Red Hat Decision Manager 7.13

Managing Red Hat Decision Manager and KIE Server settings
Red Hat Decision Manager 7.13 Managing Red Hat Decision Manager and KIE Server settings
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 7.4 is installed. For more information, see Red Hat JBoss Enterprise Application Platform 7.4 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

The product 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 deploying 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, in a Red Hat JBoss EAP cluster, 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 Process Automation Manager controller manages the KIE Server configuration and you interact with the Process Automation 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:

```xml
<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:

```xml
<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
```
Automated update tools are often provided with both patch updates and new minor versions of Red Hat Process Automation Manager to facilitate updating certain components of Red Hat Process Automation Manager, such as Business Central, KIE Server, and the headless Process Automation Manager controller. Other Red Hat Process Automation Manager artifacts, such as the decision engine and standalone Business Central, are released as new artifacts with each minor release and you must reinstall 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 Process Automation Manager 7.13. Patch updates of Red Hat Process Automation Manager, such as an update from version 7.13 to 7.13.5, include the latest security updates and bug fixes. Minor release upgrades of Red Hat Process Automation Manager, such as an upgrade from version 7.12.x to 7.13, include enhancements, security updates, and bug fixes.

**NOTE**

Only updates for Red Hat Process Automation Manager are included in Red Hat Process Automation 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 Process Automation Manager and KIE Server instances are not running. Do not apply updates while you are running an instance of Red Hat Process Automation 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 Process Automation Manager, such as an upgrade from version 7.12.x to 7.13, first apply the latest patch update to your current version of Red Hat Process Automation Manager and then follow this procedure again to upgrade to the new minor release.

2. Click [Patches](#), download the Red Hat Process Automation Manager [VERSION] Update Tool and extract the downloaded `rhpam-$VERSION-update.zip` file to a temporary directory.

   This update tool automates the update of certain components of Red Hat Process Automation Manager, such as Business Central, KIE Server, and the headless Process Automation 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 Process Automation Manager distribution.

3. If you want to preserve any files from being updated by the update tool, navigate to the extracted `rhpam-$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 block 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 blocked 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 `rhpam-$VERSION-update.zip` file and run the `apply-updates` script in the following format:

```
IMPORTANT

Make sure that your Red Hat Process Automation 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 Process Automation 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 Process Automation Manager update tool:

- `rhpam-business-central-eap7-deployable`: Updates Business Central (`business-central.war`)
- `rhpam-kie-server-ee8`: Updates KIE Server (`kie-server.war`)

**NOTE**

The update tool will update and replace Red Hat JBoss EAP EE7 to Red Hat JBoss EAP EE8. Red Hat JBoss EAP EE7 is used for WebLogic and WebSphere, whereas version EE8 is used for Red Hat JBoss EAP. Make sure that KIE Server on WebLogic and WebSphere is not updated by the update tool.

- `rhpam-kie-server-jws`: Updates KIE Server on Red Hat JBoss Web Server (`kie-server.war`)
- **rhpam-controller-ee7**: Updates the headless Process Automation Manager controller (controller.war)

- **rhpam-controller-jws**: Updates the headless Process Automation Manager controller on Red Hat JBoss Web Server (controller.war)

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

```bash
$ ./apply-updates.sh ~EAP_HOME/standalone/deployments/business-central.war rhpam-business-central-eap7-deployable
$ ./apply-updates.sh ~EAP_HOME/standalone/deployments/kie-server.war rhpam-kie-server-ee8
```

Example update to headless Process Automation Manager controller, if used:

```bash
$ ./apply-updates.sh ~EAP_HOME/standalone/deployments/controller.war rhpam-controller-ee7
```

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

5. After the update tool completes, return to the [Software Downloads](https://example.com) 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 Process Automation Manager distribution. For files that already exist in your Red Hat Process Automation 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.

6. If you use the standalone Red Hat Process Automation Manager 7.13.5 Maven Repository artifact (**rhpam-7.13.5-maven-repository.zip**), such as in air-gap environments, download the Red Hat Process Automation Manager 7.13.5 Maven Repository and extract the downloaded **rhpam-7.13.5-maven-repository.zip** file to your existing `~/maven-repository` directory to update the relevant contents.

Example Maven repository update:

```bash
$ unzip -o rhpam-7.13.5-maven-repository.zip 'rhba-7.13.5.GA-maven-repository/maven-repository/*' -d /tmp/rhbaMavenRepoUpdate
$ mv /tmp/rhbaMavenRepoUpdate/rhba-7.13.5.GA-maven-repository/maven-repository/$REPO_PATH/
```

**NOTE**

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

7. Optional: If you are changing Red Hat Process Automation Manager from using property-based user storage to file-based user storage, complete the following steps:

   a. Navigate to the `$JBoss_HOME` directory and run one of the following commands:

      - On Linux or Unix-based systems:
On Windows:

$ ./bin/standalone.bat --admin-only -c standalone-full.xml

$ ./bin/jboss-cli.bat --connect --file=rhpam-$VERSION-update/elytron/add-kie-fs-realm.cli

b. Run the following command:

- On Linux or Unix-based systems:

  $ ./bin/elytron-tool.sh filesystem-realm --users-file standalone/configuration/application-users.properties --roles-file standalone/configuration/application-roles.properties --output-location standalone/configuration/kie-fs-realm-users --filesystem-realm-name kie-fs-realm-users

- On Windows:

  $ ./bin/elytron-tool.bat filesystem-realm --users-file standalone/configuration/application-users.properties --roles-file standalone/configuration/application-roles.properties --output-location standalone/configuration/kie-fs-realm-users --filesystem-realm-name kie-fs-realm-users

c. Navigate to the directory where you extracted the `rhpam-$VERSION-update.zip` file and run one of the following commands to apply the `kie-fs-realm` patch:

- On Linux or Unix-based systems:

  $ ./elytron/kie-fs-realm-patch.sh ~/$JBOSS_HOME/standalone/configuration/kie-fs-realm-users/

- On Windows:

  $ ./elytron/kie-fs-realm-patch.bat ~/$JBOSS_HOME/standalone/configuration/kie-fs-realm-users/

8. After you finish applying all relevant updates, start Red Hat Process Automation Manager and KIE Server and log in to Business Central.

9. 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 `rhpam-$VERSION-update` folder to revert the update tool changes. You can also reinstall the relevant release artifacts from your previous version of Red Hat Decision Manager 7.13 Managing Red Hat Decision Manager and KIE Server settings.
Red Hat Process Automation 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 7.13 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
-Dorg.kie.server.id=myserver
-Dorg.kie.server.user=kie_server_username
-Dorg.kie.server.pwd=kie_server_password
-Dorg.kie.server.controller.user=controller_username
-Dorg.kie.server.controller.pwd=controller_password
-Dorg.kie.server.location=http://localhost:8080/kie-server/services/rest/server
```

1. Start command with `standalone-full.xml` server profile
2. Server ID that must match the server configuration name defined in Business Central
3. User name to connect with KIE Server from the Process Automation Manager controller
4. Password to connect with KIE Server from the Process Automation Manager controller
5. Process Automation Manager controller location, Business Central URL with `rest/controller` suffix
6. User name to connect to the Process Automation Manager controller REST API
7. Password to connect to the Process Automation Manager controller REST API
8. 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:
  
  ```java
  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:
  
  ```xml
  <property name="org.kie.server.xstream.enabled.packages" value="org.example.***"/>
  ```

- Set the following JVM property:

  ```java
  -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 Process Automation Manager controller to start KIE Server.

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

IMPORTANT

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

When KIE Server is configured with a list of Process Automation 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 KIE Server in standalone mode without connecting to Process Automation 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 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 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.
If a KIE Server is not configured in your Red Hat Process Automation Manager environment, or if you require additional KIE Servers in your Red Hat Process Automation 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 Red Hat Decision Manager environment on Red Hat OpenShift Container Platform 4 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 Process Automation Manager controller manages the KIE Server configuration and you interact with the Process Automation 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 Process Automation Manager controller to manage KIE Server, as described in Chapter 9, Installing and running the headless Process Automation 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 KIE Server, a user with the role **kie-server**

**Procedure**

1. In your Red Hat Process Automation Manager installation directory, navigate to the `standalone-full.xml` file. For example, if you use a Red Hat JBoss EAP installation for Red Hat Process Automation Manager, go to `$EAP_HOME/standalone/configuration/standalone-full.xml`.

2. Open the `standalone-full.xml` file and under the `<system-properties>` tag, set the following JVM properties:

<table>
<thead>
<tr>
<th>Table 8.1. JVM Properties for the managed KIE Server instance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property</strong></td>
</tr>
<tr>
<td>org.kie.server.id</td>
</tr>
<tr>
<td>org.kie.server.controller.user</td>
</tr>
<tr>
<td>org.kie.server.controller.pwd</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 8.2. JVM Properties for the Business Central instance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property</strong></td>
</tr>
<tr>
<td>org.kie.server.user</td>
</tr>
<tr>
<td>org.kie.server.pwd</td>
</tr>
</tbody>
</table>

The following example shows how to configure a KIE Server instance:

```xml
<property name="org.kie.server.id" value="default-kie-server"/>
<property name="org.kie.server.controller" value="http://localhost:8080/business-central/rest/controller"/>
<property name="org.kie.server.controller.user" value="controllerUser"/>
```
The following example shows how to configure a Business Central instance:

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

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 Process Automation Manager on KIE Server, see Running Red Hat Process Automation 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>
  </kie-server-info>
</response>
```

4. Verify successful registration:

a. Log in to Business Central.

b. Click **Menu → Deploy → Execution Servers**.
   
   If registration is successful, you will see the registered server ID.
CHAPTER 9. INSTALLING AND RUNNING THE HEADLESS PROCESS AUTOMATION 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 Process Automation Manager controller manages the KIE Server configuration and you interact with the Process Automation Manager controller to create and maintain KIE containers.

Business Central has an embedded Process Automation 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 Process Automation Manager controller.

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

KIE Server can be managed by the Process Automation 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 Process Automation Manager controller manages the KIE Server configuration and you interact with the Process Automation Manager controller to create and maintain KIE containers.

The Process Automation 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 Process Automation 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 Process Automation Manager controller.

Prerequisites

- Two computers with backed-up Red Hat JBoss EAP 7.4 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 7.4 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.


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:
9. Complete the installation.

10. To verify that the Process Automation 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 PROCESS AUTOMATION MANAGER CONTROLLER

You can install the headless Process Automation 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 7.4 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: Process Automation Manager
   - Version: 7.13.5


4. Extract the rhpam-7.13.5-controller-ee7.zip archive to a temporary directory. In the following examples this directory is called TEMP_DIR.

5. Copy the TEMP_DIR/rhpam-7.13.5-controller-ee7/controller.war directory to EAP_HOME/standalone/deployments/.

   **WARNING**

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

7. When prompted to overwrite files, select Yes.

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

### 9.2.1. Creating a headless Process Automation Manager controller user

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

**Prerequisites**

- The headless Process Automation 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 `<USERNAME>` and `<PASSWORD>` with the user name and password of your choice.

   ```sh
   $ ./bin/jboss-cli.sh --commands="embed-server --std-out=echo,/subsystem=elytron/filesystem-realm=ApplicationRealm:add-identity(identity=<USERNAME>),/subsystem=elytron/filesystem-realm=ApplicationRealm:set-password(identity=<USERNAME>, clear={password='<PASSWORD>'}),/subsystem=elytron/filesystem-realm=ApplicationRealm:add-identity-attribute(identity=<USERNAME>, name=role, value=['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 Process Automation Manager controller

If KIE Server will be managed by the headless Process Automation Manager controller, you must edit the **standalone-full.xml** file in KIE Server installation and the **standalone.xml** file in the headless Process Automation Manager controller installation.

**Prerequisites**

- KIE Server is installed in an **EAP_HOME**.

- The headless Process Automation Manager controller is installed in an **EAP_HOME**.
NOTE

You should install KIE Server and the headless Process Automation Manager controller on different servers in production environments. However, if you install KIE Server and the headless Process Automation 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, rhpam-7.13.5-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 Process Automation Manager controller. KIE Server connects to this URL during startup.

9.3. RUNNING THE HEADLESS PROCESS AUTOMATION MANAGER CONTROLLER
After you have installed the headless Process Automation Manager controller on Red Hat JBoss EAP, use this procedure to run the headless Process Automation Manager controller.

**Prerequisites**

- The headless Process Automation 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 Process Automation Manager controller on the same Red Hat JBoss EAP instance as the Red Hat JBoss EAP instance where you installed KIE Server, enter one of the following commands:
   - On Linux or UNIX-based systems:
     ```bash
     $ ./standalone.sh -c standalone-full.xml
     ```
   - On Windows:
     ```bash
     standalone.bat -c standalone-full.xml
     ```

3. If you installed the headless Process Automation Manager controller on a separate Red Hat JBoss EAP instance from the Red Hat JBoss EAP instance where you installed KIE Server, start the headless Process Automation 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:
     ```bash
     $ ./standalone.sh
     ```
   - On Windows:
     ```bash
     standalone.bat
     ```

4. To verify that the headless Process Automation 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.
   ```bash
   ```

   **NOTE**
   Alternatively, you can use the KIE Server Java API Client to access the headless Process Automation Manager controller.
9.4. CLUSTERING KIE SERVERS WITH THE HEADLESS PROCESS AUTOMATION MANAGER CONTROLLER

The Process Automation Manager controller is integrated with Business Central. However, if you do not install Business Central, you can install the headless Process Automation 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 7.4 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: Process Automation Manager
   - Version: 7.13.5


4. Extract the rhpam-7.13.5-controller-ee7.zip archive to a temporary directory. In the following examples this directory is called $TEMP_DIR$.

5. Copy the $TEMP_DIR$/rhpam-7.13.5-controller-ee7/controller.war directory to $EAP_HOME$/standalone/deployments/.

   **WARNING**

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


7. When prompted to overwrite files, click Yes.
8. In the `EAP_HOME/standalone/deployments/` directory, create an empty file named `controller.war.dodeploy`. This file ensures that the headless Process Automation Manager controller is automatically deployed when the server starts.

9. Open the `EAP_HOME/standalone/configuration/standalone.xml` file in a text editor.

10. 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:

    ```xml
    <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>
    
    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.

11. To start the headless Process Automation Manager controller, navigate to `EAP_HOME/bin` and enter the following command:

    - On Linux or UNIX-based systems:
      ```bash
      $ ./standalone.sh
      
      - On Windows:
      ```

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

---

<table>
<thead>
<tr>
<th>Configuration</th>
<th>XML Entry</th>
<th>Permissible Values</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classes used for serialization in the remote services</td>
<td>remoteable-class</td>
<td>Valid CustomClass</td>
<td>No default value</td>
</tr>
</tbody>
</table>
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.


**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 Process Automation Manager 7.13.5 Source Distribution from the Red Hat Customer Portal and navigate to ~rhpam-7.13.5-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
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**

```yaml
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_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**

```bash
$ 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
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
11.2. CONFIGURING PROMETHEUS METRICS MONITORING FOR KIE SERVER ON RED HAT OPENSSHIFT 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 Process Automation Manager 7.13.5 Source Distribution from the Red Hat Customer Portal and navigate to ~/rhpam-7.13.5-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 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 7.13.

- 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:

   ```bash
   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, rhpam713-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:

   ```yaml
   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:

   ```yaml
   apiVersion: v1
   kind: Service
   metadata:
     annotations:
       description: RHPAM Prometheus metrics exposed
   labels:
     app: myapp-kieserver
     application: myapp-kieserver
     template: myapp-kieserver
     metrics: rhpam
   ```
3. In a command terminal, use the `oc` command to apply the `service-metrics.yaml` file to your OpenShift deployment:

   ```bash
   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.

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

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

   ```bash
   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](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](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**

![Prometheus expression browser](image1)

**Figure 11.6. Prometheus expression browser with KIE Server target**

![Prometheus targets](image2)

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

![Grafana DMN models](image3)

**Figure 11.8. Grafana dashboard with KIE Server metrics for solvers**

![Grafana solvers](image4)
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”. 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 7.13
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

```xml
<packaging>jar</packaging>

<properties>
  <version.org.kie>7.67.0.Final-redhat-00024</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-platform</artifactId>
    <version>${version.org.kie}</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

```java
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) {
```

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

```java
package org.kie.server.ext.prometheus;

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) {
}
```
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 an Red Hat Decision Manager environment on Red Hat OpenShift Container Platform 4 using Operators`.

6. Start the KIE Server and deploy the built project to the running KIE Server. You can deploy the
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 OPENSHIFT 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:

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

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:

```xml
<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/business-central/rest/repositories
  ```
- For KIE Server:
  ```
  curl http://admin:password@localhost:8080/kie-server/services/rest/server/
  ```
CHAPTER 15. KIE SERVER SYSTEM PROPERTIES

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

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>org.drools.server.ext.disabled</td>
<td>true, false</td>
<td>false</td>
<td>If set to <strong>true</strong>, disables the Business Rule Management (BRM) support (for example, rules support).</td>
</tr>
<tr>
<td>org.optaplanner.server.ext.disabled</td>
<td>true, false</td>
<td>false</td>
<td>If set to <strong>true</strong>, disables the Red Hat build of OptaPlanner support.</td>
</tr>
<tr>
<td>org.kie.prometheus.server.ext.disabled</td>
<td>true, false</td>
<td>true</td>
<td>If set to <strong>true</strong>, disables the Prometheus Server extension.</td>
</tr>
<tr>
<td>org.kie.scenariosimulation.server.ext.disabled</td>
<td>true, false</td>
<td>true</td>
<td>If set to <strong>true</strong>, disables the Test scenario Server extension.</td>
</tr>
<tr>
<td>org.kie.dmn.server.ext.disabled</td>
<td>true, false</td>
<td>false</td>
<td>If set to <strong>true</strong>, disables the KIE Server DMN support.</td>
</tr>
<tr>
<td>org.kie.swagger.server.ext.disabled</td>
<td>true, false</td>
<td>false</td>
<td>If set to <strong>true</strong>, disables the KIE Server swagger documentation support</td>
</tr>
</tbody>
</table>

**NOTE**

Some Process Automation 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 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 Process Automation Manager controller

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>org.kie.server.id</td>
<td>String</td>
<td>N/A</td>
<td>An arbitrary ID to be assigned to the server. If a headless Process Automation Manager controller is configured outside of Business Central, this is the ID under which the server connects to the headless Process Automation Manager controller to fetch the KIE container configurations. If not provided, the ID is automatically generated.</td>
</tr>
<tr>
<td>Property</td>
<td>Values</td>
<td>Default</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>----------------</td>
<td>----------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>org.kie.server.user</td>
<td>String</td>
<td>kieserver</td>
<td>The user name used to connect with KIE Server from the Process Automation Manager controller, required when running in managed mode. Set this property in Business Central system properties. Set this property when using a Process Automation Manager controller.</td>
</tr>
<tr>
<td>org.kie.server.pwd</td>
<td>String</td>
<td>kieserver1!</td>
<td>The password used to connect with KIE Server from the Process Automation Manager controller, required when running in managed mode. Set this property in Business Central system properties. Set this property when using a Process Automation Manager controller.</td>
</tr>
<tr>
<td>org.kie.server.token</td>
<td>String</td>
<td>N/A</td>
<td>A property that enables you to use token-based authentication between the Process Automation Manager controller and KIE Server instead of the basic user name and password authentication. The Process Automation 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.</td>
</tr>
<tr>
<td>org.kie.server.location</td>
<td>URL</td>
<td>N/A</td>
<td>The URL of the KIE Server instance used by the Process Automation Manager controller to call back on this server, for example, <a href="http://localhost:8230/kie-server/services/rest/server">http://localhost:8230/kie-server/services/rest/server</a>. Setting this property is required when using a Process Automation Manager controller.</td>
</tr>
<tr>
<td>org.kie.server.controller</td>
<td>Comma-separated list</td>
<td>N/A</td>
<td>A comma-separated list of URLs to the Process Automation Manager controller REST endpoints, for example, <a href="http://localhost:8080/business-central/rest/controller">http://localhost:8080/business-central/rest/controller</a>. Setting this property is required when using a Process Automation Manager controller.</td>
</tr>
<tr>
<td>org.kie.server.controller.user</td>
<td>String</td>
<td>kieserver</td>
<td>The user name to connect to the Process Automation Manager controller REST API. Setting this property is required when using a Process Automation Manager controller.</td>
</tr>
<tr>
<td>Property</td>
<td>Values</td>
<td>Default</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>--------</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td><code>org.kie.server.controller.pwd</code></td>
<td>String</td>
<td>kieserver1!</td>
<td>The password to connect to the Process Automation Manager controller REST API. Setting this property is required when using a Process Automation Manager controller.</td>
</tr>
<tr>
<td><code>org.kie.server.controller.token</code></td>
<td>String</td>
<td>N/A</td>
<td>A property that enables you to use token-based authentication between KIE Server and the Process Automation 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.</td>
</tr>
<tr>
<td><code>org.kie.server.controller.connect</code></td>
<td>Long</td>
<td>10000</td>
<td>The waiting time in milliseconds between repeated attempts to connect KIE Server to the Process Automation Manager controller when the server starts.</td>
</tr>
</tbody>
</table>

Table 15.3. System properties for loading keystore

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>kie.keystore.keyStoreURL</code></td>
<td>URL</td>
<td>N/A</td>
<td>The URL is used to load a Java Cryptography Extension KeyStore (JCEKS). For example, <code>file:///home/kie/keystores/keystore.jceks</code>.</td>
</tr>
<tr>
<td><code>kie.keystore.keyStorePw d</code></td>
<td>String</td>
<td>N/A</td>
<td>The password is used for the JCEKS.</td>
</tr>
<tr>
<td><code>kie.keystore.key.server.alias</code></td>
<td>String</td>
<td>N/A</td>
<td>The alias name of the key for REST services where the password is stored.</td>
</tr>
<tr>
<td><code>kie.keystore.key.server.p wdl</code></td>
<td>String</td>
<td>N/A</td>
<td>The password of an alias for REST services.</td>
</tr>
<tr>
<td><code>kie.keystore.key.ctrl.alias</code></td>
<td>String</td>
<td>N/A</td>
<td>The alias of the key for default REST Process Automation Manager controller.</td>
</tr>
<tr>
<td><code>kie.keystore.key.ctrl.pwd</code></td>
<td>String</td>
<td>N/A</td>
<td>The password of an alias for default REST Process Automation Manager controller.</td>
</tr>
</tbody>
</table>

Table 15.4. System properties for retrying committing transactions
<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>org.kie.optlock.retries</td>
<td>Integer</td>
<td>5</td>
<td>This property describes how many times the process engine retries a transaction before failing permanently.</td>
</tr>
<tr>
<td>org.kie.optlock.delay</td>
<td>Integer</td>
<td>50</td>
<td>The delay time before the first retry, in milliseconds.</td>
</tr>
<tr>
<td>org.kie.optlock.delayFactor</td>
<td>Integer</td>
<td>4</td>
<td>The multiplier for increasing the delay time for each subsequent retry. With the default values, the process engine waits 50 milliseconds before the first retry, 200 milliseconds before the second retry, 800 milliseconds before the third retry, and so on.</td>
</tr>
</tbody>
</table>

Table 15.5. Other system properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>kie.maven.settings.custom</td>
<td>Path</td>
<td>N/A</td>
<td>The location of a custom settings.xml file for Maven configuration.</td>
</tr>
<tr>
<td>kie.server.jms.queues.response</td>
<td>String</td>
<td>queue/KIE.SERVER.RESPONSE</td>
<td>The response queue JNDI name for JMS.</td>
</tr>
<tr>
<td>org.drools.server.filter.classes</td>
<td>true, false</td>
<td>false</td>
<td>When set to true, the Drools KIE Server extension accepts custom classes annotated by the XmlRootElement or Remotable annotations only.</td>
</tr>
<tr>
<td>org.kie.server.domain</td>
<td>String</td>
<td>N/A</td>
<td>The JAAS LoginContext domain used to authenticate users when using JMS.</td>
</tr>
<tr>
<td>org.kie.server.repo</td>
<td>Path</td>
<td>.</td>
<td>The location where KIE Server state files are stored.</td>
</tr>
<tr>
<td>Property</td>
<td>Values</td>
<td>Default</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>----------------</td>
<td>---------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| org.kie.server.sync.deploy       | true, false    | false   | A property that instructs KIE Server to hold the deployment until the Process Automation Manager controller provides the container deployment configuration. This property only affects servers running in managed mode. The following options are available:  
  * **false**: The connection to the Process Automation Manager controller is asynchronous. The application starts, connects to the Process Automation 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 Process Automation 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>| 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 <strong>true</strong>, 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 allowlist for marshalling using XStream.                                                  |</p>
<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>org.kie.store.services.class</td>
<td>String</td>
<td>org.drools.persistence.jpa.KnowledgeStoreServiceImpl</td>
<td>Fully qualified name of the class that implements KieStoreServices that are responsible for bootstrapping KieSession instances.</td>
</tr>
<tr>
<td>org.kie.server.strict.id.format</td>
<td>true, false</td>
<td>false</td>
<td>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, {&quot;value&quot; : 1}.</td>
</tr>
<tr>
<td>org.kie.server.json.customObjectDeserializerCNFE Behavior</td>
<td>IGNORE, WARN, EXCEPTION</td>
<td>IGNORE</td>
<td>While using JSON unmarshalling, when a class in a payload is not found, the behavior can be changed using this property as follows:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- If the property is set to IGNORE, the payload is converted to a HashMap</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- If the property is set to WARN, the payload is converted to a HashMap and a warning is logged</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- If the property is set to EXCEPTION, KieServer throws an exception</td>
</tr>
<tr>
<td>org.kie.server.strict.jaxb.format</td>
<td>true, false</td>
<td>false</td>
<td>When the value of this property is set to true, KieServer validates the data type of the data in the REST API payload. For example, if a data field has the number data type and contains something other than a number, you will receive an error.</td>
</tr>
</tbody>
</table>
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

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

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": "7.67.0.20190818-050814",
      "name": "test-kie-server",
      "location": "http://localhost:8080/kie-server/services/rest/server",
      "capabilities": ["KieServer", "BRM", "BRP", "DMN", "Swagger"],
      "messages": [null]
    }
  }
}
```
To enable or disable KIE Server extensions, configure the related ".server.ext.disabled" 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**

   ```xml
   <packaging>jar</packaging>

   <properties>
   <version.org.kie>7.67.0.Final-redhat-00024</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>
   </dependency>
   ```
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**

```java
public class CusomtDroolsKieServerApplicationComponentsService implements KieServerApplicationComponentsService {

    private static final String OWNER_EXTENSION = "Drools";

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

        RulesExecutionService rulesExecutionService = null;
        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));
        }

        return components;
    }
}
```

1. Delivers REST endpoints to the KIE Server infrastructure that is deployed when the application starts.
2. Specifies the extension that you are extending, such as the Drools extension in this example.
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 (```

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.

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 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

```java
// 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);
      }
   }
```
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

```java
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.newGetObject());
    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:
- 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 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:
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

```xml
<packaging>jar</packaging>

<properties>
    <version.org.kie>7.67.0.Final-redhat-00024</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>
```
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

```java
public class MinaDroolsKieServerExtension implements KieServerExtension {
    private static final Logger logger = LoggerFactory.getLogger(MinaDroolsKieServerExtension.class);

    private 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();
}
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**

```java
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();
}
```

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:
Specifies the capability that is covered by this extension. The capability must be unique within KIE Server.

Defines a human-readable name for the extension.

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

```java
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
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

```bash
# 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
16.3. 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>7.67.0.Final-redhat-00024</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
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 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

```java
public interface RulesMinaServicesClient extends RuleServicesClient {
}

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("") || 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("") || response.startsWith("{")) {
                return new ServiceResponse<String>(ResponseType.SUCCESS, null, response);
            } else {
                return new ServiceResponse<String>(ResponseType.FAILURE, response);
            }
        }
    }
```
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**

```java
public class MinaClientBuilderImpl implements KieServicesClientBuilder {

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

    public Map<Class<?>, Object> build(KieServicesConfiguration configuration, ClassLoader classLoader) {
        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 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**

```java
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");

capabilities.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 an 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 7.4
- Planning a Red Hat Decision Manager installation
- Installing and configuring Red Hat Decision Manager on Red Hat JBoss EAP 7.4
- Deploying an Red Hat Decision Manager environment on Red Hat OpenShift Container Platform 4 using Operators
- Deploying an Red Hat Decision Manager environment on Red Hat OpenShift Container Platform 3 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.
- **Custom Tasks Administration**: Enable or disable default service tasks and upload custom service tasks.
- **Dashbuilder Data Transfer**: Import and export Dashbuilder data as ZIP files in Business Central.
- **Profiles**: Set the workbench profile as Planner and Rules or Full.
- **Archetypes**: 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 7.4.14 is installed. For more information, see [Red Hat JBoss Enterprise Application Platform 7.4 Installation Guide](https://access.redhat.com/documentation/en-us/red_hat_jboss_enterprise_application_platform/7.4/admin/configure/).
- Red Hat Decision Manager is installed and running. For more information, see [Installing and configuring Red Hat Decision Manager on Red Hat JBoss EAP 7.4](https://access.redhat.com/documentation/en-us/red_hat_decision_manager/7.4/admin/configure/).
- 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
- rest-all
- developer
- rest-project
- 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. Optional: 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.

NOTE
If Business Central uses Red Hat Single Sign-On (RH-SSO), the groups in Business Central are created from the roles in RH-SSO.

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

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

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

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

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

```xml
<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:

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

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>org.uberfire.ext.security.management.wildfly.cli.host</td>
<td>The native administration interface host.</td>
<td>localhost</td>
</tr>
<tr>
<td>org.uberfire.ext.security.management.wildfly.cli.port</td>
<td>The native administration interface port.</td>
<td>9990</td>
</tr>
<tr>
<td>org.uberfire.ext.security.management.wildfly.cli.user</td>
<td>The native administration interface username.</td>
<td>NA</td>
</tr>
<tr>
<td>org.uberfire.ext.security.management.wildfly.cli.password</td>
<td>The native administration interface user's password.</td>
<td>NA</td>
</tr>
<tr>
<td>org.uberfire.ext.security.management.wildfly.cli.realm</td>
<td>The realm used by the application’s security context.</td>
<td>ApplicationRealm</td>
</tr>
</tbody>
</table>

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

```xml
<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"/>
```

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

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

### 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

6. Click the arrow next to a resource type to expand the resource type whose permissions you want to change.
7. 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.

8. 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**

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Roles** or **Groups**.
2. Select a role or group.
3. Select a page from the **Home Page** list.
4. 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**

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Roles** or **Groups**.
2. Select a role or group.
3. 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 JFrog 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 upper-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 upper-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 upper-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 AND DATABASE DRIVER 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 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 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 upper-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 **Name**, **Connection URL**, **User**, **Password**, and **Driver** fields of the data source.
4. Click **Test Connection** to verify the connection to the database.
5. Click **Finish**.

### 22.2. 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 upper-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**.
22.3. 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 upper-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.

22.4. 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 upper-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** fields of the database driver.
4. Click **Finish**.

22.5. EDITING A DATABASE DRIVER
You can edit the properties of a database driver from the **Driver Definition** pane.

**Procedure**

1. In Business Central, select the **Admin** icon in the upper-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**.

22.6. DELETING A DATABASE DRIVER
You can remove database drivers from the **DataSource Definition** pane of Business Central.

**Procedure**
Procedure

1. In Business Central, select the Admin icon in the upper-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.
CHAPTER 23. DATA SETS AUTHORING

A data set is a collection of related sets of information and can be stored 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 can 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. The data set definition specifies the location of the data set, options 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 Sets page opens.

2. Click New Data Set and select one of the following provider types:
   - **Bean**: Generates a data set from a Java class
   - **CSV**: Generates a data set from a remote or local CSV file
   - **SQL**: Generates a data set from an ANSI-SQL compliant database
   - **Elastic Search**: Generates a data set from Elastic Search nodes
   - **Prometheus**: Generates a data set using the Prometheus query
   - **Kafka**: Generates a data set using metrics from Kafka broker, consumer, or producer

   **NOTE**
   You must configure KIE Server for Prometheus, Kafka, and Execution Server options.

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

   **NOTE**
   The configuration steps differ based on the provider you choose.

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, select the data set, 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 Caching data 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. You can access the Data refresh every feature on the Advanced tab of the data set. The Refresh on stale data feature refreshes the cached data when the back-end data changes.

23.4. CACHING DATA

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

You can set the **Client Cache** and **Backend Cache** settings on the **Advanced** tab of the data set.

**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 installed in Apache Maven repositories in which you can set or create a template structure 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 upper-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 upper-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 upper-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 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 archetypes to Business Central, you can use them as 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

In Business Central, a project is a part of your space and stores the related assets. You can add multiple projects in a space.

For example, an organization includes various departments, such as HR, Payroll, Engineering, and R&D. You can map each department to a space in Business Central, along with adding respective projects.

You can customize the project settings in Business Central. Also, you can create a new project or clone projects from an existing Git repository.

Procedure

1. In Business Central, select the Admin icon in the upper-right corner and select Projects.

2. In the Project Preferences panel, select the preference you want to modify. The project preferences include:
   - **Project Importing**: This preference consists of the following property:
     - Select the **Allow multiple projects to be imported on cluster** to import multiple projects on a cluster.
   - **File exporting**: This preference consists of the following properties:

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

   - **Spaces**: This preference consists of the following properties:

<pre><code> | 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. |
</code></pre>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alias (in singular)</td>
<td>Determines the customized alias (singular) of the space.</td>
</tr>
<tr>
<td>Alias (in plural)</td>
<td>Determines the customized alias (plural) of the space.</td>
</tr>
</tbody>
</table>

- **Default values**: This preference consists of the following properties:

  **Table 25.3. Default values properties**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version</td>
<td>The default version number of a project when creating projects.</td>
</tr>
<tr>
<td>Description</td>
<td>The default description of a project when creating projects.</td>
</tr>
<tr>
<td>Branch</td>
<td>The default branch to be used when using a Git repository.</td>
</tr>
<tr>
<td>Assets Per Page</td>
<td>Used to customize the number of assets per page in the project. The default value is 15.</td>
</tr>
</tbody>
</table>

- **Advanced GAV preferences**: This preference consists of the following properties:

  **Table 25.4. Advanced GAV preference properties**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disable GAV conflict check?</td>
<td>Determines whether to enable or disable the GAV conflict check. Disabling this checkbox enables the projects to contain the same GAV (group ID, artifact, and version).</td>
</tr>
<tr>
<td>Allow child GAV edition?</td>
<td>Determines whether to allow child or subprojects to contain GAV edition.</td>
</tr>
</tbody>
</table>

**NOTE**

Duplicate GAV detection is disabled for projects in the 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
- Spanish
- French
- Japanese

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:

  ```plaintext
  ssh-rsa
  AAAAB3NzaC1yc2EAAAADAQABAAABAQDmak4Wu23RZ6xmN94bOsqecZxuTa4RRhhQmHmTJZMB7HM57/90u/B/gB/GhsPEu1nAXL0npY56iT/MPQ8vRm2C2W9A7CzN5+z5yyL3W01YZy3kzsk77CjULjfrhrfQSL3b2sPG5jy5E5/ny/C/swSytcwCT/PE7aXTS9H6cHIKUdYPzlt94SHoBxWRiK7Pji9d-eLB+hmdzlVbV1a1ezu5a8yu2kcHi6Nxxfl5iR2rscfDTp0imC1jMoC6ZDiBvZSxL9F\>
  TMWfdNnmTIJveBtv9nAbnAvlwIwilS0V0Kd1s3GxBxeZYAcKbcsK9sJzusptk5dxGsG2Z8vInagIN60aOQ7b7tcomczCYYwviGQ9gRX8sGsVrw39gsDlGYP2A4bRr7eHn1Ng1b0HCchA5+QCDk4Hbz1UnmHmPA2Lg9c3WGM2qedvQdVJxuS3mlwYQoL40aXPs6890PvFUipiVSznF50dpjPnwsMxJZEF1HdTXgZD1BhS4ogZl7czyUNfKvkE69yJDbTHjqD0c0kuQu09tvxqmBzhX31yF4VcsMeADcf228iwN4LZnC/GwonYtq5+G93zJfOOkPHEME8c2XuPuCXF795isxyJ8SB/Aw/PJAheTm0y0s0l14eWqxsDxkBOGn+ivU0cZrVMssHJEJb4o0FLT7ilHhOW56/IMdD9w==
  ```

- **{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:

  ```json
  {
    "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 can run custom logic. You can customize and reuse custom tasks across multiple business processes or across all projects in Business Central. You can also add custom elements in the designer palette, including name, icon, sub-category, input and output parameters, and documentation. 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.
4. To add a custom task, click **Add Custom Task**, browse to the relevant JAR file, and click the **Upload** icon. If a class implements a `WorkItemHandler`, you can replace annotations with a `.wid` file by adding the file to Business Central separately.

5. Optional: To remove a custom task, click **remove** on the row of the custom task you want to remove and click **Ok** to confirm removal.

6. 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.

7. 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.

8. 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.
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. 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 32.1. LDAP UserGroupCallback properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ldap.bind.user</td>
<td>User name for connecting to the LDAP server.</td>
</tr>
<tr>
<td></td>
<td>This property is optional if it is not specified and the LDAP server accepts anonymous access.</td>
</tr>
<tr>
<td>ldap.bind.pwd</td>
<td>Password for connecting to the LDAP server.</td>
</tr>
<tr>
<td></td>
<td>This property is optional if it is not specified and the LDAP server accepts anonymous access.</td>
</tr>
<tr>
<td>ldap.user.ctx</td>
<td>Context in LDAP with user information.</td>
</tr>
<tr>
<td>ldap.role.ctx</td>
<td>Context in LDAP with group and role.</td>
</tr>
<tr>
<td>ldap.user.roles.ctx</td>
<td>Context in LDAP with user group and role membership information.</td>
</tr>
<tr>
<td></td>
<td>This property is optional if it is not specified and the ldap.role.ctx property is used instead.</td>
</tr>
<tr>
<td>ldap.user.filter</td>
<td>Filter for searching user information.</td>
</tr>
<tr>
<td></td>
<td>This property usually contains substitution keys {0} that are replaced with parameters.</td>
</tr>
<tr>
<td>ldap.role.filter</td>
<td>Filter for searching group and role information.</td>
</tr>
<tr>
<td></td>
<td>This property usually contains substitution keys {0} that are replaced with parameters.</td>
</tr>
<tr>
<td>ldap.user.roles.filter</td>
<td>Filter for searching user group and role membership information.</td>
</tr>
<tr>
<td></td>
<td>This property usually contains substitution keys {0} that are replaced with parameters.</td>
</tr>
<tr>
<td>ldap.user.attr.id</td>
<td>Attribute name of the user ID in LDAP.</td>
</tr>
<tr>
<td></td>
<td>This property is optional if it is not specified and the uid property is used instead.</td>
</tr>
</tbody>
</table>
### 32.1. 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:

  ```java
  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);
  ```
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 33. 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 33.1. Database UserGroupCallback properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>db.ds.jndi.name</td>
<td>JNDI name of the data source used for connections</td>
</tr>
<tr>
<td>db.user.query</td>
<td>Verifies the user existence</td>
</tr>
<tr>
<td>db.user.roles.query</td>
<td>Collects the groups for a given user</td>
</tr>
<tr>
<td>db.roles.query</td>
<td>Verifies the group existence</td>
</tr>
</tbody>
</table>

33.1. 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:

  ```java
  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:

  ```bash
  -Djbpm.usergroup.callback.properties=FILE_LOCATION_ON_CLASSPATH
  ```
Ensure that you register the database callback when starting the user task server.

For example:

```java
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 34. 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 35. 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.

35.1. 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.
5. Click Save to confirm the changes.

   NOTE

   You can click Reset to undo all 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).

35.2. 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.

Red Hat Decision Manager 7.13 Managing Red Hat Decision Manager and KIE Server settings
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 36. CONFIGURING THE ENVIRONMENT MODE IN KIE SERVER AND BUSINESS CENTRAL

You can set KIE Server to run in \texttt{production} mode or in \texttt{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 \texttt{Deploy} in Business Central to deploy the built KJAR file to a KIE Server without stopping any running instances (if applicable), or click \texttt{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 \texttt{Redeploy} option in Business Central is disabled and you can click only \texttt{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 \texttt{org.kie.server.mode} system property to \texttt{org.kie.server.mode=development} or \texttt{org.kie.server.mode=production}.

2. To configure the deployment behavior for a project in Business Central, go to project \texttt{Settings} → \texttt{General Settings} → \texttt{Version} and toggle the \texttt{Development Mode} option.

\textbf{NOTE}

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

You cannot deploy a project with \texttt{Development Mode} turned on or with a manually added \texttt{SNAPSHOT} version suffix to a KIE Server that is in production mode.
CHAPTER 37. 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.

### 37.1. 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:
   ```bash
   $ touch post-commit
   ```

2. Set the permissions of the *post-commit* file to 755:
   ```bash
   $ 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:
     ```bash
     #!/bin/bash
git push origin +master
     ```
   - To log a message:
     ```bash
     #!/bin/bash
echo 'Hello World'
     ```
   - To execute code of another file:
     ```bash
     #!/bin/bash
java -jar _EAP_HOME_/bin/.niogit/<SPACE>/<PROJECT_NAME>.git/hooks/git-push.jar
     ```

---

**CHAPTER 37. GIT HOOKS AND REMOTE GIT REPOSITORY INTEGRATION**

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   $ touch post-commit
   ```

2. Set the permissions of the *post-commit* file to 755:
   ```bash
   $ 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:
     ```bash
     #!/bin/bash
git push origin +master
     ```
   - To log a message:
     ```bash
     #!/bin/bash
echo 'Hello World'
     ```
   - To execute code of another file:
     ```bash
     #!/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*.

### 37.2. IMPORTING REMOTE GIT REPOSITORIES

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

**Prerequisites**

- Red Hat Process Automation Manager is installed in a Red Hat JBoss EAP 7.4 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 ![import](import_icon.png) 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 37.1, “Creating post-commit Git hooks”.

8. Optional: To check that the configuration was successful, create a guided rule in Business Central:


   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

37.3. 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 Process Automation Manager is installed in a Red Hat JBoss EAP 7.4 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:

   ```bash
   $ 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:

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

   For more information about creating post-commit Git hooks, see Section 37.1, “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.

**37.4. 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 Process Automation Manager is installed in a Red Hat JBoss EAP 7.4 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 37.1, “Creating post-commit Git hooks”.

2. 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:

  ```xml
  <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:

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

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

Additional resources

- Customizing Git - Git Hooks

### 37.5. 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 Process Automation Manager is installed in a Red Hat JBoss EAP 7.4 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 37.1. Example `.gitremote` parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>provider</strong></td>
<td>The Git provider. Only two values are accepted: GIT_HUB and GIT_LAB. Required</td>
</tr>
<tr>
<td><strong>login</strong></td>
<td>The user name for the Git provider. Required</td>
</tr>
</tbody>
</table>
## Parameter Description

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>password</td>
<td>A plain text password. Not required if a <strong>token</strong> is provided.</td>
</tr>
<tr>
<td>token</td>
<td>A generated token to replace the <strong>username</strong> and <strong>password</strong> based unsecured connection. Note: If this is not set a warning is displayed that you are using an unsecured connection. Not required if a <strong>password</strong> is provided. Note: GitLab only supports token authentication.</td>
</tr>
<tr>
<td>remoteGitUrl</td>
<td>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.</td>
</tr>
<tr>
<td>useSSH</td>
<td>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.</td>
</tr>
<tr>
<td>ignore</td>
<td>A comma separated regular expressions to ignore project names that match any of these expressions. Optional.</td>
</tr>
<tr>
<td>githubOrg</td>
<td>Defines the repository organization if GitHub is used as the provider. Optional.</td>
</tr>
<tr>
<td>gitlabGroup</td>
<td>Defines the repository group and subgroup if GitLab is used as the provider. Optional.</td>
</tr>
</tbody>
</table>

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
java -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*.

### 37.6. 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).

### 37.7. 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.
2. 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:

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

### 37.7.1. 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>
<thead>
<tr>
<th>Exit code</th>
<th>Customized message</th>
<th>UI notification color</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Success! All working as expected.</td>
<td>Green</td>
</tr>
<tr>
<td>1 to 30</td>
<td>Warning! Please check the logs and advise your admin.</td>
<td>Orange</td>
</tr>
<tr>
<td>31 to 255</td>
<td>Error! Please advise your admin immediately.</td>
<td>Red</td>
</tr>
</tbody>
</table>

#### 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.

### 37.7.2. 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 38. 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.

38.1. 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 39. 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 40. BUSINESS CENTRAL SYSTEM PROPERTIES

The Business Central system properties listed in this section are passed to standalone*.xml files.

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.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 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.ssh.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 Process Automation Manager controller
Use the following properties to configure the connections with the KIE Server nodes from the Process Automation Manager controller:

- **org.kie.server.controller**: The URL is used to connect to the Process Automation Manager controller. For example, `ws://localhost:8080/business-central/websocket/controller`.

- **org.kie.server.user**: User name used to connect to the KIE Server nodes from the Process Automation Manager controller. This property is only required when using this Business Central installation as a Process Automation Manager controller.

- **org.kie.server.pwd**: Password used to connect to the KIE Server nodes from the Process Automation Manager controller. This property is only required when using this Business Central installation as a Process Automation 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.library.assets_per_page**: You can customize the number of assets per page in the project screen. Default value: `15`.

- **org.kie.verification.disable-dtable-realtime-verification**: Disables the real-time validation and verification of decision tables. Default value: `false`.

### Process Automation Manager controller

Use the following properties to configure how to connect to the Process Automation Manager controller:

- **org.kie.workbench.controller**: The URL used to connect to the Process Automation Manager controller, for example, `ws://localhost:8080/kie-server-controller/websocket/controller`.

- **org.kie.workbench.controller.user**: The Process Automation Manager controller user. Default value: `kieserver`.


- **org.kie.workbench.controller.token**: The token string used to connect to the Process Automation 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 Process Automation Manager controller.

- **kie.keystore.key.ctrl.pwd**: The password of the alias for the default REST Process Automation 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 41. 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 36, 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.verification.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 42. 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 43. 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/business-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/business-central/kie-wb.jsp?
      standalone=true&perspective=LibraryPerspective&header=UberfireBreadcrumbsContainer
      The standalone library perspective with the breadcrumb trail opens in the browser.
CHAPTER 44. 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/business-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/business-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 45. 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/business-central/kie-wb.jsp?
   standalone=true&perspective=ContentManagerPerspective

   The standalone content manager perspective opens in the browser.
CHAPTER 46. 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/business-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. CREATING CUSTOM PAGES IN BUSINESS CENTRAL

As a business analyst or business rules developer, you can use the Page Editor in Business Central to create static pages and dynamic dashboards to display specific information about your project. A dashboard is a collection of pages that contain at least one dynamic reporting component. You can define a data set to feed the reporting components of a dashboard. You can export dashboards to the standalone Dashbuilder Runtime dashboard viewer on Red Hat JBoss EAP or the Dashbuilder Standalone dashboard viewer on Red Hat OpenShift Container Platform.

Prerequisites

- You are logged in to Business Central as a user with permission to edit pages.
CHAPTER 47. BUSINESS CENTRAL CUSTOM DASHBOARDS

A dashboard is a collection of Business Central pages that contain at least one reporting component. Dashboards often contain data sets, navigation trees, and permissions.

- Data set authoring: Define a data set for accessing the data and displaying it through the pages. For more information, see Adding data sets.

- 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.

Additional resources

To migrate dashboards from a previous version of Business Central, use the Dashbuilder Data Transfer feature described in Section 50.1, “Exporting dashboard data”.
A data set is a collection of related sets of information and can be stored 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 can 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. The data set definition specifies the location of the data set, options 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 Sets page opens.
2. Click New Data Set and select one of the following provider types:
   - Bean: Generates a data set from a Java class
   - CSV: Generates a data set from a remote or local CSV file
   - SQL: Generates a data set from an ANSI-SQL compliant database
   - Elastic Search: Generates a data set from Elastic Search nodes
   - Prometheus: Generates a data set using the Prometheus query
   - Kafka: Generates a data set using metrics from Kafka broker, consumer, or producer

   NOTE
   You must configure KIE Server for Prometheus, Kafka, and Execution Server options.

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

   NOTE
   The configuration steps differ based on the provider you choose.

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, select the data set, 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 Caching data 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. You can access the Data refresh every feature on the Advanced tab of the data set. The Refresh on stale data feature refreshes the cached data when the back-end data changes.

48.4. CACHING DATA

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

You can set the Client Cache and Backend Cache settings on the Advanced tab of the data set.

**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. 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.

49.1. 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.

49.1.1. 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:

   ```xml
   <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="path_to_user_file"/>
   ```
The following table provides a description and default value for these properties:

### Table 49.1. Red Hat JBoss EAP security management provider based on property files

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

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"/>
```

### 49.1.2. 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"/>
```
The following table provides a description and default value for these properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>org.uberfire.ext.security.management.wildfly.cli.host</td>
<td>The native administration interface host.</td>
<td>localhost</td>
</tr>
<tr>
<td>org.uberfire.ext.security.management.wildfly.cli.port</td>
<td>The native administration interface port.</td>
<td>9990</td>
</tr>
<tr>
<td>org.uberfire.ext.security.management.wildfly.cli.user</td>
<td>The native administration interface username.</td>
<td>NA</td>
</tr>
<tr>
<td>org.uberfire.ext.security.management.wildfly.cli.password</td>
<td>The native administration interface user's password.</td>
<td>NA</td>
</tr>
<tr>
<td>org.uberfire.ext.security.management.wildfly.cli.realm</td>
<td>The realm used by the application’s security context.</td>
<td>ApplicationRealm</td>
</tr>
</tbody>
</table>

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

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

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"/>
```

### 49.2. 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.

### 49.2.1. 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 49.1. Setting the permissions**

```
<table>
<thead>
<tr>
<th>admin settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Page</td>
</tr>
<tr>
<td>Priority</td>
</tr>
<tr>
<td>Permissions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Workbench</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Pages</th>
<th>Read</th>
<th>Update</th>
<th>Delete</th>
<th>Create</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Page</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Editors</th>
<th>Read</th>
<th>Update</th>
<th>Delete</th>
<th>Create</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Spaces</th>
<th>Read</th>
<th>Update</th>
<th>Delete</th>
<th>Create</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Projects</th>
<th>Read</th>
<th>Update</th>
<th>Delete</th>
<th>Create</th>
<th>Build</th>
</tr>
</thead>
</table>
```

6. Click the arrow next to a resource type to expand the resource type whose permissions you want to change.
7. 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.

8. Click **Save**.

### 49.2.2. 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**

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

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

### 49.2.3. 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**

1. In Business Central, select the **Admin** icon in the top-right corner of the screen and select **Roles** or **Groups**.
2. Select a role or group.
3. 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 50. EXPORTING, IMPORTING, AND DEPLOYING DASHBOARDS

After you create a dashboard in Business Central, you can export the dashboard data and import it in another instance of Business Central, in Dashbuilder Runtime, or in Dashbuilder Standalone.

NOTE
This feature is only accessible by administrator users.

50.1. EXPORTING DASHBOARD DATA

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

Procedure

1. In Business Central, select the Admin icon in the upper-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 dashboard data is downloaded. The export.zip file structure is separated by data type, as shown in the following example:

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

50.2. IMPORTING BUSINESS CENTRAL DASHBOARDS

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 upper-right corner of the screen and select Dashbuilder Data Transfer.

WARNING
You should only import dashboard 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.
APPENDIX A. VERSIONING INFORMATION

Documentation last updated on Thursday, March 14th, 2024.
Red Hat Decision Manager documentation team: brms-docs@redhat.com