
org.kie.server.strict.id.format	true, false	false	While using JSON marshalling, if the property is set to true , it will always return a response in the proper JSON format. For example, if the original response contains only a single number, then the response is wrapped in a JSON format. For example, {"value" : 1} .

CHAPTER 16. KIE SERVER CAPABILITIES AND EXTENSIONS

The capabilities in KIE Server are determined by plug-in extensions that you can enable, disable, or further extend to meet your business needs. KIE Server supports the following default capabilities and extensions:

Table 16.1. KIE Server capabilities and extensions

Capability name	Extension name	Description
KieServer	KieServer	Provides the core capabilities of KIE Server, such as creating and disposing KIE containers on your server instance
BRM	Drools	Provides the Business Rule Management (BRM) capabilities, such as inserting facts and executing business rules
BRP	OptaPlanner	Provides the Business Resource Planning (BRP) capabilities, such as implementing solvers
DMN	DMN	Provides the Decision Model and Notation (DMN) capabilities, such as managing DMN data types and executing DMN models
Swagger	Swagger	Provides the Swagger web-interface capabilities for interacting with the KIE Server REST API

To view the supported extensions of a running KIE Server instance, send a **GET** request to the following REST API endpoint and review the XML or JSON server response:

Base URL for GET request for KIE Server information

```
http://SERVER:PORT/kie-server/services/rest/server
```

Example JSON response with KIE Server information

```
{
  "type": "SUCCESS",
  "msg": "Kie Server info",
  "result": {
    "kie-server-info": {
      "id": "test-kie-server",
      "version": "7.26.0.20190818-050814",
      "name": "test-kie-server",
      "location": "http://localhost:8080/kie-server/services/rest/server",
      "capabilities": [
        "KieServer",
        "BRM",
        "BRP",
        "DMN",
        "Swagger"
      ],
      "messages": [
        {
```

```

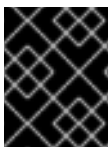
    "severity": "INFO",
    "timestamp": {
      "java.util.Date": 1566169865791
    },
    "content": [
      "Server KieServerInfo{serverId='test-kie-server', version='7.26.0.20190818-050814',
name='test-kie-server', location='http://localhost:8080/kie-server/services/rest/server', capabilities=
[KieServer, BRM, BRP, DMN, Swagger], messages=null, mode=DEVELOPMENT}started
successfully at Sun Aug 18 23:11:05 UTC 2019"
    ]
  }
],
"mode": "DEVELOPMENT"
}
}
}

```

To enable or disable KIE Server extensions, configure the related ***.server.ext.disabled** KIE Server system property. For example, to disable the **BRM** capability, set the system property **org.drools.server.ext.disabled=true**. For all KIE Server system properties, see [Chapter 15, KIE Server system properties](#).

By default, KIE Server extensions are exposed through REST or JMS data transports and use predefined client APIs. You can extend existing KIE Server capabilities with additional REST endpoints, extend supported transport methods beyond REST or JMS, or extend functionality in the KIE Server client.

This flexibility in KIE Server functionality enables you to adapt your KIE Server instances to your business needs, instead of adapting your business needs to the default KIE Server capabilities.



IMPORTANT

If you extend KIE Server functionality, Red Hat does not support the custom code that you use as part of your custom implementations and extensions.

16.1. EXTENDING AN EXISTING KIE SERVER CAPABILITY WITH A CUSTOM REST API ENDPOINT

The KIE Server REST API enables you to interact with your KIE containers and business assets (such as business rules, processes, and solvers) in Red Hat Decision Manager without using the Business Central user interface. The available REST endpoints are determined by the capabilities enabled in your KIE Server system properties (for example, **org.drools.server.ext.disabled=false** for the **BRM** capability). You can extend an existing KIE Server capability with a custom REST API endpoint to further adapt the KIE Server REST API to your business needs.

As an example, this procedure extends the **Drools** KIE Server extension (for the **BRM** capability) with the following custom REST API endpoint:

Example custom REST API endpoint

```
/server/containers/instances/{containerId}/ksession/{ksessionId}
```

This example custom endpoint accepts a list of facts to be inserted into the working memory of the decision engine, automatically executes all rules, and retrieves all objects from the KIE session in the specified KIE container.

Procedure

1. Create an empty Maven project and define the following packaging type and dependencies in the **pom.xml** file for the project:

Example pom.xml file in the sample project

```
<packaging>jar</packaging>

<properties>
  <version.org.kie>7.44.0.Final-redhat-00006</version.org.kie>
</properties>

<dependencies>
  <dependency>
    <groupId>org.kie</groupId>
    <artifactId>kie-api</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.kie</groupId>
    <artifactId>kie-internal</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.kie.server</groupId>
    <artifactId>kie-server-api</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.kie.server</groupId>
    <artifactId>kie-server-services-common</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.kie.server</groupId>
    <artifactId>kie-server-services-drools</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.kie.server</groupId>
    <artifactId>kie-server-rest-common</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.drools</groupId>
    <artifactId>drools-core</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.drools</groupId>
    <artifactId>drools-compiler</artifactId>
```

```

    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.slf4j</groupId>
    <artifactId>slf4j-api</artifactId>
    <version>1.7.25</version>
  </dependency>
</dependencies>

```

2. Implement the **org.kie.server.services.api.KieServerApplicationComponentsService** interface in a Java class in your project, as shown in the following example:

Sample implementation of the **KieServerApplicationComponentsService** interface

```

public class CusomtDroolsKieServerApplicationComponentsService implements
KieServerApplicationComponentsService { ❶

    private static final String OWNER_EXTENSION = "Drools"; ❷

    public Collection<Object> getAppComponents(String extension, SupportedTransports
type, Object... services) { ❸
        // Do not accept calls from extensions other than the owner extension:
        if ( !OWNER_EXTENSION.equals(extension) ) {
            return Collections.emptyList();
        }

        RulesExecutionService rulesExecutionService = null; ❹
        KieServerRegistry context = null;

        for( Object object : services ) {
            if( RulesExecutionService.class.isAssignableFrom(object.getClass()) ) {
                rulesExecutionService = (RulesExecutionService) object;
                continue;
            } else if( KieServerRegistry.class.isAssignableFrom(object.getClass()) ) {
                context = (KieServerRegistry) object;
                continue;
            }
        }

        List<Object> components = new ArrayList<Object>(1);
        if( SupportedTransports.REST.equals(type) ) {
            components.add(new CustomResource(rulesExecutionService, context)); ❺
        }

        return components;
    }
}

```

- ❶ Delivers REST endpoints to the KIE Server infrastructure that is deployed when the application starts.
- ❷ Specifies the extension that you are extending, such as the **Drools** extension in this example.

- 3 Returns all resources that the REST container must deploy. Each extension that is enabled in your KIE Server instance calls the **getAppComponents** method, so the **if** (
 - 4 Lists the services from the specified extension that you want to use, such as the **RulesExecutionService** and **KieServerRegistry** services from the **Drools** extension in this example.
 - 5 Specifies the transport type for the extension, either **REST** or **JMS** (**REST** in this example), and the **CustomResource** class that returns the resource as part of the **components** list.
3. Implement the **CustomResource** class that the KIE Server can use to provide the additional functionality for the new REST resource, as shown in the following example:

Sample implementation of the **CustomResource** class

```
// Custom base endpoint:
@Path("server/containers/instances/{containerId}/ksession")
public class CustomResource {

    private static final Logger logger = LoggerFactory.getLogger(CustomResource.class);

    private KieCommands commandsFactory = KieServices.Factory.get().getCommands();

    private RulesExecutionService rulesExecutionService;
    private KieServerRegistry registry;

    public CustomResource() {

    }

    public CustomResource(RulesExecutionService rulesExecutionService, KieServerRegistry
registry) {
        this.rulesExecutionService = rulesExecutionService;
        this.registry = registry;
    }

    // Supported HTTP method, path parameters, and data formats:
    @POST
    @Path("/{ksessionId}")
    @Consumes({MediaType.APPLICATION_XML, MediaType.APPLICATION_JSON})
    @Produces({MediaType.APPLICATION_XML, MediaType.APPLICATION_JSON})
    public Response insertFireReturn(@Context HttpHeaders headers,
        @PathParam("containerId") String id,
        @PathParam("ksessionId") String ksessionId,
        String cmdPayload) {

        Variant v = getVariant(headers);
        String contentType = getContentType(headers);

        // Marshalling behavior and supported actions:
        MarshallingFormat format = MarshallingFormat.fromType(contentType);
        if (format == null) {
            format = MarshallingFormat.valueOf(contentType);
        }
    }
}
```

```

try {
    KieContainerInstance kci = registry.getContainer(id);

    Marshaller marshaller = kci.getMarshaller(format);

    List<?> listOfFacts = marshaller.unmarshall(cmdPayload, List.class);

    List<Command<?>> commands = new ArrayList<Command<?>>();
    BatchExecutionCommand executionCommand =
commandsFactory.newBatchExecution(commands, ksessionId);

    for (Object fact : listOfFacts) {
        commands.add(commandsFactory.newInsert(fact, fact.toString()));
    }
    commands.add(commandsFactory.newFireAllRules());
    commands.add(commandsFactory.newGetObjects());

    ExecutionResults results = rulesExecutionService.call(kci, executionCommand);

    String result = marshaller.marshall(results);

    logger.debug("Returning OK response with content '{}'", result);
    return createResponse(result, v, Response.Status.OK);
} catch (Exception e) {
    // If marshalling fails, return the `call-container` response to maintain backward
compatibility:
    String response = "Execution failed with error : " + e.getMessage();
    logger.debug("Returning Failure response with content '{}'", response);
    return createResponse(response, v,
Response.Status.INTERNAL_SERVER_ERROR);
}
}
}

```

In this example, the **CustomResource** class for the custom endpoint specifies the following data and behavior:

- Uses the base endpoint **server/containers/instances/{containerId}/ksession**
- Uses **POST** HTTP method
- Expects the following data to be given in REST requests:
 - The **containerId** as a path argument
 - The **ksessionId** as a path argument
 - List of facts as a message payload
- Supports all KIE Server data formats:
 - XML (JAXB, XStream)
 - JSON

- Unmarshals the payload into a **List<?>** collection and, for each item in the list, creates an **InsertCommand** instance followed by **FireAllRules** and **GetObject** commands.
 - Adds all commands to the **BatchExecutionCommand** instance that calls to the decision engine.
4. To make the new endpoint discoverable for KIE Server, create a **META-INF/services/org.kie.server.services.api.KieServerApplicationComponentsService** file in your Maven project and add the fully qualified class name of the **KieServerApplicationComponentsService** implementation class within the file. For this example, the file contains the single line **org.kie.server.ext.drools.rest.CusomtDroolsKieServerApplicationComponentsService**.
 5. Build your project and copy the resulting JAR file into the **~/kie-server.war/WEB-INF/lib** directory of your project. For example, on Red Hat JBoss EAP, the path to this directory is **EAP_HOME/standalone/deployments/kie-server.war/WEB-INF/lib**.
 6. Start the KIE Server and deploy the built project to the running KIE Server. You can deploy the project using either the Business Central interface or the KIE Server REST API (a **PUT** request to **http://SERVER:PORT/kie-server/services/rest/server/containers/{containerId}**). After your project is deployed on a running KIE Server, you can start interacting with your new REST endpoint.

For this example, you can use the following information to invoke the new endpoint:

- Example request URL: **http://localhost:8080/kie-server/services/rest/server/containers/instances/demo/ksession/defaultKieSession**
- HTTP method: **POST**
- HTTP headers:
 - **Content-Type: application/json**
 - **Accept: application/json**
- Example message payload:

```
[
  {
    "org.jbpm.test.Person": {
      "name": "john",
      "age": 25
    }
  },
  {
    "org.jbpm.test.Person": {
      "name": "mary",
      "age": 22
    }
  }
]
```

- Example server response: **200** (success)
- Example server log output:

■

```
13:37:20,347 INFO [stdout] (default task-24) Hello mary
13:37:20,348 INFO [stdout] (default task-24) Hello john
```

16.2. EXTENDING KIE SERVER TO USE A CUSTOM DATA TRANSPORT

By default, KIE Server extensions are exposed through REST or JMS data transports. You can extend KIE Server to support a custom data transport to adapt KIE Server transport protocols to your business needs.

As an example, this procedure adds a custom data transport to KIE Server that uses the **Drools** extension and that is based on Apache MINA, an open-source Java network-application framework. The example custom MINA transport exchanges string-based data that relies on existing marshalling operations and supports only JSON format.

Procedure

1. Create an empty Maven project and define the following packaging type and dependencies in the **pom.xml** file for the project:

Example pom.xml file in the sample project

```
<packaging>jar</packaging>

<properties>
  <version.org.kie>7.44.0.Final-redhat-00006</version.org.kie>
</properties>

<dependencies>
  <dependency>
    <groupId>org.kie</groupId>
    <artifactId>kie-api</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.kie</groupId>
    <artifactId>kie-internal</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.kie.server</groupId>
    <artifactId>kie-server-api</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.kie.server</groupId>
    <artifactId>kie-server-services-common</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.kie.server</groupId>
    <artifactId>kie-server-services-drools</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.drools</groupId>
```

```

    <artifactId>drools-core</artifactId>
    <version>${version.org.kie}</version>
</dependency>
<dependency>
    <groupId>org.drools</groupId>
    <artifactId>drools-compiler</artifactId>
    <version>${version.org.kie}</version>
</dependency>
<dependency>
    <groupId>org.slf4j</groupId>
    <artifactId>slf4j-api</artifactId>
    <version>1.7.25</version>
</dependency>
<dependency>
    <groupId>org.apache.mina</groupId>
    <artifactId>mina-core</artifactId>
    <version>2.1.3</version>
</dependency>
</dependencies>

```

2. Implement the **org.kie.server.services.api.KieServerExtension** interface in a Java class in your project, as shown in the following example:

Sample implementation of the KieServerExtension interface

```

public class MinaDroolsKieServerExtension implements KieServerExtension {

    private static final Logger logger =
        LoggerFactory.getLogger(MinaDroolsKieServerExtension.class);

    public static final String EXTENSION_NAME = "Drools-Mina";

    private static final Boolean disabled =
        Boolean.parseBoolean(System.getProperty("org.kie.server.drools-mina.ext.disabled",
        "false"));
    private static final String MINA_HOST = System.getProperty("org.kie.server.drools-
        mina.ext.port", "localhost");
    private static final int MINA_PORT =
        Integer.parseInt(System.getProperty("org.kie.server.drools-mina.ext.port", "9123"));

    // Taken from dependency on the `Drools` extension:
    private KieContainerCommandService batchCommandService;

    // Specific to MINA:
    private IoAcceptor acceptor;

    public boolean isActive() {
        return disabled == false;
    }

    public void init(KieServerImpl kieServer, KieServerRegistry registry) {

        KieServerExtension droolsExtension = registry.getServerExtension("Drools");
        if (droolsExtension == null) {
            logger.warn("No Drools extension available, quitting...");
            return;
        }
    }
}

```

```

    }

    List<Object> droolsServices = droolsExtension.getServices();
    for( Object object : droolsServices ) {
        // If the given service is null (not configured), continue to the next service:
        if (object == null) {
            continue;
        }
        if( KieContainerCommandService.class.isAssignableFrom(object.getClass()) ) {
            batchCommandService = (KieContainerCommandService) object;
            continue;
        }
    }
    if (batchCommandService != null) {
        acceptor = new NioSocketAcceptor();
        acceptor.getFilterChain().addLast( "codec", new ProtocolCodecFilter( new
TextLineCodecFactory( Charset.forName( "UTF-8" ) ) ));

        acceptor.setHandler( new TextBasedIoHandlerAdapter(batchCommandService) );
        acceptor.getSessionConfig().setReadBufferSize( 2048 );
        acceptor.getSessionConfig().setIdleTime( IdleStatus.BOTH_IDLE, 10 );
        try {
            acceptor.bind( new InetSocketAddress(MINA_HOST, MINA_PORT) );

            logger.info("{} -- Mina server started at {} and port {}", toString(), MINA_HOST,
MINA_PORT);
        } catch (IOException e) {
            logger.error("Unable to start Mina acceptor due to {}", e.getMessage(), e);
        }
    }
}

public void destroy(KieServerImpl kieServer, KieServerRegistry registry) {
    if (acceptor != null) {
        acceptor.dispose();
        acceptor = null;
    }
    logger.info("{} -- Mina server stopped", toString());
}

public void createContainer(String id, KieContainerInstance kieContainerInstance,
Map<String, Object> parameters) {
    // Empty, already handled by the `Drools` extension
}

public void disposeContainer(String id, KieContainerInstance kieContainerInstance,
Map<String, Object> parameters) {
    // Empty, already handled by the `Drools` extension
}

public List<Object> getAppComponents(SupportedTransports type) {
    // Nothing for supported transports (REST or JMS)
    return Collections.emptyList();
}

```

```

    }

    public <T> T getAppComponents(Class<T> serviceType) {

        return null;
    }

    public String getImplementedCapability() {
        return "BRM-Mina";
    }

    public List<Object> getServices() {
        return Collections.emptyList();
    }

    public String getExtensionName() {
        return EXTENSION_NAME;
    }

    public Integer getStartOrder() {
        return 20;
    }

    @Override
    public String toString() {
        return EXTENSION_NAME + " KIE Server extension";
    }
}

```

The **KieServerExtension** interface is the main extension interface that KIE Server can use to provide the additional functionality for the new MINA transport. The interface consists of the following components:

Overview of the KieServerExtension interface

```

public interface KieServerExtension {

    boolean isActive();

    void init(KieServerImpl kieServer, KieServerRegistry registry);

    void destroy(KieServerImpl kieServer, KieServerRegistry registry);

    void createContainer(String id, KieContainerInstance kieContainerInstance, Map<String,
Object> parameters);

    void disposeContainer(String id, KieContainerInstance kieContainerInstance, Map<String,
Object> parameters);

    List<Object> getAppComponents(SupportedTransports type);

    <T> T getAppComponents(Class<T> serviceType);

    String getImplementedCapability(); 1
}

```

```

    List<Object> getServices();

    String getExtensionName(); ❷

    Integer getStartOrder(); ❸
}

```

- ❶ Specifies the capability that is covered by this extension. The capability must be unique within KIE Server.
- ❷ Defines a human-readable name for the extension.
- ❸ Determines when the specified extension should be started. For extensions that have dependencies on other extensions, this setting must not conflict with the parent setting. For example, in this case, this custom extension depends on the **Drools** extension, which has **StartOrder** set to **0**, so this custom add-on extension must be greater than **0** (set to **20** in the sample implementation).

In the previous **MinaDroolsKieServerExtension** sample implementation of this interface, the **init** method is the main element for collecting services from the **Drools** extension and for bootstrapping the MINA server. All other methods in the **KieServerExtension** interface can remain with the standard implementation to fulfill interface requirements.

The **TextBasedIoHandlerAdapter** class is the handler on the MINA server that reacts to incoming requests.

3. Implement the **TextBasedIoHandlerAdapter** handler for the MINA server, as shown in the following example:

Sample implementation of the **TextBasedIoHandlerAdapter** handler

```

public class TextBasedIoHandlerAdapter extends IoHandlerAdapter {

    private static final Logger logger =
        LoggerFactory.getLogger(TextBasedIoHandlerAdapter.class);

    private KieContainerCommandService batchCommandService;

    public TextBasedIoHandlerAdapter(KieContainerCommandService
        batchCommandService) {
        this.batchCommandService = batchCommandService;
    }

    @Override
    public void messageReceived( IoSession session, Object message ) throws Exception {
        String completeMessage = message.toString();
        logger.debug("Received message '{}'", completeMessage);
        if( completeMessage.trim().equalsIgnoreCase("quit") ||
            completeMessage.trim().equalsIgnoreCase("exit") ) {
            session.close(false);
            return;
        }

        String[] elements = completeMessage.split("\\|");
        logger.debug("Container id {}", elements[0]);
    }
}

```



```

try {
    ServiceResponse<String> result = batchCommandService.callContainer(elements[0],
elements[1], MarshallingFormat.JSON, null);

    if (result.getType().equals(ServiceResponse.ResponseType.SUCCESS)) {
        session.write(result.getResult());
        logger.debug("Successful message written with content '{}'", result.getResult());
    } else {
        session.write(result.getMsg());
        logger.debug("Failure message written with content '{}'", result.getMsg());
    }
} catch (Exception e) {

}

}
}

```

In this example, the handler class receives text messages and executes them in the **Drools** service.

Consider the following handler requirements and behavior when you use the **TextBasedIoHandlerAdapter** handler implementation:

- Anything that you submit to the handler must be a single line because each incoming transport request is a single line.
 - You must pass a KIE container ID in this single line so that the handler expects the format **containerID|payload**.
 - You can set a response in the way that it is produced by the marshaller. The response can be multiple lines.
 - The handler supports a *stream mode* that enables you to send commands without disconnecting from a KIE Server session. To end a KIE Server session in stream mode, send either an **exit** or **quit** command to the server.
4. To make the new data transport discoverable for KIE Server, create a **META-INF/services/org.kie.server.services.api.KieServerExtension** file in your Maven project and add the fully qualified class name of the **KieServerExtension** implementation class within the file. For this example, the file contains the single line **org.kie.server.ext.mina.MinaDroolsKieServerExtension**.
 5. Build your project and copy the resulting JAR file and the **mina-core-2.0.9.jar** file (which the extension depends on in this example) into the **~/kie-server.war/WEB-INF/lib** directory of your project. For example, on Red Hat JBoss EAP, the path to this directory is **EAP_HOME/standalone/deployments/kie-server.war/WEB-INF/lib**.
 6. Start the KIE Server and deploy the built project to the running KIE Server. You can deploy the project using either the Business Central interface or the KIE Server REST API (a **PUT** request to **http://SERVER:PORT/kie-server/services/rest/server/containers/{containerId}**). After your project is deployed on a running KIE Server, you can view the status of the new data transport in your KIE Server log and start using your new data transport:

New data transport in the server log

Drools-Mina KIE Server extension -- Mina server started at localhost and port 9123
 Drools-Mina KIE Server extension has been successfully registered as server extension

For this example, you can use Telnet to interact with the new MINA-based data transport in KIE Server:

Starting Telnet and connecting to KIE Server on port 9123 in a command terminal

```
telnet 127.0.0.1 9123
```

Example interactions with KIE Server in a command terminal

```
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.

# Request body:
demo|{"lookup":"defaultKieSession","commands":[{"insert":{"object":{"org.jbpm.test.Person":
{"name":"john","age":25}}},{fire-all-rules":""}]}
```

```
# Server response:
{
  "results" : [ {
    "key" : "",
    "value" : 1
  } ],
  "facts" : [ ]
}

demo|{"lookup":"defaultKieSession","commands":[{"insert":{"object":{"org.jbpm.test.Person":
{"name":"mary","age":22}}},{fire-all-rules":""}]}
```

```
{
  "results" : [ {
    "key" : "",
    "value" : 1
  } ],
  "facts" : [ ]
}

demo|{"lookup":"defaultKieSession","commands":[{"insert":{"object":{"org.jbpm.test.Person":
{"name":"james","age":25}}},{fire-all-rules":""}]}
```

```
{
  "results" : [ {
    "key" : "",
    "value" : 1
  } ],
  "facts" : [ ]
}
exit
Connection closed by foreign host.
```

Example server log output

```
16:33:40,206 INFO [stdout] (NioProcessor-2) Hello john
16:34:03,877 INFO [stdout] (NioProcessor-2) Hello mary
16:34:19,800 INFO [stdout] (NioProcessor-2) Hello james
```

16.3. EXTENDING THE KIE SERVER CLIENT WITH A CUSTOM CLIENT API

KIE Server uses predefined client APIs that you can interact with to use KIE Server services. You can extend the KIE Server client with a custom client API to adapt KIE Server services to your business needs.

As an example, this procedure adds a custom client API to KIE Server to accommodate a custom data transport (configured previously for this scenario) that is based on Apache MINA, an open-source Java network-application framework.

Procedure

1. Create an empty Maven project and define the following packaging type and dependencies in the **pom.xml** file for the project:

Example pom.xml file in the sample project

```
<packaging>jar</packaging>

<properties>
  <version.org.kie>7.44.0.Final-redhat-00006</version.org.kie>
</properties>

<dependencies>
  <dependency>
    <groupId>org.kie.server</groupId>
    <artifactId>kie-server-api</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.kie.server</groupId>
    <artifactId>kie-server-client</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
  <dependency>
    <groupId>org.drools</groupId>
    <artifactId>drools-compiler</artifactId>
    <version>${version.org.kie}</version>
  </dependency>
</dependencies>
```

2. Implement the relevant **ServicesClient** interface in a Java class in your project, as shown in the following example:

Sample RulesMinaServicesClient interface

```
public interface RulesMinaServicesClient extends RuleServicesClient {

}
```

A specific interface is required because you must register client implementations based on the interface, and you can have only one implementation for a given interface.

For this example, the custom MINA-based data transport uses the **Drools** extension, so this example **RulesMinaServicesClient** interface extends the existing **RuleServicesClient** client API from the **Drools** extension.

3. Implement the **RulesMinaServicesClient** interface that the KIE Server can use to provide the additional client functionality for the new MINA transport, as shown in the following example:

Sample implementation of the **RulesMinaServicesClient** interface

```
public class RulesMinaServicesClientImpl implements RulesMinaServicesClient {

    private String host;
    private Integer port;

    private Marshaller marshaller;

    public RulesMinaServicesClientImpl(KieServicesConfiguration configuration, ClassLoader
classloader) {
        String[] serverDetails = configuration.getServerUrl().split(":");

        this.host = serverDetails[0];
        this.port = Integer.parseInt(serverDetails[1]);

        this.marshaller = MarshallerFactory.getMarshaller(configuration.getExtraJaxbClasses(),
MarshallingFormat.JSON, classloader);
    }

    public ServiceResponse<String> executeCommands(String id, String payload) {

        try {
            String response = sendReceive(id, payload);
            if (response.startsWith("{")) {
                return new ServiceResponse<String>(ResponseType.SUCCESS, null, response);
            } else {
                return new ServiceResponse<String>(ResponseType.FAILURE, response);
            }
        } catch (Exception e) {
            throw new KieServicesException("Unable to send request to KIE Server", e);
        }
    }

    public ServiceResponse<String> executeCommands(String id, Command<?> cmd) {
        try {
            String response = sendReceive(id, marshaller.marshall(cmd));
            if (response.startsWith("{")) {
                return new ServiceResponse<String>(ResponseType.SUCCESS, null, response);
            } else {
                return new ServiceResponse<String>(ResponseType.FAILURE, response);
            }
        }
    }
}
```

```

    }
  } catch (Exception e) {
    throw new KieServicesException("Unable to send request to KIE Server", e);
  }
}

protected String sendReceive(String containerId, String content) throws Exception {

  // Flatten the content to be single line:
  content = content.replaceAll("\n", "");

  Socket minaSocket = null;
  PrintWriter out = null;
  BufferedReader in = null;

  StringBuffer data = new StringBuffer();
  try {
    minaSocket = new Socket(host, port);
    out = new PrintWriter(minaSocket.getOutputStream(), true);
    in = new BufferedReader(new InputStreamReader(minaSocket.getInputStream()));

    // Prepare and send data:
    out.println(containerId + "|" + content);
    // Wait for the first line:
    data.append(in.readLine());
    // Continue as long as data is available:
    while (in.ready()) {
      data.append(in.readLine());
    }

    return data.toString();
  } finally {
    out.close();
    in.close();
    minaSocket.close();
  }
}
}

```

This example implementation specifies the following data and behavior:

- Uses socket-based communication for simplicity
- Relies on default configurations from the KIE Server client and uses **ServerUrl** for providing the host and port of the MINA server
- Specifies JSON as the marshalling format
- Requires received messages to be JSON objects that start with an open bracket {
- Uses direct socket communication with a blocking API while waiting for the first line of the response and then reads all lines that are available
- Does not use *stream mode* and therefore disconnects the KIE Server session after invoking a command

4. Implement the **org.kie.server.client.helper.KieServicesClientBuilder** interface in a Java class in your project, as shown in the following example:

Sample implementation of the **KieServicesClientBuilder** interface

```
public class MinaClientBuilderImpl implements KieServicesClientBuilder { 1

    public String getImplementedCapability() { 2
        return "BRM-Mina";
    }

    public Map<Class<?>, Object> build(KieServicesConfiguration configuration, ClassLoader
classLoader) { 3
        Map<Class<?>, Object> services = new HashMap<Class<?>, Object>();

        services.put(RulesMinaServicesClient.class, new
RulesMinaServicesClientImpl(configuration, classLoader));

        return services;
    }
}
```

- 1 Enables you to provide additional client APIs to the generic KIE Server client infrastructure
- 2 Defines the KIE Server capability (extension) that the client uses
- 3 Provides a map of the client implementations, where the key is the interface and the value is the fully initialized implementation

5. To make the new client API discoverable for the KIE Server client, create a **META-INF/services/org.kie.server.client.helper.KieServicesClientBuilder** file in your Maven project and add the fully qualified class name of the **KieServicesClientBuilder** implementation class within the file. For this example, the file contains the single line **org.kie.server.ext.mina.client.MinaClientBuilderImpl**.
6. Build your project and copy the resulting JAR file into the **~/kie-server.war/WEB-INF/lib** directory of your project. For example, on Red Hat JBoss EAP, the path to this directory is **EAP_HOME/standalone/deployments/kie-server.war/WEB-INF/lib**.
7. Start the KIE Server and deploy the built project to the running KIE Server. You can deploy the project using either the Business Central interface or the KIE Server REST API (a **PUT** request to **http://SERVER:PORT/kie-server/services/rest/server/containers/{containerId}**). After your project is deployed on a running KIE Server, you can start interacting with your new KIE Server client. You use your new client in the same way as the standard KIE Server client, by creating the client configuration and client instance, retrieving the service client by type, and invoking client methods.

For this example, you can create a **RulesMinaServiceClient** client instance and invoke operations on KIE Server through the MINA transport:

Sample implementation to create the **RulesMinaServiceClient** client

```
protected RulesMinaServicesClient buildClient() {
```

```

KieServicesConfiguration configuration =
KieServicesFactory.newRestConfiguration("localhost:9123", null, null);
List<String> capabilities = new ArrayList<String>();
// Explicitly add capabilities (the MINA client does not respond to `get-server-info`
requests):
capabilities.add("BRM-Mina");

configuration.setCapabilities(capabilities);
configuration.setMarshallingFormat(MarshallingFormat.JSON);

configuration.addJaxbClasses(extraClasses);

KieServicesClient kieServicesClient =
KieServicesFactory.newKieServicesClient(configuration);

RulesMinaServicesClient rulesClient =
kieServicesClient.getServicesClient(RulesMinaServicesClient.class);

return rulesClient;
}

```

Sample configuration to invoke operations on KIE Server through the MINA transport

```

RulesMinaServicesClient rulesClient = buildClient();

List<Command<?>> commands = new ArrayList<Command<?>>();
BatchExecutionCommand executionCommand =
commandsFactory.newBatchExecution(commands, "defaultKieSession");

Person person = new Person();
person.setName("mary");
commands.add(commandsFactory.newInsert(person, "person"));
commands.add(commandsFactory.newFireAllRules("fired"));

ServiceResponse<String> response = rulesClient.executeCommands(containerId,
executionCommand);
Assert.assertNotNull(response);

Assert.assertEquals(ResponseType.SUCCESS, response.getType());

String data = response.getResult();

Marshaller marshaller = MarshallerFactory.getMarshaller(extraClasses,
MarshallingFormat.JSON, this.getClass().getClassLoader());

ExecutionResultImpl results = marshaller.unmarshall(data, ExecutionResultImpl.class);
Assert.assertNotNull(results);

Object personResult = results.getValue("person");
Assert.assertTrue(personResult instanceof Person);

Assert.assertEquals("mary", ((Person) personResult).getName());
Assert.assertEquals("JBoss Community", ((Person) personResult).getAddress());
Assert.assertEquals(true, ((Person) personResult).isRegistered());

```

CHAPTER 17. PERFORMANCE TUNING CONSIDERATIONS WITH KIE SERVER

The following key concepts or suggested practices can help you optimize KIE Server performance. These concepts are summarized in this section as a convenience and are explained in more detail in the cross-referenced documentation, where applicable. This section will expand or change as needed with new releases of Red Hat Decision Manager.

Ensure that development mode is enabled during development

You can set KIE Server or specific projects in Business Central to use **production** mode or **development** mode. By default, KIE Server and all new projects in Business Central are in development mode. This mode provides features that facilitate your development experience, such as flexible project deployment policies, and features that optimize KIE Server performance during development, such as disabled duplicate GAV detection. Use development mode until your Red Hat Decision Manager environment is established and completely ready for production mode.

For more information about configuring the environment mode or duplicate GAV detection, see the following resources:

- [Chapter 7, Configuring the environment mode in KIE Server and Business Central](#)
- [Packaging and deploying a Red Hat Decision Manager project](#)

Adapt KIE Server capabilities and extensions to your specific needs

The capabilities in KIE Server are determined by plug-in extensions that you can enable, disable, or further extend to meet your business needs. By default, KIE Server extensions are exposed through REST or JMS data transports and use predefined client APIs. You can extend existing KIE Server capabilities with additional REST endpoints, extend supported transport methods beyond REST or JMS, or extend functionality in the KIE Server client.

This flexibility in KIE Server functionality enables you to adapt your KIE Server instances to your business needs, instead of adapting your business needs to the default KIE Server capabilities.

For information about enabling, disabling, or extending KIE Server capabilities, see [Chapter 16, KIE Server capabilities and extensions](#).

CHAPTER 18. ADDITIONAL RESOURCES

- *[Installing and configuring Red Hat Decision Manager on Red Hat JBoss EAP 7.3](#)*
- *[Planning a Red Hat Decision Manager installation](#)*
- *[Installing and configuring Red Hat Decision Manager on Red Hat JBoss EAP 7.3](#)*
- *[Deploying a Red Hat Decision Manager environment on Red Hat OpenShift Container Platform using Operators](#)*
- *[Deploying a Red Hat Decision Manager environment on Red Hat OpenShift Container Platform using templates](#)*

PART II. CONFIGURING BUSINESS CENTRAL SETTINGS AND PROPERTIES

As an administrator, you can customize the following on the admin **Settings** page:

- **Roles:** Set the home page, priority, and permissions of a role.
- **Groups:** Set the home page, priority, and permissions of a group as well as create and delete groups.
- **Users:** Create and delete users, add or remove groups and roles from users, and view user permissions.
- **Artifacts:** View M2 repository artifacts, upload artifacts, view, and download JAR files.
- **Data Sources:** Add, update, or delete data sources and database drivers.
- **Data Sets:** Create, modify, or delete data sets.
- **Projects:** View and edit project preferences such as file export properties, space properties, default values, and advanced GAV properties.
- **Artifact Repository:** Manage artifact repository properties.
- **Languages:** Set the Business Central language.
- **Process Administration:** Set the default pagination option in Business Central.
- **Process Designer:** Set diagram editor properties.
- **SSH Keys:** Add or delete SSH keys.
- **Service Tasks Administration:** Enable or disable default service tasks and upload custom service tasks.
- **Profiles:** Set the workbench profile as **Planner and Rules** or **Full**.
- **Archetype:** View, add, validate, set as default, and delete the archetypes. Used as a template when creating a new project in Business Central.

Prerequisites

- Red Hat JBoss Enterprise Application Platform 7.3.0 is installed. For more information, see [Red Hat JBoss Enterprise Application Platform 7.3 Installation Guide](#).
- Red Hat Decision Manager is installed and running. For more information, see [Installing and configuring Red Hat Decision Manager on Red Hat JBoss EAP 7.3](#).
- You are logged in to Business Central with the **admin** user role.

CHAPTER 19. USER AND GROUP MANAGEMENT

Business Central defines three types of entities for security management: users, groups, and roles. You can assign permissions to both roles and groups. You can assign the following roles in Business Central:

- process-admin
- manager
- admin
- analyst
- developer
- user



NOTE

User roles in the application Role Registry have a role identifier, whereas user groups do not.

Use Business Central to create and manage as many users and groups as you require. A user must be assigned to at least one user-specific role to log in to Business Central. User privileges depend on permissions from the groups and roles that the user is a member of. Note that the role or group priority is considered if a user has several roles or groups assigned to it.

19.1. CREATING USERS

User privileges and settings are controlled by the roles assigned to a user and the groups that a user belongs to. You can create any number of users in Business Central.



NOTE

Do not create a user called **unknown** in process engine or KIE Server. The **unknown** user account is a reserved system name with superuser access. The **unknown** user account performs tasks related to the SLA violation listener when there are no users logged in.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Users**.
2. Click **New user**, enter a user name, and then click **Next**.
3. To assign roles to the user, click the **Roles** tab, click **Add Roles**, select the desired roles, and click **Add to selected roles**.
4. Optionally, to assign groups to the user, click the **Groups** tab, click **Add to groups**, select the desired groups, and click **Add to selected groups**.
5. Click **Create**.
6. Click **Yes** to set a password for the user, enter a desired password, and click **Change**.

**NOTE**

The user must have at least one role to access Business Central.

19.2. EDITING USERS

You can change the group and role of a user using the **Users** option on the Business Central **Settings** page. All user permissions are based on the group and role permissions of the user. You can view the user permissions from the **Permissions** tab.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Users**.
2. From the **All users** list, click the user you want to edit. The user details display in the right pane.
3. Click **Edit** to perform any of the following tasks:
 - To change the groups of a user, click the **Groups** tab, click **Add to groups**, select the groups you want the user to be part of, click **Add to selected groups**, and click **Save**.
 - To change the roles of a user, click the **Roles** tab, click **Add roles**, select the roles you want to assign to the user, click **Add to selected roles**, and click **Save**.
 - To view the user permissions, click the **Permissions** tab and expand the attributes.
 - To change the password, click **Change Password**, enter the new password, and click **Change**.
 - To delete the user, click **Delete** and then click **Yes** to confirm removal.

19.3. CREATING GROUPS

In Business Central, you can use groups to control permissions for a collection of users. You can create as many groups as you want but a group must have at least one user.

Procedure

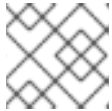
1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Groups**.
2. Click **New group**, enter a group name, and then click **Next**.
3. Select the users that you want to add to this group, and then click **Add selected users**.
The newly created group is listed under **All groups**.

19.4. EDITING GROUPS

You can edit the attribute of a group such as home page, priority, and permissions according to your requirements. From the **Groups** option on the Business Central **Settings** page, you can modify or delete a group.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Groups**.
2. From the **All groups** list, click the group that you want to edit. The user details display in the right pane.
3. Select the home page from the **Home Page** list.
4. Select the priority from the **Priority** list.
5. In the **Permissions** section, expand the resource attribute and change its permission.

**NOTE**

You can add exceptions to **Pages**, **Editor**, **Spaces**, and **Projects** permissions.

6. Click **Save** to apply the changes.

CHAPTER 20. SECURITY MANAGEMENT

Security management is the process of managing users, groups, and permissions. You can control access to Business Central resources and features from the Business Central Security management page.

Business Central defines three types of entities for security management: users, groups, and roles. You can assign permissions to both roles and groups. A user inherits permissions from the groups and roles that the user is a member of.

20.1. SECURITY MANAGEMENT PROVIDERS

In the context of security management, a realm restricts access to different application resources. Realms contain information about users, groups, roles, and permissions. A concrete user and group management service implementation for a specific realm is called a security management provider.

If the built-in security management providers do not meet the requirements of your application security realm, then you can build and register your own security management provider.



NOTE

If the security management provider is not installed, the user interface for managing the security realm is not available. After you install and configure a security management provider, the user and group management features are automatically enabled in the security management user interface.

Business Central includes the Red Hat JBoss EAP security management provider which supports realm types based on the contents of the **application-users.properties** or **application-roles.properties** property file.

20.1.1. Configuring the Red Hat JBoss EAP security management provider based on property files

You can build and register your own Red Hat JBoss EAP security management provider. To use the Red Hat JBoss EAP security management provider based on property files, complete the steps in this procedure.

Prerequisites

- Red Hat JBoss EAP is installed.

Procedure

1. To use an existing users or roles property file from the Red Hat JBoss EAP instance, include the following system properties in the **EAP_HOME/standalone/configuration/application-users.properties** and **EAP_HOME/standalone/configuration/application-roles.properties** files, as shown in the following example:

```
<property name="org.uberfire.ext.security.management.wildfly.properties.realm"
value="ApplicationRealm"/>
<property name="org.uberfire.ext.security.management.wildfly.properties.users-file-path"
```

```
value="/standalone/configuration/application-users.properties"/>
<property name="org.uberfire.ext.security.management.wildfly.properties.groups-file-path"
value="/standalone/configuration/application-roles.properties"/>
```

The following table provides a description and default value for these properties:

Table 20.1. Red Hat JBoss EAP security management provider based on property files

Property	Description	Default value
org.uberfire.ext.security.management.wildfly.properties.realm	The name of the realm. This property is not mandatory.	ApplicationRealm
org.uberfire.ext.security.management.wildfly.properties.users-file-path	The absolute file path for the users property file. This property is mandatory.	./standalone/configuration/application-users.properties
org.uberfire.ext.security.management.wildfly.properties.groups-file-path	The absolute file path for the groups property file. This property is mandatory.	./standalone/configuration/application-roles.properties

2. Create the **security-management.properties** file in the root directory of your application. For example, create the following file:

```
src/main/resources/security-management.properties
```

3. Enter the following system property and security provider name as a value in the **security-management.properties** file:

```
<property name="org.uberfire.ext.security.management.api.userManagementServices"
value="WildflyUserManagementService"/>
```

20.1.2. Configuring the Red Hat JBoss EAP security management provider based on property files and CLI mode

To use the Red Hat JBoss EAP security management provider based on property files and CLI mode, complete the steps in this procedure.

Prerequisites

- Red Hat JBoss EAP is installed.

Procedure

1. To use an existing users or roles property file from the Red Hat JBoss EAP instance, include the following system properties in the **EAP_HOME/standalone/configuration/application-users.properties** and **EAP_HOME/standalone/configuration/application-roles.properties** files, as shown in the following example:

```
<property name="org.uberfire.ext.security.management.wildfly.cli.host" value="localhost"/>
<property name="org.uberfire.ext.security.management.wildfly.cli.port" value="9990"/>
```

```
<property name="org.uberfire.ext.security.management.wildfly.cli.user" value="
<USERNAME>"/>
<property name="org.uberfire.ext.security.management.wildfly.cli.password" value="
<USER_PWD>"/>
<property name="org.uberfire.ext.security.management.wildfly.cli.realm"
value="ApplicationRealm"/>
```

The following table provides a description and default value for these properties:

Table 20.2. Red Hat JBoss EAP security management provider based on property files and CLI mode

Property	Description	Default value
org.uberfire.ext.security.management.wildfly.cli.host	The native administration interface host.	localhost
org.uberfire.ext.security.management.wildfly.cli.port	The native administration interface port.	9990
org.uberfire.ext.security.management.wildfly.cli.user	The native administration interface username.	NA
org.uberfire.ext.security.management.wildfly.cli.password	The native administration interface user's password.	NA
org.uberfire.ext.security.management.wildfly.cli.realm	The realm used by the application's security context.	ApplicationRealm

2. Create the **security-management.properties** file in the root directory of your application. For example, create the following file:

```
src/main/resources/security-management.properties
```

3. Enter the following system property and security provider name as a value in the **security-management.properties** file:

```
<property name="org.uberfire.ext.security.management.api.userManagementServices"
value="WildflyCLIUserManagementService"/>
```

20.2. PERMISSIONS AND SETTINGS

A permission is an authorization granted to a user to perform actions related to a specific resource within the application. For example, a user can have following permissions:

- View a page.
- Save the project.
- View a repository.

- Delete a dashboard.

You can grant or deny a permission and a permission can be global or resource specific. You can use permissions to protect access to resources and customize features within the application.

20.2.1. Changing permissions for groups and roles in Business Central

In Business Central, you cannot change permissions for an individual user. However, you can change permissions for groups and roles. The changed permissions apply to users with the role or that belong to a group that you changed.



NOTE

Any changes that you make to roles or groups affect all of the users associated with that role or group.

Prerequisites

- You are logged in to Business Central with the **admin** user role.

Procedure

1. To access the **Security management** page in Business Central, select the **Admin** icon in the top-right corner of the screen.
2. Click **Roles**, **Groups**, or **Users** on the Business Central **Settings** page.
The **Security management** page opens on the tab for the icon that you clicked.
3. From the list, click the role or group you want to edit. All details are displayed in the right panel.
4. Set the **Home Page** or **Priority** under the **Settings** section.
5. Set the Business Central, page, editor, space, and project permissions under the **Permissions** section.

Figure 20.1. Setting the permissions

admin settings

Home Page ⓘ

Priority ⓘ

Permissions

> Workbench ⓘ

	Read	Update	Delete	Create	
> Pages ⓘ	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
<div> - Select Page - </div> <div> Add Exception </div>					
> Editors ⓘ	<input type="text"/>				
> Spaces ⓘ	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
> Projects ⓘ	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text" value="Build"/>

6. Click the arrow next to a resource type to expand the resource type whose permissions you want to change.

- Optional: To add an exception for a resource type, click **Add Exception** and then set the permissions as required.

**NOTE**

You cannot add an exception to the Business Central resource type.

- Click **Save**.

20.2.2. Changing the Business Central home page

The home page is the page that appears after you log in to Business Central. By default, the home page is set to **Home**. You can specify a different home page for each role and group.

Procedure

- In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Roles** or **Groups**.
- Select a role or group.
- Select a page from the **Home Page** list.
- Click **Save**.

**NOTE**

The role or group must have read access to a page before you can make it the home page.

20.2.3. Setting priorities

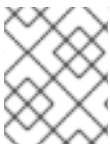
A user can have multiple roles and belong to multiple groups. The Priority setting determines the order of precedence of a role or group.

Prerequisites

- You are logged in to Business Central with the **admin** user role.

Procedure

- In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Roles** or **Groups**.
- Select a role or group.
- Select a priority from the Priority menu, and then click **Save**.

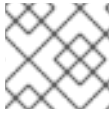
**NOTE**

If a user has a role or belongs to a group that has conflicting settings, the settings of the role or group with the highest priority applies.

CHAPTER 21. ARTIFACT MANAGEMENT

You can manage artifacts from the **Artifacts** page in Business Central. The artifact repository is a local Maven repository and there is only one Maven repository for each installation. Business Central recommends using Maven repository solutions like *Sonatype Nexus™*, *Apache Archiva™*, or *JBoss Artifactory™*.

The **Artifacts** page lists all the artifacts in the Maven repository. You can upload artifacts to the Maven repository.



NOTE

You can only upload JAR, KJAR, and **pom.xml** files to the **Artifacts** repository.

21.1. VIEWING AN ARTIFACT

You can view all the content of the local maven repository from the **Artifacts** page.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Artifacts**.
2. Click **Open** to view the artifact details.
3. Click **Ok** to go back to the **Artifacts** page.

21.2. DOWNLOADING AN ARTIFACT

You can download and save an artifact from Business Central repository to the local storage of a project.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Artifacts**.
2. Click **Download**.
3. Browse to the directory where you want to save the artifact.
4. Click **Save**.

21.3. UPLOADING AN ARTIFACT

You can upload an artifact from the local storage to a project in Business Central.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Artifacts**.
2. Click **Upload**.

3. Click **Choose File** and browse to the directory from where you want to upload the artifact.
4. Click **Upload**.

**NOTE**

If you are using a non-Maven artifact, first deploy the artifact to the Maven repository using the **mvn deploy** command and then refresh the artifact list in Business Central.

CHAPTER 22. DATA SOURCE MANAGEMENT

Business Central provides data source management features that enable you to define data sources for accessing a database. These data sources are then used by other Business Central components such as the data sets. A database driver enables communication between a data source and the targeted database.

From the **Data Source Authoring** page you can add data sources and database drivers to Business Central.



NOTE

Business Central provides a default data source that can be used but cannot be edited or deleted.

22.1. ADDING A DATABASE DRIVER

You can add a new database driver to Business Central.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Data Sources**.
2. In the **DataSource Explorer** pane, click **Add Driver**. The **New driver** window opens.
3. In the **New driver** window, enter the **Name**, **Driver Class Name**, **Group Id**, **Artifact Id**, and **Version** of the database driver.
4. Click **Finish** to add the driver to Business Central.

22.2. EDITING A DATABASE DRIVER

You can update the properties of a database driver from the **Driver Definition** pane.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Data Sources**.
2. In the **DataSource Explorer** pane, select the driver you want to edit.
3. In the **Driver Definition** pane, make the necessary changes to the **Name**, **Driver Class Name**, **Group Id**, **Artifact Id**, and the **Version** fields.
4. Click **Update**.
5. Click **Yes** to save the changes to the driver.

22.3. DELETING A DATABASE DRIVER

You can remove database drivers from the **Data Source Definition** pane of Business Central.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Data Sources**.
2. In the **DataSource Explorer** pane, select the driver you want to delete.
3. Click **Remove**.
4. Click **Delete** to delete the driver.

22.4. ADDING A DATA SOURCE

You can add a new data source to Business Central from the **Data Sources Authoring** page.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Data Sources**.
2. In the **DataSource Explorer** pane, click **Add DataSource**. The **New data source** window opens.
3. In the **New data source** window, enter the data source **Name**, database **Connection URL**, **User** and **Password**, and **Driver**.
4. Click **Test Connection** to verify the connection to the database.
5. Click **Finish** to add the data source to Business Central.

22.5. EDITING A DATA SOURCE

You can edit the properties of a data source and also test its connection to the database in Business Central.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Data Sources**.
2. In the **DataSource Explorer** pane, click the data source you want to edit.
3. In the **Data Source Definition** pane, make the necessary changes to the **Name**, **Connection URL**, **User**, **Password**, and the **Driver** fields.
4. Click **Test Connection** to verify the connection to the database.
5. Click **Update**.
6. Click **Save** to confirm the changes to the data source.

22.6. DELETING A DATA SOURCE

You can delete an existing data source from the **DataSource Explorer** pane in Business Central.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Data Sources**.
2. In the **DataSource Explorer** pane, click the data source you want to delete.
3. Click **Remove**.
4. Click **Delete** to confirm the deletion of the data source.

CHAPTER 23. DATA SETS AUTHORIZING

A data set is a collection of related sets of information. It can be stored in many ways, such as in a database, in a Microsoft Excel file, or in memory. A data set definition instructs Business Central methods to access, read, and parse a data set. Business Central does not store data. It enables you to define access to a data set regardless of where the data is stored.

For example, if data is stored in a database, a valid data set could contain the entire database or a subset of the database as a result of an SQL query. In both cases, the data is used as input for the reporting components of Business Central which then displays the information.

To access a data set, you must create and register a data set definition. This data set definition specifies the location of the data set, the ways to access it, read it, and parse it, and the columns that it contains.



NOTE

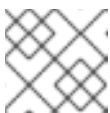
The **Data Sets** page is visible only to users with the **admin** role.

23.1. ADDING DATA SETS

You can create a data set to fetch data from an external data source and use that data for the reporting components.

Procedure

1. In Business Central, go to **Admin → Data Sets**. The **Data Set Explorer** page opens.
2. Click **New Data Set** and select one of the following provider types:
 - **Bean**: Use to generate a data set from a Java class
 - **CSV**: Use to generate a data set from a remote or local CSV file
 - **SQL**: Use to generate a data set from an ANSI-SQL compliant database
 - **Elastic Search**: Use to generate a data set from Elastic Search nodes
 - **Execution Server**: Use to generate a data set using the custom query feature of an Execution Server



NOTE

KIE Server must be configured with this option.

3. Complete the **Data Set Creation Wizard** and click **Test**.



NOTE

The configuration steps differ based on the provider you chose.

4. Click **Save**.

23.2. EDITING DATA SETS

You can edit existing data sets to ensure that the data fetched to the reporting components is up-to-date.

Procedure

1. In Business Central, go to **Admin → Data Sets**. The **Data Set Explorer** page opens.
2. In the **Data Set Explorer** pane, search for the data set you want to edit and click **Edit**.
3. In the **Data Set Editor** pane, use the appropriate tab to edit the data as required. The tabs differ based on the data set provider type you chose.
For example, the following changes are applicable for editing a **CSV** data provider:
 - **CSV Configuration:** Enables you to change the name of the data set definition, the source file, the separator, and other properties.
 - **Preview:** Enables you to preview the data. After you click **Test** in the **CSV Configuration** tab, the system executes the data set lookup call and if the data is available, a preview appears. Note that the **Preview** tab has two sub-tabs:
 - **Data columns:** Enables you to specify what columns are part of your data set definition.
 - **Filter:** Enables you to add a new filter.
 - **Advanced:** Enables you to manage the following configurations:
 - **Caching:** See [Section 48.4, "Caching"](#) for more information.
 - **Cache life-cycle** Enables you to specify an interval of time after which a data set (or data) is refreshed. The **Refresh on stale data** feature refreshes the cached data when the back-end data changes.
4. After making the required changes, click **Validate**.
5. Click **Save**.

23.3. DATA REFRESH

The data refresh feature enables you to specify an interval of time after which a data set (or data) is refreshed. The **Refresh on stale data** feature refreshes the cached data when the back-end data changes.

23.4. CACHING

Business Central provides caching mechanisms for storing data sets and performing data operations using in-memory data. Caching data reduces network traffic, remote system payload, and processing time. To avoid performance issues, configure the cache settings in Business Central.

For any data lookup call that results in a data set, the caching method determines where the data lookup call is executed and where the resulting data set is stored. An example of a data lookup call would be all the mortgage applications whose locale parameter is set as "Urban".

Business Central data set functionality provides two cache levels:

- Client level

- Back-end level

Client cache

When the cache is turned on, the data set is cached in a web browser during the lookup operation and further lookup operations do not perform requests to the back-end. Data set operations like grouping, aggregations, filtering, and sorting are processed in the web browser. Enable client caching only if the data set size is small, for example, for data sets with less than 10 MB of data. For large data sets, browser issues such as slow performance or intermittent freezing can occur. Client caching reduces the number of back-end requests including requests to the storage system.

Back-end cache

When the cache is enabled, the decision engine caches the data set. This reduces the number of back-end requests to the remote storage system. All data set operations are performed in the decision engine using in-memory data. Enable back-end caching only if the data set size is not updated frequently and it can be stored and processed in memory. Using back-end caching is also useful in cases with low latency connectivity issues with the remote storage.



NOTE

Back-end cache settings are not always visible in the **Advanced** tab of the **Data Set Editor** because Java and CSV data providers rely on back-end caching (data set must be in the memory) in order to resolve any data lookup operation using the in-memory decision engine.

CHAPTER 24. ARCHETYPE MANAGEMENT

Business Central provides an archetype management feature that enables you to list, add, validate, set as default, and delete the archetypes. You can manage archetypes from the **Archetypes** page in Business Central. Archetypes are projects that are installed in Apache Maven repositories in which a template structure is set or can be created if required.

For the most up-to-date and detailed information about archetypes, see the [Introduction to Archetypes page](#).

24.1. LISTING ARCHETYPES

The **Archetypes** page lists all the archetypes that are added in Business Central. This list provides the detailed information about **Group ID**, **Artifact ID**, **Version**, **Created Date**, **Status**, and **Actions** of an archetype.

Prerequisites

- You have created an archetype and listed it in the Business Central **Settings** from the maven repository.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Archetypes**.
In the **Status** column, green icon indicates it is a valid archetype, red icon indicates it is an invalid archetype whereas blue icon indicates the corresponding archetype is the default one for the new spaces.

24.2. ADDING AN ARCHETYPE

You can add a new archetype to Business Central.

Prerequisites

- You have installed an archetype in the Maven repository.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Archetypes**.
2. Click **Add Archetype**.
3. In the **Add Archetype** panel, enter the GAV attributes in the **Group ID**, **Artifact ID**, and **Version** fields respectively.
4. Click **Add**.

Business Central validates the newly added archetype and make it available to be used as a template in all the spaces.

24.3. MANAGING ADDITIONAL FEATURES OF AN ARCHETYPE


You can delete, set a default, and validate the archetypes from the **Archetypes** page in Business Central.

Prerequisites

- You have created an archetype and listed in the Business Central **Settings** from the Maven repository.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Archetypes**.

2. From the **Actions** column, click the  icon on the right side of an archetype.
 - Select **Delete** from the drop-down menu to delete an archetype from the list.
 - Select **Validate** from the drop-down menu to validate whether the archetype is valid or not.



NOTE

When the Business Central is starting up, all the registered archetypes are automatically validated.

- Select **Set as default** from the drop-down menu to set an archetype as a default for the new spaces.

24.4. CREATING A PROJECT USING ARCHETYPES

You can use archetypes to create a project in Business Central. When you create a project in Business Central, it is added to the Git repository that is connected to your Red Hat Decision Manager installation.

Prerequisites

- You have created an archetype and listed it in the Business Central **Settings** from the Maven repository.
- You have set an archetype as default in your space in the Business Central.

Procedure

1. In Business Central, go to **Menu → Design → Projects**.
2. Select or create the space into which you want to add a new project from an archetype template.
3. Click **Add Project**.
4. Type the project name and description in the **Name** and **Description** fields respectively.
5. Click **Configure Advanced Options**.
6. Select the **Based on template** check box.

7. Select the archetype from drop-down options if required. The default archetype is selected that is already set in the space.
8. Click **Add**.

The **Assets** view of the project opens based on the selected archetype template.


24.5. MANAGING ARCHETYPES USING SPACE SETTINGS IN BUSINESS CENTRAL

When you add the archetypes to Business Central, they can be used as a templates in all the spaces. You can manage all the archetypes from the **Settings** tab which is available in the space. This tab is visible only to users with the **admin** role.

Prerequisites

- You have installed an archetype in the Maven repository.
- You have created an archetype and listed it in the Business Central **Settings** from the Maven repository.

Procedure

1. In Business Central, go to **Menu → Design → Projects**.
2. Select or create the space into which you want to manage the archetypes. The default space is **MySpace**.
3. Click **Settings**.
4. To include or exclude the archetypes in the space, select the **Include** check box.
5. From the **Actions** column, click the  icon on the right side of an archetype and select **Set as default** from the drop-down menu to set an archetype as a default for the space.
6. Click **Save**.

CHAPTER 25. CUSTOMIZING PROJECT PREFERENCES

A project stores assets and is part of a space. A space can hold multiple projects.

For example, an organization has many departments, such as HR, Payroll, Engineering, R&D, and so on. Each department maps to a space and every department can have its own projects.

You can create a new project from scratch or clone projects from an existing Git repository.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Projects**. The **Projects** page opens.
2. In the **Project Preferences** pane, click the preference you want to modify. The following preferences are available:
 - **File exporting:** This preference has the following properties:

Table 25.1. File exporting properties

Field	Description
PDF orientation	Determines whether the PDF orientation is portrait or landscape.
PDF units	Determines whether the PDF unit is <i>PT</i> , <i>MM</i> , <i>CN</i> or <i>IN</i> .
PDF page format	Determines whether the PDF page format is <i>A[0-10]</i> , <i>B[0-10]</i> , or <i>C[0-10]</i> .

- **Spaces:** This preference has the following properties:

Table 25.2. Spaces properties

Field	Description
Name	The default name of the space that is created automatically if none exists.
Owner	The default owner of the space that is created automatically if none exists.
Group ID	The default group ID of the space that is created automatically if none exists.
Alias (in singular)	Determines the customized alias (singular) of the space.

Field	Description
Alias (in plural)	Determines the customized alias (plural) of the space.

- **Default values:** This preference has the following properties:

Table 25.3. Default values properties

Field	Description
Version	The default version number of a project when creating projects using the Quick setup option.
Description	The default description of a project when creating projects using the Quick setup option.
Branch	The default branch to be used when using a Git repository.

- **Advanced GAV preferences:** This preference has the following properties:

Table 25.4. Advanced GAV preference properties

Field	Description
Disable GAV conflict check?	Determines whether to enable or disable the GAV conflict check. Disabling this feature allows projects to have the same GAV (Group ID, Artifact, Version).
Allow child GAV edition?	Determines whether to allow child/sub-projects to have GAV edition.

**NOTE**

Duplicate GAV detection is disabled for projects in **Development Mode**. To enable duplicate GAV detection for a project in Business Central, go to project **Settings** → **General Settings** → **Version** and toggle the **Development Mode** option to **OFF** (if applicable).

3. Click **Save**.

CHAPTER 26. CUSTOMIZING ARTIFACT REPOSITORY PROPERTIES

In some cases, projects need to resolve external dependencies to build domain model JAR files. A repository contains the needed artifacts and has the following features:

- The repository is a Maven repository.
- All snapshots are time stamped.
- Assets are stored mostly in the local hard drive.

By default, the artifact repository is in **\$WORKING_DIRECTORY/repositories/kie**.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Artifact Repository**. The **Artifact Repository** page opens.
2. Make selections and enter information in the **Properties** section.
3. Click **Save**.

CHAPTER 27. CUSTOMIZING LANGUAGE SETTINGS

You can change the language on the Business Central **Settings** page. Business Central supports the following languages:

- English
- German
- Spanish
- French
- Japanese
- Portuguese
- Chinese(Simplified)

The default language is English.

Procedure

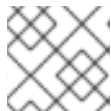
1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Languages**. The **Language Selector** window opens.
2. Select the desired language from the **Language** list.
3. Click **Ok**.

CHAPTER 28. CUSTOMIZING PROCESS ADMINISTRATION

You can customize the default pagination option in Business Central by editing the **Default items per page** property on the **Process Administration** page.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Process Administration**.
2. From the **Properties** section, update the **Default items per page** property and click **Save**.



NOTE

You can specify 10, 20, 50, or 100 items to display on each page.

CHAPTER 29. CUSTOMIZING THE PROCESS DESIGNER

You can customize the process designer in Business Central by editing the properties of the diagram editor on the Business Central **Settings** page.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Process Designer**.
2. In the **Properties** section, update any of the following properties:
 - Select the **Auto hide category panel** check box to automatically hide a category toolbar panel.
 - In the **Drawing area width** field, enter an integer value between 2800 and 5600 to set the width of the drawing area.
 - In the **Drawing area height** field, enter an integer value between 1400 and 2800 to set the height of the drawing area.
 - Select the **Enable HiDPI** check box if you are using a high resolution display and are seeing blurry text and objects. This option is disabled by default.
3. Click **Save**.

CHAPTER 30. SSH KEYS

Business Central provides an SSH keystore service to enable user SSH authentication. Business Central provides a configurable default SSH keystore, extensible APIs (for custom implementations), and support for multiple SSH public key formats.

You can access the **SSH Keys** option on the Business Central **Settings** page to register your SSH public keys.

30.1. DEFAULT SSH KEYSTORE

The default SSH keystore included with Business Central provides a file-based storage mechanism to store a user's public keys. By default, Business Central uses the ***.security** folder as the root directory. However, you can also use a custom storage path by setting the value of the **appformer.ssh.keys.storage.folder** system property to point to a different folder.

The SSH public keys are stored in the **{securityFolderPath}/pkeys/{userName}/** folder structure.

Each SSH public key consists of the following files, located in the storage folder:

- **{keyId}.pub**: This file contains the SSH public key content. As the file name determines the logic key ID on the system, ensure that the file name is not modified during run time.

For example:

```
ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAQDmak4Wu23RZ6XmN94bOssecZxuTa4RRhhQm
HmTZjMB7HM57/90u/B/gB/GhsPEu1nAXL0npY56tT/MPQ8vRm2C2W9A7CzN5+z5yyL3W01Y
Zy3kzslk77CjULjfhrcfQSL3b2sPG5jv5E5/nyC/swSytucwT/PE7aXTS9H6cHIKUdYPzlt94SHoBx
WRIK7PJi9d+eLB+hmDzvbVa1ezu5a8yu2kcHi6Nxxfl5iRj2rsceDTp0imC1jMoC6ZDfBvZSxL9F>
TMwFdNnmTIJveBtv9nAbnAvIWlIS0VOKdj1s3GxBxeZYAcKbcsK9sJzusptk5dxGsG2Z8vInagIN
6OaOQ7b7tcomzCYYwviGQ9gRX8sGsVrw39gsDIGYP2tA4bRr7ecHnlNg1b0HCchA5+QCDk
4Hbz1UrnHmPA2Lg9c3WGM2qedvQdVJXuS3mlwYOqL40aXP6890PvFJUlpivSznF50djPnws
MxJZEf1HdTXgZD1Bh54ogZf7czyUNfkNkE69yJDbTHjpQd0cKUQnu9tVxqmBzhX31yF4VcsMe
ADcf2Z8wIA3n4LZnC/GwonYlq5+G93zJpFOkPhme8c2XuPuCXF795lsxyJ8SB/AlwPJAhEtm0y
0s0l1I4eWqxsDxkBOgN+ivU0czrVMssHJEJb4o0FLf7iHhOW56/iMdD9w== userName
```

- **.{keyId}.pub.meta**: This file contains the key metadata in JSON format. A new metadata file is dynamically generated if a key has no metadata.

For example:

```
{
  "name": "Key",
  "creationDate": "Oct 10, 2018 10:10:50 PM",
  "lastTimeUsed": "Oct 11, 2018 12:11:23 PM"
}
```

30.2. CUSTOM SSH KEYSTORE

You can extend and customize the default SSH keystore according to your requirements. Use the **appformer.ssh.keystore** system property to specify the Java class name of the SSH service to use. If this property is not defined or it contains an incorrect value, then the default SSH keystore is loaded.

**NOTE**

To create a custom implementation of the SSH keystore, your Java class must implement the **org.uberfire.ssh.service.backend.keystore.SSHKeyStore** class defined in the **uberfire-ssh-api** module.

30.3. CREATING AN SSH KEY

Before you can add or register SSH keys to Business Central, you must generate an SSH key on your system.

Procedure

1. Open a command terminal on your system.
2. Run the **ssh-keygen** command to create the SSH key as shown in the following example, where **<user_login>** is your user name:

```
ssh-keygen -t rsa -b 4096 -C "<user_login>"
```

**NOTE**

The SSH key formats supported by Business Central keystore are **ssh-rsa**, **ssh-dss**, **ecdsa-sha2-nistp256**, **ecdsa-sha2-nistp384**, and **ecdsa-sha2-nistp521**.

3. When prompted, press Enter and accept the default key file location as shown in the following example, where **<user_login>** is your user name:

```
Enter a file in which to save the key (/home/<user_login>/.ssh/id_rsa): [Press enter]
```

4. At the command prompt, enter and confirm the passphrase:

```
Enter passphrase (empty for no passphrase): [Type a passphrase]
Enter same passphrase again: [Type passphrase again]
```

5. Start the **ssh-agent**:

```
eval "$(ssh-agent -s)"
Agent pid <any-number-here>
```

6. Add the new SSH private key to the **ssh-agent**. If you have used a different key name, replace **id_rsa** in that code:

```
ssh-add ~/.ssh/id_rsa
```

30.4. REGISTERING YOUR SSH PUBLIC KEY WITH THE SSH KEYSTORE

You must register your newly created SSH public key with the Business Central keystore.

Procedure

1. Open a command terminal on your system.

2. Run the **cat** command as shown in the following example, where **id_rsa** is your key name:

```
cat ~/.ssh/id_rsa.pub
```

3. Copy the contents of your SSH public key.
4. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **SSH Keys**.
5. On the **SSH Keys** page, click **Add SSH Key**.
6. In the **Add SSH Key** window, enter a name in the **Name** field and copy the contents of the SSH public key to the **Key** field.

**NOTE**

The **Name** and the **Key** fields are mandatory.

7. Click **Add SSH Key** to register the key.

30.5. DELETING AN SSH KEY

You can delete an SSH key from Business Central by from the **SSH Keys** page.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **SSH Keys**.
2. On the **SSH Keys** page, click the delete icon of the SSH key you want to delete.
3. Click **Delete SSH Key** to confirm the deletion.

CHAPTER 31. MANAGING CUSTOM TASKS IN BUSINESS CENTRAL

Custom tasks (work items) are tasks that you can customize and reuse across multiple business processes or across all projects in Business Central. Red Hat Decision Manager provides a set of custom tasks within the custom task repository in Business Central. You can enable or disable the default custom tasks and upload custom tasks into Business Central to implement the tasks in the relevant processes.




NOTE

Red Hat Decision Manager includes a limited set of supported custom tasks. Custom tasks that are not included in Red Hat Decision Manager are not supported.

Procedure



1. In Business Central, click  in the upper-right corner and select **Custom Tasks Administration**.


This page lists the custom task installation settings and available custom tasks for processes in projects throughout Business Central. The custom tasks that you enable on this page become available in the project-level settings where you can then install each custom task to be used in processes. The way in which the custom tasks are installed in a project is determined by the global settings that you enable or disable under **Settings** on this **Custom Tasks Administration** page.

2. Under **Settings**, enable or disable each setting to determine how the available custom tasks are implemented when a user installs them at the project level.

The following custom task settings are available:

- **Install as Maven artifact** Uploads the custom task JAR file to the Maven repository that is configured with Business Central, if the file is not already present.
 - **Install custom task dependencies into project** Adds any custom task dependencies to the **pom.xml** file of the project where the task is installed.
 - **Use version range when installing custom task into project** Uses a version range instead of a fixed version of a custom task that is added as a project dependency. Example: **[7.16,)** instead of **7.16.0.Final**
3. Enable or disable (set to **ON** or **OFF**) any available custom tasks as needed. Custom tasks that you enable are displayed in project-level settings for all projects in Business Central.

Figure 31.1. Enable custom tasks and custom task settings

Custom Tasks Administration 

Settings

Install as Maven artifact ☒ ON

Instructs if enabled custom tasks should be installed into Maven repository









Install custom task dependencies into project ☒ ON

Instructs that custom task dependencies are added as project dependencies upon installation

Use version range when installing custom task into a project ☐ OFF

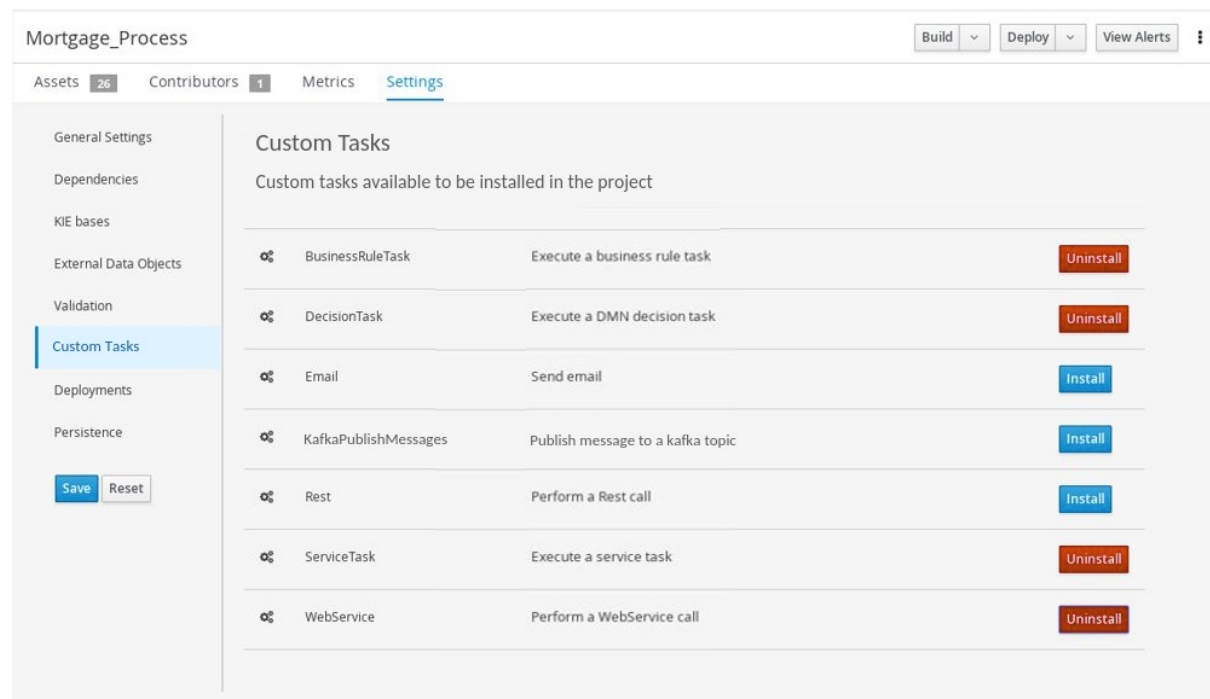
Instructs that a version range will be used when installing custom task in projects

[Add Custom Task](#)

	BusinessRuleTask	Execute business rule or service tasks Execute a business rule task	<input checked="" type="checkbox"/> ON <input type="checkbox"/> OFF
	CamelXSLTConnector	Use Apache Camel connectors in your processes Process a message using an XSLT template	<input type="checkbox"/> OFF <input type="checkbox"/> ON
	DecisionTask	Execute business rule or service tasks Execute a DMN decision task	<input checked="" type="checkbox"/> ON <input type="checkbox"/> OFF
	Email	Send an email Send email	<input checked="" type="checkbox"/> ON <input type="checkbox"/> OFF
	KafkaPublishMessages	publish kafka messages from a process Publish message to a kafka topic	<input checked="" type="checkbox"/> ON <input type="checkbox"/> OFF
	Rest	Perform REST calls Perform a Rest call	<input checked="" type="checkbox"/> ON <input type="checkbox"/> OFF
	ServiceTask	Execute business rule or service tasks Execute a service task	<input checked="" type="checkbox"/> ON <input type="checkbox"/> OFF
	WebService	Perform Webservice operations Perform a Webservice call	<input checked="" type="checkbox"/> ON <input type="checkbox"/> OFF

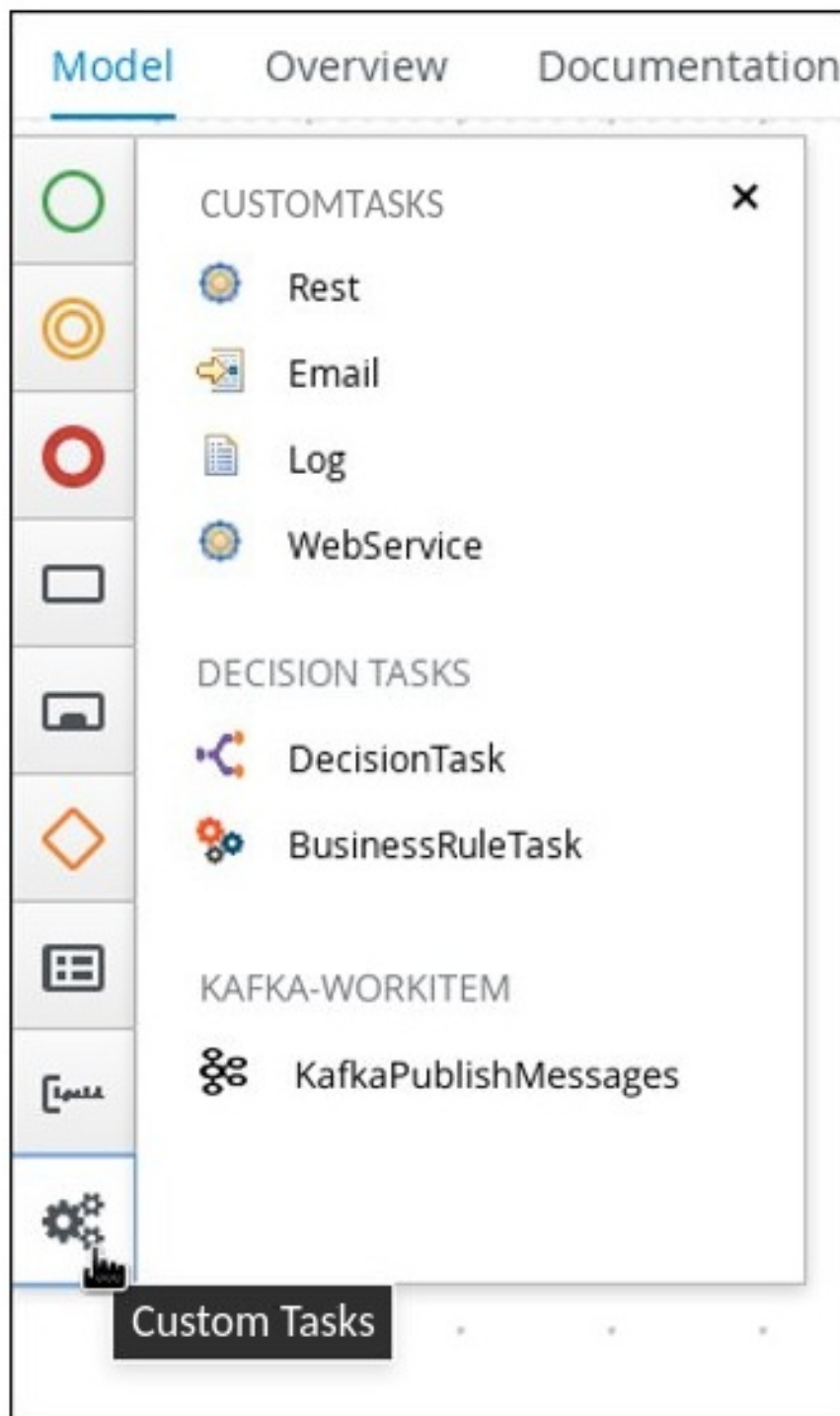
- To add a custom task, click **Add Custom Task**, browse to the relevant JAR file, and click the **Upload** icon. The JAR file must contain work item handler implementations annotated with **@Wid**.
- Optionally, to remove a custom task, click **remove** on the row of the custom task you want to remove and click **Ok** to confirm removal.
- After you configure all required custom tasks, navigate to a project in Business Central and go to the project **Settings** → **Custom Tasks** page to view the available custom tasks that you enabled.
- For each custom task, click **Install** to make the task available to the processes in that project or click **Uninstall** to exclude the task from the processes in the project.
- If you are prompted for additional information when you install a custom task, enter the required information and click **Install** again.
The required parameters for the custom task depend on the type of task. For example, rule and decision tasks require artifact GAV information (Group ID, Artifact ID, Version), email tasks require host and port access information, and REST tasks require API credentials. Other custom tasks might not require any additional parameters.

Figure 31.2. Install custom tasks for use in processes



9. Click **Save**.
10. Return to the project page, select or add a business process in the project, and in the process designer palette, select the **Custom Tasks** option to view the available custom tasks that you enabled and installed:

Figure 31.3. Access installed custom tasks in process designer



CHAPTER 32. EXPORTING AND IMPORTING DASHBUILDER DATA

Dashbuilder is a dashboard and reporting tool integrated in Business Central and is used by the Datasets editor. You can import and export Dashbuilder data as ZIP files in Business Central.



IMPORTANT

This feature is only accessible by administrator users.

32.1. EXPORTING DASHBUILDER DATA

You can export all the dashbuilder related data such as datasets from Business Central as a ZIP file.

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Dashbuilder Data Transfer**.
2. On the **Dashbuilder Data Transfer** page, click **Export all**.
An **export.zip** file containing all dashbuilder data is downloaded. The **export.zip** file structure is separated by data type. For example:

```
dashbuilder/datasets/definitions/dataset-example1.dset
dashbuilder/datasets/definitions/dataset-example2.dset
dashbuilder/datasets/readme.md
VERSION
```

32.2. IMPORTING DASHBUILDER DATA

You can import Dashbuilder data to Business Central from a ZIP file if the archive is structured in the same way as the following example:

```
dashbuilder/datasets/definitions/dataset-example1.dset
dashbuilder/datasets/definitions/dataset-example2.dset
dashbuilder/datasets/readme.md
VERSION
```

Procedure

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Dashbuilder Data Transfer**.



WARNING

You should only import Dashbuilder data to a clean installation of Red Hat Decision Manager in order to avoid overwriting data on an existing system.

2. On the **Dashbuilder Data Transfer** page, click the **Choose File** icon.
3. Navigate to the ZIP file you want to import and select the file.
4. Click the **Upload** icon.
5. Click **Import**.

CHAPTER 33. LDAP CONNECTION

Business Central provides a dedicated **UserGroupCallback** implementation for LDAP servers with Red Hat Decision Manager to enable the user task service to retrieve information on users, groups, and roles directly from an LDAP service.

You can configure the following LDAP **UserGroupCallback** implementation properties:

Table 33.1. LDAP UserGroupCallback properties

Property	Description
ldap.bind.user	User name for connecting to the LDAP server. This property is optional if it is not specified and the LDAP server accepts anonymous access.
ldap.bind.pwd	Password for connecting to the LDAP server. This property is optional if it is not specified and the LDAP server accepts anonymous access.
ldap.user.ctx	Context in LDAP with user information.
ldap.role.ctx	Context in LDAP with group and role.
ldap.user.roles.ctx	Context in LDAP with user group and role membership information. This property is optional if it is not specified and the ldap.role.ctx property is used instead.
ldap.user.filter	Filter for searching user information. This property usually contains substitution keys {0} that are replaced with parameters.
ldap.role.filter	Filter for searching group and role information. This property usually contains substitution keys {0} that are replaced with parameters.
ldap.user.roles.filter	Filter for searching user group and role membership information. This property usually contains substitution keys {0} that are replaced with parameters.
ldap.user.attr.id	Attribute name of the user ID in LDAP. This property is optional if it is not specified and the uid property is used instead.

Property	Description
ldap.roles.attr.id	Attribute name of the group and role ID in LDAP. This property is optional if it is not specified and the cn property is used instead.
ldap.user.id.dn	User ID in a DN, instructs the callback to query for user DN before searching for roles. This is optional and is false by default.
java.naming.factory.initial	Initial context factory class name; is com.sun.jndi.ldap.LdapCtxFactory by default.
java.naming.security.authentication	Authentication type where the possible values are none , simple , and strong . This is simple by default.
java.naming.security.protocol	Security protocol to be used, for example, ssl .
java.naming.provider.url	LDAP url (by default ldap://localhost:389 ; if the protocol is set to ssl then ldap://localhost:636)

33.1. LDAP USERGROUPCALLBACK IMPLEMENTATION

You can use the LDAP **UserGroupCallback** implementation by configuring the respective LDAP properties in one of the following ways:

- Programmatically: Build a properties object with the respective **LDAPUserGroupCallbackImpl** properties and create **LDAPUserGroupCallbackImpl** using the same properties object as its parameter.

For example:

```
import org.kie.api.PropertiesConfiguration;
import org.kie.api.task.UserGroupCallback;
...
Properties properties = new Properties();
properties.setProperty(LDAPUserGroupCallbackImpl.USER_CTX, "ou=People,dc=my-domain,dc=com");
properties.setProperty(LDAPUserGroupCallbackImpl.ROLE_CTX, "ou=Roles,dc=my-domain,dc=com");
properties.setProperty(LDAPUserGroupCallbackImpl.USER_ROLES_CTX, "ou=Roles,dc=my-domain,dc=com");
properties.setProperty(LDAPUserGroupCallbackImpl.USER_FILTER, "(uid={0})");
properties.setProperty(LDAPUserGroupCallbackImpl.ROLE_FILTER, "(cn={0})");
properties.setProperty(LDAPUserGroupCallbackImpl.USER_ROLES_FILTER, "(member={0})");

UserGroupCallback ldapUserGroupCallback = new
```

```
LDAPUserGroupCallbackImpl(properties);
```

```
UserGroupCallbackManager.getInstance().setCallback(ldapUserGroupCallback);
```

- Declaratively: Create the **jbpm.usergroup.callback.properties** file in the root of your application or specify the file location as a system property.
For example:

-Djbpm.usergroup.callback.properties=FILE_LOCATION_ON_CLASSPATH

Ensure that you register the LDAP callback when starting the user task server.

For example:

```
#ldap.bind.user=
#ldap.bind.pwd=
ldap.user.ctx=ou\=People,dc\=my-domain,dc\=com
ldap.role.ctx=ou\=Roles,dc\=my-domain,dc\=com
ldap.user.roles.ctx=ou\=Roles,dc\=my-domain,dc\=com
ldap.user.filter=(uid\={0})
ldap.role.filter=(cn\={0})
ldap.user.roles.filter=(member\={0})
#ldap.user.attr.id=
#ldap.roles.attr.id=
```

Additional resources

- [Roles and users](#)
- [Red Hat Single Sign-On Server Administration Guide](#)
- [Defining LDAP login domain](#)
- [LDAP login module](#)
- [LDAPExtended login module](#)
- [AdvancedLDAP login module](#)
- [AdvancedAdLDAP login module](#)
- [LDAP connectivity options](#)
- [LDAPUsers login module](#)

CHAPTER 34. DATABASE CONNECTION

Business Central provides a dedicated **UserGroupCallback** implementation for database server with Red Hat Decision Manager to enable the user task service. The user task service helps in retrieving information on users and groups (roles) directly from databases.

You can configure the following database **UserGroupCallback** implementation properties:

Table 34.1. Database UserGroupCallback properties

Property	Description
db.ds.jndi.name	JNDI name of the data source used for connections
db.user.query	Verifies the user existence
db.user.roles.query	Collects the groups for a given user
db.roles.query	Verifies the group existence

34.1. DATABASE USERGROUPCALLBACK IMPLEMENTATION

In database **UserGroupCallback** implementation, you must create the required database. You can use this implementation by configuring the respective database properties in one of the following ways:

- Programmatically: Build a properties object with the respective **DBUserGroupCallbackImpl** properties and create **DBUserGroupCallbackImpl** using the same properties object as its parameter.

For example:

```
import static org.jbpm.services.task.identity.DBUserGroupCallbackImpl.DS_JNDI_NAME;
import static
org.jbpm.services.task.identity.DBUserGroupCallbackImpl.PRINCIPAL_QUERY;
import static org.jbpm.services.task.identity.DBUserGroupCallbackImpl.ROLES_QUERY;
import static
org.jbpm.services.task.identity.DBUserGroupCallbackImpl.USER_ROLES_QUERY;
...
props = new Properties();
props.setProperty(DS_JNDI_NAME, "jdbc/jbpm-ds");
props.setProperty(PRINCIPAL_QUERY, "select userId from Users where userId = ?");
props.setProperty(ROLES_QUERY, "select groupId from UserGroups where groupId = ?");
props.setProperty(USER_ROLES_QUERY, "select groupId from UserGroups where userId =
?");

callback = new DBUserGroupCallbackImpl(props);
```

- Declaratively: Create the **jbpm.usergroup.callback.properties** file in the root of your application or specify the file location as a system property.

For example:

-Djbpm.usergroup.callback.properties=FILE_LOCATION_ON_CLASSPATH

Ensure that you register the database callback when starting the user task server.

For example:

```
System.setProperty("jbpm.usergroup.callback.properties",
"/jbpm.usergroup.callback.db.properties");
callback = new DBUserGroupCallbackImpl(true);
...
db.ds.jndi.name = jdbc/jbpm-ds
db.user.query = select userId from Users where userId = ?
db.roles.query = select groupId from UserGroups where groupId = ?
db.user.roles.query = select groupId from UserGroups where userId = ?
```

Additional resources

- [Roles and users](#)

CHAPTER 35. CONFIGURING MAVEN USING SETTINGS.XML FILE

Java application development uses the Apache Maven build automation tool to build and manage software projects. Maven uses Project Object Model (POM) configuration XML files to define both, the project properties and the build process.

Maven uses repositories to store Java libraries, plug-ins, and other build artifacts. Repositories can be either local or remote. A local repository is a download of artifacts from a remote repository cached on a local machine. A remote repository is any other repository accessed using common protocols, such as **http://** when located on an HTTP server, or **file://** when located on a file server. The default repository is the public remote Maven 2 Central Repository. Configuration of Maven is performed by modifying the settings.xml file. You can either configure global Maven settings in the **M2_HOME/conf/settings.xml** file, or user-level settings in the **USER_HOME/.m2/settings.xml** file.

Additional resources

- [Configuring an external Maven repository for Business Central and KIE Server](#)
- [Packaging and deploying a Red Hat Decision Manager project in Maven](#)
- [Maven settings and repositories for Red Hat Decision Manager](#)
- [System integration with Maven](#)
- [Welcome to Apache Maven](#)
- [Apache Maven Project - Introduction to Repositories](#)
- [Apache Maven Parent POMs Reference](#).

CHAPTER 36. GAV CHECK MANAGEMENT

In Business Central, projects are identified by the **Group ID**, **Artifact ID**, and **Version** (GAV) Maven naming convention. GAV values differentiate projects and project versions as well as identify dependencies with particular projects.

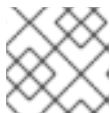
By default, Business Central detects duplicate GAVs. This feature can be disabled by users with the *admin* role.

36.1. CONFIGURING GAV CHECKS AND CHILD GAV EDITION

This procedure describes how to configure GAV checks in Business Central.

Procedure

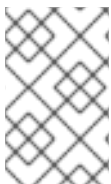
1. In Business Central, go to **Menu → Design → Projects** and click the project name.
2. In the project window, click the **Settings** tab.
3. In the **General Settings** tab, perform any of the following tasks:
 - To enable other projects to have the same GAV, select the **Disable GAV conflict check** check box.
 - To enable child projects to have GAV edition, select the **Allow child GAV edition** check box.
4. Click **Save**.



NOTE

You can click **Reset** to undo all changes.

5. Click **Save** to confirm the changes.



NOTE

Duplicate GAV detection is disabled for projects in **Development Mode**. To enable duplicate GAV detection in Business Central, go to project **Settings → General Settings → Version** and toggle the **Development Mode** option to **OFF** (if applicable).

36.2. CONFIGURING GAV CHECKS FOR ALL PROJECTS

This procedure describes how to configure GAV checks for all projects in Business Central. You can also disable GAV checks at system startup.

Procedures

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Projects**. The **Projects** window opens.
2. In the **Advanced GAV preferences** tab, perform any of the following tasks:
 - To enable other projects to have the same GAV, select the **Disable GAV conflict check**

check box.

- To enable child projects to have GAV edition, select the **Allow child GAV edition** check box.

3. Click **Save**.



NOTE

You can also disable the duplicate GAV detection feature by setting the **org.guvnor.project.gav.check.disabled** system property to *true* for Business Central at system startup:

```
$ ~/EAP_HOME/bin/standalone.sh -c standalone-full.xml  
-Dorg.guvnor.project.gav.check.disabled=true
```

CHAPTER 37. CONFIGURING THE ENVIRONMENT MODE IN KIE SERVER AND BUSINESS CENTRAL

You can set KIE Server to run in **production** mode or in **development** mode. Development mode provides a flexible deployment policy that enables you to update existing deployment units (KIE containers) while maintaining active process instances for small changes. It also enables you to reset the deployment unit state before updating active process instances for larger changes. Production mode is optimal for production environments, where each deployment creates a new deployment unit.

In a development environment, you can click **Deploy** in Business Central to deploy the built KJAR file to a KIE Server without stopping any running instances (if applicable), or click **Redeploy** to deploy the built KJAR file and replace all instances. The next time you deploy or redeploy the built KJAR, the previous deployment unit (KIE container) is automatically updated in the same target KIE Server.

In a production environment, the **Redeploy** option in Business Central is disabled and you can click only **Deploy** to deploy the built KJAR file to a new deployment unit (KIE container) on a KIE Server.

Procedure

1. To configure the KIE Server environment mode, set the **org.kie.server.mode** system property to **org.kie.server.mode=development** or **org.kie.server.mode=production**.
2. To configure the deployment behavior for a project in Business Central, go to project **Settings** → **General Settings** → **Version** and toggle the **Development Mode** option.



NOTE

By default, KIE Server and all new projects in Business Central are in development mode.

You cannot deploy a project with **Development Mode** turned on or with a manually added **SNAPSHOT** version suffix to a KIE Server that is in production mode.

CHAPTER 38. GIT HOOKS AND REMOTE GIT REPOSITORY INTEGRATION

Git hooks are bash scripts that execute before or after Git events such as **git commit** or **git push**. In Business Central, you can use Git hooks to configure repositories to trigger specified actions every time events happen. For more information about Git hooks, see [Customizing Git Hooks](#).

You can integrate remote Git repositories with Business Central by using post-commit Git hooks. This enables you to automate content replication between Business Central and remote repositories. For example, you can implement a real-time backup strategy where changes you make to your Business Central projects are replicated to your remote Git repositories.



NOTE

Business Central only supports post-commit Git hooks.

A post-commit Git hook executes after every commit as a sync operation. Business Central waits for the post-commit bash to complete and no other write operation occurs in the repository.

38.1. CREATING POST-COMMIT GIT HOOKS

You can create a post-commit Git hook bash script file that executes code contained in that file or execute code from a different file such as a Java program.

Procedure

1. Create a **post-commit** Git hook file:

```
$ touch post-commit
```

2. Set the permissions of the **post-commit** file to **755**:

```
$ chmod 755 post-commit
```

3. Add **#!/bin/bash** and any required code to the **post-commit** file, for example:

- To push all changes to a remote repository:

```
#!/bin/bash
git push origin +master
```

- To log a message:

```
#!/bin/bash
echo 'Hello World'
```

- To execute code of another file:

```
#!/bin/bash
java -jar _EAP_HOME_/bin/.niogit/<SPACE>/<PROJECT_NAME>.git/hooks/git-push.jar
```



NOTE

To use post-commit Git hooks that execute Java code, you must use the following Java libraries:

- [JGit](#): Used to interact with internal Business Central Git repositories.
- [GitHub API for Java](#): Used to communicate with GitHub.

For more information about post-commit Git hook and Java code examples, see [Business Central post-commit Git Hooks Integration](#).


38.2. IMPORTING REMOTE GIT REPOSITORIES

You can import a remote Git repository in to Business Central and configure a post-commit Git hook to automatically push changes to that remote repository.

Prerequisites

- Red Hat Decision Manager is installed in a Red Hat JBoss EAP 7.3 server instance.
- Red Hat Decision Manager projects exist in an external Git repository.
- Read access credentials for the external Git repository.
- (For Windows) Cygwin is installed with the Git package added during installation and the path to the Cygwin **/bin** folder is added to your environment **PATH** variable. For example, **C:\cygwin64\bin**. For more information about Cygwin installation, see [Installing and Updating Cygwin Packages](#).

Procedure

1. In Business Central, go to **Menu → Projects**.
2. Select or create the space that you want to import the Git projects into.
3. Click  on the right side of the screen and select **Import Project**.
4. In the **Import Project** window, enter the URL of your Git repository, for example, https://github.com/USERNAME/REPOSITORY_NAME.git, and the credentials for the Git repository.
5. Click **Import**.
The project is added to the Business Central Git repository and is then available in the space.



IMPORTANT

Use the HTTPS or Git protocol instead of a SCP-style SSH URL. Business Central does not support the basic SSH URL and an error appears if you use this URL.

You must have your public ssh key configured in your Git provider.

The Git repository must be a KJAR project, containing only a single KJAR that is compatible with the Red Hat Decision Manager version. The KJAR content must be in the root of the repository.

6. In a command terminal, navigate to the **hooks** folder located in the repository Git folder of the project. For example:

```
$ cd _EAP_HOME_/bin/.niogit/<SPACE>/<PROJECT_NAME>.git/hooks
```

7. Create a **post-commit** file that pushes changes to the remote Git repository. For example:

```
#!/bin/sh
git push origin +master
```

For more information about creating post-commit Git hooks, see [Section 38.1, “Creating post-commit Git hooks”](#).

8. Optional: To check that the configuration was successful, create a guided rule in Business Central:
 - a. In Business Central go to **Menu → Projects → Add Asset → Guided Rule**.
 - b. On the **Create new Guided Rule** page, enter the required information.
 - c. Click **Ok**.
Business Central automatically pushes all changes to the remote repository.

Additional resources

- [Customizing Git - Git Hooks](#)

38.3. CONFIGURING GIT HOOKS FOR EXISTING REMOTE GIT PROJECT REPOSITORIES

If you have an existing remote Git repository project you can create a post-commit Git hook in a remote Git repository of that existing project and integrate the remote Git repository with Business Central.

Prerequisites

- Red Hat Decision Manager is installed in a Red Hat JBoss EAP 7.3 server instance.
- Red Hat Decision Manager projects exist in an external Git repository.
- Read access credentials for the external Git repository.
- (For Windows operating system) Cygwin is installed with the Git package added during

installation and the path to the Cygwin **/bin** folder is added to your environment **PATH** variable. For example, **C:\cygwin64\bin**. For more information about Cygwin installation, see [Installing and Updating Cygwin Packages](#).

Procedure

1. In a command terminal, navigate to the **hooks** folder located in the repository Git folder of the project. For example:

```
$ cd _EAP_HOME_/bin/.niogit/<SPACE>/<PROJECT_NAME>.git/hooks
```

2. Create a **post-commit** file that pushes changes to the remote Git repository. For example:

```
#!/bin/sh
git push origin +master
```

For more information about creating post-commit Git hooks, see [Section 38.1, "Creating post-commit Git hooks"](#).

3. Optional: To check that the configuration was successful, create a guided rule in Business Central:
 - a. In Business Central go to **Menu → Projects → Add Asset → Guided Rule**.
 - b. On the **Create new Guided Rule** page, enter the required information.
 - c. Click **Ok**.
Business Central automatically pushes all changes to the remote repository.

38.4. CONFIGURING GIT HOOKS AS A SYSTEM PROPERTY FOR BUSINESS CENTRAL

If you do not have an existing Git repository project or if you want to apply post-commit Git hooks to a large number of project repositories you can specify a directory containing a hook file for the value of the **org.uberfire.nio.git.hooks** system property. This directory is copied to the Git repositories.



NOTE

If you specify the **org.uberfire.nio.git.hooks** system property, all Business Central internal repositories and project repositories use the post-commit Git hook. You should only use fully qualified paths in your script.

Prerequisites

- Red Hat Decision Manager is installed in a Red Hat JBoss EAP 7.3 server instance.
- (For Windows operating system) Cygwin is installed with the Git package added during installation and the path to the Cygwin **/bin** folder is added to your environment **PATH** variable. For example, **C:\cygwin64\bin**. For more information about Cygwin installation, see [Installing and Updating Cygwin Packages](#).

Procedure

1. Create a post-commit Git hook in a directory on your local system.

For more information about creating post-commit Git hooks, see [Section 38.1, “Creating post-commit Git hooks”](#).

- To specify the directory with the hook file for the value of the **org.uberfire.nio.git.hooks** system property, do one of the following tasks:

- Add the **org.uberfire.nio.git.hooks** system property to the **standalone.xml** file. For example:

```
<system-properties>
  <property name="org.uberfire.nio.git.hooks" value="_EAP_HOME_/hooks">
  </property>
  ...
</system-properties>
```

- Use the **-Dorg.uberfire.nio.git.hooks** environment variable when executing Business Central. For example:

```
$ ./standalone.sh -c standalone-full.xml -
Dorg.uberfire.nio.git.hooks=_EAP_HOME_/hooks
```

- Start Business Central.

The post-commit Git hook is copied to all Business Central internal repositories and project repositories.

Additional resources

- [Customizing Git - Git Hooks](#)

38.5. INTEGRATING REMOTE GIT REPOSITORIES

In the following example, you use a post-commit Git hook and Java code to integrate Business Central with a remote Git repository. For the Java code example, see [Business Central post-commit Git Hooks Integration](#). The example provides the following functionality:

- Automatic generation of the template **.gitremote** configuration file
- Validation of the **.gitremote** configuration file for required parameters
- Patterns defined in the ignore parameter of the **.gitremote** file are ignored by Git
- Message and notification output to users
- Support for GitLab and GitHub token authentication
- Support for GitLab group and subgroup project creation
- Support for GitHub organization repository creation

Prerequisites

- Red Hat Decision Manager is installed in a Red Hat JBoss EAP 7.3 server instance.
- Java Development Kit (JDK) 8 is installed.

- Maven is installed.

Procedure

1. In a terminal window, clone the GitHub repository to your system:

```
$ git clone https://github.com/kiegroup/bc-git-integration-push.git
```

2. Navigate to the cloned repository:

```
$ cd bc-git-integration-push
```

3. Execute a Maven clean install:

```
$ mvn clean install
```

4. Create a **/hooks** folder in your **EAP_HOME** directory:

```
$ mkdir -p _EAP_HOME_/hooks/
```

5. Copy the **git-push-2.1-SNAPSHOT.jar** to the **EAP_HOME/hooks/** folder:

```
$ cp bc-git-integration-push/target/git-push-2.1-SNAPSHOT.jar _EAP_HOME_/hooks/
```

6. Optional: To create a template **.gitremote** configuration file, run **git-push-2.1-SNAPSHOT.jar**:

```
$ java -jar git-push-2.1-SNAPSHOT.jar
```

Example template **.gitremote** configuration file

```
#This is an auto generated template empty property file
provider=GIT_HUB
login=
password=
token=
remoteGitUrl=https://api.github.com/
useSSH=false
ignore=.*demo.*, test.*
githubOrg=OrgName
gitlabGroup=Group/subgroup
```

7. Modify the **.gitremote** configuration file parameters.

Table 38.1. Example **.gitremote parameters**

Parameter	Description
provider	The Git provider. Only two values are accepted: GIT_HUB and GIT_LAB. Required
login	The user name for the Git provider. Required

Parameter	Description
password	A plain text password. Not required if a token is provided.
token	A generated token to replace the username and password based unsecured connection. Note: If this is not set a warning is displayed that you are using an unsecured connection. Not required if a password is provided. Note: GitLab only supports token authentication.
remoteGitUrl	A public provider URL or a locally hosted enterprise for any provider. Required. Note: The public GitHub URL should be the API URL. For example, api.github.com.
useSSH	Boolean to allow the SSH protocol to push changes to the remote repository. Optional. Default = false. Note: This parameter uses the local ~/.ssh/ directory to obtain the SSH configuration.
ignore	A comma separated regular expressions to ignore project names that match any of these expressions. Optional.
githubOrg	Defines the repository organization if GitHub is used as the provider. Optional.
gitlabGroup	Defines the repository group and subgroup if GitLab is used as the provider Optional.

8. Create a **post-commit** Git hook file in **EAP_HOME/hooks**:

```
$ touch post-commit
```

9. Set the permissions of the **post-commit** file to **755**:

```
$ chmod 755 post-commit
```

10. Add **#!/bin/bash** and code to execute **git-push-2.1-SNAPSHOT.jar** to the **post-commit** file:

```
$ echo "#!/bin/bash\njava -jar $APP_SERVER_HOME/hooks/git-push-2.1-SNAPSHOT.jar" > hooks/post-commit
```

11. Start Business Central with the **-Dorg.uberfire.nio.git.hooks** environment variable set. For example:

```
$ ./standalone.sh -c standalone-full.xml -Dorg.uberfire.nio.git.hooks=_EAP_HOME_/hooks
```



NOTE

To use post-commit Git hooks that execute Java code, you must use the following Java libraries:

- [JGit](#): Used to interact with internal Business Central Git repositories.
- [GitHub API for Java](#): Used to communicate with GitHub.

For more information about post-commit Git hook and Java code examples, see [Business Central post-commit Git Hooks Integration](#).

38.6. GIT HOOK EXIT CODES

When a Git hook exits an integer value is returned which determines the status of the Git hook execution. This integer value is known as a Git hook exit code. The execution status can be a success (1), warning (2 to 30) or error (31 to 255).

38.7. CUSTOMIZING GIT HOOK NOTIFICATIONS

Business Central provides a mechanism that enables users to receive customized Git hook notifications based on the hook exit codes.

To enable the notification mechanism you must create a ***.properties** file containing the custom messages and then specify the path to that file as the value of the **appformer.git.hooks.bundle** system property.

Procedure

1. Create the ***.properties** file and add a line for each exit code with a corresponding message in the following format:

<exit_code>=<display_message>

The **<exit_code>** is the Git hook exit code and the **<display_message>** is the custom message that is displayed to a user.

For example:

```
0=Success! All working as expected.
1=Warning! Please check the logs and advise your admin.
.
.
31=Error! Please advise your admin immediately.
```



NOTE

It is not necessary to define all the possible exit codes in the ***.properties** file. Notifications appear only for the exit codes defined in the ***.properties** file.



IMPORTANT

The notification service only supports the **ISO 8859-1 (LATIN 1)** character set in the properties file. If you want to use extended characters, please use their escaped Unicode character code sequences.

- To enable Git hook notifications, specify the path to the file as the value of the **appformer.git.hooks.bundle** system property.
See the following example of a **standalone.xml** file with the setting that points to a **Messages.properties** file:

```
<system-properties>
  <property name="appformer.git.hooks.bundle" value="/opt/jboss-as/git-hooks-
messages/Messages.properties">
  </property>
  ...
</system-properties>
```

38.7.1. Git hook notifications in Business Central

You can view Git hook notifications in Business Central. There are three Git hook exit code notification types.

Table 38.2. Git hook UI notification types

Exit code	Customized message	UI notification color
0	Success! All working as expected.	Green
1 to 30	Warning! Please check the logs and advise your admin.	Orange
31 to 255	Error! Please advise your admin immediately.	Red



IMPORTANT

UNIX machines only support error codes between 0 (success) to 255 (error), any exit code outside of this range will end up being converted into a different code which may cause showing a wrong notification message.

Windows machines don't have this limitation and support a wide range of exit codes.

38.7.2. Git hook notification internationalization support

You can internationalize notification messages by placing additional properties files in the same path as the original properties file specified as the **appformer.git.hooks.bundle** system property.

The name of the different localized files must be **<filename>_<lang>.properties**, where the **<filename>** is the same as the original. For example, where the system property points to **Messages.properties**, you can create **Messages_en.properties** for English, **Messages_fr.properties** for French, or **Messages_it.properties** for Italian.

The notification service will choose the properties file based on the user's language, if there are no available translations for that language it will use the entries from the original **Messages.properties** file.

CHAPTER 39. ROLE-BASED ACCESS CONTROL FOR BRANCHES IN BUSINESS CENTRAL

Business Central provides the option for users to restrict the access for a target branch for a specific collaborator type. The security check uses both the **Security Management** screen and contributors sources to grant or deny permissions to spaces and projects. For example, if a user has the security permission to update a project and has write permission on that branch, based on the contributor type, then they are able to create new assets.

39.1. CUSTOMIZING ROLE-BASED BRANCH ACCESS

You can customize contributor role permissions for each branch of a project in Business Central. For example, you can set **Read**, **Write**, **Delete**, and **Deploy** access for each role assigned to a branch.

Procedure

1. In Business Central, go to **Menu → Design → Projects**.
2. If needed, add a new contributor:
 - a. Click the project name and then click the **Contributors** tab.
 - b. Click **Add Contributor**.
 - c. Enter user name in the text field.
 - d. Select the **Contributor** role type from the drop-down list.
 - e. Click **Ok**.
3. Customize role-based branch access for the relevant contributor:
 - a. Click **Settings → Branch Management**.
 - b. Select the branch name from the drop-down list.
 - c. In the **Role Access** section, select or deselect the permissions check boxes to specify role-based branch access for each available role type.
 - d. Click **Save** and click **Save** again to confirm your changes.

CHAPTER 40. VIEWING PROCESS INSTANCE LOGS

You can view all the process events of an instance from its **Logs** tab. The instance logs list all the current and previous process states. Business Central has two types of logs for process instances, **Business** and **Technical** logs.

Procedure

1. In Business Central, go to **Menu → Manage → Process Instances**.
2. On the **Manage Process Instances** page, click the process instance whose log you want to view.
3. Select the **Logs** tab:
 - Click **Business** to view the business events log.
 - Click **Technical** to view the technical events log.
 - Click **Asc** or **Desc** to change the order of the log files.

CHAPTER 41. BUSINESS CENTRAL SYSTEM PROPERTIES

The Business Central system properties listed in this section are passed to **standalone*.xml** files. To install standalone Business Central, you can use the listed properties in the following command:

```
java -jar rhdm-7.9.1-decision-central-standalone.jar -s application-config.yaml -D<property>=<value>
-D<property>=<value>
```

In this command, **<property>** is a property from list and **<value>** is a value that you assign to that property.

Git directory

Use the following properties to set the location and name for the Business Central Git directory:

- **org.uberfire.nio.git.dir**: Location of the Business Central Git directory.
- **org.uberfire.nio.git.dirname**: Name of the Business Central Git directory. Default value: **.niogit**.
- **org.uberfire.nio.git.ketch**: Enables or disables Git ketch.
- **org.uberfire.nio.git.hooks**: Location of the Git hooks directory.

Git over HTTP

Use the following properties to configure access to the Git repository over HTTP:

- **org.uberfire.nio.git.proxy.ssh.over.http**: Specifies whether SSH should use an HTTP proxy. Default value: **false**.
- **http.proxyHost**: Defines the host name of the HTTP proxy. Default value: **null**.
- **http.proxyPort**: Defines the host port (integer value) of the HTTP proxy. Default value: **null**.
- **http.proxyUser**: Defines the user name of the HTTP proxy.
- **http.proxyPassword**: Defines the user password of the HTTP proxy.
- **org.uberfire.nio.git.http.enabled**: Enables or disables the HTTP daemon. Default value: **true**.
- **org.uberfire.nio.git.http.host**: If the HTTP daemon is enabled, it uses this property as the host identifier. This is an informative property that is used to display how to access the Git repository over HTTP. The HTTP still relies on the servlet container. Default value: **localhost**.
- **org.uberfire.nio.git.http.hostname**: If the HTTP daemon is enabled, it uses this property as the host name identifier. This is an informative property that is used to display how to access the Git repository over HTTP. The HTTP still relies on the servlet container. Default value: **localhost**.
- **org.uberfire.nio.git.http.port**: If the HTTP daemon is enabled, it uses this property as the port number. This is an informative property that is used to display how to access the Git repository over HTTP. The HTTP still relies on the servlet container. Default value: **8080**.

Git over HTTPS

Use the following properties to configure access to the Git repository over HTTPS:

- **org.uberfire.nio.git.proxy.ssh.over.https**: Specifies whether SSH uses an HTTPS proxy. Default value: **false**.
- **https.proxyHost**: Defines the host name of the HTTPS proxy. Default value: **null**.
- **https.proxyPort**: Defines the host port (integer value) of the HTTPS proxy. Default value: **null**.
- **https.proxyUser**: Defines the user name of the HTTPS proxy.
- **https.proxyPassword**: Defines the user password of the HTTPS proxy.
- **user.dir**: Location of the user directory.
- **org.uberfire.nio.git.https.enabled**: Enables or disables the HTTPS daemon. Default value: **false**
- **org.uberfire.nio.git.https.host**: If the HTTPS daemon is enabled, it uses this property as the host identifier. This is an informative property that is used to display how to access the Git repository over HTTPS. The HTTPS still relies on the servlet container. Default value: **localhost**.
- **org.uberfire.nio.git.https.hostname**: If the HTTPS daemon is enabled, it uses this property as the host name identifier. This is an informative property that is used to display how to access the Git repository over HTTPS. The HTTPS still relies on the servlet container. Default value: **localhost**.
- **org.uberfire.nio.git.https.port**: If the HTTPS daemon is enabled, it uses this property as the port number. This is an informative property that is used to display how to access the Git repository over HTTPS. The HTTPS still relies on the servlet container. Default value: **8080**.

JGit

- **org.uberfire.nio.jgit.cache.instances**: Defines the JGit cache size.
- **org.uberfire.nio.jgit.cache.overflow.cleanup.size**: Defines the JGit cache overflow cleanup size.
- **org.uberfire.nio.jgit.remove.eldest.iterations**: Enables or disables whether to remove eldest JGit iterations.
- **org.uberfire.nio.jgit.cache.evict.threshold.duration**: Defines the JGit evict threshold duration.
- **org.uberfire.nio.jgit.cache.evict.threshold.time.unit**: Defines the JGit evict threshold time unit.

Git daemon

Use the following properties to enable and configure the Git daemon:

- **org.uberfire.nio.git.daemon.enabled**: Enables or disables the Git daemon. Default value: **true**.
- **org.uberfire.nio.git.daemon.host**: If the Git daemon is enabled, it uses this property as the local host identifier. Default value: **localhost**.

- **org.uberfire.nio.git.daemon.hostname:** If the Git daemon is enabled, it uses this property as the local host name identifier. Default value: **localhost**
- **org.uberfire.nio.git.daemon.port:** If the Git daemon is enabled, it uses this property as the port number. Default value: **9418**.
- **org.uberfire.nio.git.http.sslVerify:** Enables or disables SSL certificate checking for Git repositories. Default value: **true**.



NOTE

If the default or assigned port is already in use, a new port is automatically selected. Ensure that the ports are available and check the log for more information.

Git SSH

Use the following properties to enable and configure the Git SSH daemon:

- **org.uberfire.nio.git.ssh.enabled:** Enables or disables the SSH daemon. Default value: **true**.
- **org.uberfire.nio.git.ssh.host:** If the SSH daemon is enabled, it uses this property as the local host identifier. Default value: **localhost**.
- **org.uberfire.nio.git.ssh.hostname:** If the SSH daemon is enabled, it uses this property as local host name identifier. Default value: **localhost**.
- **org.uberfire.nio.git.ssh.port:** If the SSH daemon is enabled, it uses this property as the port number. Default value: **8001**.



NOTE

If the default or assigned port is already in use, a new port is automatically selected. Ensure that the ports are available and check the log for more information.

- **org.uberfire.nio.git.ssh.cert.dir:** Location of the **.security** directory where local certificates are stored. Default value: Working directory.
- **org.uberfire.nio.git.ssh.idle.timeout:** Sets the SSH idle timeout.
- **org.uberfire.nio.git.ssh.passphrase:** Pass phrase used to access the public key store of your operating system when cloning git repositories with SCP style URLs. Example: **git@github.com:user/repository.git**.
- **org.uberfire.nio.git.ssh.algorithm:** Algorithm used by SSH. Default value: **RSA**.
- **org.uberfire.nio.git.gc.limit:** Sets the GC limit.
- **org.uberfire.nio.git.ssh.ciphers:** A comma-separated string of ciphers. The available ciphers are **aes128-ctr**, **aes192-ctr**, **aes256-ctr**, **arcfour128**, **arcfour256**, **aes192-cbc**, **aes256-cbc**. If the property is not used, all available ciphers are loaded.
- **org.uberfire.nio.git.ssh.macs:** A comma-separated string of message authentication codes (MACs). The available MACs are **hmac-md5**, **hmac-md5-96**, **hmac-sha1**, **hmac-sha1-96**, **hmac-sha2-256**, **hmac-sha2-512**. If the property is not used, all available MACs are loaded.

**NOTE**

If you plan to use RSA or any algorithm other than DSA, make sure you set up your application server to use the Bouncy Castle JCE library.

KIE Server nodes and Decision Manager controller

Use the following properties to configure the connections with the KIE Server nodes from the Decision Manager controller:

- **org.kie.server.controller**: The URL is used to connect to the Decision Manager controller. For example, **ws://localhost:8080/decision-central/websocket/controller**.
- **org.kie.server.user**: User name used to connect to the KIE Server nodes from the Decision Manager controller. This property is only required when using this Business Central installation as a Decision Manager controller.
- **org.kie.server.pwd**: Password used to connect to the KIE Server nodes from the Decision Manager controller. This property is only required when using this Business Central installation as a Decision Manager controller.

Maven and miscellaneous

Use the following properties to configure Maven and other miscellaneous functions:

- **kie.maven.offline.force**: Forces Maven to behave as if offline. If true, disables online dependency resolution. Default value: **false**.

**NOTE**

Use this property for Business Central only. If you share a runtime environment with any other component, isolate the configuration and apply it only to Business Central.

- **org.uberfire.gzip.enable**: Enables or disables Gzip compression on the **GzipFilter** compression filter. Default value: **true**.
- **org.kie.workbench.profile**: Selects the Business Central profile. Possible values are **FULL** or **PLANNER_AND_RULES**. A prefix **FULL_** sets the profile and hides the profile preferences from the administrator preferences. Default value: **FULL**.
- **org.appformer.m2repo.url**: Business Central uses the default location of the Maven repository when looking for dependencies. It directs to the Maven repository inside Business Central, for example, **http://localhost:8080/business-central/maven2**. Set this property before starting Business Central. Default value: File path to the inner **m2** repository.
- **appformer.ssh.keystore**: Defines the custom SSH keystore to be used with Business Central by specifying a class name. If the property is not available, the default SSH keystore is used.
- **appformer.ssh.keys.storage.folder**: When using the default SSH keystore, this property defines the storage folder for the user's SSH public keys. If the property is not available, the keys are stored in the Business Central **.security** folder.
- **appformer.experimental.features**: Enables the experimental features framework. Default value: **false**.

- **org.kie.demo:** Enables an external clone of a demo application from GitHub.
- **org.uberfire.metadata.index.dir:** Place where the Lucene **.index** directory is stored. Default value: Working directory.
- **org.uberfire.ldap.regex.role_mapper:** Regex pattern used to map LDAP principal names to the application role name. Note that the variable role must be a part of the pattern as the application role name substitutes the variable role when matching a principle value and role name.
- **org.uberfire.sys.repo.monitor.disabled:** Disables the configuration monitor. Do not disable unless you are sure. Default value: **false**.
- **org.uberfire.secure.key:** Password used by password encryption. Default value: **org.uberfire.admin**.
- **org.uberfire.secure.alg:** Crypto algorithm used by password encryption. Default value: **PBEWithMD5AndDES**.
- **org.uberfire.domain:** Security-domain name used by uberfire. Default value: **ApplicationRealm**.
- **org.guvnor.m2repo.dir:** Place where the Maven repository folder is stored. Default value: **<working-directory>/repositories/kie**.
- **org.guvnor.project.gav.check.disabled:** Disables group ID, artifact ID, and version (GAV) checks. Default value: **false**.
- **org.kie.build.disable-project-explorer:** Disables automatic build of a selected project in Project Explorer. Default value: **false**.
- **org.kie.builder.cache.size:** Defines the cache size of the project builder. Default value: **20**.
- **org.kie.verification.disable-dtable-realtime-verification:** Disables the real-time validation and verification of decision tables. Default value: **false**.

Decision Manager controller

Use the following properties to configure how to connect to the Decision Manager controller:

- **org.kie.workbench.controller:** The URL used to connect to the Decision Manager controller, for example, **ws://localhost:8080/kie-server-controller/websocket/controller**.
- **org.kie.workbench.controller.user:** The Decision Manager controller user. Default value: **kieserver**.
- **org.kie.workbench.controller.pwd:** The Decision Manager controller password. Default value: **kieserver1!**.
- **org.kie.workbench.controller.token:** The token string used to connect to the Decision Manager controller.

Java Cryptography Extension KeyStore (JCEKS)

Use the following properties to configure JCEKS:

- **kie.keystore.keyStoreURL:** The URL used to load a Java Cryptography Extension KeyStore (JCEKS). For example, **file:///home/kie/keystores/keystore.jceks**.

- **kie.keystore.keyStorePwd**: The password used for the JCEKS.
- **kie.keystore.key.ctrl.alias**: The alias of the key for the default REST Decision Manager controller.
- **kie.keystore.key.ctrl.pwd**: The password of the alias for the default REST Decision Manager controller.

Rendering

Use the following properties to switch between Business Central and KIE Server rendered forms:

- **org.jbpm.wb.forms.renderer.ext**: Switches the form rendering between Business Central and KIE Server. By default, the form rendering is performed by Business Central. Default value: **false**.
- **org.jbpm.wb.forms.renderer.name**: Enables you to switch between Business Central and KIE Server rendered forms. Default value: **workbench**.

CHAPTER 42. PERFORMANCE TUNING CONSIDERATIONS WITH BUSINESS CENTRAL

The following key concepts or suggested practices can help you optimize Business Central configuration and Red Hat Decision Manager performance. These concepts are summarized in this section as a convenience and are explained in more detail in the cross-referenced documentation, where applicable. This section will expand or change as needed with new releases of Red Hat Decision Manager.

Ensure that development mode is enabled during development

You can set KIE Server or specific projects in Business Central to use **production** mode or **development** mode. By default, KIE Server and all new projects in Business Central are in development mode. This mode provides features that facilitate your development experience, such as flexible project deployment policies, and features that optimize KIE Server performance during development, such as disabled duplicate GAV detection. Use development mode until your Red Hat Decision Manager environment is established and completely ready for production mode. For more information about configuring the environment mode or duplicate GAV detection, see the following resources:

- [Chapter 37, Configuring the environment mode in KIE Server and Business Central](#)
- [Packaging and deploying a Red Hat Decision Manager project](#)

Disable verification and validation of complex guided decision tables

The decision table verification and validation feature of Business Central is enabled by default. This feature helps you validate your guided decision tables, but with complex guided decision tables, this feature can hinder decision engine performance. You can disable this feature by setting the **org.kie.verificaton.disable-dtable-realtime-verification** system property value to **true**. For more information about guided decision table validation, see [Designing a decision service using guided decision tables](#).

Disable automatic builds if you have many large projects

In Business Central, when you navigate between projects in the **Project Explorer** side panel, the selected project is built automatically so that the **Alerts** window is updated to show any build errors for the project. If you have large projects or frequently switch between many projects that are under active development, this feature can hinder Business Central and decision engine performance. To disable automatic project builds, set the **org.kie.build.disable-project-explorer** system property to **true**.

PART III. USING STANDALONE PERSPECTIVES IN BUSINESS CENTRAL

As a business rules developer, you can embed standalone perspectives from Business Central in your web application and then use them to edit rules, processes, decision tables, and other assets.

Prerequisites

- Business Central is deployed and is running on a web/application server.
- You are logged in to Business Central.

CHAPTER 43. STANDALONE PERSPECTIVES IN BUSINESS CENTRAL

Business Central provides specialized editors for authoring assets based on the asset's format. Business Central has a feature that enables you to use these editors individually. This feature is known as the standalone perspective mode of the editor or simply the *standalone perspectives*.

As a business rules developer, you can embed a standalone perspective in your web application and then use it to edit rules, processes, decision tables, and other assets. After embedding a perspective you can edit an asset in your own application without switching to Business Central. You can use this feature to customize your web application. In addition to standalone perspectives you can also embed standalone custom pages (dashboards) in your applications.

You can access a standalone perspective by using a specific web address in a browser with the **standalone** and **perspective** parameters. A standalone perspective's web address may also contain additional parameters.

CHAPTER 44. USING THE STANDALONE LIBRARY PERSPECTIVE

You can use the library perspective of Business Central to select a project you want to edit. You can also perform all the authoring functions on the selected project.

The standalone library perspective can be used in two ways, *with* and *without* using the **header=UberfireBreadcrumbsContainer** parameter. The difference is that the address with the **header** parameter will display a breadcrumb trail on top of the library perspective. Using this link you can create additional **Spaces** for your projects.

Procedure

1. Log in to Business Central.
2. In a web browser, enter the appropriate web address:
 - a. For accessing the standalone library perspective *without* the **header** parameter
http://localhost:8080/decision-central/kie-wb.jsp?standalone=true&perspective=LibraryPerspective

The standalone library perspective without the breadcrumb trail opens in the browser.

- b. For accessing the standalone library perspective *with* the **header** parameter
http://localhost:8080/decision-central/kie-wb.jsp?standalone=true&perspective=LibraryPerspective&header=UberfireBreadcrumbsContainer

The standalone library perspective with the breadcrumb trail opens in the browser.

CHAPTER 45. USING THE STANDALONE EDITOR PERSPECTIVE

You can use the standalone editor perspective of Business Central to access an asset's specific editor. By using this perspective, you can open an asset's editor and can modify the asset as required.

The web address for accessing an asset's standalone editor perspective contains the **standalone** and **path** parameters. The **path** parameter must contain the complete path to the asset and the web address can end with **#StandaloneEditorPerspective** string. Also, by varying the **path** parameter, you can access a specific asset's editor in the standalone mode.

Procedure

1. Log in to Business Central.
2. In a web browser, enter the appropriate web address as required, for example,
 - a. For editing a process:
`http://localhost:8080/decision-central/kie-wb.jsp?standalone&path=default://master@MySpace/Shop/src/main/resources/com/purchase.bpmn#StandaloneEditorPerspective`

The *Process Designer* opens in the standalone mode.

- b. For editing a form:
`http://localhost:8080/decision-central/kie-wb.jsp?standalone&path=default://master@MySpace/Mortgage_Process/src/main/resources/ApplicationMortgage.frm#StandaloneEditorPerspective`

The *Form Modeler* opens in the standalone mode.

CHAPTER 46. USING THE STANDALONE CONTENT MANAGER PERSPECTIVE

By using the standalone content manager perspective in your application, you can create and edit your application's content and its navigation menus.

Procedure

1. Log in to Business Central.
2. In a web browser, enter the following web address in the address bar,
`http://localhost:8080/decision-central/kie-wb.jsp?standalone=true&perspective=ContentManagerPerspective`

The standalone content manager perspective opens in the browser.

CHAPTER 47. USING STANDALONE CUSTOM PAGES(DASHBOARDS)

Apart from standalone perspectives, you can also embed custom pages, also known as dashboards, in your application. For accessing the custom pages from your application, provide the name of the custom page as the value of the **perspective** parameter. Note that the **perspective** parameter is case-sensitive.

Procedure

1. Log in to Business Central.
2. In a web browser, enter the custom page's web address in the address bar, for example,
`http://localhost:8080/decision-central/kie-wb.jsp?standalone=true&perspective=CustomPageName`

The standalone custom page opens in the browser. Replace the value, *CustomPageName*, with the name of the custom page you want to use in the standalone mode.

PART IV. BUILDING CUSTOM DASHBOARD WIDGETS

As a business analyst or business rules developer, use the **Page Editor** tool to design and define your page and specify the information to be displayed on it. You can decide which components are a part of your page. You can also customize the component properties of a page according to your requirements. Optionally, before creating a page, you can define a data set to feed the reporting components of the page.

Prerequisites

- You have sufficient permissions for creating pages.

CHAPTER 48. DATA SETS AUTHORIZING

A data set is a collection of related sets of information. It can be stored in many ways, such as in a database, in a Microsoft Excel file, or in memory. A data set definition instructs Business Central methods to access, read, and parse a data set. Business Central does not store data. It enables you to define access to a data set regardless of where the data is stored.

For example, if data is stored in a database, a valid data set could contain the entire database or a subset of the database as a result of an SQL query. In both cases, the data is used as input for the reporting components of Business Central which then displays the information.

To access a data set, you must create and register a data set definition. This data set definition specifies the location of the data set, the ways to access it, read it, and parse it, and the columns that it contains.



NOTE

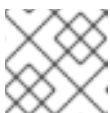
The **Data Sets** page is visible only to users with the **admin** role.

48.1. ADDING DATA SETS

You can create a data set to fetch data from an external data source and use that data for the reporting components.

Procedure

1. In Business Central, go to **Admin → Data Sets**. The **Data Set Explorer** page opens.
2. Click **New Data Set** and select one of the following provider types:
 - **Bean**: Use to generate a data set from a Java class
 - **CSV**: Use to generate a data set from a remote or local CSV file
 - **SQL**: Use to generate a data set from an ANSI-SQL compliant database
 - **Elastic Search**: Use to generate a data set from Elastic Search nodes
 - **Execution Server**: Use to generate a data set using the custom query feature of an Execution Server



NOTE

KIE Server must be configured with this option.

3. Complete the **Data Set Creation Wizard** and click **Test**.



NOTE

The configuration steps differ based on the provider you chose.

4. Click **Save**.

48.2. EDITING DATA SETS

You can edit existing data sets to ensure that the data fetched to the reporting components is up-to-date.

Procedure

1. In Business Central, go to **Admin → Data Sets**. The **Data Set Explorer** page opens.
2. In the **Data Set Explorer** pane, search for the data set you want to edit and click **Edit**.
3. In the **Data Set Editor** pane, use the appropriate tab to edit the data as required. The tabs differ based on the data set provider type you chose.
For example, the following changes are applicable for editing a **CSV** data provider:
 - **CSV Configuration:** Enables you to change the name of the data set definition, the source file, the separator, and other properties.
 - **Preview:** Enables you to preview the data. After you click **Test** in the **CSV Configuration** tab, the system executes the data set lookup call and if the data is available, a preview appears. Note that the **Preview** tab has two sub-tabs:
 - **Data columns:** Enables you to specify what columns are part of your data set definition.
 - **Filter:** Enables you to add a new filter.
 - **Advanced:** Enables you to manage the following configurations:
 - **Caching:** See [Section 48.4, "Caching"](#) for more information.
 - **Cache life-cycle** Enables you to specify an interval of time after which a data set (or data) is refreshed. The **Refresh on stale data** feature refreshes the cached data when the back-end data changes.
4. After making the required changes, click **Validate**.
5. Click **Save**.

48.3. DATA REFRESH

The data refresh feature enables you to specify an interval of time after which a data set (or data) is refreshed. The **Refresh on stale data** feature refreshes the cached data when the back-end data changes.

48.4. CACHING

Business Central provides caching mechanisms for storing data sets and performing data operations using in-memory data. Caching data reduces network traffic, remote system payload, and processing time. To avoid performance issues, configure the cache settings in Business Central.

For any data lookup call that results in a data set, the caching method determines where the data lookup call is executed and where the resulting data set is stored. An example of a data lookup call would be all the mortgage applications whose locale parameter is set as "Urban".

Business Central data set functionality provides two cache levels:

- Client level

- Back-end level

Client cache

When the cache is turned on, the data set is cached in a web browser during the lookup operation and further lookup operations do not perform requests to the back-end. Data set operations like grouping, aggregations, filtering, and sorting are processed in the web browser. Enable client caching only if the data set size is small, for example, for data sets with less than 10 MB of data. For large data sets, browser issues such as slow performance or intermittent freezing can occur. Client caching reduces the number of back-end requests including requests to the storage system.

Back-end cache

When the cache is enabled, the decision engine caches the data set. This reduces the number of back-end requests to the remote storage system. All data set operations are performed in the decision engine using in-memory data. Enable back-end caching only if the data set size is not updated frequently and it can be stored and processed in memory. Using back-end caching is also useful in cases with low latency connectivity issues with the remote storage.



NOTE

Back-end cache settings are not always visible in the **Advanced** tab of the **Data Set Editor** because Java and CSV data providers rely on back-end caching (data set must be in the memory) in order to resolve any data lookup operation using the in-memory decision engine.

CHAPTER 49. PAGE AUTHORIZING

Pages, also known as perspectives, are collections of following components:

- Core components
- Navigational components
- Reporting components

Also, a page can have none or any number of components. The **Page Editor** tool is used to edit the pages.

A page has either the **Fluid** style or the **Page** style. The **Fluid** style is a classical web page with a vertical scroll bar, when the page exceeds the available height. The **Page** style is a web page that will always fit to the windows height.

49.1. CREATING PAGES

You can use the Pages perspective to create a page that consists of different types of components. After a page has been created and all the components in it defined, use the **Page Editor** to save, delete, rename, or copy pages as required.

The following procedure describes how to create a page and add the required components to it:

Procedure

1. In Business Central, go to **Menu → Design → Pages**.
2. In the **Pages** panel, click **New**. Alternatively, click **New Page** on the **Page Editor** pane.
3. In the **New Page** dialog box, enter a value in the **Name** field and select the required style.
4. Click **Ok**. The new page opens in the **Page Editor**.
5. In the **Components** pane, expand the components and drag the required component types to the editor canvass.
6. After placing the components on the page, edit its properties from the **Properties** pane.
7. Click **Save** and then click **Save** again.

49.2. SAVING, DELETING, RENAMING, OR COPYING PAGES

After you have created and defined a page, use the **Page Editor** to save, delete, rename, or copy pages as required.

Procedure

1. In Business Central, go to **Menu → Design → Pages**.
2. Select a page from the **Pages** panel. The page opens in the **Page Editor**.
3. Perform the desired operation and select **Save**, **Delete**, **Rename**, or **Copy** from the upper right corner of the **Page Editor**.

Figure 49.1. Save, delete, rename, or copy pages



49.3. NAVIGATION TREE

The **Workbench** navigation tree contains the entries that are displayed in Business Central's **Main** menu. Changes to this navigation tree structure will be reflected in the **Main** menu on the Home page. Such mechanism can be used, for example, to publish new pages.

Also, additional navigation trees can be created. These custom trees can be used to configure the navigation components within a page. You cannot delete the **Workbench** tree from the **Navigation** panel but you can edit the **Workbench** tree hierarchy to suit your requirements. This feature helps users customize the **Main** menu of Business Central with new pages.



NOTE

The **Workbench** tree, which appears by default in the **Navigation** panel, is the main **Menu** of Business Central.

49.3.1. Creating a navigation tree

You can create as many custom navigation trees as required. A custom navigation tree differs from the default **Workbench** navigation tree in one aspect. The custom navigation trees can be deleted but the default tree can not be removed from Business Central. They can contain the default groups and entries from the **Workbench** tree as well as user created groups and trees.

Prerequisites

- You have sufficient user permissions for creating a navigation tree.

Procedure

1. Log in to Business Central and go to **Menu → Design → Pages**.
2. Select the **Navigation** panel and then click **New**.
3. Enter the name of the new navigation tree and click the check mark icon or, press Enter.
4. Click **Save**.

49.3.2. Editing a navigation tree

You can use the **Navigation** panel from the Pages perspective to edit the custom navigation trees. You can further customize the trees by adding groups, dividers, and page entries, deleting the specific entries of the tree, and reordering, renaming, or deleting them.

Prerequisites

- You have sufficient user permissions for editing a navigation tree.

49.3.3. Adding groups, dividers, and page entries to a navigation tree

You can add groups, dividers, and page entries to a navigation tree.

Procedure

1. In Business Central, go to **Menu → Design → Pages**.
2. Click the **Navigation** panel and then select the navigation tree you want to add the entries to.
3. Click the gear icon of the tree and then select **New Group**, **New Divider**, or **New Page**.
4. Enter the name of the new group or page and click the check mark icon or press Enter.



NOTE

Divider entries do not have a name property.

5. Click **Save**.

49.3.4. Reordering a navigation tree

In the **Navigation** panel you can reorder the navigation trees as well as its entries.



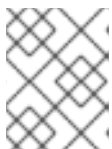
NOTE

The reordering options of tree entries will differ according to their position in the tree hierarchy.

Reordering navigation trees

Procedure

1. In Business Central, go to **Menu → Design → Pages**.
2. Click the **Navigation** panel and then select the navigation tree you want to reorder.
3. Click the gear icon of the tree and then move up or down as required.



NOTE

First and last entries of a navigation tree have only two reordering options available.

4. Click **Save**.

Reordering the entries of a navigation tree

Procedure

1. In Business Central, go to **Menu → Design → Pages**.
2. Click the **Navigation** panel and then expand the navigation tree.
3. Click the gear icon of the entry you want to reorder and then move up or down as required.

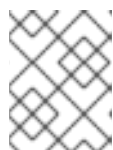
4. Optionally, click **Goto Page** to view the selected page.
5. Click **Save**.

49.3.5. Renaming a navigation tree

You can rename all navigation trees except the Workbench tree.

Procedure

1. In Business Central, go to **Menu → Design → Pages**.
2. Click the **Navigation** panel and then select the custom navigation tree you want to rename.



NOTE

To rename an entry of a tree, expand the tree and select the entry that you want to rename.

3. Click the edit icon of the tree or the tree entry.
4. Enter the new name of the tree and click the check mark icon.



NOTE

You cannot rename divider entries.

5. Click **Save**.

49.3.6. Deleting a navigation tree

You can delete any navigation tree except the **Workbench** tree from the **Navigation** panel of the Pages perspective.

Procedure

1. In Business Central, go to **Menu → Design → Pages**.
2. In the **Navigation** panel, select the navigation tree that you want to delete, then click the delete icon.
3. Click **Save**.

49.3.7. Deleting the entries of a navigation tree

You can delete the entries of a navigation tree.

Procedure

1. In Business Central, go to **Menu → Design → Pages**.
2. Click the **Navigation** panel.

3. Expand the tree that contains the entries you want delete.
4. Click the delete icon of the entry.
5. Click **Save**.

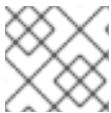
49.4. COMPONENTS

A page contains different types of components. You can use the following component types in a page:

- **Core** components: Used to specify custom HTML information or display existing pages. There are two types of core components.

Table 49.1. Core component sub-types

Core component sub-types	Description
HTML	This component opens an HTML editor widget. This can be used to create HTML pages using text, images, tables, links, colors, and so on. You can customize the page as per your requirements.
Page	This component allows you to add previously created pages to a new dashboard. You can use this component to nest custom pages you have already created in your dashboard.



NOTE

Core components are not mandatory.

- **Navigation** components: Used for navigating between pages. There are six types of navigation components.

Table 49.2. Navigation component sub-types

Navigation component sub-types	Description
Target Div	This component is used by the Tab list, Menu bar, and the Tree navigator components to display their entries and keep track of the last item clicked.
Menu Bar	This component displays the entries of a navigation tree in the form of a menu bar. There is no limit to the number of levels supported by Business Central.
Tile Navigator	This component displays the navigation group in the form of tiles. Groups are displayed as folders but for single entries, its content is displayed instead when selected.

Navigation component sub-types	Description
Tree	This component displays the entries in a vertical tree structure format.
Carousel	This component displays or cycles through the selected pages like a carousel or a slide show.
Tab List	This component displays selected menu pages as tabs at the top of the component.



NOTE

The target div setting is **not** needed for non-target div components such as Carousel or Tile navigator.

- **Reporting** components: Used for displaying data from data sets (see [Data sets authoring](#) section) in the form of graphs, tables, maps, and so on. There are ten types of reporting components. The reporting components can be configured using the **New Displayer** widget, which has the following three tabs:
 - **Type**: Choose how to display custom data graphically.
 - **Data**: Choose a data set from the list of custom data sets that you had created from the **Data Sets** section available in the **Settings** menu.
 - **Display**: Edit and customize how the content is displayed by adding titles, changing colors, size, and so on.

49.4.1. Placing components on the page editor to create a page

To create pages, you must drag the components to the **Editor** canvas of the Pages perspective. After placing all of the required components on the page, click **Save**.

49.4.2. Using the Preview tab to preview pages

While creating or editing pages, click the **Preview** tab on the **Page Editor** to preview a page before saving it.

49.4.3. Component properties

The components used in a page have different properties associated with them. The **Properties** panel enables you to customize a component by editing the following properties:

- **Panel** properties: Used to customize component panel properties such as **Width**, **Height**, and **Background Color**.
- **Margin** properties: Used to customize component margin properties such as **Top**, **Bottom**, **Left**, and **Right**.

- **Padding** properties: Used to customize component padding properties such as **Top**, **Bottom**, **Left**, and **Right**.



NOTE

HTML components also have additional text properties to customize component **Alignment**, **Decoration**, **Color**, **Size**, and **Weight** properties.

49.5. EXTERNAL COMPONENTS

In Business Central, you can add external components to a page. The components are disabled by default. To enable the external components, change the value of **dashbuilder.components.enable** system property to **true**.

The external component location is set and configured with the **dashbuilder.components.dir** system property. The default value of this system property is **/tmp/dashbuilder/components**. You must set the component under the components directory with a parent directory, which is used as the component ID. For example, if the component ID is **mycomp** and the component directory is **/tmp/dashbuilder/components**, then the component base directory is **/tmp/dashbuilder/components/mycomp**.

Business Central checks the **manifest.json** file in the components directory. The **manifest.json** must contain at least one **name** text parameter.

Table 49.3. manifest.json file descriptions

Parameter	Description
name	Name of the component displayed under Components section.
icon	Icon of the component displayed under Components section.
noData	A flag that indicates that the component does not require a data set.
parameters	The list of parameters are using ComponentParameter type. Supported parameter types include name , type , category , defaultValue , label , and comboValues .

Sample manifest.json file

```
{
  "name": "Heat Map Experiment",
  "icon": "fa fa-bell-o",
  "parameters": [
    {
      "name": "svg",
      "type": "text",
      "defaultValue": "",
      "label": "SVG XML",
    }
  ]
}
```

```

        "category": "SVG Content"
    },
    {
        "name": "svgUrl",
        "type": "text",
        "defaultValue": "",
        "label": "SVG URL",
        "category": "SVG URL"
    }
    ,
    {
        "name": "ksProcessId",
        "type": "text",
        "defaultValue": "",
        "label": "Process ID",
        "category": "Kie Server"
    }
    ]
}

```

49.5.1. Creating external components

The following procedure describes how to create and add the external components to a page:

Procedure

1. Set the component under components directory with a parent directory.
For example, if the component ID is **mycomp** and the component directory is **/tmp/dashbuilder/components**, then the component base directory is **/tmp/dashbuilder/components/mycomp**.
2. Create the **manifest.json** file in the component directory.
3. Create **index.html** file with HTML content.
4. In a terminal application, navigate to **EAP_HOME/bin**.
5. To enable the external components, set the value of **dashbuilder.components.enable** system property to **true**:

```

$ ~/EAP_HOME/bin/standalone.sh -c standalone-full.xml
-Ddashbuilder.components.dir={component directory base path} -
Ddashbuilder.components.enable=true

```

6. Start Business Central, go to **Menu → Design → Pages**.
External Components is available under **Components** pane.
7. In the **Components** pane, expand the **External Components** and drag the required component types to the canvas.
8. Click **Save**.

CHAPTER 50. SECURITY MANAGEMENT

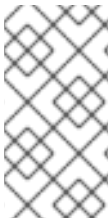
Security management is the process of managing users, groups, and permissions. You can control access to Business Central resources and features from the Business Central Security management page.

Business Central defines three types of entities for security management: users, groups, and roles. You can assign permissions to both roles and groups. A user inherits permissions from the groups and roles that the user is a member of.

50.1. SECURITY MANAGEMENT PROVIDERS

In the context of security management, a realm restricts access to different application resources. Realms contain information about users, groups, roles, and permissions. A concrete user and group management service implementation for a specific realm is called a security management provider.

If the built-in security management providers do not meet the requirements of your application security realm, then you can build and register your own security management provider.



NOTE

If the security management provider is not installed, the user interface for managing the security realm is not available. After you install and configure a security management provider, the user and group management features are automatically enabled in the security management user interface.

Business Central includes the Red Hat JBoss EAP security management provider which supports realm types based on the contents of the **application-users.properties** or **application-roles.properties** property file.

50.1.1. Configuring the Red Hat JBoss EAP security management provider based on property files

You can build and register your own Red Hat JBoss EAP security management provider. To use the Red Hat JBoss EAP security management provider based on property files, complete the steps in this procedure.

Prerequisites

- Red Hat JBoss EAP is installed.

Procedure

1. To use an existing users or roles property file from the Red Hat JBoss EAP instance, include the following system properties in the **EAP_HOME/standalone/configuration/application-users.properties** and **EAP_HOME/standalone/configuration/application-roles.properties** files, as shown in the following example:

```
<property name="org.uberfire.ext.security.management.wildfly.properties.realm"
value="ApplicationRealm"/>
<property name="org.uberfire.ext.security.management.wildfly.properties.users-file-path"
```

```
value="/standalone/configuration/application-users.properties"/>
<property name="org.uberfire.ext.security.management.wildfly.properties.groups-file-path"
value="/standalone/configuration/application-roles.properties"/>
```

The following table provides a description and default value for these properties:

Table 50.1. Red Hat JBoss EAP security management provider based on property files

Property	Description	Default value
org.uberfire.ext.security.management.wildfly.properties.realm	The name of the realm. This property is not mandatory.	ApplicationRealm
org.uberfire.ext.security.management.wildfly.properties.users-file-path	The absolute file path for the users property file. This property is mandatory.	./standalone/configuration/application-users.properties
org.uberfire.ext.security.management.wildfly.properties.groups-file-path	The absolute file path for the groups property file. This property is mandatory.	./standalone/configuration/application-roles.properties

2. Create the **security-management.properties** file in the root directory of your application. For example, create the following file:

```
src/main/resources/security-management.properties
```

3. Enter the following system property and security provider name as a value in the **security-management.properties** file:

```
<property name="org.uberfire.ext.security.management.api.userManagementServices"
value="WildflyUserManagementService"/>
```

50.1.2. Configuring the Red Hat JBoss EAP security management provider based on property files and CLI mode

To use the Red Hat JBoss EAP security management provider based on property files and CLI mode, complete the steps in this procedure.

Prerequisites

- Red Hat JBoss EAP is installed.

Procedure

1. To use an existing users or roles property file from the Red Hat JBoss EAP instance, include the following system properties in the **EAP_HOME/standalone/configuration/application-users.properties** and **EAP_HOME/standalone/configuration/application-roles.properties** files, as shown in the following example:

```
<property name="org.uberfire.ext.security.management.wildfly.cli.host" value="localhost"/>
<property name="org.uberfire.ext.security.management.wildfly.cli.port" value="9990"/>
```

```
<property name="org.uberfire.ext.security.management.wildfly.cli.user" value="
<USERNAME>"/>
<property name="org.uberfire.ext.security.management.wildfly.cli.password" value="
<USER_PWD>"/>
<property name="org.uberfire.ext.security.management.wildfly.cli.realm"
value="ApplicationRealm"/>
```

The following table provides a description and default value for these properties:

Table 50.2. Red Hat JBoss EAP security management provider based on property files and CLI mode

Property	Description	Default value
org.uberfire.ext.security.m anagement.wildfly.cli.host	The native administration interface host.	localhost
org.uberfire.ext.security.m anagement.wildfly.cli.port	The native administration interface port.	9990
org.uberfire.ext.security.m anagement.wildfly.cli.user	The native administration interface username.	NA
org.uberfire.ext.security.m anagement.wildfly.cli.pass word	The native administration interface user's password.	NA
org.uberfire.ext.security.m anagement.wildfly.cli.real m	The realm used by the application's security context.	ApplicationRealm

2. Create the **security-management.properties** file in the root directory of your application. For example, create the following file:

```
src/main/resources/security-management.properties
```

3. Enter the following system property and security provider name as a value in the **security-management.properties** file:

```
<property name="org.uberfire.ext.security.management.api.userManagementServices"
value="WildflyCLIUserManagementService"/>
```

50.2. PERMISSIONS AND SETTINGS

A permission is an authorization granted to a user to perform actions related to a specific resource within the application. For example, a user can have following permissions:

- View a page.
- Save the project.
- View a repository.

- Delete a dashboard.

You can grant or deny a permission and a permission can be global or resource specific. You can use permissions to protect access to resources and customize features within the application.

50.2.1. Changing permissions for groups and roles in Business Central

In Business Central, you cannot change permissions for an individual user. However, you can change permissions for groups and roles. The changed permissions apply to users with the role or that belong to a group that you changed.



NOTE

Any changes that you make to roles or groups affect all of the users associated with that role or group.

Prerequisites

- You are logged in to Business Central with the **admin** user role.

Procedure

1. To access the **Security management** page in Business Central, select the **Admin** icon in the top-right corner of the screen.
2. Click **Roles**, **Groups**, or **Users** on the Business Central **Settings** page. The **Security management** page opens on the tab for the icon that you clicked.
3. From the list, click the role or group you want to edit. All details are displayed in the right panel.
4. Set the **Home Page** or **Priority** under the **Settings** section.
5. Set the Business Central, page, editor, space, and project permissions under the **Permissions** section.

Figure 50.1. Setting the permissions

admin settings

Home Page ⓘ

Priority ⓘ

Permissions

> Workbench ⓘ

Pages ⓘ	Read	Update	Delete	Create
<div>- Select Page -</div> <div>Add Exception</div>				

> Editors ⓘ

Editors	Read

> Spaces ⓘ

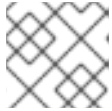
Spaces	Read	Update	Delete	Create

> Projects ⓘ

Projects	Read	Update	Delete	Create	Build

6. Click the arrow next to a resource type to expand the resource type whose permissions you want to change.

- Optional: To add an exception for a resource type, click **Add Exception** and then set the permissions as required.

**NOTE**

You cannot add an exception to the Business Central resource type.

- Click **Save**.

50.2.2. Changing the Business Central home page

The home page is the page that appears after you log in to Business Central. By default, the home page is set to **Home**. You can specify a different home page for each role and group.

Procedure

- In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Roles** or **Groups**.
- Select a role or group.
- Select a page from the **Home Page** list.
- Click **Save**.

**NOTE**

The role or group must have read access to a page before you can make it the home page.

50.2.3. Setting priorities

A user can have multiple roles and belong to multiple groups. The Priority setting determines the order of precedence of a role or group.

Prerequisites

- You are logged in to Business Central with the **admin** user role.

Procedure

- In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Roles** or **Groups**.
- Select a role or group.
- Select a priority from the Priority menu, and then click **Save**.

**NOTE**

If a user has a role or belongs to a group that has conflicting settings, the settings of the role or group with the highest priority applies.

CHAPTER 51. CREATING A CUSTOM DASHBOARD WIDGET

In order to create custom dashboards, users must combine some of the features of the Business Central (like data sets, pages, navigation trees, and permissions) together and publish them. Dashboards are pages containing at least one reporting component.

There are four stages in the creation of a custom dashboard:

- Data set authoring - In this stage, you define a data set for accessing the data and displaying it through the pages. For more information, see [Adding data sets](#).
- Page authoring - In this stage, you create the pages which are used to display the data from the data sets, among other things. For more information, see [Creating pages](#).
- Publication - In this stage, navigation between pages are defined when you create the custom navigation trees or modify the existing default one (**Workbench** tree). For more information, see [Creating a navigation tree](#) or [Editing a navigation tree](#).
- Security management - In this stage, role and group permissions are set which defines the privileges that are granted to a user when the user is working on Business Central. For more information, see [Security management](#).



NOTE

You will have to follow the stages listed above if you plan on migrating your dashboards from previous versions of Business Central to the latest one. Note that there is no automatic migration path or tooling to assist you in that regard. You must recreate all your dashboards from scratch.

APPENDIX A. VERSIONING INFORMATION

Documentation last updated on Monday, November 15, 2021.

APPENDIX B. CONTACT INFORMATION

Red Hat Decision Manager documentation team: brms-docs@redhat.com