



# **Red Hat JBoss BPM Suite 6.4**

## **Administration and Configuration Guide**

The Administration and Configuration Guide for Red Hat JBoss BPM Suite



# Red Hat JBoss BPM Suite 6.4 Administration and Configuration Guide

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The Administration and Configuration Guide for Red Hat JBoss BPM Suite

Red Customer Content Services  
brms-docs@redhat.com

Emily Murphy

Gemma Sheldon

Michele Haglund

Mikhail Ramendik

Stetson Robinson

Vidya Iyengar

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## Abstract

A guide for administrators and advanced users dealing with Red Hat JBoss BPM Suite setup, configuration, and advanced usage.

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## PART I. INTRODUCTION

# CHAPTER 1. BUSINESS PROCESS MODEL AND NOTATION

Business Process Model and Notation (BPMN) is a standard notation for business process modeling. It aspires to link the gap between business analysts and programmers by providing a workflow language that can be clearly understood by both.

## 1.1. COMPONENTS

Red Hat JBoss BPM Suite integrates multiple components to support business processes throughout their entire life cycle and to provide process management features and tools for business analysts, developers, and business users. The product can be deployed on various JEE-compliant servers; the recommended option is Red Hat JBoss Enterprise Application Platform 6.

Red Hat JBoss BPM Suite consists of the following main components:

- *Execution Engine*: Provides the runtime environment for Processes and Business Rules. It encompasses a workflow library that can be embedded into a user web application. Runtime manager is the root object and contains the following components:
  - *Runtime Engine*: Implements the core behavior of the computer language and it is provided by the runtime manager.
    - *Process Engine*: The environment for business process model execution.
    - *Task Service*: Handles human task lifecycles.
  - *Rule Engine*: Can be used with the process engine or on its own.
    - *Rules Evaluation*: Executes business rules on the provided set of facts.
    - *Complex Event Processing*: Applies business rules on incoming stream of events.
- *Business Central*: A web-based application that accommodates tooling for asset creation, management, and monitoring by providing an integrated web environment.
  - *Asset Repository*: The central sharing location (Knowledge Store) for business assets, processes, rules, forms, etc. Users access this repository through the Project Explorer view of Business Central via **Authoring** → **Project Authoring**. By default, the product initializes a local GIT repository as its Asset Repository. However, other repositories may be added or removed as necessary.
  - *Artifact Repository*: A Maven based repository for storage of project jar artifacts.
  - *Execution Server*: Provides an execution environment for business process instances and tasks.
  - *Business Activity Monitor*: Provides customizable view on business performance.



### NOTE

Red Hat JBoss BRMS comes with its own Business Central application that is a subset of the Business Central application in Red Hat JBoss BPM Suite.

## 1.2. PROJECT

A project is a container for asset packages (business processes, rules, work definitions, decision tables,

fact models, data models, and DSLs) that lives in the Knowledge Repository. It is this container that defines the properties of the KIE Base and KIE Session that are applied to its content. In the GUI, you can edit these entities in the Project Editor.

As a project is a Maven project, it contains the Project Object Model file (**pom.xml**) with information on how to build the output artifact. It also contains the Module Descriptor file, **kmodule.xml**, that contains the KIE Base and KIE Session configuration for the assets in the project.

## 1.3. CREATING PROJECT

It is possible to create a project either in the *Project Authoring* perspective of Business Central or using the REST API calls.

### Creating Project in Business Central



#### IMPORTANT

Note that only users with the **admin** role in Business Central can create projects.

#### Procedure: Using Business Central to Create Project

1. In Business Central, go to **Authoring** → **Project Authoring**.
2. In the **Project Explorer**, select the organizational unit and the repository in which you want to create the project.
3. On the perspective menu, click **New Item** → **Project**.  
The **New Project** dialog window opens.

## New Project

 New Project  
Wizard

## Project General Settings

Project Name

MortgageProject

Project Description

*Insert a project description for documentation purposes ...*

## Group artifact version

Group ID ⓘ

org.mycompany.common

Example: com.myorganization.myprojects

Artifact ID ⓘ

myframework

Example: MyProject

Version ⓘ

2.1.1

Example: 1.0.0

&lt; Previous

Next &gt;

Cancel

✓ Finish

4. Define the *Project General Settings* and *Group artifact version* details of the new project. These parameters are stored in the **pom.xml** Maven configuration file.

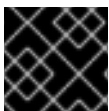
See the detailed description of the parameters:

- **Project Name:** name of the project (for example **MortgageProject**).
- **Project Description:** description of the project, which may be useful for the project documentation purposes.
- **Group ID:** group ID of the project (for example **org.mycompany.common**).
- **Artifact ID:** artifact ID unique in the group (for example **myframework**). Avoid using a space or any other special character that might lead to an invalid name.
- **Version:** version of the project (for example **2.1.1**).

5. Click **Finish**.

The project screen view is updated with the new project details as defined in the **pom.xml** file. You can switch between project descriptor files and edit their content by clicking the **Project Settings: Project General Settings** button at the top of the project screen view.

## Creating Project Using REST API



## IMPORTANT

Note that only users with the **rest-all** or **rest-project** role can create projects.

To create a project in the repository, issue the **POST** REST API call. Details of the project are defined by the corresponding JSON entity.

Input parameter of the call is an **Entity** instance. The call returns a **CreateProjectRequest** instance.

### Example 1.1. Creating Project Using Curl Utility

Example JSON entity containing details of a project to be created:

```
{
  "name"      : "MortgageProject",
  "description": null,
  "groupId"   : "org.mycompany.common",
  "version"   : "2.1.1"
}
```

Execute the following command:

```
curl -X POST 'localhost:8080/business-
central/rest/repositories/REPOSITORY_NAME/projects/' -u
USERNAME:PASSWORD -H 'Accept: application/json' -H 'Content-Type:
application/json' -d
'{"name":"MortgageProject","description":null,"groupId":"org.mycompany.c
ommons","version":"2.1.1"}'
```

For further information, refer to chapter *Knowledge Store REST API*, section *Repository Calls* of the *Red Hat JBoss BPM Suite Development Guide*.

## 1.4. ADDING DEPENDENCIES

To add dependencies to your project, do the following:

1. Open the Project Editor for the given project:
  - a. In the **Project Explorer** view of the **Project Authoring** perspective, open the project directory.
  - b. Click **Open Project Editor** to open the project view.
2. In the **Project Screen** view, select in the **Project Settings** drop-down box the **Dependencies** item.
3. On the updated **Project Screen**, click the **Add** button to add a maven dependency or click the **Add from repository** button to add a dependency from the Knowledge Store (Artifact repository):
  - a. When adding a maven dependency, a user has to define the **Group ID**, **Artifact ID** and the **Version ID** in the **Dependency** dialogue window.
  - b. When adding a dependency from the Knowledge Store, select the dependency in the displayed dialog box: the dependency will be added to the dependency table.
4. To apply the various changes, the dependencies must be saved.

Additionally, you can use the **Package white list** when working with dependencies. When you add a repository, you can click the gear icon and select **Add all** or **Add none**, which results in including all or none of the packages from the added dependency.

**WARNING**

If working with modified artifacts, do not re-upload modified non-snapshot artifacts as Maven will not know these artifacts have been updated, and it will not work if it is deployed in this manner.

## 1.5. CREATING PACKAGE

To be able to import resources and reference them, create your resources, including processes, in a package of a particular project. To create a package:

1. In Project Explorer, locate the project in which you want to create a package and open the **Repository View**. Navigate to the **src/main/resources/** directory.
2. Click **New Item** → **Package**.
3. In the **Create New Package** dialog window, enter a name of the package. The location of the package in the repository is already correctly set in the text box below.

To add resources into the newly created package, make sure to select the package when creating the resource.

For more information about creating processes, see [Chapter 9, Process Creation, Import, and Export](#).



## PART II. CONFIGURATION

## CHAPTER 2. BUSINESS CENTRAL CONFIGURATION

All Business Central configuration settings are loaded from the **`EAP_HOME/standalone/deployments/business-central.war/WEB-INF/web.xml`** file. If you deploy Business Central on Red Hat JBoss EAP server, files **`jboss-web.xml`** and **`jboss-deployment-structure.xml`** contain configuration settings as well.



### NOTE

Business Central can be run on different platforms. For more information, see Red Hat JBoss BPM Suite [Installation and Configuration Guide](#).

### 2.1. ACCESS CONTROL

The access control mechanism includes authorization and authentication. To grant a specific user access to Red Hat JBoss BPM Suite, the user needs to have the respective roles assigned:

- **admin:** Administrates Red Hat JBoss BPM Suite system and has full access rights to make any changes necessary, including the ability to add and remove users from the system.
- **analyst:** Creates and designs processes and forms, instantiates the processes, and deploys artifacts. This role is very similar to the **developer** role, with the exception that analysts do not have access to the asset repository and deployments.
- **developer:** Implements code required by processes. Users with this role cannot access administration tasks.
- **user:** Claims, performs, and invokes other actions, such as escalation and rejection, on the assigned tasks. The user role grants no access to authoring functions.
- **manager:** Monitors the system and its statistics. Users with this role can access only dashboards.

Creating users is described in section [Creating Users](#) of the *Red Hat JBoss BPM Suite Installation and Configuration Guide*.

Roles assigned to a user can be updated in the **`EAP_HOME/standalone/configuration/application-roles.properties`** file.

#### Workbench Configuration

Within Red Hat JBoss BPM Suite, users may set up roles using LDAP to modify existing roles. Users may modify the roles in the workbench configuration to ensure the unique LDAP based roles conform to enterprise standards by editing the deployments directory located at **`JBoss_HOME/standalone/deployments/business-central.war/WEB-INF/classes/workbench-policy.properties`**.

If authenticating user via LDAP over Git, administrators must set system property **`org.uberfire.domain`** to the name of login module it should use to authenticate users via the Git service. This must be set in the **`standalone.xml`** file in EAP.



## NOTE

You can further customize Business Central with parameters `no_build` or `no_search`. The parameters disable the build and search functionality. Include one or both parameters in the Business Central URL, for example **`http://SERVER:PORT/business-central/kie-wb.jsp?no_build&no_search`**.

## Authentication in Human Tasks

Every Task that needs to be executed is assigned to one or multiple roles or groups, so that any user with the given role or the given group assigned can claim the Task instance and execute it. Tasks can also be assigned to one or multiple users directly. JBoss BPM Suite uses the **`UserGroupCallback`** interface to assign tasks to user.



## WARNING

A group for a Human Task must not be named after an existing user of the system. Doing so causes intermittent issues.

## LDAP Configuration

You can configure LDAP domain during the installation of Red Hat JBoss BPM Suite. See the *Red Hat JBoss BPM Suite Installation Guide* for further information. When already installed, Business Central uses JBoss Security Domains defined in **`EAP_HOME/standalone/configuration/standalone/configuration/standalone.xml`** by default. The security domain is referenced in **`business-central.war/WEB-INF/jboss-web.xml`**.

To configure LDAP on your existing Red Hat JBoss BPM Suite installation:

1. Define an LDAP security domain.
  - a. In **`standalone.xml`**, locate **`<security-domains>`**.
  - b. Add your login module:

```
<!-- Including an LDAP based security domain to enable LDAP based
authentication and authorization for users of Business Central
console -->
```

**1**

```
<security-domain name="ldap" cache-type="default">
  <authentication>
```

**2**

```
    <login-module
      code="org.jboss.security.auth.spi.LdapExtLoginModule"
      flag="required">
      <module-option name="java.naming.provider.url"
        value="ldap://10.10.10.10:389"/>
      <module-option name="java.naming.factory.initial"
        value="com.sun.jndi.ldap.LdapCtxFactory"/>
      <module-option name="java.naming.security.authentication"
        value="simple"/>
      <module-option name="bindDN" value="uid=admin,ou=system"/>
```

```

        <module-option name="bindCredential" value="secret"/>
        <module-option name="baseCtxDN"
value="ou=People,dc=jboss,dc=org"/>
        <module-option name="baseFilter" value="(uid={0})"/>
        <module-option name="rolesCtxDN"
value="ou=Groups,dc=jboss,dc=org"/>
        <module-option name="roleFilter" value="(member={0})"/>
        <module-option name="roleAttributeID" value="cn"/>
        <module-option name="roleNameAttributeID" value="cn"/>
        <module-option name="roleRecursion" value="2"/>
        <module-option name="roleAttributeIsDN" value="false"/>
        <module-option name="parseRoleNameFromDN" value="false"/>
        <module-option name="java.naming.referral" value="follow"/>
        <module-option name="searchScope" value="SUBTREE_SCOPE"/>
    </login-module>
</authentication>
</security-domain>
...

```

**1** Name of your security domain referenced in **jboss-web.xml**.

**2** A required attribute for external LDAP authentication.

For more information about the LDAP login module, see [Ldap Login Module](#) from the *Red Hat JBoss EAP Login Module Reference*.

- c. Locate **<hornetq-server>** and add the following lines:

```

<security-domain>ldap</security-domain>
<security-enabled>true</security-enabled>

```

- d. Refer to your LDAP security domain in **jboss-web.xml**:

```

<jboss-web>
    <security-domain>ldap</security-domain>
</jboss-web>

```

2. If you require LDAP integration in task services, provide the task service configuration.

- a. Open **EAP\_HOME/standalone/deployments/business-central.war/WEB-INF/beans.xml**.

- b. Change

```

<class>org.jbpm.services.cdi.producer.JAASUserGroupInfoProducer</class>

```

to

```

<class>org.jbpm.services.cdi.producer.LDAPUserGroupInfoProducer</class>.

```

- c. Create a **jbpm.usergroup.callback.properties** file in **EAP\_HOME/standalone/deployments/business-central.war/WEB-INF/classes/jbpm.usergroup.callback.properties** and provide your usergroup callback properties, for example:

```

java.naming.provider.url=ldap://localhost:10389

```

```

ldap.bind.user=uid\=admin,ou\=system
ldap.bind.pwd=secret
ldap.user.ctx=ou\=People,dc\=jboss,dc\=org
ldap.role.ctx=ou\=Groups,dc\=jboss,dc\=org
ldap.user.roles.ctx=ou\=Groups,dc\=jboss,dc\=org
ldap.user.filter=(uid\={0})
ldap.role.filter=(cn\={0})
ldap.user.roles.filter=(member\={0})
ldap.search.scope=SUBTREE_SCOPE

```

- d. Create a **jbpm.user.info.properties** file in **EAP\_HOME/standalone/deployments/business-central.war/WEB-INF/classes/jbpm.user.info.properties** and provide your user info properties, for example:

```

java.naming.provider.url=ldap://localhost:10389
ldap.bind.user=uid\=admin,ou\=system
ldap.bind.pwd=secret
ldap.user.ctx=ou\=People,dc\=jboss,dc\=org
ldap.role.ctx=ou\=Groups,dc\=jboss,dc\=org
ldap.user.filter=(uid\={0})
ldap.role.filter=(cn\={0})
ldap.search.scope=SUBTREE_SCOPE

```

3. Ensure correct roles assigned to the users in your LDAP server, for example **admin**, **analyst**, and others.

You can define your own roles in **EAP\_HOME/standalone/deployments/business-central.war/WEB-INF/classes/workbench-policy.properties**.

## 2.2. BUSINESS CENTRAL PROFILE CONFIGURATION

Red Hat JBoss BPM Suite 6 (or better) server is capable of starting the Business Central application in three different modes:

- *Full profile*: Default profile that is active without additional configuration required (UI and remote services e.g. REST).
- *Execution server profile*: Disables completely UI components of the application and allows only remote access e.g. via REST interface.
- *UI server profile*: Disables remote services e.g. REST and allows only UI access to the application.

To change the profile use the following configuration steps.

### Procedure: Configuring Business Central Profiles

1. Select the desired **web.xml** inside **BPMS\_HOME/standalone/deployments/business-central.war/WEB-INF/**. The following files are provided:
  - **web.xml** (default) for full profile
  - **web-exec-server.xml** for execution server profile

- **web-ui-server.xml** for UI server profile
2. To activate a profile other than the default full profile, the **web-<PROFILE>.xml** file must be renamed to **web.xml**. The following steps demonstrate one way to enable the execution server profile:
    - a. Backup the **web.xml** file from the full profile

```
$ mv web.xml web-full.xml
```
    - b. Rename the **web-exec-server.xml** file:

```
$ mv web-exec-server.xml web.xml
```
  3. Start application server with additional system property to instruct the profile manager to activate given profile.
    - **Dorg.kie.active.profile=full** - To activate full profile or skip the property completely
    - **Dorg.kie.active.profile=exec-server** - To activate execution server profile
    - **Dorg.kie.active.profile=ui-server** - To activate UI server profile

## 2.3. BRANDING BUSINESS CENTRAL APPLICATION

The Business Central web application can be customized by overriding some of its default styles. The personalized Business Central branding allows you to get a consistent appearance across all your applications, while it is also possible to create a different user interfaces for each team within your company. The customizable elements are built by using HTML files and images, which enables an easy and flexible customization of the application without having to recompile the code.

The following Business Central application elements can be customized:

- In the login screen, the foreground corner images, company logo, and project logo can be changed.
- The upper application banner displayed after logging in can be personalized.
- In help pop-up windows, the label text and splash help images can be customized.

### 2.3.1. Customizing Business Central Login Page

#### Procedure: Changing Foreground Corner Images

1. Start the EAP server and open Business Central in a web browser.
2. To change the upper right corner foreground image, copy the substitute PNG file named **bg-login.png** to the **EAP\_HOME/standalone/deployments/business-central.war/img/** directory in your Red Hat JBoss BPM Suite installation.
3. To change the lower right corner foreground image, copy the substitute PNG file named **bg-login-2.png** to the **EAP\_HOME/standalone/deployments/business-central.war/img/** directory in your Red Hat JBoss BPM Suite installation.

4. Force a full reload of the login page, bypassing the cache, to view the changes. For example, in most Linux and Windows web browsers, press **Ctrl+F5**.

### Procedure: Changing Company Logo and Project Logo

1. Start the EAP server and open Business Central in a web browser.
2. Navigate to the **`EAP_HOME/standalone/deployments/business-central.war/img/`** directory in your Red Hat JBoss BPM Suite installation.
3. To change the company logo that appears at the upper right hand corner of the login page, replace the default image **`login-screen-logo.png`** with a new image in the PNG format.
4. To change the project logo that appears above the login text fields, replace the default image **`RH_JBoss_BPMS_Logo.svg`** with a new SVG file.
5. Force a full reload of the login page, bypassing the cache, to view the changes.

### 2.3.2. Customizing Business Central Application Header

1. Start the EAP server, open Business Central in a web browser, and log in with your user credentials.
2. Copy your new application header image in the SVG format to the **`EAP_HOME/standalone/deployments/business-central.war/banner/`** directory in your Red Hat JBoss BPM Suite installation.
3. Open **`EAP_HOME/standalone/deployments/business-central.war/banner/banner.html`** file in a text editor.
4. In the **`banner.html`** file, edit the following **`<img>`** tag to provide the name of your new header image:

```

```

5. Force a full reload of the page, bypassing the cache, to view the changes.

### 2.3.3. Customizing Business Central Splash Help Windows

Each splash page and its corresponding HTML file are located in the **`EAP_HOME/standalone/deployments/business-central.war/plugins/`** directory. The files contain information about the images and the text to be displayed. For example, the **`authoring_perspective.splash.js`** splash page points to the **`authoring_perspective.splash.html`** file, which contains the names, captions, and location of all the image files that appear in the splash help pop-up windows of the Business Central Authoring perspective.

### Procedure: Changing Splash Help Images and Captions

1. Start the EAP server, open Business Central in a web browser, and log in with your user credentials.
2. Copy the new splash help images to the **`EAP_HOME/standalone/deployments/business-central.war/images/`** directory in your Red Hat JBoss BPM Suite installation.

3. Open the corresponding HTML file from the **plugins** directory in a text editor.
4. Edit the HTML file to point to your new splash help image. For example, to change the first image that appears in the Authoring perspective splash help, edit the following **<img>** tag in the **authoring\_perspective.splash.html** file to add your new image:

```

```

5. To change the image caption that appears on the splash help, edit the **<h4>** and **<p>** tag contents in the **<div>** tag below the corresponding **<img>** tag:

```
<div class="carousel-caption">
  <h4>Authoring</h4>

  <p>Modularized and customizable workbench</p>
</div>
```

6. Force a full reload, bypassing the cache, and access the splash help pop-up windows to view the changes.

## 2.4. DEPLOYMENT DESCRIPTORS

Processes and rules within Red Hat JBoss BPM Suite 6 onwards are stored in Apache Maven based packaging, and are known as knowledge archives or KJAR. The rules, processes, assets, etc. 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 knowledge bases and sessions. This **kmodule.xml** file, by default, is empty.

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

*Deployment Descriptors*, a new feature introduced in the 6.1 branch of Red Hat JBoss BPM Suite, allows you fine grained control over your deployment and supplements the **kmodule.xml** file. The presence of these descriptors is optional and your deployment will proceed successfully without them. The properties that you can set using these descriptors are purely technical in nature and include meta values like persistence, auditing and runtime strategy.

These descriptors allow you to configure the execution server on multiple levels (server level default, different deployment descriptor per KJAR and so on). This allows you to make simple customizations to the execution server's out-of-the-box configuration (possibly per KJAR).

You 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 filename) by specifying it as a system parameter:

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

### 2.4.1. 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 allows 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).

### Can You Override this Hierarchal Merge Mode Behavior?

Yes. In the default way, if there are deployment descriptors present at multiple levels, the configuration properties are merged with the granular ones overriding the coarse values, and with missing configuration items at the granular level being supplied with those values from the higher levels. The end result is a merged Deployment Descriptor configuration. This default merge mode is called the **MERGE\_COLLECTIONS** mode. However, you can change it (see [Section 2.4.2, “Managing Deployment Descriptors”](#)) if it does not suit your environment to one of the following modes:

- **KEEP\_ALL**: In this mode, all higher level values override all lower level values (server level values replace KJAR level values)
- **OVERRIDE\_ALL**: In this mode, all lower level values override all higher level values (KJAR values replace server level values)
- **OVERRIDE\_EMPTY**: In this mode, all *non empty* configuration items from lower levels replace those at higher levels, including items that are represented as collections.
- **MERGE\_COLLECTIONS (DEFAULT)**: In this mode, all non empty configuration items from lower level replace those from higher levels (like in **OVERRIDE\_EMPTY**), but collection properties are merged (combined).

Deployment Descriptors from dependent KJARs are placed lower than the actual KJAR being deployed, but they still have higher hierarchy than the server level.

### Do I Need to Provide a Full Deployment Descriptor for All Kjars?

*No*, and this is where the beauty of the merge between different files can help you. Providing partial Deployment Descriptors is possible and recommended. For example, if you want to only override the audit mode in a KJAR, then you just need to provide that and the rest of the values will be merged from server level or higher level KJARs.

It is worth noting that when using **OVERRIDE\_ALL** merge mode, all configuration items should be specified since the relevant KJAR will always use them and will not merge with any other deployment descriptor in the hierarchy.

### 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 2.1. Deployment Descriptors**

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

| Configuration   | XML Entry      | Permissible Values            | Default Value    |
|---|----------------|-------------------------------|------------------|
| Additional configuration options of Knowledge Session | configurations | Valid <b>NamedObjectModel</b> | No default value |

### How Do You Provide Values For Collections-Based Configuration Items?

In the table of valid configuration items earlier, you would have noticed that the valid values for the collection based items are either **ObjectModel** or **NamedObjectModel**. Both are similar and provide a definition of the object to be built or created at runtime, with the exception that the **NamedObjectModel** object details name the object to be looked. Both these types are defined using an identifier, optional parameters and resolver (to resolve the object).

#### Identifier

Defines all the information about the object, such as fully qualified class name, Spring bean id or an MVEL expression.

#### Parameters

Optional parameters that should be used while creating instances of objects from this model.

#### Resolver

Identifier of the resolver that will be used to create object instances from the model, that is reflection, mvel, or Spring.

As an example, if you have built a custom marshaling strategy and want your deployments to use that strategy instead of the default, you will need to provide that strategy as an **ObjectModel**, with the identifier being **com.mycompany.MyStrategy**, resolver being reflection (the easiest and the default) and any parameters that are required for your strategy to work. Reflection will then be used to create an instance of this strategy using the fully qualified class name that you have provided as the identifier.

```
<marshalling-strategy>
  <resolver>reflection</resolver>
  <identifier>com.myCompany.MyStrategy</identifier>
  <parameters>
    <parameter xsi:type="xs:string"
xmlns:xs="http://www.w3.org/2001/XMLSchema">
      param
    </parameter>
  </parameters>
</marshalling-strategy>
```

In the case that reflection based on resolver is not enough (as demonstrated in the previous example), you can use a resolver based on MVEL expression as the identifier of the object model. While evaluating expressions, you can substitute out-of-the-box parameters. For example:

```
<marshalling-strategy>
  <resolver>mvel</resolver>
  <identifier>new com.myCompany.CustomStrategy(runtimeManager)
</identifier>
</marshalling-strategy>
```

The Spring based resolver allows you to look up a bean by its identifier from a Spring application context. Whenever JBoss BPM Suite is used with Spring, this resolver helps in deploying KJARs into the runtime. As an example (note that the identifier in this case is a named bean in the Spring context):

```
<marshalling-strategy>
  <resolver>spring</resolver>
  <identifier>customStrategy</identifier>
</marshalling-strategy>
```

## 2.4.2. Managing Deployment Descriptors

Deployment Descriptors can be edited via the Business Central in one of two ways. Either graphically (by clicking on **Authoring** → **Project Authoring** → **Deployment Descriptor** or by clicking on **Authoring** → **Administration** menu and then clicking through to the **META-INF** folder in the File Explorer. Click on the **kie-deployment-descriptor.xml** file to edit it manually.

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

### Overriding Hierarchical Merge Mode Behavior

To change the default mode of **MERGE\_COLLECTIONS** to one of **KEEP\_ALL**, **OVERRIDE\_ALL**, or **OVERRIDE\_EMPTY**, you can use the following methods, depending on the requirement.

- Set the system property **org.kie.dd.mergemode** to one of these values. This merge mode will become default for all KJARs deployed in the system, unless you override it at a KJAR level via the next method.
- When deploying a new deployment unit via Business Central (**Deploy** → **Deployments**) you can select what merge mode should be used for that particular KJAR.
- When deploying via the REST API, you can add **mergemode** query parameter to the command URL to one of these modes to set the merge mode for that deployment.

### Restricting Access to the Runtime Engine

One of the configuration items discussed earlier, **required-roles**, can be edited via 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 runtime.

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

## 2.5. MANAGING DEPLOYMENT OVERRIDE POLICY

If a user tries to deploy an artifact with a GAV (Group-Id, Artifact-Id and Version) that already exists in the system, the deployment will fail and an error message will be displayed in the **Messages** panel.

This feature prevents the user from overwriting an existing deployment by mistake.

By default this feature is enabled, that is, by default the system will prevent the user from overwriting an existing installation with the same GAV.

However, there may be cases when the user *may* want to overwrite existing deployments with the same GAV. Although you cannot enable overwriting on a per-deployment basis, you can set this up for the system as a whole by using the system setting **org.kie.override.deploy.enabled**. This setting, is **false** by default. Change it to **true** to enable overwriting of deployments with the same GAV by providing it at startup time of your server (**-Dorg.kie.override.deploy.enabled=true**).

## 2.6. EXTENDING BUSINESS CENTRAL

Starting with version 6.1 of Red Hat JBoss BPM Suite, Business Central can be configured to add new screens, menus, editors, splashscreens and perspectives by the Administrator. These elements can extend functionality of Business Central and can be accessed through the **Extensions** → **Plugin Management**.

You can now define your own Javascript and HTML based plugins to extend Business Central and add them without having to worry about copying files in the underlying filesystem. Let us add a new screen in the system to show you the basics of this functionality.

### 2.6.1. Plugin Management

You access the **Plugin Management** screen by clicking on **Extensions** → **Plugin Management**. This brings up the *Plugin Explorer* screen that lists all the existing plugins under their respective categories:


- *Perspective Plugin*
- *Screen Plugin*
- *Editor Plugin*
- *Splashscreen Plugin*
- and *Dynamic Menu*

Open any of these, and you will see the existing plugins in each category, including the uneditable system generated ones.

Let us create a new plugin that echoes "Hello World" when users visit the screen for that plugin. In general, the steps to creating a new plugin are:

1. Create a new screen
2. Create a new perspective (and add the new screen to it)
3. Create a new menu (and add the new perspective to it)
4. Apps (optional)

#### Adding a New Screen

Click the  button and select **New Screen**. You will be prompted to enter the name of this new screen. Enter "HelloWorldJS" and press the **OK** button. The Screen plugin editor will open, divided into 4 sections: **Template**, **CSS**, **JavaScript** and **Media**.



## NOTE

All manually created elements go into their respective categories in case you want to edit them later. In this case, to open the Screen plugin editor again if you close it, open the **Screen Plugin** category and scroll past the system generated screens to your manually created plugin and click on it to open the Screen plugin editor again.

Template is where your HTML goes, CSS is for styling, JavaScript is for your functions and Media is for uploading and managing images.

Since we are making a simple Hello World plugin, enter the following code in the Template section: **<div>My Hello World Screen</div>**. This can be any HTML code, and you can use the supplied **Angular** and **Knockout** frameworks. For the purposes of this example, we are not using any of those frameworks, but you can choose to by selecting them from the drop down in the Template section.

Enter your JavaScript code in the JavaScript section. Some common methods and properties are defined for you, including **main**, **on\_close** and **on\_open**. For this demo, select the **on\_open** and enter the following: **function () { alert('Hello World'); }**

Click the **Save** button to finish creating the screen. After you save the screen, refresh business central so that the Screen Plugin is listed in the Screen Component of Perspective plugin.

### Adding New Perspective

Once a screen has been created, you need to create a perspective on which this screen will reside. Perspectives can also be created similar to the way a screen is created by clicking on the New button and then selecting **New Perspective**. You can now provide a name for this perspective, say **HelloWorldPerspective**. This will open the Perspective plugin editor, similar to the Screen plugin editor.

The Perspective Editor is like a drag and drop grid builder for screens and HTML components. Remove any existing grids and then drag a 6×6 grid on the right hand side to the left hand side.

Next, open the **Components** category and drag a Screen Component on the right hand side to the left hand side (in any grid). This will open the **Edit Component** dialog box that allows you to select the screen created in the previous step (**HelloWorldJS**). Click the **OK** button and then click **Save** to save this perspective. To tag your perspective, enter **Home** in the tag name field and click **Tags**. Click **OK** and save the changes.

You can open this perspective again from the Perspective plugins listed on the left hand side.

### Adding New Menu

The final step in creating our plugin is to add a dynamic menu from where the new screen/perspective can be called up. To do so, go to **Extensions** → **Plugin Management** and then click on the *New* button to select *New Dynamic Menu*. Give this dynamic menu a name (**HelloWorldMenu**) and then click the **OK** button. The dynamic menu editor opens up.

Enter the perspective name (**HelloWorldPerspective**) as the **Activity Id** and the name for the drop down menu (**HelloWorldMenuDropDown**). Click **OK** and then **Save**.

This new menu will be added to your workbench the next time you refresh Business Central. Refresh it now to see **HelloWorldMenu** added to your top level menu. Click on it to reveal **HelloWorldMenuDropDown**, which when clicked will open your perspective/screen with the message **Hello World**.

You have created your first Plugin!


### Working with Apps (Optional)

If you create multiple plugins, you can use the Apps directory feature to organize your own components and plugins, instead of having to rely on just the top menu entries.

When you save a new perspective, you can add labels (tags) for them and these labels (tags) are used to associate a perspective with an App directory. You can open the App directories by clicking on **Extensions** → **Apps**.

The Apps directory provides an alternate way to open your perspective. When you created your **HelloWorldPerspective**, you entered the tag **Home**. The Apps directory by default contains a single directory called **Home** with which you associated your perspective. This is where you will find it when you open the Apps directory. You can click on it to run the perspective now.

You can create multiple directories and associate perspectives with those directories depending on functional and vertical business requirements. For example, you could create an HR directory and then associate all HR related perspectives with that directory to better manage Apps.

You can create a new directory by clicking the  button.

### 2.6.2. The JavaScript (JS) API for Extensions

The extensibility of Business Central is achieved by an underlying JavaScript (JS) API which is automatically loaded if it is placed in the **plugins** folder of the Business Central webapp (typically: **INSTALL\_DIR/business-central.war/plugins/**), or it can be loaded via regular JavaScript calls.

This API is divided into multiple sets depending on the functionality it performs.

#### Register Perspective API

Allows for the dynamic creation of perspectives. The example below creates a panel using the **registerPerspective** method:

```
$registerPerspective({
  id: "Home",
  is_default: true,
  panel_type:
"org.uberfire.client.workbench.panels.impl.MultiListWorkbenchPanelPresen
ter",
  view: {
    parts: [
      {
        place: "welcome",
        min_height: 100,
        parameters: {}
      }
    ],
    panels: [
      {
        width: 250,
        min_width: 200,
        position: "west",
        panel_type:
"org.uberfire.client.workbench.panels.impl.MultiListWorkbenchPanelPresen
ter",
        parts: [
          {
```

```

        place: "YouTubeVideos",
        parameters: {}
    }
},
{
    position: "east",
    panel_type:
"org.uberfire.client.workbench.panels.impl.MultiListWorkbenchPanelPresen
ter",
    parts: [
        {
            place: "TodoListScreen",
            parameters: {}
        }
    ],
},
{
    height: 400,
    position: "south",
    panel_type:
"org.uberfire.client.workbench.panels.impl.MultiTabWorkbenchPanelPresent
er",
    parts: [
        {
            place: "YouTubeScreen",
            parameters: {}
        }
    ]
}
]
}
});

```

## Editor API

Allows you to dynamically create editors and associate them with a file type. The example below creates a sample editor and associates it with **filename** file type.

```

$registerEditor({
    "id": "sample editor",
    "type": "editor",
    "templateUrl": "editor.html",
    "resourceType":
"org.uberfire.client.workbench.type.AnyResourceType",
    "on_concurrent_update":function(){
        alert('on_concurrent_update callback')
    }

    $vfs_readAllString(document.getElementById('filename').innerHTML,
    function(a) {
        document.getElementById('editor').value= a;
    });
},
"on_startup": function (uri) {
    $vfs_readAllString(uri, function(a) {
        alert('sample on_startup callback')
    })
}
});

```



```

        });
    },
    "on_open":function(uri){
        $vfs_readAllString(uri, function(a) {
            document.getElementById('editor').value=a;
        });
        document.getElementById('filename').innerHTML = uri;
    }
});
});

```

In addition to **on\_startup** and **on\_open** methods seen in the previous example, the API exposes the following callback events for managing the editor's lifecycle:

- **on\_concurrent\_update;**
- **on\_concurrent\_delete;**
- **on\_concurrent\_rename;**
- **on\_concurrent\_copy;**
- **on\_rename;**
- **on\_delete;**
- **on\_copy;**
- **on\_update;**
- **on\_open;**
- **on\_close;**
- **on\_focus;**
- **on\_lost\_focus;**
- **on\_may\_close;**
- **on\_startup;**
- **on\_shutdown;**

You can display this editor via an HTML template:

```

<div id="sampleEditor">
    <p>Sample JS editor (generated by editor-sample.js)</p>
    <textarea id="editor"></textarea>

    <p>Current file:</p><span id="filename"></span>
    <button id="save" type="button"
onclick="$vfs_write(document.getElementById('filename').innerHTML,
document.getElementById('editor').value, function(a)
{});">Save</button>
    <br>

```

```

    <p>This button change the file content, and uberfire send a callback
    to the editor:</p>
    <button id="reset" type="button"
    onclick="$vfs_write(document.getElementById('filename').innerHTML,
    'Something else', function(a) {});">Reset File</button>
  </div>

```

## PlaceManager API

The methods of this API allow you to request that the Business Central display a particular component associated with a target: **\$goToPlace("componentIdentifier")**;

## Register plugin API

The methods of this API allow you to create dynamic plugins (that will be transformed in Business Central screens) via the JS API.

```

$registerPlugin( {
  id: "my_angular_js",
  type: "angularjs",
  templateUrl: "angular.sample.html",
  title: function () {
    return "angular " + Math.floor(Math.random() * 10);
  },
  on_close: function () {
    alert("this is a pure JS alert!");
  }
});

```

The plugin references the **angular.sample.html** template:

```

<div ng-controller="TodoCtrl">
  <span>{{remaining()}} of {{todos.length}} remaining</span>
  [ <a href="" ng-click="archive()">archive</a> ]
  <ul class="unstyled">
    <li ng-repeat="todo in todos">
      <input type="checkbox" ng-model="todo.done">
      <span class="done-{{todo.done}}">{{todo.text}}</span>
    </li>
  </ul>
  <form ng-submit="addTodo()">
    <input type="text" ng-model="todoText" size="30"
    placeholder="add new todo here">
    <input class="btn-primary" type="submit" value="add">
  </form>
  <form ng-submit="goto()">
    <input type="text" ng-model="placeText" size="30"
    placeholder="place to go">
    <input class="btn-primary" type="submit" value="goTo">
  </form>
</div>

```

A plugin can be hooked to Business Central events via a series of JavaScript callbacks:

- **on\_concurrent\_update**;
- **on\_concurrent\_delete**;

- `on_concurrent_rename;`
- `on_concurrent_copy;`
- `on_rename;`
- `on_delete;`
- `on_copy;`
- `on_update;`
- `on_open;`
- `on_close;`
- `on_focus;`
- `on_lost_focus;`
- `on_may_close;`
- `on_startup;`
- `on_shutdown;`

### Register splash screens API

use the methods in this API to create splash screens.

```
$registerSplashScreen({
  id: "home.splash",
  templateUrl: "home.splash.html",
  body_height: 325,
  title: function () {
    return "Cool Home Splash " + Math.floor(Math.random() * 10);
  },
  display_next_time: true,
  interception_points: ["Home"]
});
```

### Virtual File System (VFS) API

with this API, you can read and write a file saved in the file system using an asynchronous call.

```
$vfs_readAllString(uri, function(a) {
  //callback logic
});


$vfs_write(uri,content, function(a) {
  //callback logic
})
```

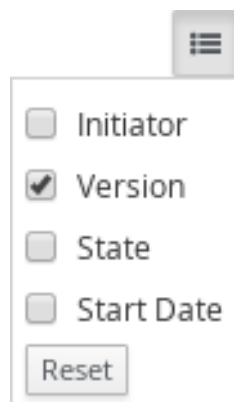
## 2.7. CONFIGURING TABLE COLUMNS

Business Central allows you to configure views that contain lists of items in the form of tables. You can resize columns, move columns, add or remove the default list of columns and sort the columns. This functionality is provided for all views that contain tables.

Once you make changes to the columns of a table view, these changes are persisted for the current logged in user.

## Adding and Removing Columns

Tables that allow columns to be configured have the  button in the top right corner. Clicking on this button opens up the list of columns that can be added or removed to the current table with a check box next to each column:



## Resizing Columns

To resize columns, place your cursor between the edges of the column header and move in the direction that you want:

| Id | Name       |
|----|------------|
| 1  | HelloWorld |

## Moving Columns

To re-order and drag and drop a column in a different position, hover your mouse over the rightmost area of the column header:

| Description | Version |
|-------------|---------|
| HelloWorld  | 1.0     |

You can now grab the column and move it:

| Description |  | Version |  |
|-------------|--|---------|--|
| HelloWorld  |  | 1.0     |  |

Drop it over the column header that you want to move it to.

## Sorting Columns

To sort columns, click on the desired column's header. To reverse-sort, click on the header again.

## CHAPTER 3. INTELLIGENT PROCESS SERVER

The Intelligent Process Server is a standalone, built-in component that can be used to instantiate and execute rules through interfaces available for REST, JMS, or a Java client side application, as well as to manage processes, jobs, and Business Resource Planner functionality through solvers. Created as a web deployable WAR file, this server can be deployed on any web container. The current version of the Intelligent Process Server is included with default extensions for both Red Hat JBoss BRMS and Red Hat JBoss BPM Suite.

This server has a low footprint with minimal memory consumption and therefore can be deployed easily on a cloud instance. Each instance of this server can open and instantiate multiple KIE containers which allows you to execute multiple rule services in parallel.

You can provision the Intelligent Process Server instances through Business Central. In this chapter, the steps required to set up the Intelligent Process Server, provision and connect to the server through Business Central, control what artifacts go in each instance, and go through its lifecycle are provided.



### NOTE

For more information, see the [Intelligent Process Server and Realtime Decision Server](#) chapter of the *Red Hat JBoss BPM Suite Development Guide*.

### 3.1. DEPLOYING INTELLIGENT PROCESS SERVER

The Intelligent Process Server is distributed as a web application archive (WAR) file **kie-server.war**. When you install Red Hat JBoss BPM Suite, the WAR file is installed and deployed in your web container by default.

You can copy the WAR file and deploy it in any other web container, such as Red Hat JBoss Web Server or another Red Hat JBoss EAP install. Note that the WAR file must be compatible with the container.

1. Once you have deployed the WAR file, create a user with the role **kie-server** in the web container.



### NOTE

You can change the **kie-server** user role in the **web.xml** file or in Keycloak.

1. Verify that you can access the decision engine: open **http://SERVER:PORT/kie-server/services/rest/server/** in a web browser and enter the user name and the password specified in the previous step.
2. Once authenticated, an XML response in the form of engine status opens:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<response type="SUCCESS" msg="Kie Server info">
  <kie-server-info>
    <capabilities>BPM</capabilities>
    <capabilities>KieServer</capabilities>
    <capabilities>BRM</capabilities>
    <location>http://localhost:8230/kie-
server/services/rest/server</location>
    <name>KieServer@/kie-server</name>
    <id>15ad5bfa-7532-3eea-940a-abbbbc89f1e8</id>
```

```
<version>6.4.0.Final-redhat-5</version>
</kie-server-info>
</response>
```

## 3.2. INSTALLING INTELLIGENT PROCESS SERVER IN OTHER CONTAINERS

### 3.2.1. Red Hat JBoss Web Server 2. X/3.X, Tomcat 8. X/9.X

Use the following procedure to install the Intelligent Process Server in a Tomcat container.

1. Follow the steps described in section [Generic Deployable Bundle Installation](#) of *Red Hat JBoss BPM Suite Installation Guide* to download and extract the generic deployable archive containing **kie-server.war**.
2. Configure users and roles. Make sure that the **TOMCAT\_HOME/conf/tomcat-users.xml** file contains the following role and user definition. The user name and password should be unique, however, the role must be defined as **kie-server**:

```
<role rolename="kie-server"/>
<user username="serveruser" password="my.s3cr3t.pass" roles="kie-
server"/>
```

3. Start the server: run **TOMCAT\_HOME/bin/startup.sh** or in a Windows system **TOMCAT\_HOME/bin/startup.bat**. To make sure that the application was deployed successfully, see Tomcat logs in the **TOMCAT\_HOME/logs** directory. See [Section 3.3.1, “Bootstrap Switches”](#) for the list of bootstrap switches that can be used to properly configure the instance. For example:

```
$ ./startup.sh -Dorg.kie.server.id=first-kie-server -
Dorg.kie.server.location=http://localhost:8080/kie-
server/services/rest/server
```

4. To verify that the server is running, open **http://SERVER:PORT/kie-server/services/rest/server/** in a web browser and enter the user name and the password specified before. You should see a simple XML message with basic information about the server.



#### IMPORTANT

It is not possible to use the JMS interface if the Intelligent Process Server was installed on Tomcat or any other web container. The web container version of the WAR file contains only the REST interface.

## 3.3. INTELLIGENT PROCESS SERVER SETUP

### 3.3.1. Bootstrap Switches

The Intelligent Process Server accepts a number of bootstrap switches (system properties) to configure the behavior of the server.

**Table 3.1. Bootstrap Switches for Disabling Intelligent Process Server Extensions**

| Property   | Values                        | Default      | Description   |
|--|-------------------------------|--------------|---|
| <code>org.drools.server.ext.disabled</code>      | <b>true</b> ,<br><b>false</b> | <b>false</b> | If set to <b>true</b> , disables the BRM support (for example rules support).     |
| <code>org.jbpm.server.ext.disabled</code>        | <b>true</b> ,<br><b>false</b> | <b>false</b> | If set to <b>true</b> , disables the BPM support (for example processes support). |
| <code>org.optaplanner.server.ext.disabled</code> | <b>true</b> ,<br><b>false</b> | <b>false</b> | If set to <b>true</b> , disables the BRP support (for example planner support).   |
| <code>org.jbpm.ui.server.ext.disabled</code>     | <b>true</b> ,<br><b>false</b> | <b>false</b> | If set to <b>true</b> , disables the Intelligent Process Server UI extension.     |
| <code>org.kie.executor.disabled</code>           | <b>true</b> ,<br><b>false</b> | <b>false</b> | Disables the Red Hat JBoss BPM Suite executor.                                    |

**NOTE**

Some controller properties listed below are marked as required. Set these properties when you handle Intelligent Process Server container creation and removal in Business Central. If you use the Intelligent Process Server separately without any interaction with Business Central, the properties do not have to be set.

**Table 3.2. Bootstrap Switches Required for Using a Controller**

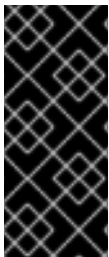
| Property                         | Values | Default                 | Description   |
|----------------------------------|--------|-------------------------|---|
| <code>org.kie.server.id</code>   | String | N/A                     | An arbitrary ID to be assigned to the server. If a remote controller is configured, this is the ID under which the server will connect to the controller to fetch the KIE container configurations. If not provided, the ID is automatically generated. |
| <code>org.kie.server.user</code> | String | <b>kieserve<br/>r</b>   | The user name used to connect with the Intelligent Process Server from the controller, required when running in managed mode. Set this property in Business Central system properties. Setting this property is required when using a controller.       |
| <code>org.kie.server.pwd</code>  | String | <b>kieserve<br/>r1!</b> | The password used to connect with the Intelligent Process Server from the controller, required when running in managed mode. Set this property in Business Central system properties. Setting this property is required when using a controller.        |

| Property                                 | Values               | Default                 | Description   |
|--|----------------------|-------------------------|---|
| <b>org.kie.server.token</b>              | String               | N/A                     | This property enables you to use a token-based authentication between the controller and the Intelligent Process Server instead of the basic user name/password authentication. The controller sends the token as a parameter in the request header. Note that long-lived access tokens are required as the tokens are not refreshed. |
| <b>org.kie.server.location</b>           | URL                  | N/A                     | The URL of the Intelligent Process Server instance used by the 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 controller.                            |
| <b>org.kie.server.controller</b>         | Comma-separated list | N/A                     | A comma-separated list of URLs to the 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 controller.   |
| <b>org.kie.server.controller.user</b>    | String               | <b>kieserve<br/>r</b>   | The user name to connect to the controller REST API. Setting this property is required when using a controller.   |
| <b>org.kie.server.controller.pwd</b>     | String               | <b>kieserve<br/>r1!</b> | The password to connect to the controller REST API. Setting this property is required when using a controller.  |
| <b>org.kie.server.controller.token</b>   | String               | N/A                     | This property enables you to use a token-based authentication between the Intelligent Process Server and the controller instead of the basic user name/password authentication. The server sends the token as a parameter in the request header. Note that long-lived access tokens are required as the tokens are not refreshed.     |
| <b>org.kie.server.controller.connect</b> | Long                 | <b>10000</b>            | The waiting time in milliseconds between repeated attempts to connect the Intelligent Process Server to the controller when the server starts.  |

Table 3.3. Bootstrap Switches for Persistence Properties



| Property                                  | Values | Default | Description   |
|---|--------|---------|---|
| <b>org.kie.server.persistence.ds</b>      | String | N/A     | A data source JNDI name. Set this property when enabling the BPM support.                                     |
| <b>org.kie.server.persistence.tm</b>      | String | N/A     | A transaction manager platform for Hibernate properties set. Set this property when enabling the BPM support. |
| <b>org.kie.server.persistence.dialect</b> | String | N/A     | The Hibernate dialect to be used. Set this property when enabling the BPM support.                            |
| <b>org.kie.server.persistence.schema</b>  | String | N/A     | The database schema to be used.   |



### IMPORTANT

Make sure the new data source for the Intelligent Process Server points to a different database schema than the data source used by Business Central by modifying the **org.kie.server.persistence.ds** property in order to avoid conflicts. This does not apply if you configured unified execution servers as described in [Section 3.3.4, “Unified Execution Servers”](#).

**Table 3.4. Bootstrap Switches for Executor Properties**

| Property                            | Values   | Default        | Description  |
|-------------------------------------|--|----------------|--|
| <b>org.kie.executor.interval</b>    | Integer  | <b>3</b>       | The time between the moment the Red Hat JBoss BPM Suite executor finishes a job and the moment it starts a new one, in a time unit specified in the <b>org.kie.executor.timeunit</b> property. |
| <b>org.kie.executor.timeunit</b>    | <a href="#">java.util.concurrent.TimeUnit</a> constant | <b>SECONDS</b> | The time unit in which the <b>org.kie.executor.interval</b> property is specified.   |
| <b>org.kie.executor.pool.size</b>   | Integer  | <b>1</b>       | The number of threads used by the Red Hat JBoss BPM Suite executor.  |
| <b>org.kie.executor.retry.count</b> | Integer  | <b>3</b>       | The number of retries the Red Hat JBoss BPM Suite executor attempts on a failed job.   |

**Table 3.5. Callback Bootstrap Switches**

| Property                           | Values  | Default     | Description  |
|------------------------------------|---|-------------|--|
| <b>org.jbpm.ht.callback</b>        | <b>mvel</b><br><b>ldap</b><br><b>db</b><br><b>jaas</b><br><b>props</b><br><b>custom</b> | <b>jaas</b> | <p>Specifies the implementation of user group callback to be used:</p> <ul style="list-style-type: none"> <li>• <b>mvel</b>: Default; mostly used for testing.</li> <li>• <b>ldap</b>: LDAP; requires additional configuration in the <a href="#">jbpm.usergroup.callback.properties</a> file.</li> <li>• <b>db</b>: Database; requires additional configuration in the <a href="#">jbpm.usergroup.callback.properties</a> file.</li> <li>• <b>jaas</b>: JAAS; delegates to the container to fetch information about user data.</li> <li>• <b>props</b>: A simple property file; requires additional file that will keep all information (users and groups).</li> <li>• <b>custom</b>: A custom implementation; specify the fully qualified name of the class in the <b>org.jbpm.ht.custom.callback</b> property.</li> </ul> |
| <b>org.jbpm.ht.custom.callback</b> | Fully qualified name  | N/A         | A custom implementation of the <b>UserGroupCallback</b> interface in case the <b>org.jbpm.ht.callback</b> property is set to <b>custom</b> .   |

Table 3.6. Other Bootstrap Switches

| Property                                | Values                        | Default                          | Description   |
|---|-------------------------------|----------------------------------|---|
| <b>kie.maven.settings.custom</b>        | Path                          | N/A                              | The location of a custom <b>settings.xml</b> file for Maven configuration.  |
| <b>kie.server.jms.queues.response</b>   | String                        | <b>queue/KIE.SERVER.RESPONSE</b> | The response queue JNDI name for JMS.   |
| <b>org.drools.server.filter.classes</b> | <b>true</b> ,<br><b>false</b> | <b>false</b>                     | When set to <b>true</b> , the Drools Intelligent Process Server extension accepts custom classes annotated by the <b>XmlRootElement</b> or <b>Remotable</b> annotations only. |

| Property                                     | Values                        | Default      | Description   |
|--|-------------------------------|--------------|---|
| <code>org.kie.server.bypass.auth.user</code> | <b>true</b> ,<br><b>false</b> | <b>false</b> | Allows to bypass the authenticated user for task-related operations, for example queries.   |
| <code>org.kie.server.domain</code>           | String                        | N/A          | The JAAS <b>LoginContext</b> domain used to authenticate users when using JMS.  |
| <code>org.kie.server.repo</code>             | Path                          | .            | The location where Intelligent Process Server state files will be stored.   |
| <code>org.kie.server.sync.deploy</code>      | <b>true</b> ,<br><b>false</b> | <b>false</b> | <p>Instructs the Intelligent Process Server to hold the deployment until the controller provides the containers deployment configuration. This property affects only the servers running in managed mode. The options are as follows:</p> <ul style="list-style-type: none"> <li>• <b>false</b>; the connection to the controller is asynchronous. The application starts, connects to the controller, and once successful, deploys the containers. The application accepts requests even before the containers are available.</li> <li>• <b>true</b>; the deployment of the server application joins the 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 instance. It is strongly recommended to use only one application (the server) on one server instance.</li> </ul> |

### 3.3.2. Managed Intelligent Process Server

A managed instance requires an available controller to start the Intelligent Process Server.

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



#### IMPORTANT

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

When the Intelligent Process Server is configured with a list of 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 consistence and prevents the server from running with redundant configuration.



## NOTE

To run the Intelligent Process Server in standalone mode without connecting to controllers, see [Section 3.3.3, “Unmanaged Intelligent Process Server”](#).

## Configuring Intelligent Process Server Managed by Business Central



## WARNING

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

Configure the Business Central to manage an Intelligent Process Server instance by performing the following steps:

## Configuring Intelligent Process Server Managed by Business Central

1. Make sure users with the following roles exist:
  - In Business Central, a user with the role **rest-all**.
  - On the Intelligent Process Server, a user with the role **kie-server**.



## NOTE

In production environments, use two distinct users, each with one role. In this sample situation, we use only one user named **controllerUser** that has both the **rest-all** and the **kie-server** roles.

If such users do not exist, create them.

- On Red Hat JBoss EAP, go to **EAP\_HOME/bin/** and execute:

```
$ ./add-user.sh -a --user controllerUser --password
controllerUser1234; --role kie-server,rest-all
```

**WARNING**

Plain-text passwords are not secure. For production environments, use a password vault. For more information, see the [Password Vault](#) chapter of the *Red Hat JBoss Enterprise Application Platform 6.4 How To Configure Server Security* guide.

- On Red Hat JBoss Web Server, see [Section 3.2.1, “Red Hat JBoss Web Server 2.X/3.X, Tomcat 8.X/9.X”](#).
  - On IBM WebSphere Application Server, see the [Creating Users and Groups](#) section of the *Red Hat JBoss BPM Suite IBM WebSphere Installation and Configuration Guide*.
  - On Oracle WebLogic Server, see the [Configuring Security Settings](#) section of the *Red Hat JBoss BPM Suite Oracle Weblogic Installation and Configuration Guide*.
2. Set the following JVM properties. The location of Business Central and the Intelligent Process Server may be different. In such case, ensure you set the properties on the correct server instances.
- On Red Hat JBoss EAP, modify the `<system-properties>` section in:
    - `EAP_HOME/standalone/configuration/standalone*.xml` for standalone mode.
    - `EAP_HOME/domain/configuration/domain.xml` for domain mode.
  - On Red Hat JBoss Web Server, see [Section 3.2.1, “Red Hat JBoss Web Server 2.X/3.X, Tomcat 8.X/9.X”](#).
  - On IBM WebSphere Application Server, see section [Adding Custom JVM Properties](#) of the *Red Hat JBoss BPM Suite IBM WebSphere Installation and Configuration Guide*.
  - On Oracle WebLogic Server, see section [Setting Environment Variables](#) of the *Red Hat JBoss BPM Suite Oracle WebLogic Installation and Configuration Guide*.

**Table 3.7. JVM Properties for Intelligent Process Server Instance**

| Property                               | Value   | Note                               |
|--|---|------------------------------------|
| <code>org.kie.server.id</code>         | <code>default-kie-server</code>   | The Intelligent Process Server ID. |
| <code>org.kie.server.controller</code> | <a href="http://localhost:8080/business-central/rest/controller">http://localhost:8080/business-central/rest/controller</a> | The location of Business Central.  |

| Property                                    | Value  | Note   |
|---|--|--|
| <code>org.kie.server.controller.user</code> | <code>controllerUser</code>  | The user name with the role <b>rest-all</b> as mentioned in the previous step. |
| <code>org.kie.server.controller.pwd</code>  | <code>controllerUser1234;</code>                                   | The password of the user mentioned in the previous step.                       |
| <code>org.kie.server.location</code>        | <code>http://localhost:8080/kie-server/services/rest/server</code> | The location of the Intelligent Process Server.                                |

Table 3.8. JVM Properties for Business Central Instance

| Property                         | Value                            | Note   |
|----------------------------------|----------------------------------|--|
| <code>org.kie.server.user</code> | <code>controllerUser</code>      | The user name with the role <b>kie-server</b> as mentioned in the previous step. |
| <code>org.kie.server.pwd</code>  | <code>controllerUser1234;</code> | The password of the user mentioned in the previous step.                         |

- Verify the successful start of the Intelligent Process Server by sending a GET request to `http://SERVER:PORT/kie-server/services/rest/server/`. Once authenticated, you get an XML response similar to this:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<response type="SUCCESS" msg="Kie Server info">
  <kie-server-info>
    <capabilities>BRM</capabilities>
    <capabilities>BPM-UI</capabilities>
    <capabilities>BPM</capabilities>
    <capabilities>BRP</capabilities>
    <capabilities>KieServer</capabilities>
    <location>http://localhost:8080/kie-
server/services/rest/server</location>
    <messages>
      <content>Server KieServerInfo{serverId='local-server-
123', version='6.4.0.Final-redhat-3',
location='http://localhost:8080/kie-
server/services/rest/server'}started successfully at Fri Jun 03
13:48:44 CEST 2016</content>
      <severity>INFO</severity>
      <timestamp>2016-06-03T13:48:44.606+02:00</timestamp>
    </messages>
    <name>local-server-123</name>
    <id>local-server-123</id>
  </kie-server-info>
</response>
```

```

    <version>6.4.0.Final-redhat-3</version>
  </kie-server-info>
</response>

```

4. Verify successful registration by logging into Business Central and selecting **Deploy** → **Execution Servers**. If successful, you can see the registered server ID.

### 3.3.3. Unmanaged Intelligent Process Server

An unmanaged Intelligent Process Server is a standalone instance, and therefore must be configured individually using REST/JMS API from the Intelligent Process Server itself. There is no controller involved. The configuration is automatically persisted by the server into a file and that is used as the internal server state, in case of restarts.

The configuration is updated during the following operations:

- Deploy KIE Container
- Undeploy KIE Container
- Start KIE Container
- Stop KIE Container



#### NOTE

If the Intelligent Process Server is restarted, it will attempt to re-establish the same state that was persisted before shutdown. Therefore, KIE Containers that were running will be started, but the ones that were stopped will not.

### 3.3.4. Unified Execution Servers

Since Red Hat JBoss BPM Suite version 6.4, it is possible to configure both Business Central and the Intelligent Process Server to use the same data source. This enables you to work with your processes using both applications. In such a setup, it is recommended to use Business Central for operations that require a graphical user interface and the Intelligent Process Server for all remote calls.

**WARNING**

The following restrictions apply:

- The Container ID must be the same as the deployment unit ID.
- The **SINGLETON** runtime strategy cannot be used.
- Triggering the execution of a part of a single process instance, between two safe points, on both the execution servers results in a successful execution on the first execution server only. The other execution server will throw an exception and will not modify the process data in the database.

Do not deploy both Business Central and Intelligent Process Server in the same application server in a production environment. Deploying both Business Central and Intelligent Process Server in the same application server is only applicable for development environments. Furthermore, unified execution settings require the exact same configurations (such as database, scheduler, executor, KJAR deployments, and so on) regardless of whether the deployment uses a single application server or not.

When configuring unified execution servers, the Intelligent Process Server must be managed by Business Central according to [Section 3.3.2, “Managed Intelligent Process Server”](#), and the following system properties need to be set:

- On Red Hat JBoss EAP, modify the **<system-properties>** section in:
  - **EAP\_HOME/standalone/configuration/standalone\*.xml** for standalone mode.
  - **EAP\_HOME/domain/configuration/domain.xml** for domain mode.
- On Red Hat JBoss Web Server, see [Section 3.2.1, “Red Hat JBoss Web Server 2.X/3.X, Tomcat 8.X/9.X”](#).
- On IBM WebSphere Application Server, see the [Adding Custom JVM Properties](#) section of the *Red Hat JBoss BPM Suite IBM WebSphere Installation and Configuration Guide*.
- On Oracle WebLogic Server, see the [Setting Environment Variables](#) section of the *Red Hat JBoss BPM Suite Oracle WebLogic Installation and Configuration Guide*.

## 3.4. CREATING CONTAINERS

Once the Intelligent Process Server is registered, you can start adding containers. Containers are self-contained environments that have been provisioned to hold instances of your packaged and deployed rule instances.

To create a container:

1. Log in to Business Central.
2. In the main menu on the top, click **Deploy** → **Execution Servers**.



3. Select your server from the **SERVER TEMPLATES** section on the left side of the page.
4. Click **Add Container** in the **KIE CONTAINERS** section.  
The **New Container** dialog window opens.
5. Enter a name of your container and search for the project you want to deploy in the container.  
Click **Select** next to the project to automatically enter the project's details.  
Alternatively, you can enter **Group Name**, **Artifact Id**, and **Version** manually.

**WARNING**

When entering the container's version number, do *not* use the **LATEST** or **RELEASE** keywords. This feature has been deprecated and can cause deployment issues.

6. Click **Next** to configure the runtime strategy, **KieBase**, **KieSession**, and merge mode for your container. You can skip this step.
7. Click **Finish**.

After the container is successfully created, click **Start** at the upper right hand corner to start it.

**Figure 3.1. Container in Started Mode**

myContainer Group Id:org.jbpm | Artifact Id:CustomersRelationship

Status Version Config Process Config

my\_kie\_server\_id@localhost:8080



 <http://localhost:8080/kie-server/services/rest/server/containers/myContainer> v1.0

To verify that the container is running, send a [GET] request to the endpoint.

### Example 3.1. Server Response

```
<response type="SUCCESS" msg="Info for container myContainer">
  <kie-container container-id="myContainer" status="STARTED">
    <messages>
```

```

    <content>Container myContainer successfully created with module
    org.jbpm:CustomersRelationship:1.0.</content>
    <severity>INFO</severity>
    <timestamp>2016-03-02T11:43:40.806+01:00</timestamp>
  </messages>
  <release-id>
    <artifact-id>CustomersRelationship</artifact-id>
    <group-id>org.jbpm</group-id>
    <version>1.0</version>
  </release-id>
  <resolved-release-id>
    <artifact-id>CustomersRelationship</artifact-id>
    <group-id>org.jbpm</group-id>
    <version>1.0</version>
  </resolved-release-id>
  <scanner status="DISPOSED"/>
</kie-container>
</response>

```

## 3.5. MANAGING CONTAINERS

Containers within the Intelligent Process Server can be started, stopped, and updated from Business Central.

### 3.5.1. Starting, Stopping, and Deleting Containers

A container is stopped by default. To start the container:

1. Log in to Business Central.
2. In the main menu on the top, click **Deploy** → **Execution Servers**.
3. Select your server from the **SERVER TEMPLATES** section on the left side of the page.
4. Find the container you want to start under the **KIE CONTAINERS** section on the left.
5. Click **Start** at the upper right hand corner.  
Alternatively, click **Stop** to stop a running container. Once a container is stopped, you can click **Remove** to remove it.

### 3.5.2. Upgrading Containers

It is possible to update deployed containers without restarting the Intelligent Process Server, which can be used in cases where business rule changes cause new versions of packages to be provisioned. You can have multiple versions of the same package provisioned and deployed.

To upgrade a container:

1. Log in to Business Central.
2. In the main menu on the top, click **Deploy** → **Execution Servers**.
3. Select your server from the **SERVER TEMPLATES** section on the left side of the page.

4. Find the container you want to upgrade under the **KIE CONTAINERS** section on the left.
5. Click on the **Version Configuration** tab at the top.
6. Enter a new version and click **Upgrade**.  
 Optionally, if you want a deployed container to always have the latest version of your deployment without manually editing it, set the **Version** value to **LATEST** and click **Scan Now**. If a newer version of a container deployment is found in the repository during the scanning, the container is automatically upgraded to this newer version. To start the scanner in the background, click **Start Scanner** and specify a scan interval in milliseconds.

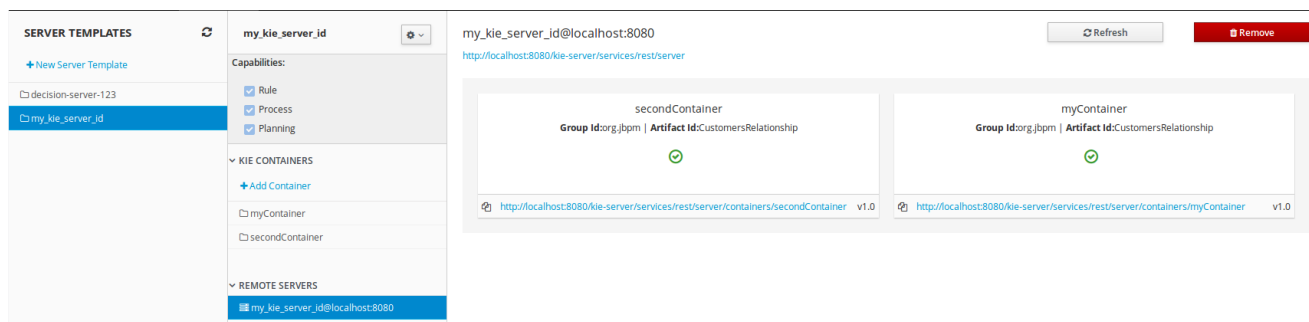
The **Version** value can be set to **LATEST** if you are creating a deployment for the first time.

### 3.5.3. Managing Multiple Containers

The Intelligent Process Server allows you to create and provision multiple containers.

Select your server under the **REMOTE SERVERS** section to view all containers and their statuses.

**Figure 3.2. Managing Multiple Containers**



## CHAPTER 4. REPOSITORY HOOKS

In Business Central, it is possible to trigger a chosen action every time a particular event happens. For this purpose, you can configure the repository to use scripts called hooks.

### 4.1. CONFIGURING GIT HOOKS

Business Central can automatically push changes to a remote repository using the Git hooks. Git hooks support has been introduced with the release of Red Hat JBoss BPM Suite 6.2.0.



#### NOTE

Please note that currently only the **post-commit** hook is supported. **Post-commit** hooks are triggered after finishing the entire commit process.

The following procedure shows how to configure the **post-commit** hook to automatically push your changes to the remote repository.

1. In Business Central, go to **Authoring** → **Administration**.
2. Below the main menu, click **Repositories** → **Clone repository**.
3. In the displayed **Clone repository** dialog box, fill in the repository information:
  - Repository Name
  - Organizational Unit
  - Git URL: For example `https://github.com/USERNAME/REPOSITORY_NAME.git`



#### IMPORTANT

It is important to use the HTTPS or Git protocol instead of a SCP-style SSH URL. Business Central does not support the basic SSH URL and fails with *Invalid URL format*.

**Figure 4.1. An invalid SCP-style SSH URL.**

The screenshot shows a 'Clone Repository' dialog box with a title bar containing a close button (X). Below the title bar is a section titled 'Repository Information'. It contains five input fields: 'Repository Name' with the value 'NewRepository', 'Organizational Unit' with a dropdown menu showing 'example', 'Git URL' with the value 'git@github.com:user/ExampleRepository/repo.git' and a red border and error message 'Invalid URL format' below it, 'User Name' with the value 'user', and 'Password' with masked characters '.....'. At the bottom right are two buttons: 'Cancel' and 'Clone' (with a cloud icon).

- User Name: your Git user name
- Password: your Git password

4. Change to the created repository:

```
cd JBOSS_HOME/bin/.niogit/REPOSITORY_NAME.git
```

5. Change the remote URL:

```
git remote set-url origin
git@github.com:USERNAME/REPOSITORY_NAME.git
```

Make sure that you can access the remote repository through command line using SSH. For example, the private SSH key for the repository should exist under the `~/.ssh/` directory.

If you created a new repository, you may encounter the following error:

```
fatal: No such remote 'origin'
```

To resolve it, add the remote origin URL:

```
git remote add origin git@github.com:USERNAME/REPOSITORY_NAME.git
```

6. Verify that the remote repository was successfully added:

```
git remote -v
```

The command should list the following:

```
origin  git@github.com:USERNAME/REPOSITORY_NAME.git (fetch)
origin  git@github.com:USERNAME/REPOSITORY_NAME.git (push)
```

7. Create a file named **post-commit** with the permissions set to **rw-r--r--** under **JBOSS\_HOME/bin/.niogit/REPOSITORY\_NAME.git/hooks** with the following content:

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

8. Make sure that the configuration was successful by creating a new guided rule in Business Central:
  - a. Go to **Authoring** → **Project Authoring** → **New Item** → **Guided Rule**.
  - b. Fill in the required information in the displayed **Create new Guided Rule** window.
  - c. Click **Ok**.

All of the changes should be pushed automatically.

For further information about remote Git repositories, see [How to configure the BxMS 6 server to use a remote Git repository for storing assets?](#).

It is also possible to specify the system property **org.uberfire.nio.git.hooks**. Its value determines a directory with default hook files, which will be copied to the newly created Git repositories. See the example of a **standalone.xml** file with this setting below:

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

## CHAPTER 5. COMMAND LINE CONFIGURATION

The **kie-config-cli** tool is a command line configuration tool that provides capabilities to manage the system repository from the command line and can be used in an online or offline mode.

### Online mode (default and recommended)

On startup, the tool connects to a Git repository using a Git server provided by **kie-wb**. All changes are made locally and published to upstream only after explicitly executing the `push-changes` command. Use the `exit` command to publish local changes. To discard local changes on exit, use the `discard` command.

### Offline mode (installer style)

Creates and manipulates the system repository directly on the server (there is no discard option).

The tool is available on the [Red Hat Customer Portal](#). To download the **kie-config-cli** tool, do the following:

1. Go to the [Red Hat Customer Portal](#) and log in.
2. Click **DOWNLOADS** at the top of the page.
3. In the **Product Downloads** page that opens, click **Red Hat JBoss BPM Suite**.
  - a. From the **Version** drop-down menu, select **6.4.0**.
  - b. In the displayed table, navigate to the **Supplementary Tools** row and then click **Download**.

Extract the zip package for supplementary tools you downloaded from the [Red Hat Customer Portal](#). It contains the directory **kie-config-cli-6.MINOR\_VERSION-redhat-x-dist** with file **kie-config-cli.sh**.

### 5.1. STARTING THE KIE-CONFIG-CLI TOOL IN ONLINE MODE

1. To start the **kie-config-cli** tool in online mode, navigate to the **kie-config-cli-6.MINOR\_VERSION-redhat-x-dist** directory where you installed the tool and then execute the following command.
2. In a Unix environment run:

```
./kie-config-cli.sh
```

In a Windows environment run:

```
./kie-config-cli.bat
```

By default, the tool starts in online mode and asks for user credentials and a Git URL to connect to (the default value is **git://localhost/system**). To connect to a remote server, replace the host and port with appropriate values.

Example: **git://kie-wb-host:9148/system**

### 5.2. STARTING THE KIE-CONFIG-CLI TOOL IN OFFLINE MODE

To operate in offline mode, append the offline parameter to the command as below.

1. Navigate to the **kie-config-cli-6.MINOR\_VERSION-redhat-x-dist** directory where you installed the tool.
2. In a Unix environment, run:

```
./kie-config-cli.sh offline
```

In a Windows environment, run:

```
./kie-config-cli.bat offline
```

Executing this command changes the tool's behaviour and displays a request to specify the folder where the system repository (**.niogit**) is located. If **.niogit** does not yet exist, the folder value can be left empty and a brand new setup is created.

### 5.3. COMMANDS AVAILABLE FOR THE KIE-CONFIG-CLI TOOL

The following commands are available for managing the Git repository using the **kie-config-cli** tool:

- **add-deployment**: Adds a new deployment unit
- **add-repo-org-unit**: Adds a repository to the organizational unit
- **add-role-org-unit**: Adds role(s) to an organizational unit
- **add-role-project**: Adds role(s) to a project
- **add-role-repo**: Adds role(s) to a repository
- **create-org-unit**: Creates new organizational unit
- **create-repo**: Creates a new git repository
- **discard**: Does not publish local changes, cleans up temporary directories and closes the tool
- **exit**: Publishes work, cleans up temporary directories and closes the tool
- **fetch-changes**: Fetches changes from upstream repository
- **help**: Prints available commands with descriptions
- **list-deployment**: Lists available deployments
- **list-org-units**: Lists available organizational units
- **list-repo**: Lists available repositories
- **push-changes**: Pushes changes to upstream repository (in online mode only)
- **remove-deployment**: Removes existing deployment
- **remove-org-unit**: Removes existing organizational unit
- **remove-repo**: Removes an existing repository from config only



- **remove-repo-org-unit**: Removes a repository from the organizational unit
- **remove-role-org-unit**: Removes role(s) from an organizational unit
- **remove-role-project**: Removes role(s) from a project
- **remove-role-repo**: Removes role(s) from a repository

## CHAPTER 6. MIGRATION

Migrating your projects from Red Hat JBoss BPM Suite 5 to Red Hat JBoss BPM Suite 6 requires careful planning and step by step evaluation of the various issues. You can plan for migration either manually, or by using automatic processes. Most real world migration will require a combination of these two processes.

Because Red Hat JBoss BPM Suite 6 uses Git for storing assets, artifacts and code repositories including processes and rules, you should start by creating an empty project in Red Hat JBoss BPM Suite 6 as the basis for your migration with dummy files as placeholders for the various assets and artifacts. Running a Git clone of this empty project into your favorite IDE will initiate the migration process.

Based on the placeholder files in your cloned project, you can start adding assets at the correct locations. The Red Hat JBoss BPM Suite 6 system is smart enough to pick these changes and apply them correctly. Ensure that when you are importing old rule files that they are imported with the right package name structure.

Since Maven is used for building projects, the projects assets like the rules, processes and models are accessible as a simple JAR file.

This section lists the generally accepted step by step ways to migrate your project. These are just guidelines though, and actual migration may vary a lot from this.

In general, you should:

1. Migrate the data first: These are your business assets.
2. Next, migrate your runtime processes.
3. Finally, convert old API calls to new ones one by one.

Let us look at these steps in more detail in the next few sections:

### 6.1. DATA MIGRATION

To migrate data from Red Hat JBoss BPM Suite 5, do the following:

1. Download the migration tool by logging in at the [Red Hat Customer Portal](#) and then navigating to Red Hat JBoss BPM Suite Software Downloads section. Click on **Red Hat JBoss BPM Suite Migration Tool** to download the zip archive.
2. Unzip the downloaded zip archive in a directory of your choice and navigate to this directory in a command prompt. This directory contains four folders:
  - **bin** - contains the launch scripts.
  - **jcr-exporter-libs** - contains the libs specific to the **export-from-JCR** part of the migration.
  - **vfs-importer-libs** - contains the libs specific to the **import-into-Git** part of the migration.
  - **conf** - contains global migration tool configuration.

3. For production databases, copy the JDBC driver for the database that is used by the JCR repository into the **jcr-exporter-libs** directory of the migration tool.
4. Execute the following command:

```
./bin/runMigration.sh -i <source-path> -o <destination-path> -r
<repository-name>
```

Where:

- **<source-path>** is a path to a source JCR repository.
- **<desintation-path>** is a path to a destination Git VFS. This folder must not exist already.
- **<repository-name>** an arbitrary name for the new repository.

The repository is migrated at the specified destination.

Besides the **-i** command, you can also use **-h** to print out a help message and **-f** which forces an overwrite of the output directory, thus eliminating the need for manual deletion of this directory.

### Importing the Repository in Business Central

The repository can be imported in business central by cloning it. In the Administration perspective, click on the **Repositories** → **Clone Repository** menu to start the process.



#### NOTE

Assets can also be migrated manually as they are all just text files. The BPMN2 specification and the DRL syntax did not change between the different versions.

### Importing the Repository in JBDS

To import the repository in JBoss Developer Studio, do the following

1. Start JBoss Developer Studio.
2. Start the Red Hat JBoss BPM Suite server (if not already running) by selecting the server from the server tab and click the start icon.
3. Select **File** → **Import...** and navigate to the Git folder. Open the Git folder to select **Projects from Git** and click next.
4. Select the repository source as **Existing local repository** and click next.
5. Select the repository that is to be configured from the list of available repositories.
6. Import the project as a general project in the next window and click next. Name this project and click Finish.

## 6.2. RUNTIME MIGRATION

To run Red Hat JBoss BPM Suite 5 processes in Red Hat JBoss BPM Suite 6, do the following:

1. Set the system property **jbpms.v5.id.strategy** to true in the JBoss BPM Suite **standalone.xml** file:

```
<property name="jbpm.v5.id.strategy" value="true"/>
```

2. Add the Maven dependencies. For a list of Maven dependencies, see example *Embedded jBPM Engine Dependencies* in chapter [Dependency Management](#) of the *Red Hat JBoss BPM Suite Development Guide*.
3. Load the KieSession as shown here:

```
import org.kie.api.runtime.KieSession;
import org.kie.internal.persistence.jpa.JPAKnowledgeService;
...

KieSession ksession =
    JPAKnowledgeService.loadStatefulKnowledgeSession(sessionID, kbase,
    sessionConf, env);
```

4. Continue the normal execution of the process using KieSession methods:

```
ksession.signalEvent("SomeEvent", null);
```

## 6.3. API AND BACKWARDS COMPATIBILITY

### Migrating to Version 6.1

In version 6.1, 5.X APIs are no longer officially supported.

Red Hat JBoss BPM Suite no longer provides backward compatibility with the rule, event, and process application programming interface (API) from Red Hat JBoss BRMS 5. The content of the **knowledge-api** JAR file is no longer supported in version 6.1 and is replaced by APIs contained in the **kie-api** JAR file that were introduced in Red Hat JBoss BPM Suite 6.0.

If you used the legacy 5.x API (located in **knowledge-api.jar**), please migrate (rewrite) the API calls to the new KIE API. Please be aware that several other APIs have changed between Red Hat JBoss BRMS 5.x and Red Hat JBoss BPM Suite 6.x, namely the task service API and the REST API.

### Migrating to Version 6.0

The Red Hat JBoss BPM Suite 6 system provides backward compatibility with the rule, event and process interactions from JBoss BRMS 5. You should eventually migrate (rewrite) these interactions to the all new revamped core API because this backward compatibility is likely to be deprecated.

If you cannot migrate your code to use the new API, then you can use the API provided by the purpose built **knowledge-api** JAR for backwards compatible code. This API is the public interface for working with JBoss BPM Suite and JBoss BRMS and is backwards compatible.

If you are instead using the REST API in Red Hat JBoss BPM Suite 5, note that this has changed as well and there is no mechanism in it for backwards compatibility.

## 6.4. MIGRATING TASK SERVICE

Red Hat JBoss BPM Suite 6 provides support for a locally running task server only. This means that you do not need to setup any messaging service in your project. This differs from Red Hat JBoss BPM Suite 5 because it provided a task server that was bridged from the core engine by using, most commonly, the messaging system provided by HornetQ.

To help you bridge the gap until you can migrate this in your current architecture, there is a helper or utility method, **LocalHTWorkItemHandler**.

Since the TaskService API is part of the public API you will now need to refactor your imports because of package changes and refactor your methods due to API changes themselves.

## CHAPTER 7. DATA MANAGEMENT

### 7.1. DATA BACKUPS

When applying a backup mechanism to Red Hat JBoss BPM Suite, ensure you back up the following resources:

- Any customized deployment descriptors (such as, `web.xml`, `jboss-web.xml`, `jboss.xml`).
- Any customized properties files.



#### NOTE

Consider backing up the entire `business-central.war` and `dashbuilder.war` files.

- The `JBOSS-HOME/bin/.niogit` folder. This directory contains Git repositories that Business Central manages internally to store project and configuration data.



#### NOTE

The location of the `.niogit` directory may be different based on your configuration. See [the `org.uberfire.nio.git.dir` system property](#).

### 7.2. SETUP INDEXES

#### Setup Foreign Key Indexes

Some databases, for instance Oracle and PostgreSQL, do not automatically create an index for each foreign key. This can result in deadlocks occurring. To avoid this situation, it is necessary to create an index on all foreign keys, especially in the Oracle database.

#### Setup Indexes for Process and Task Dashboard

Process and Task Dashboard in 6.1 has been refactored in order to cope with high volume of task and process instances. In order to get good response times while querying the database the following JBoss BPM Suite tables need to be indexed: `processinstancetype` and `bamtasksummary`.

Note that *ALL* the columns in these two tables need to be indexed and not just the primary and foreign keys.

### 7.3. SETTING UP AND EDITING THE DATABASE

For information on how to change the database for Red Hat JBoss BPM Suite, see [Persistence Setups](#) of the *Red Hat JBoss BPM Suite Installation Guide*.

### 7.4. DDL SCRIPTS

DDL scripts for database tables for Red Hat JBoss BPM Suite are available for download on the Customer Portal. These scripts allow you to study the tables and use them to create the tables and indexes manually or in databases that are not directly supported.

To download these scripts:

1. Login to the [Customer Portal](#).
2. Click on Red Hat JBoss BPM Suite and select the version of the product for your requirements.
3. Click on **Download** in the row *Red Hat JBoss BPM Suite 6.4.0 Supplementary Tools* to download the supplementary tools.

Unzip the file on your machine. The DDL scripts are located in the **ddl-scripts** directory. Database scripts are provided for DB2, H2, MySQL5, Oracle, PostgreSQL, and SQLServer.

The complete Entity Relationship diagram can be viewed in this [Red Hat Solution](#).

## CHAPTER 8. ASSET REPOSITORY

Business Rules, Process definition files, and other assets and resources created in Business Central are stored in Asset repository, which is otherwise known as the Knowledge Store.

The Knowledge Store is a centralized repository for your business knowledge. The Knowledge Store connects to the Git repository to store various knowledge assets and artifacts at a single location. Business Central provides a web front-end that allows you to view and update the stored content. You can access the content by using the Project Explorer from the unified environment of Red Hat JBoss BPM Suite.

All business assets are stored in repositories. These repositories are then saved in directories called organizational units. By default, the Knowledge Store in Business Central does not contain any organizational unit. Therefore, to be able to create your own business assets, you need to create an organizational unit and a repository first.

### 8.1. CREATING AN ORGANIZATIONAL UNIT

It is possible to create an organizational unit either in the **Administration** perspective of Business Central, using the **kie-config-cli** tool, or the REST API calls.

#### Creating an Organizational Unit in Business Central



#### IMPORTANT

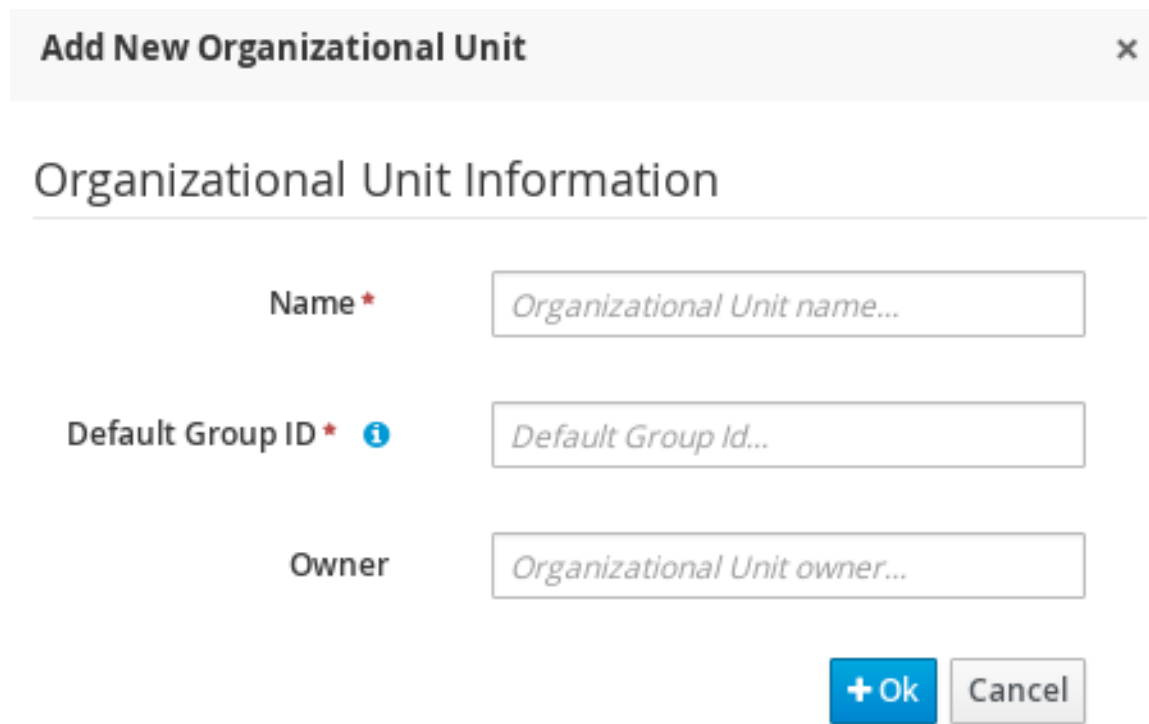
Note that only users with the **admin** role in Business Central can create organizational units.

#### Procedure: Using Business Central to Create an Organizational Unit

1. In Business Central, go to **Authoring** → **Administration**.
2. On the perspective menu, click **Organizational Units** → **Manage Organizational Units**.
3. In the **Organization Unit Manager** view, click **Add**.  
The **Add New Organizational Unit** dialog window opens.



Figure 8.1. Add New Organizational Unit\_Dialog Window



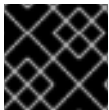
4. Enter the two mandatory parameters (name and default group ID) and click **Ok**.

#### Creating an Organizational Unit Using the `kie-config-cli` Tool

Organizational units can be created using the `kie-config-cli` tool as well. To do so, run the `create-org-unit` command. The tool then guides you through the entire process of creating an organizational unit by asking for other required parameters. Type `help` for a list of all commands.

For more information about the `kie-config-cli` tool, see [Chapter 5, Command Line Configuration](#).

#### Creating an Organizational Unit Using the REST API



#### IMPORTANT

Note that only users with the `rest-all` role can create organizational units.

To create an organizational unit in Knowledge Store, issue the **POST** REST API call. Details of the organizational unit are defined by the JSON entity.

Input parameter of the call is a `OrganizationalUnit` instance. Call returns a `CreateOrganizationalUnitRequest` instance.

#### Example 8.1. Creating an Organizational Unit Using the Curl Utility

Example JSON entity containing details of an organizational unit to be created:

```
{
  "name"      : "helloWorldUnit",
  "owner"     : "tester",
  "description" : null,
  "repositories" : []
}
```

Execute the following command:

```
curl -X POST 'localhost:8080/business-central/rest/organizationalunits/'
-u USERNAME:PASSWORD -H 'Accept: application/json' -H 'Content-Type:
application/json' -d
'{"name":"helloWorldUnit","owner":"tester","description":null,"repositories":[]}'
```

For further information, refer to chapter *Knowledge Store REST API*, section *Organizational Unit Calls* of *Red Hat JBoss BPM Suite Development Guide*.

## 8.2. CREATING A REPOSITORY

There are three ways to create a repository: through the **Administration** perspective of Business Central, the **kie-config-cli** tool, or using the REST API calls.

### Creating a Repository in Business Central



#### IMPORTANT

Note that only users with the **admin** role in Business Central can create repositories.

#### Procedure: Using Business Central to Create a Repository

1. In Business Central, go to **Authoring** → **Administration**.
2. On the perspective menu, click **Repositories** → **New repository**.  
The **New Repository** pop-up window is displayed.

**Figure 8.2. New Repository Dialog Window**

3. Specify the two mandatory parameters:

- **Repository name**



#### NOTE

Make sure that the repository name is a valid file name. Avoid using a space or any special character that might lead to an invalid name.

- **Organizational unit:** Specifies the location of the newly created repository.

#### 4. Click **Finish**.

You can view the newly created repository either in the **File Explorer** or the **Project Explorer**.

### Creating Repository Using **kie-config-cli** Tool

To create a new Git repository using the **kie-config-cli** tool, run the **create-repo** command. The tool then guides you through the entire process of creating a repository by asking for other required parameters. Type **help** for a list of all commands.

For more information about the **kie-config-cli** tool, see [Chapter 5, Command Line Configuration](#).

### Creating Repository Using REST API



#### IMPORTANT

Note that only users with the **rest-all** role can create repositories.

To create a repository in the Knowledge Store, issue the **POST** REST API call. Details of the repository are defined by the JSON entity. Make sure you established an authenticated HTTP session before executing this call.

Input parameter of the call is a **RepositoryRequest** instance. Call returns a **CreateOrCloneRepositoryRequest** instance.

#### Example 8.2. Creating Repository Using Curl Utility

Example JSON entity containing details of a repository to be created:

```
{
  "name"           : "newRepository",
  "description"    : null,
  "gitURL"         : null,
  "requestType"    : "new",
  "organizationalUnitName" : "helloWorldUnit"
}
```

Execute the following command:

```
curl -X POST 'localhost:8080/business-central/rest/repositories/' -u
USERNAME:PASSWORD -H 'Accept: application/json' -H 'Content-Type:
application/json' -d
'{"name":"newRepository","description":null,"requestType":"new","gitURL"
:null,"organizationalUnitName":"helloWorldUnit"}'
```

For further information, refer to chapter *Knowledge Store REST API*, section *Repository Calls* of *Red Hat JBoss BPM Suite Development Guide*.

## 8.3. CLONING A REPOSITORY

It is possible to clone a repository either in Business Central or using the REST API calls. The **kie-config-cli** tool cannot be used to clone arbitrary repositories. Run **git clone**, or use one of the following options instead:

## Cloning a Repository in Business Central



### IMPORTANT

Note that only users with the **admin** role in Business Central can clone repositories.

### Procedure: Using Business Central to Clone a Repository

1. In Business Central, go to **Authoring** → **Administration**.
2. On the perspective menu, choose **Repositories** → **Clone repository**.  
The **Clone Repository** pop-up window is displayed.

Figure 8.3. Clone Repository Dialog Window

**Clone Repository** [Close]

**Repository Information**

Repository Name \*

Organizational Unit \*

Git URL \*

User Name

Password

3. In the **Clone Repository** dialog window, enter the repository details:
  - a. Enter the **Repository Name** to be used as the repository identifier in the Asset repository and select the **Organizational Unit** it should be added to.
  - b. Enter the URL of the Git repository:
    - For a local repository, use `file:///PATH_TO_REPOSITORY/REPOSITORY_NAME`.
    - For a remote or preexisting repository, use `https://github.com/USERNAME/REPOSITORY_NAME.git` or `git://HOST_NAME/REPOSITORY_NAME`.



### IMPORTANT

It is important to use the HTTPS or Git protocol instead of a SCP-style SSH URL. Business Central does not support the basic SSH URL and fails with **Invalid URL format**.



### NOTE

The file protocol is only supported for READ operations. WRITE operations are *not* supported.

- c. If applicable, enter the **User Name** and **Password** of your Git account to be used for authentication.
4. Click **Clone**.  
A confirmation prompt with the notification that the repository was created successfully is displayed.
5. Click **Ok**.  
The repository is now being indexed. Some workbench features may be unavailable until the indexing has completed.

You can view the cloned repository either in the **File Explorer** or the **Project Explorer**.



### NOTE

If you are deploying Business Central on WebLogic server, set the following Java system property in the **setDomainEnv.sh** file (for Linux) or **setDomainEnv.cmd** file (for Windows):

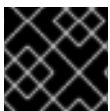
```
JAVA_OPTIONS="%JAVA_OPTIONS% -DUseSunHttpHandler=true"
```

This enables the WebLogic server to use the HTTP handlers.

### Cloning a Repository Using the REST API

To clone a repository, issue the **POST** REST API call. This call creates or clones (according to the value of the **requestType** parameter) the repository defined by the JSON entity.

The input parameter of the call is a **RepositoryRequest** instance. The Call returns a **CreateOrCloneRepositoryRequest** instance.



### IMPORTANT

Note that, only users with the **rest -all** role can clone repositories.

### Example 8.3. Cloning a Repository Using the Curl Utility

Example JSON entity containing details of a repository to be cloned:

```
{
  "name"           : "clonedRepository",
  "description"    : null,
  "requestType"    : "clone",
```

```

    "gitURL" : "git://localhost:9418/newRepository",
    "organizationalUnitName" : "helloWorldUnit"
  }

```

Execute the following command:

```

curl -X POST 'localhost:8080/business-central/rest/repositories/' -u
USERNAME:PASSWORD -H 'Accept: application/json' -H 'Content-Type:
application/json' -d
'{"name":"clonedRepository","description":null,"requestType":"clone","gi
tURL":"git://localhost:9418/newRepository","organizationalUnitName":"hel
loWorldUnit"}'

```

For further information, refer to chapter *Knowledge Store REST API*, section *Repository Calls* of *Red Hat JBoss BPM Suite Development Guide*.

## 8.4. REMOVING A REPOSITORY

Repositories can be removed using any of the following procedures.

### Removing a Repository in Business Central

The simplest way to remove a repository is using the **RepositoryEditor** in Business Central.

#### Procedure: Using Business Central to Remove a Repository

1. In Business Central, go to **Authoring** → **Administration**.
2. Select **Repositories** from the tree menu on the left.
3. In the **RepositoryEditor** on the right side of the page, locate the repository you want to delete from the list of available repositories.
4. From the drop-down menu, select **master** → **Delete**.

The following message will appear:

```

Are you sure you want to remove Repository "REPOSITORY_NAME"? Some
editors may become inoperable if their content is inaccessible.

```

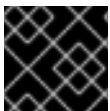
5. Press **OK** to delete the repository.

### Removing a Repository Using the kie-config-cli Tool

Repositories can be removed using the **kie-config-cli** tool as well. To do so, run the **remove-repo** command.

For further information about the **kie-config-cli** tool, see [Chapter 5, Command Line Configuration](#).

### Removing a Repository Using the REST API



#### IMPORTANT

Note that only users with the **rest-all** role can remove repositories.

To remove a repository from the Knowledge Store, issue the **DELETE** REST API call. Make sure you established an authenticated HTTP session before executing this call.

The call returns a **RemoveRepositoryRequest** instance.

#### Example 8.4. Removing a Repository Using the Curl Utility

Execute the following command:

```
curl -X DELETE 'localhost:8080/business-
central/rest/repositories/REPOSITORY_NAME' -u USERNAME:PASSWORD -H
'Accept: application/json' -H 'Content-Type: application/json'
```

For further information, refer to chapter *Knowledge Store REST API*, section *Repository Calls* of *Red Hat JBoss BPM Suite Development Guide*.

## 8.5. MANAGING ASSETS



### NOTE

To activate and use the feature described below, login to Business Central with a user that has the **kiemgmt** role assigned.

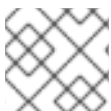
To make management of projects easier, Red Hat JBoss BPM Suite now provides a way to manage multiple projects based on standards. This allows you to create repository structures using industry standard best practices for maintenance, versioning and distribution of your projects.

To start with, repositories can now be managed or unmanaged.

### Managed and Unmanaged Repositories

Unmanaged Repositories are the repository structures that you are used to. They can contain multiple unrelated projects.

Managed Repositories, on the other hand, provide version control at the project level and project branches for managing the release cycle. Further, Managed Repositories can be restricted to just a single project or encompass multiple projects. When you create a Managed Repository, the asset management configuration process is automatically launched in order to create the repository branches. Corresponding project structure is created as well.



### NOTE

Multi-project repositories must be managed.

### Procedure: Creating an Unmanaged Repository

1. In Business Central, go to **Authoring** → **Administration**.
2. Click **Repositories** → **New Repository**.  
The **New Repository** window is displayed.
3. Enter the repository name and select an organizational unit the repository belongs to.

- Click **Finish**.

### Procedure: Creating a Managed Repository

- In Business Central, go to **Authoring** → **Administration**.
- Click **Repositories** → **New Repository**.  
The **New Repository** window is displayed.
- Enter the repository name and select an organizational unit the repository belongs to.
- Select the **Managed Repository** check box and click **Next** to enter additional details of the Managed Repository.

**New Repository** [Close]

☒ Basic Settings

☐ Managed Repository Settings

Repository Name \*

In Organizational Unit \*

☒ Managed Repository

< Previous   Next >   Cancel   ✓ Finish

- Choose either the **Single-project Repository** or the **Multi-project Repository** radio button. If the project you are creating is simple and self-contained, select the **Single-project Repository** radio button. Note that you will not be able to add more projects to this repository later.

For more complex projects, where there is likely to be a parent project that encompasses smaller ones, select the **Multi-project Repository** radio button.



New Repository

×

☒ Basic Settings

☒ Managed Repository Settings

Repository Type:

☐ Single-project Repository

☒ Multi-project Repository

Project Branches:

☒ Automatically Configure Branches (master/dev/release)

Project Settings:

Name \*

test

Description

enter project description

Group \*

demo

Artifact \*

test

Version \*

1.0.0-SNAPSHOT

< Previous

Next >

Cancel

✓ Finish

- Enter the details of the managed project along with the GAV (Group, Artifact, Version) details. Note that all projects created in a **Multi-project Repository** will be managed together, with their version numbers being incremented together as well. Details of the parent project will be inherited by all future projects that you create in this Managed Repository.

- Click **Finish**.

## NOTE

If you create an unmanaged repository and add a **pom.xml** file (a parent Project Object Model (POM) file) directly under the repository directory, Red Hat JBoss BPM Suite converts the repository to a managed repository. For instructions about changing the repository status back to unmanaged, see the Red Hat Knowledgebase article [An Unmanaged Repository Unexpectedly Turned Into "Managed" in BRMS / BPM Suite](#).

## Managed Branches

With Managed Repositories comes the added advantage of Managed Branches. As in Git, you can choose to work on different branches of your project (for example: master, dev and release). This process of branching can also be automated for you, by selecting the checkbox while creating a new Managed Repository (for both single and multi-projects).

You can switch between branches by selecting the desired branch while working in the Project Explorer.

## Repository Structure

If you do not select automatic branch management while creating a repository, you can create branches manually afterwards. For Managed Repositories, you can do so by using the **Configure** button. This button, along with **Promote** and **Release** buttons, is provided in the **Repository Structure** view. You

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can access this view, by clicking on **Repository** → **Repository Structure** in the Project Explorer perspective menu.

Clicking on the **Configure** button allows you to create branches or edit automatically created ones.

Configure Repository

×

Repository

test2

Source Branch

master

Dev Branch \*

dev

The branch will be called (dev)-1.0.0-SNAPSHOT

Release Branch \*

release

The branch will be called (release)-1.0.0-SNAPSHOT

Version \*

1.0.0-SNAPSHOT

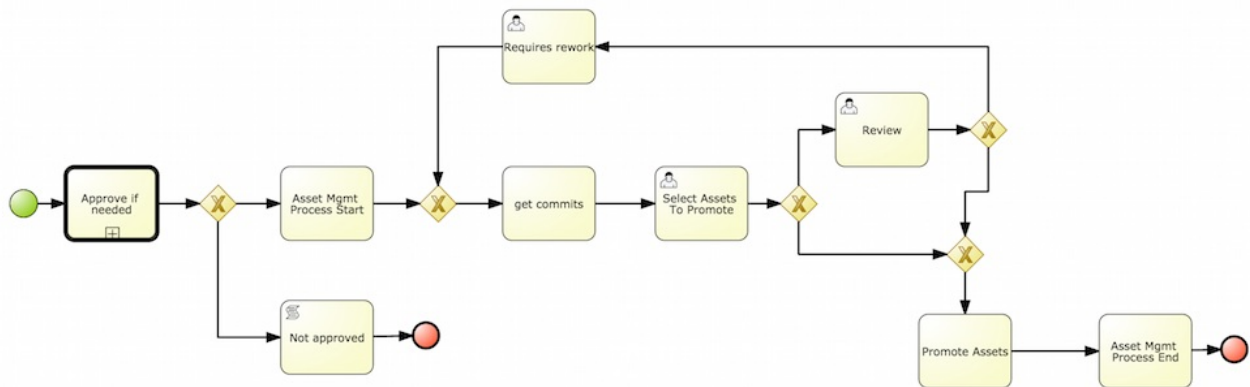
The current repository version is: 1.0.0-SNAPSHOT

+ Ok

Cancel

You can promote assets from the master branch to other branches using the **Promote** button. Similarly, you can Release branches and deploy them on the server using the **Release** button.

Both these functions are controlled internally by the use of pre-defined processes that are deployed on your instance. For example, when you click on **Promote** button after having done work on your development branch, a Promote Changes process is started in the background. A user, with the role of **kiemgmt** will have a user task appear in this task list to review the assets being promoted. This user can claim this task, and decide to promote all, some or none of the assets. The underlying process will cherry-pick the commits selected by the user to a release branch. This user can also request another review of these assets and this process can be repeated multiple times till all the assets are ready for release. The flow for this process is shown below:



Similarly, when you click on the **Release** button, a release process flow is initiated. This process flow builds the project and updates all the Maven artifacts to the next version, and deploys the project to the runtime, if runtime deployment details are supplied.



### WARNING

Project branches to be released must start with the keyword **release**.

**Release Configuration** ✕

|                     |  |
|---------------------|--|
| Repository          | <input type="text" value="TestManagedRepository"/>   |
| Source Branch       | <input type="text" value="master"/>  |
| Release Version *   | <input type="text" value="1.0.0"/><br><small>The current repository version is: 1.0.0-SNAPSHOT</small> |
| Deploy To Runtime * | <input checked="" type="checkbox"/>  |
| User Name *         | <input type="text" value="admin"/>   |
| Password *          | <input type="password" value="Password"/>  |
| Server URL *        | <input type="text" value="http://localhost:8080/business-central/"/>                                   |

## 8.6. MAVEN REPOSITORY

Maven is a software project management tool which uses a project object model (POM) file to manage:

- Builds
- Documentation
- Reporting
- Dependencies
- Releases
- SCMs
- Distribution

A Maven repository is used to hold or store the build artifacts and project dependencies and is generally of two types:

### Local

Refers to a local repository where all the project dependencies are stored and is located with the current installation in the default folder as "m2". It is a cache of the remote downloads, and also contains the temporary build artifacts which have not yet been released.

### Remote

Refers to any other type of repository that can be accessed by a variety of protocols such as **file://** or **http://**. These repositories can be at a remote location set up by a third-party for downloading of artifacts or an internal repository set up on a file or HTTP server, used to share private artifacts between the development teams for managing internal releases.

## 8.7. CONFIGURING DEPLOYMENT TO A REMOTE NEXUS REPOSITORY

Nexus is a repository manager frequently used in organizations to centralize storage and management of software development artifacts. It is possible to configure your project so that artifacts produced by every build are automatically deployed to a repository on a remote Nexus server.

To configure your project to deploy artifacts to a remote Nexus repository, add a **distributionManagement** element to your project's **pom.xml** file as demonstrated in the code example below.

```
<distributionManagement>
  <repository>
    <id>deployment</id>
    <name>Internal Releases</name>

    <url>http://your_nexus_host:8081/nexus/content/repositories/releases</url>
  </repository>
  <snapshotRepository>
    <id>deployment</id>
    <name>Internal Releases</name>

    <url>http://your_nexus_host:8081/nexus/content/repositories/snapshots/</url>
  </snapshotRepository>
</distributionManagement>
```

Replace the URLs in the example with real URLs of your Nexus repositories. The repository specified in the **snapshotRepository** element is used when the **-SNAPSHOT** qualifier is appended to the project's current version number. In other cases the repository specified in the **repository** element is used.

If your Nexus server requires authentication, you will also need to modify your projects Maven settings to add your credentials in the **settings-security.xml** file, using a master password. By default, this file is in the **\$M2\_HOME/conf** folder, unless you have changed its location by modifying the **kie.maven.settings.custom** system property. It is also possible to create new user-specific **settings.xml** and **settings-security.xml** files in the **~/.m2** folder. In that case, these files will override the original ones.

See the following example of the **settings-security.xml**:

```
<servers>
  <server>
    <id>deployment</id>
    <username>admin</username>
    <password>{COQLCE6DU6GtCS5P=}</password>
```

```
</server>  
</servers>
```



## IMPORTANT

Note that keeping your server authentication credentials (for example the passwords) as a plain text in the **settings.xml** file is *not* recommended. All the information should be hashed with a master password in the **settings-security.xml** file.

For further information about password encryption and creating a master password, see the Apache Maven documentation, article [Password Encryption](#).

With this configuration in place, clicking the **Build & Deploy** button in Business Central executes a Maven build and deploys the built artifacts both to the local repository and to one of the Nexus repositories specified in the **pom.xml** file.

## CHAPTER 9. PROCESS CREATION, IMPORT, AND EXPORT

### 9.1. CREATING PROCESS



#### NOTE


Decide whether you want to create a process in a package of a particular project. See [Section 1.5, “Creating Package”](#) for more information.

To create a process:

1. In Business Central, click **Authoring** → **Project Authoring**.
2. In Project Explorer, locate the project in which you want to create the process.
3. Click **New Item** → **Business Process** at the top of Project Explorer.  
The **Create New Business Process** dialog window opens.
4. Enter a name and select a package (optional). Click **Ok**.  
Process Editor with the newly created process opens.

### 9.2. IMPORTING PROCESS

#### Importing Process in BPMN2 or JSON Format in Process Editor

1. In Business Central, click **Authoring** → **Project Authoring**.
2. In Project Explorer, locate the project and the respective package into which you want to import the process.
3. If you want to merge the process with any other existing process, open the already existing process in Process Editor. If you want to import a process without changing any of the existing processes, create a new process.
4. In Process Editor, click the **Import** icon  and choose the format of the imported process.  
The **Import** dialog window opens.



#### NOTE

The available **Migrate jPDL 3.2 to BPMN2** tool is a technical preview feature and therefore is *not* supported.

5. Click **Choose File** and locate the process file, or paste the process definition into the available text box. Click **Import**.
6. The **Replace existing model?** dialog window opens. To overwrite the opened process with the imported process, click **Yes**. To merge the two processes, click **No**.


When importing processes, Process Editor provides visual support for process elements and therefore requires information about elements' position on the canvas. If the information is not provided, you need to edit the process position on the canvas manually.

### Importing Process into Git Repository

1. Clone the repository.
2. Add the process BPMN2 file into the ***REPOSITORY/PROJECT/src/main/resources/PACKAGE*** directory.
3. Commit the changes.
4. Push the changes.

## 9.3. EXPORTING PROCESS

To export a business process:

1. In Business Central, click **Authoring** → **Project Authoring**.
2. Open the process in Process Editor.
3. Click  and select **View Process Sources**.  
The **Process Sources** dialog window opens.
4. Click **Download BPMN2** to download the process.



## CHAPTER 10. SCHEDULER SERVICE

The Red Hat JBoss BPM Suite engine employs scheduler service to execute jobs at a scheduled time and date. Red Hat JBoss BPM Suite has three types of scheduler service:

### ThreadPoolSchedulerService

Default scheduler service that manages its own thread pool to allocate available worker threads for the scheduled task. This service is best for a single node use case.

### EjbSchedulerService

Scheduler service implementation backed by EJB Timer Service. You can enable this if you have a **jbpmservices-ejb-timer-XXX.jar** file in your application. This service is only available under Java EE container and uses the container's thread pool. This service is best for a single node use case.

### QuartzSchedulerService

Scheduler service implementation backed by Quartz job scheduler. You can enable this when Quartz is configured. For more information, see [Setting Quartz](#) in the *Red Hat JBoss BPM Suite Installation Guide*. This service is required for a cluster use case.



### NOTE

For WebSphere, use clustered EjbSchedulerService instead of QuartzSchedulerService, even in a cluster use case. For more information, see [How to set up BPM Suite Timers to work in Websphere Application Server clustering](#) on the Red Hat website.

## PART III. INTEGRATION

# CHAPTER 11. DEPLOYING RED HAT JBOSS BPM SUITE TO AMAZON EC2 WEB SERVICE

Amazon Elastic Compute Cloud (hereinafter referred to as Amazon EC2) is a web service providing a computing environment in the Amazon Web Services (AWS) cloud. Deploying Red Hat JBoss BPM Suite to Amazon EC2 has been supported since version 6.2.

Amazon EC2 can be used to create a virtual machine and its computing environments called instances. Templates for this instances are then known as Amazon Machine Images or AMIs. The service allows you to modify the instance to use a required configuration of CPU, memory, storage, and other properties. The cost of the service is calculated based on the used compute capacity.

For more information about Amazon EC2 and all the provided features, see the official [AWS Documentation](#).

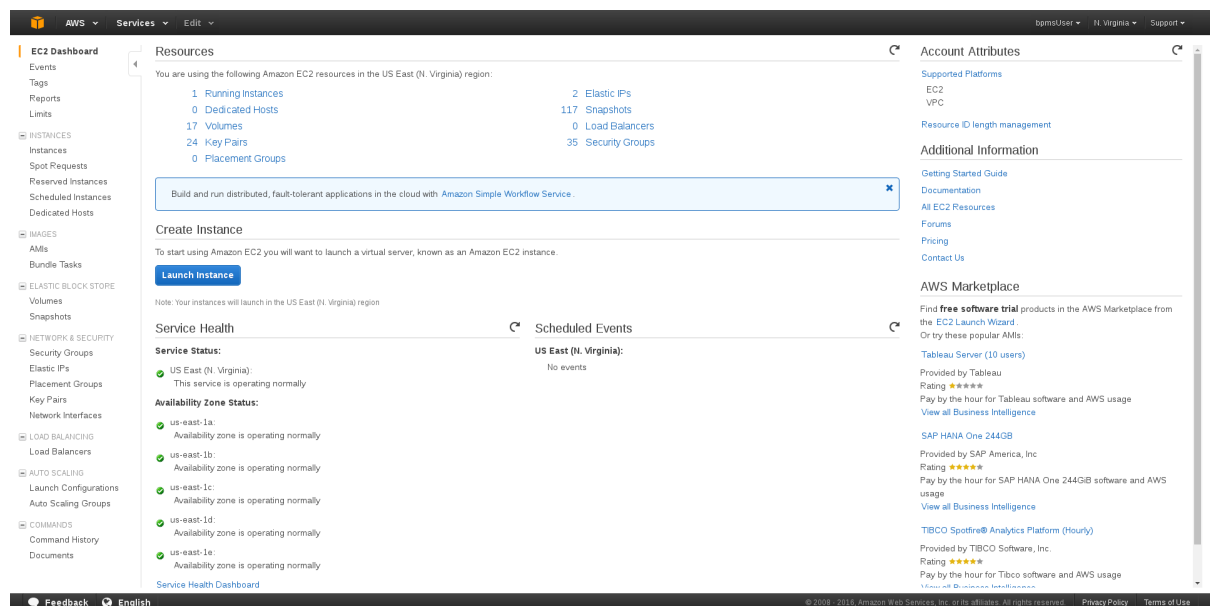
## 11.1. GETTING STARTED WITH AMAZON EC2

### Logging into AWS

1. Go to the [Amazon Web Services](#) main page, click **Sign in to the Console** and enter your user credentials.
2. On the AWS home page that opens, choose **EC2 Virtual Servers in the Cloud** in the left hand corner.

You are redirected to the **EC2 Dashboard**.

**Figure 11.1. Amazon EC2 Dashboard**



**EC2 Dashboard** provides an overview of your AWS account as well as the information about the overall service health and scheduled events. The **Resources** section of the dashboard contains links to all running instances, created key pairs, security groups, and more. To launch a virtual server, click the **Launch Instance** quick link in the **Create Instance** section. The main menu on the left side of the page contains links necessary for configuring instances and images, setting up networks and controlling security issues.



## IMPORTANT

Note that login information in Amazon EC2 is encrypted. Before creating or starting an instance, you need to import your public key to AWS in order to be able to connect to the instance.

### Importing Public Key

1. In the main menu on the left, click **Key Pairs** under the **NETWORK & SECURITY** drop-down menu.
2. Click **Import Key Pair** at the top of the page.  
The **Import Key Pair** dialog window opens.
3. Define the name of the key pair and either upload the public key from file, or copy and paste the content of your public key into the **Public key contents** text field.
4. Click **Import**.  
The imported key pair appears in the displayed list of key pairs.

Alternatively, you can create your own key pair using Amazon EC2. For more information, see the [Amazon EC2 Key Pairs](#) chapter in the *AWS Documentation*.

## 11.2. CREATING AND STARTING VIRTUAL MACHINE INSTANCES

To deploy Red Hat JBoss BPM Suite to Amazon EC2, you must have a valid membership in the JBoss Cloud Access program. The program provides a number of supported AMIs created by Red Hat, while each of them has Red Hat Enterprise Linux 6 and Red Hat JBoss EAP 6 (together with other required software) pre-installed.

For further information about supported Amazon EC2 instance types, see the [Deploy JBoss EAP 6 on Amazon EC2](#) chapter of *Red Hat JBoss Enterprise Application Platform 6.4 Administration and Configuration Guide*.

To create a virtual machine instance, do the following:

### Creating Virtual Machine Instance

1. In the main menu, click **AMIs** under the **IMAGES** drop-down menu.
2. Choose one of the supported AMIs.  
For example **RHEL - 6.7\_HVM\_GA - JBEAP - 6.4.7 - 20160421 - x86\_64 - 1 - Access2 - GP2 (ami-50bba23a)**.
3. Click **Launch**.  
The **Choose an Instance Type** window opens. An *instance type* is a custom configuration of CPU, memory, storage, and networking capacity of your virtual machine instance.
4. Choose one of the listed instance types.  
Instance type depends on the needs of your application. KIE Server and Business Central are usually two separated instances in AWS and each of them requires different settings. However, at least 2 vCPUs (the number of virtual CPUs) and 7.5 GiB of memory is recommended.

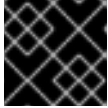
It is possible to launch the instance directly from here by clicking **Review and Launch**. If you want to change additional settings, see the following steps.

5. Click **Next: Configure Instance Details**.

In this step, you can choose a number of launched instances, network (either EC2-Classic or VPC, the Amazon Virtual Private Cloud), or enable detailed monitoring. If you want to keep the default settings, continue to the next tab.

6. Click **Next: Add Storage**.

This screen allows you to add more Amazon Elastic Block Store (Amazon EBS) volumes and modify the settings of the root volume. The minimum recommended size of the root volume is **30 GiB**.



### IMPORTANT

Make sure that the set volume size is greater than the size of the used snapshot.

7. Click **Next: Tag Instance** and specify the tags for the instance that can help you search and filter the instances later. For example, the key **Name** can indicate a logical name of the instance in the instance list.

8. Click **Next: Configure Security Group**.

A *security group* is a virtual firewall containing a number of firewall rules that control the traffic for your instance. Each instance can have one or more security groups assigned and these groups can be modified at any time.

You need to create a new security group in order to be able to deploy Red Hat JBoss BPM Suite:

### Creating New Security Group

1. If not already selected, select the **Create a new security group** check box.
2. Fill in the **Security group name** and **Description**.
3. Keep the default SSH type TCP protocol rule.
4. Define three new firewall rules by clicking **Add Rule**:
  - Default SSH access to Business Central:
    - **Type**: Custom TCP Rule
    - **Protocol**: TCP
    - **Port Range**: 8001
  - Default HTTP port of Red Hat JBoss EAP:
    - **Type**: Custom TCP Rule
    - **Protocol**: TCP
    - **Port Range**: 8080
  - Default Git port:
    - **Type**: Custom TCP Rule
    - **Protocol**: TCP

- o **Port Range:** 9418

| Type ⓘ          | Protocol ⓘ | Port Range ⓘ | Source ⓘ  |
|-----------------|------------|--------------|-----------|
| SSH             | TCP        | 22           | 0.0.0.0/0 |
| Custom TCP Rule | TCP        | 8001         | 0.0.0.0/0 |
| Custom TCP Rule | TCP        | 8080         | 0.0.0.0/0 |
| Custom TCP Rule | TCP        | 9418         | 0.0.0.0/0 |



### WARNING

All the configured ports must be allowed in the **PORTS\_ALLOWED** property of user data. For more information, see [Configuring User Data](#).

9. Click **Review and Launch**.

10. Review your instance details and if you want to launch the instance, click **Launch**.

A list of all created instances can be found under the **Instances** option in the main menu on the left. You can filter, search and launch the instances as well as view the instance description and edit the settings.

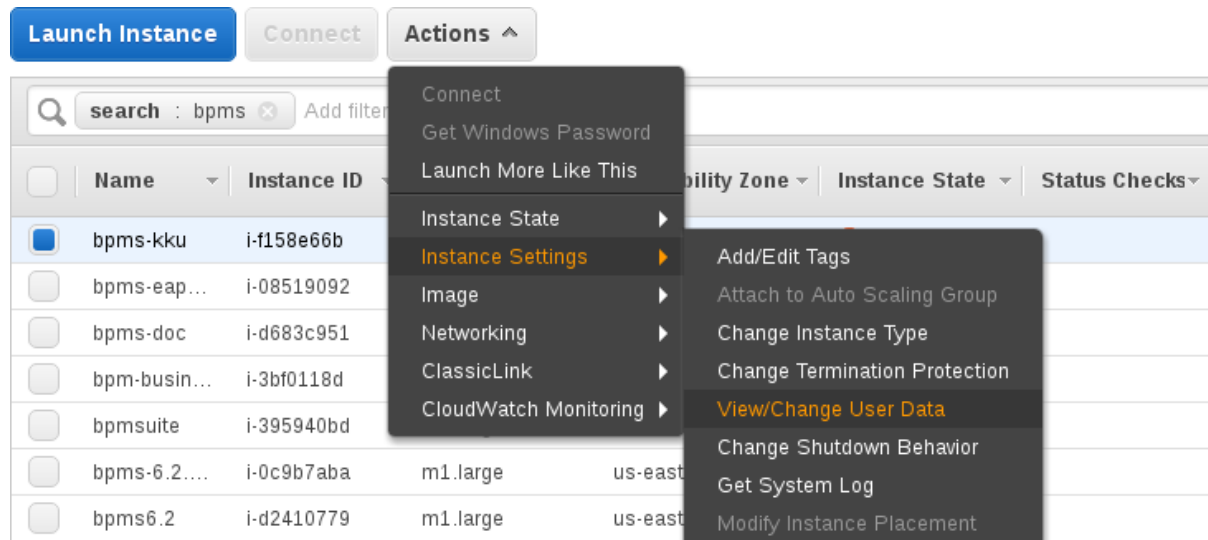
**Figure 11.2. List of Instances Searched by Name**

| Launch Instance Connect Actions |              |             |               |                   |                |               |              |            |           |            |            |                                 |                   |
|---------------------------------|--------------|-------------|---------------|-------------------|----------------|---------------|--------------|------------|-----------|------------|------------|---------------------------------|-------------------|
| search : bpms Add filter        |              |             |               |                   |                |               |              |            |           |            |            |                                 |                   |
|                                 | Name         | Instance ID | Instance Type | Availability Zone | Instance State | Status Checks | Alarm Status | Public DNS | Public IP | Key Name   | Monitoring | Launch Time                     | Security Groups   |
| <input type="checkbox"/>        | bpms-kku     | i-f158e66b  | m3.large      | us-east-1d        | stopped        | None          |              |            |           | kkutova    | disabled   | May 24, 2016 at 11:30:43 AM...  | bpms-sec-group    |
| <input type="checkbox"/>        | bpms-eap...  | i-08519092  | m3.large      | us-east-1d        | stopped        | None          |              |            |           | rsynek-key | disabled   | May 10, 2016 at 10:15:11 AM...  | bpms-sec-group    |
| <input type="checkbox"/>        | bpms-dec     | i-d683c951  | m1.large      | us-east-1a        | stopped        | None          |              |            |           | rsynek-key | disabled   | May 10, 2016 at 9:25:41 AM...   | bpms-sec-group    |
| <input type="checkbox"/>        | bpm-busin... | i-3bf0118d  | m1.large      | us-east-1a        | stopped        | None          |              |            |           | rsynek-key | disabled   | April 8, 2016 at 12:38:54 PM... | bpms-6.2-security |
| <input type="checkbox"/>        | bpmsuite     | i-395940bd  | m1.large      | us-east-1a        | stopped        | None          |              |            |           | rsynek-key | disabled   | April 5, 2016 at 8:37:37 AM...  | bpms-sec-group    |
| <input type="checkbox"/>        | bpms-6.2.... | i-0c9b7aba  | m1.large      | us-east-1a        | stopped        | None          |              |            |           | rsynek-key | disabled   | November 25, 2015 at 4:20:4...  | bpms-6.2-security |
| <input type="checkbox"/>        | bpms6.2      | i-d2410779  | m1.large      | us-east-1e        | stopped        | None          |              |            |           | rsynek-key | disabled   | November 25, 2015 at 8:40:0...  | launch-wizard-13  |

In case you created a custom security group and defined new firewall rules with specific ports, you have to allow these ports in user data for the new virtual machine instance.

## Configuring User Data

1. In the main menu, go to **INSTANCES** → **Instances**.
2. In the list of instances, find and select the instance you want to configure.
3. Click **Actions** → **Instance Settings** → **View/Change User Data**.



4. In the **View/Change User Data** dialog window that opens, define the **PORTS\_ALLOWED** property. For example:

```
PORTS_ALLOWED="8001 8080 9418"
```

## View/Change User Data

**Instance ID:** i-f158e66b

**User Data:**

PORTS\_ALLOWED="8001 8080 9418"

☒ Plain text
 ☐ Input is already base64 encoded

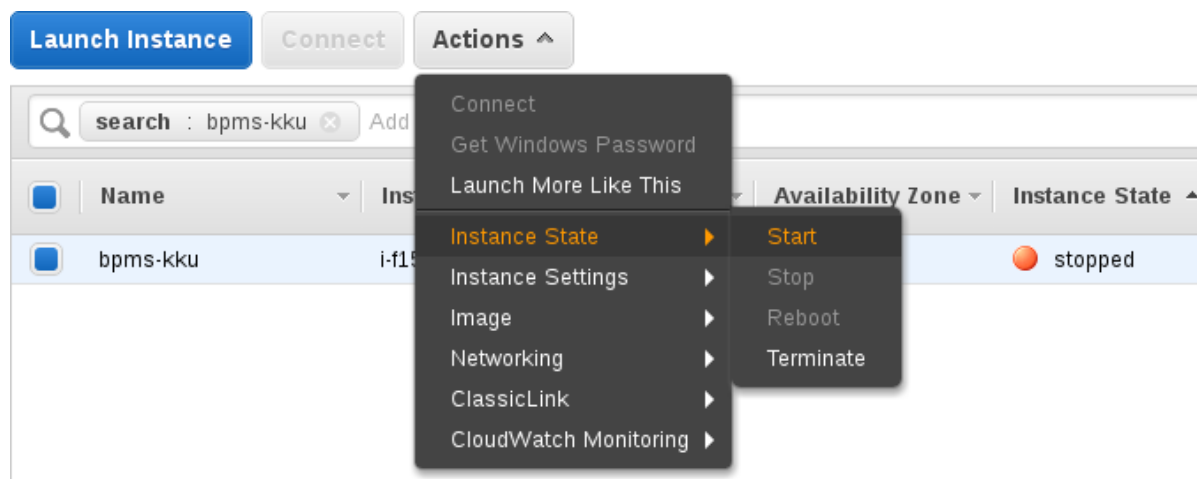
[Cancel](#)
[Save](#)

5. Click **Save**.

To start the created instance, do the following:

### Starting Virtual Machine Instance

1. In the main menu, go to **INSTANCES** → **Instances**.
2. Select the instance from the list and click **Actions** → **Instance State** → **Start**.



3. In the **Start Instances** dialog window that opens, click **Yes, Start** to confirm that you want to start the instance.
4. Wait until the result of a status check changes to **2/2 checks passed**.



#### NOTE

Do not forget to stop your instance after you no longer need it.

## 11.3. INSTALLING RED HAT JBOSS BPM SUITE ON VIRTUAL MACHINE INSTANCE

First, follow the steps below to connect to your instance:

### Connecting to Instance

1. Start the instance.
2. Click **Connect** to view details required for accessing your instance.  
The **Connect To Your Instance** pop-up window opens.
3. Copy the public DNS address.
4. Execute the following command:

```
~]$ ssh ec2-user@PUBLIC_DNS_ADDRESS
```

5. Enter **yes** to confirm that you want to connect to your instance.

### Installing Red Hat JBoss BPM Suite on VM Instance

1. Connect to the instance on which you want to install Red Hat JBoss BPM Suite.
2. Update your instance in order to get the latest version of Red Hat JBoss EAP 6.x by executing the following command:

```
~]$ sudo yum -y update
```

3. Switch to root:

-



```
~]$ sudo su
```

4. Copy the following configuration files to **/etc/jbossas/standalone/** and **/etc/jbossas/domain/**:

- **standalone.xml**
- **standalone-full.xml**
- **standalone-full-ha.xml**
- **standalone-ha.xml**
- **standalone-osgi.xml**

Follow the instructions:

- a. Download Red Hat JBoss BPM Suite 6.3.0 Deployable for EAP 6 from [Customer Portal](#).
- b. Change directory to the location of the downloaded zip file.
- c. Copy the zip file into the **/tmp/** directory of your virtual machine instance:

```
~]$ scp jboss-bpmsuite-6.3.0.GA-deployable-eap6.x.zip ec2-user@PUBLIC_DNS_ADDRESS:/tmp
```

- d. Go to the **/tmp/** directory of your VM instance and unzip the file:

```
~]$ unzip jboss-bpmsuite-6.3.0.GA-deployable-eap6.x.zip
```

- e. Change directory to **jboss-eap-6.4/standalone/configuration/** and copy all the configuration files listed above into **/etc/jbossas/standalone/** and **/etc/jbossas/domain/**, for example:

```
~]$ cp standalone.xml /etc/jbossas/standalone/
```

Enter **y** to overwrite the file.

- f. Make sure that the files were overwritten: **standalone.xml** should contain the following:

```
<system-properties>
  <property name="org.kie.example" value="true"/>
  <property name="org.jbpm.designer.perspective" value="full"/>
  <property name="designerdataobjects" value="false"/>
</system-properties>
```

5. Copy the required applications (for example Business Central) to **/usr/share/jbossas/standalone/deployments/**:

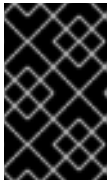
- a. Change directory to **/tmp/jboss-eap-6.4/standalone/deployments/**.
- b. Copy Business Central:

```
~]# cp -r business-central.war
/usr/share/jbossas/standalone/deployments/
```

```
~]# cp -r business-central.war.dodeploy
/usr/share/jbossas/standalone/deployments/
```

6. Set the proper Red Hat JBoss EAP binding address.

Each virtual machine has private and public IP addresses. The public IP address can be accessed outside the AWS, while the private IP address is accessible only inside the virtual network of your Amazon EC2 account.



### IMPORTANT

Every time you start the instance, the addresses change. Refer to the [Red Hat JBoss Enterprise Application Platform 6.4 Administration and Configuration Guide](#) for more information.

One way to set the address is by doing the following:

- a. Run **ifconfig** and copy the **inet addr** address (for example **10.233.159.148**).
- b. Open **/etc/jbossas/standalone/standalone.xml** and set the proper binding address:

```
<interfaces>
...
<interface name="public">
  <inet-address value="10.233.159.148"/>
</interface>
...
</interfaces>
```

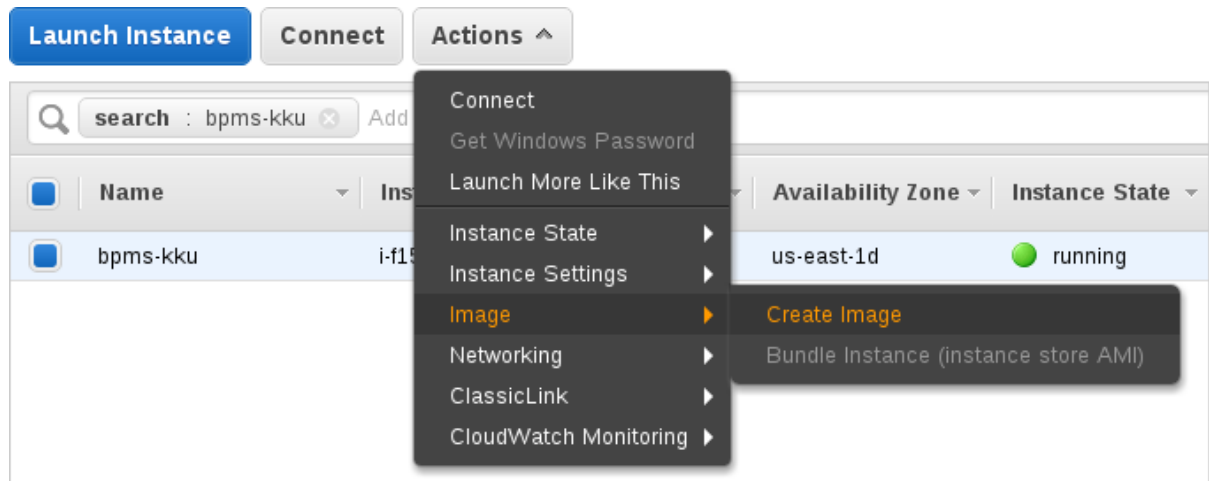
7. Enable Git and SSH access to Business Central: add the following system properties (with *your* private IP address) into **/etc/jbossas/standalone/standalone.xml**.

```
<property name="org.uberfire.nio.git.daemon.host"
value="10.233.159.148"/>
<property name="org.uberfire.nio.git.ssh.host"
value="10.233.159.148"/>
```

Once the setup has been done, you can create a new AMI from your instance.

### Creating new AMI from Configured Instance

1. In the main menu, go to **INSTANCES** → **Instances**.
2. Locate your configured instance and click **Actions** → **Image** → **Create Image**.



3. In the **Create Image** dialog window, specify the image details and click **Create Image**.

## 11.4. RUNNING RED HAT JBOSS BPM SUITE ON VIRTUAL MACHINE INSTANCE

### Running Red Hat JBoss BPM Suite on VM Instance

1. Start Red Hat JBoss EAP by executing the command:

```
~]# /etc/init.d/jbossas start
```

Alternatively, you can use the command with option **stop** (or **restart**) to stop (or restart) the Red Hat JBoss EAP.

The following message appears:

```
Starting jbossas:                                     [ OK
]
```

If the deployment finished successfully, the **business-central.war.dodeploy** file in **/usr/share/jbossas/standalone/deployments/** changes to **business-central.war.deployed**.

2. To log in to Business Central, navigate to **http://PUBLIC\_DNS\_ADDRESS:8080/business-central** in a web browser.

## CHAPTER 12. INTEGRATING RED HAT JBOSS BPM SUITE WITH RED HAT JBOSS FUSE

Red Hat JBoss Fuse integration allows users of Red Hat JBoss Fuse to complement their integration solution with additional features provided by Red Hat JBoss BPM Suite and Red Hat JBoss BRMS.

Red Hat JBoss BPM Suite integration is provided by two **features.xml** files:

- **drools-karaf-features-VERSION-features.xml**  
This file provides core Red Hat JBoss BPM Suite and Red Hat JBoss BRMS features, which defines the OSGi features that can be deployed into Red Hat JBoss Fuse. This file is a part of the Red Hat JBoss BPM Suite and Red Hat JBoss BRMS product. OSGi users can install features from this file in order to install Red Hat JBoss BRMS engine or Red Hat JBoss BPM Suite engine into Red Hat JBoss Fuse and use it in their applications.
- **karaf-features-VERSION-features.xml**  
This file provides additional features used for integrating Red Hat JBoss BPM Suite and Red Hat JBoss BRMS with Apache Camel, primarily in Red Hat JBoss Fuse. This file is part of the Integration Pack and it defines OSGi features that enable integration with Apache Camel and SwitchYard. In addition to the **karaf-features** XML file, the Integration Pack also contains a **features.xml** file for quick starts.
- **drools-karaf-features-VERSION-features-fuse-6\_3.xml**  
This file is used for integration of Red Hat JBoss BPM Suite with Red Hat JBoss Fuse 6.3.0.

For further information about integration of Red Hat JBoss BPM Suite with Red Hat JBoss Fuse, see the [Install Integration Pack](#) chapter of the *Red Hat JBoss Fuse Integration Guide*.

### 12.1. CORE RED HAT JBOSS BPM SUITE AND RED HAT JBOSS BRMS FEATURES

Core Red Hat JBoss BPM Suite and Red Hat JBoss BRMS features are provided by one of the following files:

- For integration with Red Hat JBoss Fuse 6.2.1, use the **drools-karaf-features-VERSION-features.xml** file.
- For integration with Red Hat JBoss Fuse 6.3.0, use the **drools-karaf-features-VERSION-features-fuse-6\_3.xml** file  
**VERSION** is the version of Red Hat JBoss BPM Suite you are using, for example **6.5.0.Final-redhat-9**. See the [Supported Component Versions](#) chapter of the *Red Hat JBoss BPM Suite Installation Guide*.

The files are present in the product Maven repository (**org/drools/drools-karaf-features**) or the **jboss-brms-bpmsuite-VERSION-redhat-VERSION-fuse-features.zip** file. These files provide the following features:

- **drools-common**
- **drools-module**
- **drools-templates**
- **drools-decisiontable**

- **drools-jpa**
- **kie**
- **kie-ci**
- **kie-spring**
- **kie-aries-blueprint**
- **jbpn-commons**
- **jbpn-human-task**
- **jbpn**
- **droolsjbpn-hibernate**
- **h2**

The following table provides example of use cases for some of the features listed above.

**Table 12.1. Features and Use Case Examples**

| Feature                                | Use Case  |
|--|---|
| <b>drools-module</b>                   | Use the Red Hat JBoss BRMS engine for rules evaluation, without requiring persistence, processes, or decision tables.   |
| <b>drools-jpa</b>                      | Use the Red Hat JBoss BRMS engine for rules evaluation with persistence and transactions, but without requiring processes or decision tables. The <b>drools-jpa</b> feature already includes <b>drools-module</b> , however you may also need to install the <b>droolsjbpn-hibernate</b> feature, or ensure there is a compatible hibernate bundle installed. |
| <b>drools-decisiontable</b>            | Use the Red Hat JBoss BRMS engine with decision tables.   |
| <b>jbpn</b>                            | Use the Red Hat JBoss BPM Suite (or Red Hat JBoss BRMS engine with processes). The <b>jbpn</b> feature already includes <b>drools-module</b> and <b>drools-jpa</b> . You may also need to install the <b>droolsjbpn-hibernate</b> feature, or ensure that there is a compatible hibernate bundle installed.   |
| <b>jbpn</b> and <b>jbpn-human-task</b> | Use the Red Hat JBoss BPM Suite (or Red Hat JBoss BRMS engine with processes) with Human Task.  |

| Feature  | Use Case  |
|--|---|
| core engine JARs and <b>kie-ci</b>               | Use Red Hat JBoss BRMS or Red Hat JBoss BPM Suite with <b>KieScanner</b> (KIE-CI) to download kJARs from a Maven repository.      |
| <b>kie-spring</b>                                | Use KIE-Spring integration. See <a href="#">the section called “kie-spring Feature Further Information”</a> for more information. |
| <b>kie-spring</b> and <b>kie-aries-blueprint</b> | Use KIE-Aries-Blueprint integration.  |

### kie-spring Feature Further Information

- Use `org.drools.osgi.spring.OsgiKModuleBeanFactoryPostProcessor` instead of `org.kie.spring.KModuleBeanFactoryPostProcessor` to postprocess KIE elements in an OSGi environment.
- Do not install the **drools-module** feature before the **kie-spring** feature. Otherwise, the **drools-compiler** bundle does not detect packages exported by **kie-spring**.  
Run `osgi:refresh drools-compiler_bundle_ID` if you have installed the features in the incorrect order to force **drools-compiler** to rebuild its Import-Package metadata.

## 12.2. ADDITIONAL FEATURES FOR SWITCHYARD AND APACHE CAMEL INTEGRATION

The following additional features for integration with SwitchYard and Apache Camel on Red Hat JBoss Fuse are provided by the integration pack:

- **fuse-bxms-switchyard-common-knowledge**
- **fuse-bxms-switchyard-rules**
- **fuse-bxms-switchyard-bpm**
- **kie-camel**
- **jbpm-workitems-camel**

The integration pack features are defined in the **karaf-features-*VERSION*-features.xml** file. This file (and supporting repositories) is located in <http://repository.jboss.org/nexus/content/repositories/public>, which is already configured for use on Red Hat JBoss Fuse out of the box in **INSTALLATION\_DIRECTORY/etc/org.ops4j.pax.url.mvn.cfg**.

The file can also be downloaded from either the Red Hat JBoss Fuse product page or Red Hat JBoss BPM Suite product page on the Red Hat Customer Portal.

## 12.3. INSTALLING AND UPDATING CORE INTEGRATION FEATURES



## NOTE

This section refers to features in the **drools-karaf-features-*VERSION*-features.xml** file. For additional integration features, see [Section 12.4, “Installing Additional Integration Features”](#).

If you have already installed an older version of the core Red Hat JBoss BPM Suite and Red Hat JBoss BRMS features (for example, **drools-karaf-features-6.2.0.Final-redhat-6-features.xml**), you need to remove them and all associated files before installing the most recent **features.xml** file.

### Procedure: Removing Existing drools-karaf-features Installation

1. Start the Red Hat JBoss Fuse console using:

```
$ ./INSTALLATION_DIRECTORY/bin/fuse
```

2. Uninstall old features or applications that used the previous **features.xml** file. For example:

```
JBossFuse:karaf@root> features:uninstall drools-module
JBossFuse:karaf@root> features:uninstall jbpm
JBossFuse:karaf@root> features:uninstall kie-ci
```

3. Search for references of bundles using **drools**, **kie**, or **jbpm**, and remove them:

```
karaf@root> list -t 0 -s | grep drools
karaf@root> list -t 0 -s | grep kie
karaf@root> list -t 0 -s | grep jbpm
```

To remove the bundles:

```
karaf@root> osgi:uninstall BUNDLE_ID
```

4. Remove the old **drools-karaf-features** URL:

```
karaf@root> features:removeurl mvn:org.drools/drools-karaf-features/6.2.0.Final-redhat-VERSION/xml/features
```

5. Restart Red Hat JBoss Fuse.

To install the **drools-karaf-features**:

### Procedure: Installing Core Red Hat JBoss BPM Suite and Red Hat JBoss BRMS Features

1. Configure required repositories:

- Edit the **INSTALLATION\_DIRECTORY/etc/org.ops4j.pax.url.mvn.cfg** file in your Red Hat JBoss Fuse installation and add the following entry to the **org.ops4j.pax.url.mvn.repositories** variable (note that entries are separated by , \):
  - <https://maven.repository.redhat.com/ga/>

2. Start Red Hat JBoss Fuse:

```
$ ./INSTALLATION_DIRECTORY/bin/fuse
```

3. Add a reference to the core features file by running the following console command:  
For Red Hat JBoss Fuse 6.2.1, use:

```
JBossFuse:karaf@root> features:addurl mvn:org.drools/drools-karaf-features/VERSION/xml/features
```

For Red Hat JBoss Fuse 6.3.0, use:

```
JBossFuse:karaf@root> features:addurl mvn:org.drools/drools-karaf-features/VERSION/xml/features-fuse-6_3
```

For example:

```
features:addurl mvn:org.drools/drools-karaf-features/6.4.0.Final-redhat-10/xml/features-fuse-6_3
```

To see the current **drools-karaf-features** version, see the [Supported Component Versions](#) chapter of the *Red Hat JBoss BPM Suite Installation Guide*.

4. You can now install the features provided by this file by running, for example, the following console command:

```
JBossFuse:karaf@root> features:install jbpm
```

## 12.4. INSTALLING ADDITIONAL INTEGRATION FEATURES

Use the following procedure for additional integration with SwitchYard and Apache Camel.

### Procedure: SwitchYard and Apache Camel Integration

1. Download the **fuse-integration** package that is aligned with your version of Red Hat JBoss Fuse.



#### NOTE

For instance, if you want to use the **6.2.0.redhat-117** version of Red Hat JBoss Fuse, you need to install the **fuse-6.2.0.redhat-117** Red Hat JBoss Fuse integration features.

2. Add the remote Maven repository that contains the fuse dependencies to your **karaf** instance:
  - Edit **FUSE\_HOME/etc/org.ops4j.pax.url.mvn.cfg**
3. Update the Drools features URL:

```
JBossFuse:karaf@root> features:addurl mvn:org.switchyard.karaf/mvn:org.switchyard.karaf/switchyard/SWITCHYARD_VERSION/xml/core-features
```



```
JBossFuse:karaf@root> features:addurl
mvn:org.jboss.integration.fuse/karaf-features/1.0.0.redhat-
VERSION/xml/features
```

Additionally, update the **drools-karaf-features** URL. For Red Hat JBoss Fuse 6.2.1, use:

```
JBossFuse:karaf@root> features:addurl mvn:org.drools/drools-karaf-
features/VERSION/xml/features
```

For Red Hat JBoss Fuse 6.3.0, use:

```
JBossFuse:karaf@root> features:addurl mvn:org.drools/drools-karaf-
features/VERSION/xml/features-fuse-6_3
```

To see the current **drools-karaf-features** version, see the [Supported Component Versions](#) chapter of the *Red Hat JBoss BPM Suite Installation Guide*.

4. You can now install the features provided for SwitchYard and Apache Camel integration by running, for example, the following console command:

```
JBossFuse:karaf@root> features:install fuse-bxms-switchyard-rules
JBossFuse:karaf@root> features:install kie-camel
JBossFuse:karaf@root> features:install jbpm-workitems-camel
```

## 12.5. CONFIGURING DEPENDENCIES

When you configure KIE, Red Hat JBoss BRMS, or Red Hat JBoss BPM Suite in your application, you can follow one of the following approaches to build your OSGi application bundles:

- Bundle required dependencies into your application bundle. In this approach, you declare all required artifacts as runtime dependencies in your **pom.xml**. Hence, you need not import the packages that provide these artifacts that you have already added as dependencies.
- Import the required dependencies into the application bundle. This is a preferred approach for building OSGi bundles as it adheres to the principles of OSGi framework. In this approach, you declare only the API JARs (such as **org.kie:kie-api**) as dependencies in your application bundle. You will need to install the required Red Hat JBoss BRMS and Red Hat JBoss BPM Suite bundles and then import them in your application.



### WARNING

The **MVELUserGroupCallback** class fails to initialize in an OSGi environment. Do *not* use or include **MVELUserGroupCallback** as it is not designed for production purposes.

## 12.6. INSTALLING RED HAT JBOSS FUSE INTEGRATION QUICK START APPLICATIONS

The following features for Red Hat JBoss Fuse integration quick start applications are provided by `org/jboss/integration/fuse/quickstarts/karaf-features/VERSION/karaf-features-VERSION-features.xml`:

- `fuse-bxms-quickstart-switchyard-bpm-service`
- `fuse-bxms-quickstart-switchyard-rules-camel-cbr`
- `fuse-bxms-quickstart-switchyard-rules-interview`
- `fuse-bxms-quickstart-switchyard-rules-interview-container`
- `fuse-bxms-quickstart-switchyard-rules-interview-dtable`
- `fuse-bxms-quickstart-switchyard-library`
- `fuse-bxms-quickstart-switchyard-helpdesk`
- `fuse-bxms-quickstart-camel-blueprint-drools-decision-table`
- `fuse-bxms-quickstart-camel-spring-drools-decision-table`
- `fuse-bxms-quickstart-camel-jbpm-workitems`

This file (and supporting repositories) is located in <http://repository.jboss.org/nexus/content/repositories/public>, which is already configured for use on Red Hat JBoss Fuse out of the box in `INSTALLATION_DIRECTORY/etc/org.ops4j.pax.url.mvn.cfg`.

### Procedure: Installing Quick Start Applications

1. Add a reference to the features file by running the following console command:

```
JBossFuse:karaf@root> features:addurl  
mvn:org.jboss.integration.fuse.quickstarts/karaf-  
features/1.0.0.redhat-VERSION/xml/features
```

2. You can now install the quick start applications provided by this features file by running, for example, the following console command:

```
JBossFuse:karaf@root> features:install fuse-bxms-quickstart-  
switchyard-bpm-service
```

### Procedure: Downloading and Installing Quick Start ZIP Files

1. Download the quick start application ZIP file.
2. Unpack the contents of the quick starts directory into your existing `INSTALLATION_DIRECTORY/quickstarts` directory.
3. Unpack the contents of the system directory into your existing `INSTALLATION_DIRECTORY/system` directory.

## 12.6.1. Testing Your First Quick Start Application

**Procedure: Testing Quick Start Application**

1. Start Red Hat JBoss Fuse:

```
$ ./INSTALLATION_DIRECTORY/bin/fuse
```

2. Install and start the **switchyard-bpm-service** by running the following console command:

```
JBossFuse:karaf@root> features:install fuse-bxms-quickstart-  
switchyard-bpm-service
```

**NOTE**

Any dependent features specified by the application's features file will be installed automatically.

3. Submit a web service request to invoke the SOAP gateway.
  - a. Open a terminal window and navigate to the associated quick start directory that was unpacked from the quick start application ZIP file (in this case, **switchyard-bpm-service**).
  - b. Run the following command:

```
$ mvn clean install
```

**NOTE**

You will need the following repositories configured in your **settings.xml** file:

- <http://maven.repository.redhat.com/ga/>
- <http://repository.jboss.org/nexus/content/repositories/public/>

- c. Run the following command:

```
$ mvn exec:java -Pkaraf
```

4. You will receive the following response:

```
SOAP Reply:
<soap:Envelope
xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header xmlns:SOAP-
ENV="http://schemas.xmlsoap.org/soap/envelope/">
    <soap:Body>
      <ns2:submitOrderResponse xmlns:ns2="urn:switchyard-
quickstart:bpm-service:1.0">
        <orderId>test1</orderId>
        <accepted>true</accepted>
        <status>Thanks for your order, it has been shipped!</status>
```

```
        </ns2:submitOrderResponse>
    </soap:Body>
</soap:Envelope>
```

## CHAPTER 13. INTEGRATING RED HAT JBOSS BPM SUITE WITH RED HAT SINGLE SIGN-ON

Red Hat Single Sign-On (RH-SSO) is a Single Sign-On solution that you can use for securing your browser applications and your REST web services. This chapter describes how you can integrate RH-SSO with Red Hat JBoss BPM Suite and leverage its features.

Integrating with RH-SSO brings an integrated SSO and IDM (Identity Management) environment for Red Hat JBoss BPM Suite. The session management feature of RH-SSO allows you to use different Red Hat JBoss BPM Suite environments on the web by authenticating only once.

For more information on RH-SSO, see the [RH-SSO documentation](#).

### Red Hat Single Sign On Integration Points

You can integrate RH-SSO with Intelligent Process Servers using the following integration points:

- **Business Central authentication through an RH-SSO server**  
Authenticating Red Hat JBoss BPM Suite Business Central through RH-SSO involves securing both the Business Central web client and remote services through RH-SSO. This integration enables you to connect to Business Central using either web interface or a remote service consumer through RH-SSO.
- **Intelligent Process Server authentication through an RH-SSO server**  
Authenticating Red Hat JBoss BPM Suite Intelligent Process Server through RH-SSO involves securing the remote services provided by the Intelligent Process Server as it does not provide a web interface for server authentication. This enables any remote Red Hat JBoss BPM Suite service consumer (user or a service) to authenticate through RH-SSO.
- **Third-party client authentication through an RH-SSO server**  
Authenticating a third-party client through an RH-SSO server involves third-party clients to authenticate themselves using RH-SSO to consume the remote service endpoints provided by Business Central and Intelligent Process Server, such as the REST API or remote file system services.

The following sections describe how to achieve RH-SSO integration through these integration points:

### 13.1. BUSINESS CENTRAL AUTHENTICATION THROUGH RH-SSO

To authenticate Business Central through RH-SSO:

1. Set up and run an RH-SSO server with a realm client for Business Central.
2. Install and set up the RH-SSO client adapter for EAP.
3. Secure Business Central Remote Service using RH-SSO.
4. Create an RH-SSO client and configure the RH-SSO client adapter for Dashbuilder (BAM).

#### 13.1.1. Setting Up RH-SSO with Realm Client for Business Central

Security realms are used to restrict access for the different applications resources. It is advised to create a new realm whether your RH-SSO instance is private or shared amongst other products. You can keep the master realm as a place for super administrators to create and manage the realms in your system. If you are integrating with an RH-SSO instance that is shared with other product installations to achieve Single Sign-On with those applications, all those applications must use the same realm.

Here is how you can install an RH-SSO server and create a security realm for Business Central:

### Procedure: Setting Up RH-SSO with Realm Client

1. Download RH-SSO from the [DOWNLOADS](#) section of the Red Hat Customer Portal.
2. Install and configure a basic RH-SSO standalone server. To do this, follow the instructions in chapter [Install and Boot](#) of the *Red Hat Single Sign On Getting Started Guide*. For production environment settings, consult the *Red Hat Single Sign On Server Administration Guide*.

#### NOTE

If you want to run both RH-SSO and Red Hat JBoss BPM Suite servers on the same machine, ensure that you avoid port conflicts. To do so, do one of the following:

- Update the `RHSSO_HOME/standalone/configuration/standalone.xml` file and set a port offset to 100. For example:

```
<socket-binding-group name="standard-sockets" default-interface="public" port-offset="${jboss.socket.binding.port-offset:100}">
```

- Use an environment variable to run the server:

```
bin/standalone.sh -Djboss.socket.binding.port-offset=100
```

3. Start the RH-SSO server using the following command from `RHSSO_HOME/bin`:

```
./standalone.sh
```

Once the RH-SSO server starts, open <http://localhost:8180/auth/admin> in a web browser and log in using your admin credentials that you created while installing RH-SSO. When you login for the first time, you can set up the initial user using the new user registration form.

4. In the RH-SSO Admin Console, click the **Realm Settings** left menu item.
5. On the **Realm Settings** page, click **Add Realm**.  
The **Add realm** page opens.
6. On the **Add realm** page, provide a name for the realm and click **Create**.
7. Click the **Clients** left menu item and click **Create**.  
The **Add Client** page opens.
8. On the **Add Client** page, provide the required information to create a new client for your realm. For example:

- **Client ID:** kie
- **Client protocol:** openid-connect
- **Root URL:** `http://localhost:8080/business-central`

- Click **Save** to save your changes.

Once you create a new client, its **Access Type** is set to **public** by default. Change it to **confidential**.

At this point, the RH-SSO server is configured with a realm with a client for Red Hat JBoss BPM Suite applications (Business Central, in this example) and running and listening for HTTP connections at **localhost : 8180**. This realm provides different users, roles, and sessions for the Red Hat JBoss BPM Suite applications.

### 13.1.2. Setting Up RH-SSO Client Adapter for EAP

To set up the RH-SSO client adapter for EAP:

- Install the RH-SSO adapter for EAP.
- Configure the Red Hat JBoss BPM Suite application and the RH-SSO client adapter.

#### Procedure: Installing the RH-SSO Adapter for Red Hat JBoss EAP 6 and 7

- Install Red Hat JBoss EAP 6.4.X or 7.0.  
For version 6, see chapter [Installation Instructions](#) from the *Red Hat JBoss Enterprise Application Platform Installation Guide*.  
  
For version 7, see chapter [Installing JBoss EAP](#) from the *Red Hat JBoss Enterprise Application Platform Installation Guide*.
- Install Red Hat JBoss BPM Suite in the freshly installed JBoss EAP.  
If you configure RH-SSO adapter by making changes in **standalone.xml**, and then unzip Red Hat JBoss BPM Suite, you may overwrite and lose the RH-SSO adapter configuration.
- Download the EAP adapter from the [Red Hat Customer Portal](#).
- Unzip and install the adapter. For installation instructions, see section [JBoss EAP Adapter](#) from the *Red Hat Single Sign On Securing Applications and Services Guide*.
- For version 7, go to **EAP\_HOME/standalone/configuration** and open the **standalone.xml** and **standalone-full.xml** files. Delete the **<single-sign-on/>** element from both of them.  
You do not need to perform this step for Red Hat JBoss EAP 6.

#### Procedure: Configuring the RH-SSO Adapter

- Navigate to **EAP\_HOME/standalone/configuration** in your EAP installation and edit **standalone.xml** to add the RH-SSO subsystem configuration. For example:

```
<subsystem xmlns="urn:jboss:domain:keycloak:1.1">
  <secure-deployment name="business-central.war">
    <realm>demo</realm>
    <realm-public-
key>MIGfMA0GCSqGSIb3DQEBAQUAA4GNADCBiQKBgQCrVrCuTtArbgaZzL1hvh0xtL5m
c7o0NqPVnYXkLvgcwIC3BjLGW1tGEGoJaXDuSaRllobm53JBhJx33UNv+5z/UMG4kytB
WxheNVKnL6GgqINabMaFfPLPCF8kAgKnsi79NMo+n6KnSY8YeUmec/p2vj02NjsSAVcw
EQMVhJ31LwIDAQAB</realm-public-key>
    <auth-server-url>http://localhost:8180/auth</auth-server-url>
    <ssl-required>external</ssl-required>
```

```

    <enable-basic-auth>true</enable-basic-auth>
    <resource>kie</resource>
    <credential name="secret">759514d0-dbb1-46ba-b7e7-
ff76e63c6891</credential>
    <principal-attribute>preferred_username</principal-attribute>
  </secure-deployment>
</subsystem>

```

Here,

- **secure-deployment name**: Name of your application's WAR file.
- **realm**: Name of the realm that you created for the applications to use.
- **realm-public-key**: The public key of the realm you created. You can find the key in the **Keys** tab in the **Realm settings** page of the realm you created in the RH-SSO Admin Console. If you do not provide a value for **realm-public-key**, the server retrieves it automatically.
- **auth-server-url**: The URL for the RH-SSO authentication server.
- **enable-basic-auth**: The setting to enable basic authentication mechanism, so that the clients can use both token-based and basic authentication approaches to perform the requests.
- **resource**: The name for the client that you created.
- **credential name**: The secret key for the client you created. You can find the key in the **Credentials** tab on the **Clients** page of the RH-SSO Admin Console.
- **principal-attribute**: The login name of the user. If you do not provide this value, your User Id is displayed in the application instead of your user name.



#### NOTE

The RH-SSO server converts the user names to lowercase. Therefore, after integration with RH-SSO, your user name will appear in lowercase in Business Central. If you have user names in upper-case letters hard coded in business processes, the application may not be able to identify the upper-case user.

2. Navigate to **EAP\_HOME/bin/** and start the EAP server using the following command:

```
./standalone.sh
```



#### NOTE

You can also configure RH-SSO adapter for EAP by updating your applications WAR file to use the RH-SSO security subsystem. However, the recommended approach is configuring the adapter through the RH-SSO subsystem. This means that you are updating EAP configuration instead of applying the configuration on each WAR file.

### 13.1.3. Adding a New User



To add new users and assign them a role to access Business Central:

1. Log in to the RH-SSO Admin Console and open the realm to which you wish to add a user.
2. Click the **Users** left menu item under the **Manage** section.  
An empty user list page called **Users** opens.
3. Click the **Add User** button on the empty user list to start creating your new user.  
An **Add user** page opens.
4. Provide user information on the **Add user** page and click **Save**.
5. Set a new password under the **Credentials** tab.
6. Assign the new user one of the roles that allow access to Business Central. For example, **admin** or **developer** role.  
Define the roles as realm roles in the **Realm Roles** tab under the **Roles** section.
7. Click **Role Mappings** tab on the **Users** page to assign roles.

You can now log in to your Red Hat JBoss BPM Suite application (in this example, Business Central) once the server is running using the user credentials you just created.

#### 13.1.4. Securing Business Central Remote Service Using RH-SSO

Business Central provides different remote service endpoints that can be consumed by third-party clients using remote API. To authenticate those services through RH-SSO, you must disable a security filter called **BasicAuthSecurityFilter**. To do this, follow these steps:

##### Procedure: Disabling BasicAuthSecurityFilter

1. Open your application deployment descriptor file (**WEB-INF/web.xml**) and apply the following changes to it:
  - Remove the following lines to remove the servlet filter and its mapping for class **org.uberfire.ext.security.server.BasicAuthSecurityFilter**:

```
<filter>
  <filter-name>HTTP Basic Auth Filter</filter-name>
  <filter-
class>org.uberfire.ext.security.server.BasicAuthSecurityFilter</f
ilter-class>
  <init-param>
    <param-name>realmName</param-name>
    <param-value>KIE Workbench Realm</param-value>
  </init-param>
</filter>

<filter-mapping>
  <filter-name>HTTP Basic Auth Filter</filter-name>
  <url-pattern>/rest/*</url-pattern>
  <url-pattern>/maven2/*</url-pattern>
  <url-pattern>/ws/*</url-pattern>
</filter-mapping>
```

- Add the following lines to add the **security-constraint** for the url-patterns that you have removed from the filter mapping:

```
<security-constraint>
  <web-resource-collection>
    <web-resource-name>remote-services</web-resource-name>
    <url-pattern>/rest/*</url-pattern>
    <url-pattern>/maven2/*</url-pattern>
    <url-pattern>/ws/*</url-pattern>
  </web-resource-collection>
  <auth-constraint>
    <role-name>rest-all</role-name>
  </auth-constraint>
</security-constraint>
```















2. Save your changes.

### 13.1.5. Securing Business Central File System Services Using RH-SSO

To consume other remote services, such as file systems (for example, a remote GIT service), you need to specify a correct RH-SSO login module. First, generate a JSON configuration file:

1. Navigate to the **RH-SSO Admin Console** located at <http://localhost:8080/auth/admin>.
2. Click the **Clients** left menu item.
3. Create a new client with the following settings:
  - Set **Client ID** as **kie-git**.
  - Set **Access Type** as **confidential**.
  - Disable the **Standard Flow Enabled** option.
  - Enable the **Direct Access Grants Enabled** option.

[Clients](#) > kie-gitKie-git [Settings](#)[Credentials](#)[Roles](#)[Mappers](#) [Scope](#) [Revocation](#)[Sessions](#) [Offline Access](#) [Clustering](#)[Installation](#) 

|  |   |
|--|---|
| Client ID                     | <input type="text" value="kie-git"/>                                      |
| Name                          | <input type="text"/>  |
| Description                   | <input type="text"/>  |
| Enabled                       | <input checked="" type="checkbox"/> ON <input type="checkbox"/>           |
| Consent Required              | <input type="checkbox"/> OFF <input checked="" type="checkbox"/>          |
| Client Protocol               | <input type="text" value="openid-connect"/>                               |
| Client Template               | <input type="text"/>  |
| Access Type                   | <input type="text" value="confidential"/>                                 |
| Standard Flow Enabled         | <input type="checkbox"/> OFF <input checked="" type="checkbox"/>          |
| Direct Access Grants Enabled  | <input checked="" type="checkbox"/> ON <input type="checkbox"/>           |
| Service Accounts Enabled      | <input type="checkbox"/> OFF <input checked="" type="checkbox"/>          |
| Root URL                      | <input type="text"/>  |
| Base URL                      | <input type="text"/>  |
| Admin URL                     | <input type="text"/>  |
|  | <input type="button" value="Save"/> <input type="button" value="Cancel"/> |

- Click **Save**.
- Click the **Installation** tab at the top of the client configuration screen and choose **Keycloak OIDC JSON** as a **Format Option**.
- Click **Download**.
- Move the downloaded JSON file to an accessible directory in the server's file system or add it to the application class path.  
For more information, see chapter [JAAS plugin](#) of the *Keycloak Securing Applications and Services Guide*.

After you successfully generate and download the JSON configuration file, specify the correct RH-SSO login module in the `EAP_HOME/standalone/configuration/standalone.xml` file. By default, the security domain in Business Central is set to **other**. Replace the default values of the **login-module** in this security domain with the ones presented in the example below:

```
<security-domain name="other" cache-type="default">
  <authentication>
    <login-module
      code="org.keycloak.adapters.jaas.DirectAccessGrantsLoginModule"
      flag="required">
      <module-option name="keycloak-config-file" value="$EAP_HOME/kie-
git.json"/>
    </login-module>
  </authentication>
</security-domain>
```

The JSON file specified in the **module-option** element contains a client used for securing the remote services. Replace the `$EAP_HOME/kie-git.json` value of the **module-option** element with the

absolute path or the class path (**classpath:/EXAMPLE\_PATH/kie-git.json**) to this JSON configuration file.

At this point, all users authenticated through the RH-SSO server can clone internal GIT repositories. In the following command, change *USER\_NAME* to a RH-SSO user, for example **admin**:

```
git clone ssh://USER_NAME@localhost:8001/system
```

### 13.1.6. Creating and Configuring RH-SSO Client Adapter for BAM

Once you have created a realm client for Business Central and set up the RH-SSO client adapter for EAP, you can repeat the same steps to integrate BAM with RH-SSO. After successful integration of RH-SSO with BAM, you can navigate within Business Central and BAM without having to re-login.

#### Procedure: Integrating RH-SSO with BAM

1. In the RH-SSO Admin Console, open the security realm that you created.
2. Click the **Clients** left menu item and click **Create**.  
The **Add Client** page opens.
3. On the **Add Client** page, provide the required information to create a new BAM client for your realm. For example:
  - **Client ID**: dashbuilder
  - **Root URL**: `http://localhost:8080/dashbuilder`
  - **Client protocol**: openid-connect  
Once you create a new client, its **Access Type** is set to **public** by default. Change it to **confidential**.
4. Configure the RH-SSO client adapter for BAM. To do so, navigate to **EAP\_HOME/standalone/configuration** in your EAP installation and edit **standalone.xml** to add the RH-SSO subsystem configuration. For example:

```
<secure-deployment name="dashbuilder.war">
  <realm>demo</realm>
  <realm-public-
key>MIGfMA0GCSqGSIb3DQEBAQUAA4GNADCBiQKBgQCrVrCuTtArbgaZzL1hvh0xtL5m
c7o0NqPVnYXkLvGcwIC3BjLGw1tGEGoJaXDuSaRllobm53JBhJx33UNv+5z/UMG4kytB
WxheNVKnL6GgqINabMaFfPLPCF8kAgKnsi79NMo+n6KnSY8YeUmec/p2vj02NjsSAVcW
EQMVhJ31LwIDAQAB</realm-public-key>
  <auth-server-url>http://localhost:8180/auth</auth-server-url>
  <ssl-required>external</ssl-required>
  <resource>dashbuilder</resource>
  <enable-basic-auth>true</enable-basic-auth>
  <credential name="secret">e92ec68d-6177-4239-be05-
28ef2f3460ff</credential>
  <principal-attribute>preferred_username</principal-attribute>
</secure-deployment>
```

Here,

- **secure-deployment name**: The name of the BAM war file being deployed.

- **realm-public-key**: The public key of the realm you created.
  - **resource**: The name of the client that you created for BAM (dashbuilder).
  - **enable-basic-auth**: The setting to enable basic authentication mechanism, so that the clients can use both token-based and basic authentication approaches to perform the requests.
  - **credential name**: The secret key for the client you created for BAM. You can find the key in the **Credentials** tab on the **Clients** page of the RH-SSO Admin Console.
  - **principal-attribute**: The login name of the user. If you do not provide this value, your User Id is displayed in the application instead of your user name.
5. Restart the EAP server and open <http://localhost:8080/dashbuilder> in a web browser to access BAM. Log in to BAM using your RH-SSO admin user credentials.  
You can now access both the applications (Business Central and BAM) without having to re-login.

## 13.2. INTELLIGENT PROCESS SERVER AUTHENTICATION THROUGH RH-SSO

The Red Hat JBoss BPM Suite Intelligent Process Server provides a REST API for third-party clients. You can integrate the Intelligent Process Server with RH-SSO to delegate the third-party clients identity management to the RH-SSO server.

Once you have created a realm client for Business Central and set up the RH-SSO client adapter for EAP, you can repeat the same steps to integrate the Intelligent Process Server with RH-SSO.

### 13.2.1. Creating Client for Intelligent Process Server on RH-SSO

To create a new client on your already created realm on RH-SSO Admin Console:

#### Procedure: Creating a Client for the Intelligent Process Server

1. In the RH-SSO Admin Console, open the security realm that you created.
2. Click the **Clients** left menu item and click **Create**.  
The **Add Client** page opens.
3. On the **Add Client** page, provide the required information to create a new client for your realm. For example:
  - **Client ID**: kie-execution-server
  - **Root URL**: <http://localhost:8080/kie-server>
  - **Client protocol**: openid-connect
4. Click **Save** to save your changes.  
Once you create a new client, its **Access Type** is set to **public** by default. Change it to **confidential** and click **Save** again.
5. Navigate to the **Credentials** tab and copy the secret key. The secret key is necessary to configure the kie-execution-server client in the next section.

### 13.2.2. Installing and Setting Up Intelligent Process Server with Client Adapter

To consume the Intelligent Process Server remote service endpoints, you must first create and assign the **kie-server** role in the RH-SSO Admin Console.



#### NOTE

If you deployed the Intelligent Process Server to a different application server than Business Central, install and configure RH-SSO on your second server as well.

#### Procedure: Setting Up the Intelligent Process Server

1. Navigate to **EAP\_HOME/standalone/configuration** in your EAP installation and edit **standalone.xml** to add the RH-SSO subsystem configuration. For example:

```
<subsystem xmlns="urn:jboss:domain:keycloak:1.1">
  <secure-deployment name="kie-server.war">
    <realm>demo</realm>
    <realm-public-
key>MIGfMA0GCSqGSIb3DQEBAQUAA4GNADCBiQKBgQCrVrCuTtArbgaZzL1hvh0xtL5m
c7o0NqPVnYXkLvGcwIC3BjLGW1tGEGoJaXDuSaRllobm53JBhjx33UNv+5z/UMG4kytB
WxheNVKnL6Ggq1NabMaFfPLPCF8kAgKnsi79NMo+n6KnSY8YeUmec/p2vj02NjsSAVcW
EQMVhJ31LwIDAQAB</realm-public-key>
    <auth-server-url>http://localhost:8180/auth</auth-server-url>
    <ssl-required>external</ssl-required>
    <resource>kie-execution-server</resource>
    <enable-basic-auth>true</enable-basic-auth>
    <credential name="secret">03c2b267-7f64-4647-8566-
572be673f5fa</credential>
    <principal-attribute>preferred_username</principal-attribute>
  </secure-deployment>
</subsystem>

<system-properties>
  <property name="org.kie.server.sync.deploy" value="false"/>
</system-properties>
```

Here,

- **secure-deployment name**: Name of your application WAR file.
- **realm**: Name of the realm that you created for the applications to use.
- **realm-public-key**: The public key of the realm you created. You can find the key in the **Keys** tab in the **Realm settings** page of the realm you created in the RH-SSO Admin Console. If you do not provide a value for this public key, the server retrieves it automatically.
- **auth-server-url**: The URL for the RH-SSO authentication server.
- **resource**: The name for the server client that you created.
- **enable-basic-auth**: The setting to enable basic authentication mechanism, so that the clients can use both token-based and basic authentication approaches to perform the requests.

- **credential name**: The secret key of the server client you created. You can find the key in the **Credentials** tab on the **Clients** page of the RH-SSO Admin Console.
  - **principal-attribute**: The login name of the user. If you do not provide this value, your User Id is displayed in the application instead of your user name.
2. Save your configuration changes in **standalone.xml**.
  3. Use the following command to restart the EAP server and run the Intelligent Process Server.

```
EXEC_SERVER_HOME/bin/standalone.sh -Dorg.kie.server.id=<ID> -
Dorg.kie.server.user=<USER> -Dorg.kie.server.pwd=<PWD> -
Dorg.kie.server.location=<LOCATION_URL> -Dorg.kie.server.controller=
<CONTROLLER_URL> -Dorg.kie.server.controller.user=<CONTROLLER_USER>
-Dorg.kie.server.controller.pwd=<CONTROLLER_PASSWORD>
```

Here is an example:

```
EXEC_SERVER_HOME/bin/standalone.sh -Dorg.kie.server.id=kieserver1 -
Dorg.kie.server.user=kieserver -Dorg.kie.server.pwd=password -
Dorg.kie.server.location=http://localhost:8080/kie-
server/services/rest/server -
Dorg.kie.server.controller=http://localhost:8080/business-
central/rest/controller -
Dorg.kie.server.controller.user=kiecontroller -
Dorg.kie.server.controller.pwd=password
```

4. Once the Intelligent Process Server is running, you can check the server status. In the following command, **kieserver** is a user name with the **kie-server** role and password **password**:

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

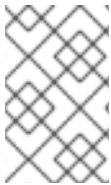
Token-based authorization is also supported for communication between Business Central and the Intelligent Process Server. You can use the complete token as a system property of your application server, instead of the user name and password, for your applications. However, you must ensure that the token does not expire for the period of interaction between the applications, as it is not automatically refreshed. To get the token, see [Section 13.3.2, “Token-Based Authentication”](#).

For the Business Central to manage the Intelligent Process Server using the tokens:

- Set the **org.kie.server.token** property.  
In such case, do not set the **org.kie.server.user** and **org.kie.server.pwd** properties. The Business Central will then use the **Authorization: Bearer \$TOKEN** authentication method.

If you want to use the REST API using the token-based authentication:

- Set the **org.kie.server.controller.token** property.  
In such case, do not set the **org.kie.server.controller.user** and **org.kie.server.controller.pwd** properties.

**NOTE**

As the Intelligent Process Server is unable to refresh the token, use a high-lifespan token. A token's lifespan must not exceed January 19 2038. Check with your security best practices to see whether this is a suitable solution for your environment.

## 13.3. THIRD-PARTY CLIENT AUTHENTICATION THROUGH RH-SSO

To use the different remote services provided by Business Central or by the Intelligent Process 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 assigned the following roles:

- **rest-all**: For using the Business Central remote services.
- **kie-server**: For using the Intelligent Process 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.

### 13.3.1. Basic Authentication

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

- For web based remote repositories endpoint:

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

- For the Intelligent Process Server:

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

### 13.3.2. Token-Based Authentication

If you want to opt for a more secure option of authentication, you can consume the remote services from both Business Central and Intelligent Process Server using a granted token provided by RH-SSO.

#### Procedure: Obtaining and Using Token for Authorizing Remote Calls

1. In the RH-SSO Admin Console, click the **Clients** left menu item and click **Create** to create a new client.  
The **Add Client** page opens.



2. On the **Add Client** page, provide the required information to create a new client for your realm. For example:
  - **Client ID**: kie-remote
  - **Client protocol**: openid-connect
3. Click **Save** to save your changes.
4. Change the token settings in **Realm Settings**:
  - a. In the RH-SSO Admin Console, click the **Realm Settings** left menu item.
  - b. Click the **Tokens** tab.
  - c. Change the value for **Access Token Lifespan** to **15** minutes.  
This gives you enough time to get a token and invoke the service before it expires.
  - d. Click **Save** to save your changes.
5. Once a public client for your remote clients is created, you can now obtain the token by making an HTTP request to the RH-SSO server's token endpoint using:

```
RESULT=`curl --data "grant_type=password&client_id=kie-remote&username=admin&password=password" http://localhost:8180/auth/realms/demo/protocol/openid-connect/token`
```

The user used in the command above is an RH-SSO user. For further information, see [Section 13.1.3, “Adding a New User”](#).

6. To view the token obtained from the RH-SSO server, use the following command:

```
TOKEN=`echo $RESULT | sed 's/.*access_token":'"/g' | sed 's/".*'//g'`
```

You can now use this token to authorize the remote calls. For example, if you want to check the internal Red Hat JBoss BPM Suite repositories, use the token as shown below:

```
curl -H "Authorization: bearer $TOKEN" http://localhost:8080/business-central/rest/repositories
```

## CHAPTER 14. INTEGRATION WITH SPRING

### 14.1. CONFIGURING RED HAT JBOSS BPM SUITE WITH SPRING

The `jboss-bpms-engine.zip` file contains the Spring module, which is called `kie-spring-VERSION-redhat-MINOR_VERSION.jar`.

You can configure the Spring modules:

#### As a Self Managed Process Engine

If you require a single runtime manager instance, use the **RuntimeManager** API. The **RuntimeManager** API synchronizes the process engine and task service internally.

#### As a Shared Task Service

If you require multiple runtime manager instances, use the jBPM services.



#### NOTE

Do not use the shared task service if you use Spring and your process is instantiated using the per process or per request runtime strategy.

#### 14.1.1. Integrating Spring with Runtime Manager API

To integrate Spring with the Runtime Manager API, include the following factory beans:

- `org.kie.spring.factorybeans.RuntimeEnvironmentFactoryBean`
- `org.kie.spring.factorybeans.RuntimeManagerFactoryBean`
- `org.kie.spring.factorybeans.TaskServiceFactoryBean`



#### NOTE

**TaskServiceFactoryBean** is required only for shared task service.

#### RuntimeEnvironmentFactoryBean

**RuntimeEnvironmentFactoryBean** produces **RuntimeEnvironment** instances consumed by **RuntimeManager**.

You can create the following types of **RuntimeEnvironment** instances:

- **DEFAULT**: The default type.
- **EMPTY**: An empty environment.
- **DEFAULT\_IN\_MEMORY**: Same as **DEFAULT** with no persistence of the runtime engine.
- **DEFAULT\_KJAR**: Same as **DEFAULT** with knowledge assets taken from kJAR and identified by **releaseID** or GAV (Group, Artifact, Version).
- **DEFAULT\_KJAR\_CL**: Built from class path that consists of a **kmodule.xml** descriptor.

Knowledge information is required for all the **RuntimeEnvironment** types. Provide one or more of the following:

- **knowledgeBase**
- **assets**
- **releaseId**
- **groupId, artifactId, version**

For the **DEFAULT**, **DEFAULT\_KJAR**, **DEFAULT\_KJAR\_CL** types, configure persistence using **entity manager factory** or **transaction manager**.

### **RuntimeManagerFactoryBean**

**RuntimeManagerFactoryBean** creates **RuntimeManager** instances based on **runtimeEnvironment**. You can create the following **runtimeEnvironment** instances:

- **SINGLETON** (default)
- **PER\_REQUEST**
- **PER\_PROCESS\_INSTANCE**

Every **RuntimeManager** instance must have a unique ID. You can dispose of any **RuntimeManager** instance created by **RuntimeManagerFactoryBean** by calling the **close()** method.

### **TaskServiceFactoryBean**

**TaskServiceFactoryBean** creates **TaskService** instance based on the given properties. Creates a single instance only.

Properties required:

- **entity manager factory**
- **transaction manager**

When using the **TaskServiceFactoryBean**, provide the Spring transaction manager. When using a shared entity manager from Spring, you can also provide **EntityManager** instance instead of entity manager factory.

Optional properties:

- **userGroupCallback**: **MVELUserGroupCallbackImpl** by default.
- **userInfo**: **DefaultUserInfo** by default.
- **listener**: List of **TaskLifecycleEventListener** instances.

### **Sample RuntimeManager Configuration with Spring**

To create a single runtime manager Spring configuration:

1. Configure the entity manager factory and the transaction manager, for example:

```
<bean id="jbpmEMF"
class="org.springframework.orm.jpa.LocalContainerEntityManagerFactor
```

```

yBean">
  <property name="persistenceUnitName"
value="org.jbpm.persistence.spring.jta"/>
</bean>

<bean id="btmConfig" factory-method="getConfiguration"
class="bitronix.tm.TransactionManagerServices"></bean>

<bean id="BitronixTransactionManager" factory-
method="getTransactionManager"
  class="bitronix.tm.TransactionManagerServices" depends-
on="btmConfig" destroy-method="shutdown" />

<bean id="jbpmTxManager"
class="org.springframework.transaction.jta.JtaTransactionManager">
  <property name="transactionManager"
ref="BitronixTransactionManager" />
  <property name="userTransaction" ref="BitronixTransactionManager"
/>
</bean>

```

This configuration provides:

- JTA transaction manager, backed by Bitronix for unit tests or servlet containers.
- The **org.jbpm.persistence.spring.jta** entity manager factory for persistence unit.

2. Configure resources you use, for example a business process:

```

<bean id="process" factory-method="newclass pathResource"
class="org.kie.internal.io.ResourceFactory">
  <constructor-arg>
    <value>jbpm/processes/sample.bpmn</value>
  </constructor-arg>
</bean>

```

The **sample.bpmn** process is included from the class path.

3. Configure **RuntimeEnvironment** using your entity manager, transaction manager, and resources:

```

<bean id="runtimeEnvironment"
class="org.kie.spring.factorybeans.RuntimeEnvironmentFactoryBean">
  <property name="type" value="DEFAULT"/>
  <property name="entityManagerFactory" ref="jbpmEMF"/>
  <property name="transactionManager" ref="jbpmTxManager"/>
  <property name="assets">
    <map>
      <entry key-ref="process"><util:constant static-
field="org.kie.api.io.ResourceType.BPMN2"/></entry>
    </map>
  </property>
</bean>

```

4. Create **RuntimeManager**:

-

```

<bean id="runtimeManager"
class="org.kie.spring.factorybeans.RuntimeManagerFactoryBean"
destroy-method="close">
    <property name="identifier" value="spring-rm"/>
    <property name="runtimeEnvironment" ref="runtimeEnvironment"/>
</bean>

```

An example of complete configuration:

```

<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns:util="http://www.springframework.org/schema/util"
    xsi:schemaLocation="http://www.springframework.org/schema/beans
http://www.springframework.org/schema/beans/spring-beans-3.0.xsd
    http://www.springframework.org/schema/util
http://www.springframework.org/schema/util/spring-util-3.0.xsd">

    <import resource="classpath:jbpm/configuration-template/assets.xml" />

    <bean id="jbpmEMF"
class="org.springframework.orm.jpa.LocalContainerEntityManagerFactoryBean"
>
        <property name="persistenceUnitName"
value="org.jbpm.persistence.spring.jta"/>
        <property name="persistenceXmlLocation"
value="classpath:jbpm/persistence-jta.xml"/>
    </bean>

    <bean id="btmConfig" factory-method="getConfiguration"
class="bitronix.tm.TransactionManagerServices"/>

    <bean id="BitronixTransactionManager" factory-
method="getTransactionManager"
        class="bitronix.tm.TransactionManagerServices" depends-
on="btmConfig" destroy-method="shutdown" />

    <bean id="jbpmTxManager"
class="org.springframework.transaction.jta.JtaTransactionManager">
        <property name="transactionManager" ref="BitronixTransactionManager"
/>
        <property name="userTransaction" ref="BitronixTransactionManager" />
    </bean>

    <bean id="runtimeEnvironment"
class="org.kie.spring.factorybeans.RuntimeEnvironmentFactoryBean">
        <property name="type" value="DEFAULT"/>
        <property name="entityManagerFactory" ref="jbpmEMF"/>
        <property name="transactionManager" ref="jbpmTxManager"/>
        <property name="assets" ref="assets"/>
    </bean>

    <bean id="logService" class="org.jbpm.process.audit.JPAAuditLogService"
depends-on="runtimeEnvironment">
        <constructor-arg value="#{runtimeEnvironment.environment}" />
        <constructor-arg value="STANDALONE_JTA" />

```

```

    </bean>
  </beans>

```

### 14.1.2. Spring and jBPM Services

If you require multiple runtime managers, you can use jBPM services directly in your application. Due to the dynamic nature of jBPM services, processes and other assets can be added and removed without restarting your application.

To configure jBPM services:

1. Add the **kie-spring** Maven dependency into your **pom.xml**:

```

<dependencies>
  ...
  <dependency>
    <groupId>org.kie</groupId>
    <artifactId>kie-spring</artifactId>
    <version>6.5.0.Final-redhat-2</version>
  </dependency>
  ...
</dependencies>

```

For the current Maven artifact version, see chapter [Supported Component Versions](#) of the *Red Hat JBoss BPM Suite Installation Guide*.



#### NOTE

Depending on your implementation, other dependencies may be necessary, for example **spring-security**.

1. Implement the **IdentityProvider** interface:

```

import java.util.ArrayList;
import java.util.Collections;
import java.util.List;

import org.kie.internal.identity.IdentityProvider;
import org.springframework.security.core.Authentication;
import org.springframework.security.core.GrantedAuthority;
import org.springframework.security.core.context.SecurityContextHolder;

public class SpringSecurityIdentityProvider implements
IdentityProvider {

    public String getName() {

        Authentication auth =
SecurityContextHolder.getContext().getAuthentication();
        if (auth != null && auth.isAuthenticated()) {
            return auth.getName();
        }
        return "system";
    }
}

```

```

    }

    public List<String> getRoles() {
        Authentication auth =
        SecurityContextHolder.getContext().getAuthentication();
        if (auth != null && auth.isAuthenticated()) {
            List<String> roles = new ArrayList<String>();

            for (GrantedAuthority ga : auth.getAuthorities()) {
                roles.add(ga.getAuthority());
            }

            return roles;
        }

        return Collections.emptyList();
    }

    public boolean hasRole(String role) {
        return false;
    }
}

```

To configure jBPM services in a Spring application:

1. Configure the transaction manager:

```

<context:annotation-config />
<tx:annotation-driven />
<tx:jta-transaction-manager />

<bean id="transactionManager"
class="org.springframework.transaction.jta.JtaTransactionManager" />

```

2. Configure JPA and persistence:

```

<bean id="entityManagerFactory"
class="org.springframework.orm.jpa.LocalContainerEntityManagerFactory
yBean" depends-on="transactionManager">
    <property name="persistenceXmlLocation" value="classpath:/META-
INF/jbpm-persistence.xml" />
</bean>

```

3. Configure security providers:

```

<util:properties id="roleProperties"
location="classpath:/roles.properties" />

<bean id="userGroupCallback"
class="org.jbpm.services.task.identity.JBossUserGroupCallbackImpl">
    <constructor-arg name="userGroups"
ref="roleProperties"></constructor-arg>
</bean>

```

```
<bean id="identityProvider"
class="org.jbpm.spring.SpringSecurityIdentityProvider"/>
```

#### 4. Configure the runtime manager factory:

```
<bean id="runtimeManagerFactory"
class="org.kie.spring.manager.SpringRuntimeManagerFactoryImpl">
  <property name="transactionManager" ref="transactionManager"/>
  <property name="userGroupCallback" ref="userGroupCallback"/>
</bean>

<bean id="transactionCmdService"
class="org.jbpm.shared.services.impl.TransactionalCommandService">
  <constructor-arg name="emf"
ref="entityManagerFactory"></constructor-arg>
</bean>

<bean id="taskService"
class="org.kie.spring.factorybeans.TaskServiceFactoryBean" destroy-
method="close">
  <property name="entityManagerFactory" ref="entityManagerFactory"/>
  <property name="transactionManager" ref="transactionManager"/>
  <property name="userGroupCallback" ref="userGroupCallback"/>
  <property name="listeners">
    <list>
      <bean
class="org.jbpm.services.task.audit.JPATaskLifecycleEventListener">
        <constructor-arg value="true"/>
      </bean>
    </list>
  </property>
</bean>
```

The runtime manager factory is Spring context aware and can interact with Spring containers.

#### 5. Configure jBPM services as Spring beans:

```
<!-- definition service -->
<bean id="definitionService"
class="org.jbpm.kie.services.impl.bpmn2.BPMN2DataServiceImpl"/>

<!-- runtime data service -->
<bean id="runtimeDataService"
class="org.jbpm.kie.services.impl.RuntimeDataServiceImpl">
  <property name="commandService" ref="transactionCmdService"/>
  <property name="identityProvider" ref="identityProvider"/>
  <property name="taskService" ref="taskService"/>
</bean>

<!-- -- deployment service -->
<bean id="deploymentService"
class="org.jbpm.kie.services.impl.KModuleDeploymentService" depends-
on="entityManagerFactory" init-method="onInit">
  <property name="bpmn2Service" ref="definitionService"/>
  <property name="emf" ref="entityManagerFactory"/>
```



```

    <property name="managerFactory" ref="runtimeManagerFactory"/>
    <property name="identityProvider" ref="identityProvider"/>
    <property name="runtimeDataService" ref="runtimeDataService"/>
</bean>

<!-- process service -->
<bean id="processService"
class="org.jbpm.kie.services.impl.ProcessServiceImpl" depends-
on="deploymentService">
    <property name="dataService" ref="runtimeDataService"/>
    <property name="deploymentService" ref="deploymentService"/>
</bean>

<!-- user task service -->
<bean id="userTaskService"
class="org.jbpm.kie.services.impl.UserTaskServiceImpl" depends-
on="deploymentService">
    <property name="dataService" ref="runtimeDataService"/>
    <property name="deploymentService" ref="deploymentService"/>
</bean>

<!-- register runtime data service as listener on deployment service
so it can receive notification about deployed and undeployed units -
->
<bean id="data"
class="org.springframework.beans.factory.config.MethodInvokingFactor
yBean" depends-on="deploymentService">
    <property name="targetObject" ref="deploymentService"></property>
    <property
name="targetMethod"><value>addListener</value></property>
    <property name="arguments">
        <list>
            <ref bean="runtimeDataService"/>
        </list>
    </property>
</bean>

```

## CHAPTER 15. INTEGRATION WITH ARIES BLUEPRINT

This chapter explains the integration elements of Red Hat JBoss BPM Suite specific to Apache Aries Blueprint.

### 15.1. KIE NAMESPACE

#### KieModule

The `<kie:kmodule>` element defines a collection of a KieBase and its associated KieSessions.

| Attribute | Description  |
|-----------|--|
| id        | The name to which other beans refer. Blueprint ID semantics applies. This attribute is required. |

Possible children:

- `kie:kbase`

#### KieBase

The `<kie:kbase>` element has the following attributes:

| Attribute           | Description   |
|---------------------|---|
| name                | The name of the KieBase. This attribute is required.  |
| packages            | A comma-separated list of the resource packages to be included in the KieBase.                                  |
| includes            | KieBase names to be included. All resources from the corresponding KieBases are included in the parent KieBase. |
| default             | A Boolean. Sets the <b>kbase</b> as default. Set to <b>false</b> by default.                                    |
| scope               | Possible values: <b>prototype</b> or <b>singleton</b> . Set to <b>singleton</b> by default.                     |
| eventProcessingMode | Event Processing Mode. Possible values: <b>STREAM</b> or <b>CLOUD</b> .   |
| equalsBehavior      | Possible values: <b>IDENTITY</b> or <b>EQUALITY</b> .   |

Possible children:

- `kie:ksession`

The **kmodule** element can contain multiple **kbase** elements.

#### Example 15.1. kbase Definition Example

```
<kie:kmodule id="sample_module">
  <kie:kbase name="kbase1" packages="org.drools.blueprint.sample">
```

```

    ...
</kie:kbase>
</kie:kmodule>

```

When you define a **kbase** or a **ksession**, you can set the bean scope:

- Set **scope** to **prototype** to instantiate a new bean instance every time the bean is called.
- Set **scope** to **singleton** to use the same bean instance every time the bean is called.

### KieSession

The `<kie:ksession>` element defines both stateful and stateless KieSessions. It has the following parameters:

| Attribute     | Description  |
|---------------|--|
| name          | The name of the KieSession. This attribute is required.  |
| type          | Possible values: <b>stateful</b> or <b>stateless</b> . Set to <b>stateful</b> by default.  |
| default       | A Boolean. Sets the <b>ksession</b> as default. Set to <b>false</b> by default.  |
| scope         | Possible values: <b>prototype</b> or <b>singleton</b> . Set to <b>singleton</b> by default.  |
| clockType     | Possible values: <b>REALTIME</b> or <b>PSEUDO</b> .  |
| listeners-ref | Specifies the reference to the event listeners group. For more information, see <a href="#">the section called “Defining a Group of Listeners”</a> . |

#### Example 15.2. ksession definition example

```

<kie:kmodule id="sample-kmodule">
  <kie:kbase name="dr1_kiesample3" packages="dr1_kiesample3">
    <kie:ksession name="ksession1" type="stateless"/>
    <kie:ksession name="ksession2"/>
  </kie:kbase>
</kie:kmodule>

```

### Kie:ReleaseId

The **kie:releaseId** element represents Maven GAV (Group ID, Artifact ID, and Version).

**kie:releaseId** requires the following properties:

| Attribute | Description  |
|-----------|--|
| id        | The name to which other beans refer. Blueprint ID semantics applies. |
| groupId   | Maven <b>groupId</b> .   |

| Attribute  | Description               |
|------------|---------------------------|
| artifactId | Maven <b>artifactId</b> . |
| version    | Maven <b>version</b> .    |

### Example 15.3. releaseId Definition Example

```
<kie:releaseId id="beanId" groupId="org.kie.blueprint"
               artifactId="named-artifactId" version="1.0.0-SNAPSHOT"/>
```

## Kie:Import

Red Hat JBoss BPM Suite now supports **kie-aries-blueprint** importing KIE objects from KJARs. The **kie:import** element supports the following attributes:

| Attribute       | Description  |
|-----------------|--|
| releaseId       | Reference to a bean ID. Standard Blueprint ID semantics applies.                                 |
| enableScanner   | Enable Scanner. This attribute is used only if <b>releaseId</b> is specified.                    |
| scannerInterval | Scanning Interval in milliseconds. This attribute is used only if <b>releaseId</b> is specified. |

Red Hat JBoss BPM Suite supports two modes of importing KIE objects:

### Global Import

The **kie:import** element uses the **KieServices.getKieClasspathContainer()** method to import KIE objects. For further information about KIE methods, see the [KIE Api](#) section of the *Red Hat JBoss BPM Suite Development Guide*.

### Global Import

```
<kie:import />
```

### Specific Import - ReleaseId

When using the **releaseId-ref** attribute on the import tag, only KIE objects identified by the referenced **releaseId** element are initialized and imported into the Blueprint context.

### KIE Objects Import Using releaseId

```
<kie:import releaseId-ref="namedKieSession"/>
<kie:releaseId id="namedKieSession" groupId="org.drools"
               artifactId="named-kiesession" version="{revnumber}"/>
```

You can enable the KIE scanning feature, **enableScanner**, for KieBases imported with a specific

releaseId. This feature is currently not available for global imports.

## Import KIE Objects using a releaseId - Enable Scanner

```
<kie:import releaseId-ref="namedKieSession"
           enableScanner="true" scannerInterval="1000"/>

<kie:releaseId id="namedKieSession" groupId="org.drools"
              artifactId="named-kiesession" version="{revnumber}"/>
```

If you define and enable a scanner, a **KieScanner** object is created with default values and inserted into the Blueprint container. You can get the **KieScanner** object from the Blueprint container using the **scanner** suffix.

## Retrieving the KieScanner from a Blueprint Container

```
// the implicit name would be releaseId-scanner
KieScanner releaseIdScanner =
(KieScanner)container.getComponentInstance("namedKieSession-scanner");
releaseIdScanner.scanNow();
```



### NOTE

**kie-ci** must be available on the classpath for the releaseId importing feature to work.

## 15.2. EVENT LISTENERS

Red Hat JBoss BPM Suite supports adding 3 types of listeners to KieSessions:

- **AgendaListener**
- **WorkingMemoryListener**
- **ProcessEventListener**

The **kie-aries-blueprint** module allows you to configure the listeners for KIE sessions using XML tags. The tags have identical names to the listener interfaces:

- **<kie:agendaEventListener>**
- **<kie:ruleRuntimeEventListener>**
- **<kie:processEventListener>**

The **kie-aries-blueprint** module allows you to define listeners as standalone listeners or as a group.

### Defining Standalone Listeners

Standalone listeners support the following parameters:

| Attribute | Description            |
|-----------|------------------------|
| ref       | A reference to a bean. |

#### Example 15.4. Listener Configuration Using bean:ref

```
<bean id="mock-agenda-listener" class="mocks.MockAgendaEventListener"/>
<bean id="mock-rr-listener" class="mocks.MockRuleRuntimeEventListener"/>
<bean id="mock-process-listener"
class="mocks.MockProcessEventListener"/>

<kie:kmodule id="listeners_kmodule">
  <kie:kbase name="drl_kiesample" packages="drl_kiesample">
    <kie:ksession name="ksession2">
      <kie:agendaEventListener ref="mock-agenda-listener"/>
      <kie:processEventListener ref="mock-process-listener"/>
      <kie:ruleRuntimeEventListener ref="mock-rr-listener"/>
    </kie:ksession>
  </kie:kbase>
</kie:kmodule>
```

### Defining Multiple Listeners of One Type

You can also define multiple listeners of one type for a KIE session.

#### Example 15.5. Listener Configuration: Multiple Listeners of One Type.

```
<bean id="mock-agenda-listener1" class="mocks.MockAgendaEventListener"/>
<bean id="mock-agenda-listener2" class="mocks.MockAgendaEventListener"/>

<kie:kmodule id="listeners_module">
  <kie:kbase name="drl_kiesample" packages="drl_kiesample">
    <kie:ksession name="ksession1">
      <kie:agendaEventListener ref="mock-agenda-listener1"/>
      <kie:agendaEventListener ref="mock-agenda-listener2"/>
    </kie:ksession>
  </kie:kbase>
</kie:kmodule>
```

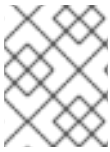
### Defining a Group of Listeners

The **kie-aries-blueprint** module allows you to group listeners. This is useful when you define a set of listeners that you want to attach to multiple sessions, or when switching from testing to production use. The following attribute is required:

| Attribute | Description       |
|-----------|-------------------|
| ID        | Unique identifier |

Possible children:

- `kie:agendaEventListener`
- `kie:ruleRuntimeEventListener`
- `kie:processEventListener`



## NOTE

The declaration order does not matter. Only one declaration of each type is allowed in a group.

### Example 15.6. Group of Listeners

```
<bean id="mock-agenda-listener" class="mocks.MockAgendaEventListener"/>
<bean id="mock-rr-listener" class="mocks.MockRuleRuntimeEventListener"/>
<bean id="mock-process-listener"
class="mocks.MockProcessEventListener"/>

<kie:kmodule id="listeners_module">
  <kie:kbase name="drl_kiesample" packages="drl_kiesample">
    <kie:ksession name="statelessWithGroupedListeners" type="stateless"
      listeners-ref="debugListeners"/>
  </kie:kbase>
</kie:kmodule>

<kie:eventListeners id="debugListeners">
  <kie:agendaEventListener ref="mock-agenda-listener"/>
  <kie:processEventListener ref="mock-process-listener"/>
  <kie:ruleRuntimeEventListener ref="mock-rr-listener"/>
</kie:eventListeners>
```

## 15.3. LOGGERS

Red Hat JBoss BPM Suite supports the following loggers:

- `ConsoleLogger`
- `FileLogger`

The `kie-aries-blueprint` module allows you to configure the loggers using XML tags with identical names:

- `<kie:consoleLogger>`
- `<kie:fileLogger>`

### Defining a Console Logger

The `<kie:consoleLogger/>` element has no attributes and must be present directly under a `<kie:ksession>` element.

### Example 15.7. Defining a Console Logger

```

<kie:kmodule id="loggers_module">
  <kie:kbase name="drl_kiesample" packages="drl_kiesample">
    <kie:ksession name="ConsoleLogger-statefulSession" type="stateful">
      <kie:consoleLogger/>
    </kie:ksession>
  </kie:kbase>
</kie:kmodule>

```

## Defining a File Logger

The `<kie:fileLogger/>` element supports the following attributes:

| Attribute | Description   |
|-----------|---|
| ID        | Unique identifier. This attribute is required.  |
| file      | Path to the log file on the disk. This attribute is required.                         |
| threaded  | Possible values: <b>true</b> or <b>false</b> . Set to <b>false</b> by default.        |
| interval  | An Integer. Specifies the interval for flushing the contents from memory to the disk. |

### Example 15.8. Defining a File Logger

```

<kie:kmodule id="loggers_module">
  <kie:kbase name="drl_kiesample" packages="drl_kiesample">
    <kie:ksession name="ConsoleLogger-statefulSession" type="stateful">
      <kie:fileLogger id="fl_logger" file="#{
systemProperties['java.io.tmpdir'] }/log1"/>
      <kie:fileLogger id="tfl_logger" file="#{
systemProperties['java.io.tmpdir'] }/log2"
        threaded="true" interval="5"/>
    </kie:ksession>
  </kie:kbase>
</kie:kmodule>

```

## Closing a FileLogger

It is recommended to close the `<kie:fileLogger>` logger to prevent memory leaks:

```

LoggerAdaptor adaptor = (LoggerAdaptor)
container.getComponentInstance("fl_logger");
adaptor.close();

```

## Defining Batch Commands

The `<kie:batch>` element allows you to define a set of batch commands for a given KIE session. The `<kie:batch>` element has no attributes and must be placed under a `<kie:ksession>` element.

### Supported Parameters for Initialization Batch Commands



- **insert-object**
  - **ref**: String. This parameter is optional.
  - **Anonymous bean**.
- **set-global**
  - **identifier**: String. This parameter is required.
  - **reg**: String. This parameter is optional.
  - **Anonymous bean**.
- **fire-all-rules**
  - **max**: Integer.
- **fire-until-halt**
- **start-process**
  - **identifier**: String. This parameter is required.
  - **ref**: String. This parameter is optional.
  - **Anonymous bean**.
- **signal-event**
  - **ref**: String. This parameter is optional.
  - **event-type**: String. This parameter is required.
  - **process-instance-id**: Integer. This parameter is optional.

### Example 15.9. Batch Commands Example

```
<kie:kmodule id="batch_commands_module">
  <kie:kbase name="drl_kiesample" packages="drl_kiesample">
    <kie:ksession name="ksessionForCommands" type="stateful">
      <kie:batch>
        <kie:insert-object ref="person2"/>
        <kie:set-global identifier="persons" ref="personsList"/>
        <kie:fire-all-rules max="10"/>
      </kie:batch>
    </kie:ksession>
  </kie:kbase>
</kie:kmodule>
```

## CHAPTER 16. CDI INTEGRATION

### 16.1. ABOUT CDI

Apart from the API based approach, Red Hat JBoss BPM Suite 6 also provides the Context and Dependency Injection (CDI) to build your custom applications. CDI is a collection of component management services for the Java EE platform that enables developers to use enterprise beans in web applications. The benefits of CDI include a simplified architecture and more reusable code.

The `jbpm-services-cdi` module provides CDI wrappers of [Kie Services](#) that enable these services to be injected in any CDI bean.



#### WARNING

A workaround is needed on the Oracle WebLogic Server for CDI to work. For more information, see [Additional Notes](#) in the *Red Hat JBoss BPM Suite Oracle WebLogic Installation and Configuration Guide*.

### 16.2. DEFINING MBEANS FOR CDI INTEGRATION

To make use of `jbpm-kie-services` in your system, you must provide some MBeans to satisfy all dependencies of the services. There are several MBeans that depend on actual scenarios.

- Entity manager and entity manager factory
- User group callback for human tasks
- Identity provider to pass authenticated user information to the services

#### Procedure

1. When running in a JEE environment such as JBoss Application Server, ensure that the mbean satisfies all requirements of the `jbpm-kie-services`:

```
public class EnvironmentProducer {

    @PersistenceUnit(unitName = "org.jbpm.domain")
    private EntityManagerFactory emf;

    @Inject
    @Selectable
    private UserGroupCallback userGroupCallback;

    @Produces
    public EntityManagerFactory getEntityManagerFactory() {
        return this.emf;
    }

    @Produces
    @RequestScoped
```

```

    public EntityManager getEntityManager() {
        EntityManager em = emf.createEntityManager();
        return em;
    }

    public void close(@Disposes EntityManager em) {
        em.close();
    }

    @Produces
    public UserGroupCallback produceSelectedUserGroupCallback() {
        return userGroupCallback;
    }
    @Produces

    public IdentityProvider produceIdentityProvider {
        return new IdentityProvider() {
            // implement IdentityProvider
        };
    }
}

```

2. Configure the **deployments/business-central.war/WEB-INF/beans.xml** file to change the current settings of the new **usergroupcallback** implementation:

```

<beans xmlns="http://java.sun.com/xml/ns/javaee"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://java.sun.com/xml/ns/javaee
http://docs.jboss.org/cdi/beans_1_0.xsd">

<alternatives>

<class>org.jbpm.services.task.identity.JAASUserGroupCallbackImpl</class>
</alternatives>

</beans>

```



## NOTE

**org.jbpm.services.task.identity.JAASUserGroupCallbackImpl** is just an example here to demonstrate the settings of the application server regardless of what it actually is (LDAP, DB, etc).

## CHAPTER 17. PERSISTENCE

The runtime data of the Process Engine can be persisted in data stores. The persistence mechanism saves the data using marshalling: the runtime data is converted into a binary dataset and the dataset is saved in the data storage.

Note that persistence is not configured by default and the engine runs without persistence.



### CUSTOM MARSHALLING MECHANISM

The runtime data is saved using marshalling (binary persistence). The marshalling mechanism is a custom serialization mechanism.

Red Hat JBoss BPM Suite will persist the following when persistence is configured:

- *Session state*: This includes the session ID, date of last modification, the session data that business rules would need for evaluation, state of timer jobs.
- *Process instance state*: This includes the process instance ID, process ID, date of last modification, date of last read access, process instance start date, runtime data (the execution status including the node being executed, variable values, etc.) and the eventtypes.
- *Work item runtime state*: This includes the work item ID, creation date, name, process instance ID, and the work item state itself.

Based on the persisted data, it is possible to restore the state of execution of all running process instances in case of failure or to temporarily remove running instances from memory and restore them later. By default, no persistence is configured.

To allow persistence, you need to add the `jbpm-persistence` jar files to the classpath of your application and configure the engine to use persistence. The engine automatically stores the runtime state in the storage when the engine reaches a safe point. Safe points are points where the process instance has paused. When a process instance invocation reaches a safe point in the engine, the engine stores any changes to the process instance as a snapshot of the process runtime data. However, when a process instance is completed, the persisted snapshot of process instance runtime data is automatically deleted.

If a failure occurs and you need to restore the engine runtime from the storage, the process instances are automatically restored and their execution resumes so there is no need to reload and trigger the process instances manually.

The runtime persistence data is to be considered internal to the engine. You should not access persisted runtime data or modify them directly as this might have unexpected side effects.

To obtain information about the current execution state, refer to the history log. Query the database for runtime data only if absolutely necessary.

### 17.1. SESSION

Sessions are persisted as **SessionInfo** entities. These persist the state of the runtime KIE session, and store the following data:

| Field | Description | Nullable |
|-------|-------------|----------|
|-------|-------------|----------|

| Field                | Description  | Nullable |
|----------------------|--|----------|
| id                   | primary key  | false    |
| lastmodificationdate | last saved to data store                                 | N/A      |
| rulesbytearray       | binary dataset with session state (binary blob)          | false    |
| startdate            | session start  |          |
| optlock              | version number used to lock value for optimistic locking |          |

## 17.2. PROCESS INSTANCE

Process instances are persisted as **ProcessInstanceInfo** entities, which persist the state of a process instance on runtime and store the following data:

| Field                    | Description  | Nullable |
|--------------------------|--|----------|
| instanceid               | primary key  | false    |
| lastmodificationdate     | last saved to data store                                 | N/A      |
| lastreaddate             | last read from data store                                | N/A      |
| processid                | ID of the process the instance is based on               | false    |
| processinstancebytearray | binary dataset with process instance state (binary blob) | false    |
| startdate                | Process instance start date                              |          |
| optlock                  | version number used lock value for optimistic locking    |          |
| state                    | Process instance state                                   | false    |

**ProcessInstanceInfo** has a 1:N relationship to the **EventTypes** entity.

The **EventTypes** entity contains the following data:

| Field      | Description   | Nullable |
|------------|---|----------|
| instanceid | reference to the Process instance<br>(foreign key to the <b>processinstanceinfo</b> ) | false    |
| element    | text field related to an event the<br>Process instance has undergone                  |          |

### Pessimistic Locking Support

The default locking mechanism for persistence of processes is *optimistic*. With multi-thread high concurrency to the same process instance, this locking strategy can result in bad performance.

With the release of the 6.1 version of Red Hat JBoss BPM Suite, this can be changed at runtime to allow the user to set locking on a per process basis and to allow it to be *pessimistic* (the change can be made at a per KIE Session level or Runtime Manager level as well and not just at the process level).

To set a process to use pessimistic locking, do this in the runtime environment:

```
import org.kie.api.runtime.Environment;
import org.kie.api.runtime.EnvironmentName;
import org.kie.api.runtime.manager.RuntimeManager;
import org.kie.api.runtime.manager.RuntimeManagerFactory;

...

// here env is an instance of org.kie.api.runtime.Environment
env.set(EnvironmentName.USE_PESSIMISTIC_LOCKING, true);

// now create your Runtime Manager using this environment
RuntimeManager manager =
RuntimeManagerFactory.Factory.get().newPerRequestRuntimeManager(environment);
```

## 17.3. WORK ITEM

Work Items are persisted as **workiteminfo** entities, which persist the state of the particular work item instance on runtime and store the following data:

| Field             | Description                | Nullable |
|-------------------|----------------------------|----------|
| workitemid        | primary key                | false    |
| name              | work item name             |          |
| processinstanceid | parent Process instance id | false    |

| Field             | Description   | Nullable |
|-------------------|---|----------|
| state             | integer representing work item state                  | false    |
| optlock           | version number used lock value for optimistic locking |          |
| workitembytearray | binary dataset with work item state (binary blob)     | false    |
| creationDate      | timestamp on which the work item was created          | false    |

## 17.4. PERSISTENCE CONFIGURATION

### 17.4.1. Persistence configuration

Although persistence is not used by default, the dependencies needed are available in the runtime directory as jar files.

Persistence is defined per session and you can define it either using the **JBPMHelper** class after you create a session or using the **JPAKnowledgeService** to create your session. The latter option provides more flexibility, while **JBPMHelper** has a method to create a session, and uses a configuration file to configure this session.

### 17.4.2. Configuring persistence using JBPMHelper

To configure persistence of your session using JBPMHelper, do the following:

1. Define your application to use an appropriate JBPMHelper session constructor:

- `KieSession ksession = JBPMHelper.newKieSession(kbase);`
- `KieSession ksession = JBPMHelper.loadKieSession(kbase, sessionId);`

2. Configure the persistence in the `jBPM.properties` file.

**Example 17.1. A sample `jBPM.properties` file with persistence for the in-memory H2 database**

```
# for creating a datasource
persistence.datasource.name=jdbc/jbpm-ds
persistence.datasource.user=sa
persistence.datasource.password=
persistence.datasource.url=jdbc:h2:tcp://localhost/~ /jbpm-db
persistence.datasource.driverClassName=org.h2.Driver

# for configuring persistence of the session
persistence.enabled=true
persistence.persistenceunit.name=org.jbpm.persistence.jpa
persistence.persistenceunit.dialect=org.hibernate.dialect.H2Dialect
```

```

t

# for configuring the human task service
taskservice.enabled=true
taskservice.datasource.name=org.jbpm.task
taskservice.transport=mina
taskservice.usergroupcallback=org.jbpm.task.service.DefaultUserGroupCallbackImpl

```

Any invocations on the session will now trigger the persistence process.

Make sure the datasource is up and running on engine start. If you are running the in-memory H2 database, you can start the database from your application using the

**JBPMHelper.startH2Server()**; method call and register it with the engine using **JBPMHelper.setupDataSource()**; method call.

### 17.4.3. Configuring persistence using JPAKnowledgeService

To create your knowledge session and configure its persistence using JPAKnowledgeService, do the following:

1. Define your application to use the knowledge session created by JPAKnowledgeService:
  - a. Define the session based on a knowledge base, a knowledge session configuration, and an environment. The environment must contain a reference to your Entity Manager Factory:

```

// create the entity manager factory and register it in the
environment
EntityManagerFactory emf =
Persistence.createEntityManagerFactory(
"org.jbpm.persistence.jpa" );
Environment env = KnowledgeBaseFactory.newEnvironment();
env.set( EnvironmentName.ENTITY_MANAGER_FACTORY, emf );

// create a new knowledge session that uses JPA to store the
runtime state
KieSession ksession = JPAKnowledgeService.newKieSession( kbase,
null, env );
int sessionId = ksession.getId();

// invoke methods on your method here
ksession.startProcess( "MyProcess" );
ksession.dispose();

```

- b. Define the session based on a specific session id.

```

// recreate the session from database using the sessionId
ksession = JPAKnowledgeService.loadKieSession(sessionId, kbase,
null, env );

```

2. Configure the persistence in the **META-INF/persistence.xml** file: configure JPA to use Hibernate and the respective database.



Information on how to configure data source on your application server should be available in the documentation delivered with the application server. For this information for JBoss Enterprise Application Platform, see the *Administration and Configuration Guide* for this product.

**Example 17.2. A sample persistence.xml file with persistence for an H2 data source jdbc/jbpm-ds**

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<persistence
  version="1.0"
  xsi:schemaLocation=
    "http://java.sun.com/xml/ns/persistence
    http://java.sun.com/xml/ns/persistence/persistence_1_0.xsd
    http://java.sun.com/xml/ns/persistence/orm
    http://java.sun.com/xml/ns/persistence/orm_1_0.xsd"
  xmlns:orm="http://java.sun.com/xml/ns/persistence/orm"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns="http://java.sun.com/xml/ns/persistence">
  <persistence-unit name="org.jbpm.persistence.jpa" transaction-
type="JTA">
    <provider>org.hibernate.ejb.HibernatePersistence</provider>
    <jta-data-source>jdbc/jbpm-ds</jta-data-source>
    <mapping-file>META-INF/JBPMorm.xml</mapping-file>
    <class>org.drools.persistence.info.SessionInfo</class>

    <class>org.jbpm.persistence.processinstance.ProcessInstanceInfo</c
lass>
    <class>org.drools.persistence.info.WorkItemInfo</class>
    <properties>
      <property name="hibernate.dialect"
value="org.hibernate.dialect.H2Dialect"/>
      <property name="hibernate.max_fetch_depth" value="3"/>
      <property name="hibernate.hbm2ddl.auto" value="update"/>
      <property name="hibernate.show_sql" value="true"/>
      <property name="hibernate.transaction.manager_lookup_class"

value="org.hibernate.transaction.BTMTransactionManagerLookup"/>
    </properties>
  </persistence-unit>
</persistence>
```

Any invocations on the session will now trigger the persistence process.

Make sure the datasource is up and running on engine start. If you are running the in-memory H2 database, you can start the database from your application using the **JBPMHelper.startH2Server()**; method call and register it with the engine using **JBPMHelper.setupDataSource()**; method call.



## SAMPLE DATA SOURCE CONFIGURATION FOR SIMPLE JAVA ENVIRONMENT

If you are running JBoss BPM Suite in a simple Java environment, your data source configuration will be similar to the following:

```
PoolingDataSource ds = new PoolingDataSource();
ds.setUniqueName("jdbc/jbpm-ds");
ds.setClassName("bitronix.tm.resource.jdbc.lrc.LrcXADataSource"
);
ds.setMaxPoolSize(3);
ds.setAllowLocalTransactions(true);
ds.getDriverProperties().put("user", "sa");
ds.getDriverProperties().put("password", "sasa");
ds.getDriverProperties().put("URL",
"jdbc:h2:tcp://localhost/~jbpm-db");
ds.getDriverProperties().put("driverClassName",
"org.h2.Driver");
ds.init();
```

## CHAPTER 18. TRANSACTIONS

### 18.1. TRANSACTIONS

The Process Engine supports JTA transactions: local transactions are only supported when using Spring. Pure local transactions are not supported.

By default, each method invocation is considered a transaction. To change this behavior, for example, to combine multiple commands into one transaction, you will need to specify transaction boundaries.

### 18.2. DEFINING TRANSACTIONS

To define a transaction, do the following:

1. Register the transaction manager in your environment:

#### Example 18.1. Code with transaction manager registration

```
// create the entity manager factory
EntityManagerFactory emf =
EntityManagerFactoryManager.get().getOrCreate("org.jbpm.persistence
e.jpa");
TransactionManager tm =
TransactionManagerServices.getTransactionManager();
Environment env = EnvironmentFactory.newEnvironment();
env.set(EnvironmentName.ENTITY_MANAGER_FACTORY, emf);
env.set(EnvironmentName.TRANSACTION_MANAGER, tm);

// setup the runtime environment
RuntimeEnvironment environment =
RuntimeEnvironmentBuilder.Factory.get()
.newDefaultBuilder()
.addAsset(ResourceFactory.newClassPathResource("MyProcessDefinitio
n.bpmn2"), ResourceType.BPMN2)
.addEnvironmentEntry(EnvironmentName.TRANSACTION_MANAGER, tm)

.addEnvironmentEntry(EnvironmentName.PERSISTENCE_CONTEXT_MANAGER,
new JpaProcessPersistenceContextManager(env))

.addEnvironmentEntry(EnvironmentName.TASK_PERSISTENCE_CONTEXT_MANA
GER, new JPATaskPersistenceContextManager(env))
.get();
```

2. Initialize the KieSession:

```
// get the KieSession
RuntimeManager manager =
RuntimeManagerFactory.Factory.get().newPerProcessInstanceRuntimeMana
ger(environment);
RuntimeEngine runtime =
manager.getRuntimeEngine(ProcessInstanceIdContext.get());
KieSession ksession = runtime.getKieSession();
```

3. Define the transaction manager in `jndi.properties`:**Example 18.2. Definition of Bitronix transaction manager in `jndi.properties`**

```
java.naming.factory.initial=bitronix.tm.jndi.BitronixInitialContextFactory
```

**USING ANOTHER TRANSACTION MANAGER**

To use a different JTA transaction manager, edit the **`hibernate.transaction.manager_lookup_class`**, the transaction manager property, in the **`persistence.xml`** file to load your transaction manager.

For example, if choosing JBoss Transaction Manager:

```
<property
  name="hibernate.transaction.manager_lookup_class"
  value="org.hibernate.transaction.JBossTransactionManagerLookup"/>
```

## 4. Define the start and the end of the transaction.

```
// start the transaction
UserTransaction ut =
InitialContext.doLookup("java:comp/UserTransaction");
ut.begin();

// perform multiple commands inside one transaction
ksession.insert( new Person( "John Doe" ) );
ksession.startProcess("MyProcess");

// commit the transaction
ut.commit();
```

**18.3. CONTAINER MANAGED TRANSACTIONS**

In cases where JBoss BPM Suite is embedded inside an application that is in a container that can manage transactions by itself (Container Managed Transactions - CMT), a special dedicated transaction manager is provided using the

**`org.jbpm.persistence.jta.ContainerManagerTransactionManager`** class. This is because the default implementation of the transaction manager in JBoss BPM Suite is based on the **`UserTransaction`** class getting the transaction status. However, some application servers in a CMT mode do not allow accessing the **`UserTransaction`** instance from JNDI.

Operations executed on this manager are all no-op because they cannot affect the underlying CMT. The **`ContainerManagedTransactionManager`** class expects that the transaction is always active (returning **`ACTIVE`** to the **`getStatus()`** method).



## NOTE

Even though the container manages transactions, the container should be made aware of any exceptions that happen during process instance execution. Exceptions thrown by the engine should be propagated up to the container to properly rollback transactions.

## Configuring the Transaction Manager

To configure and use the **ContainerManagedTransactionManager**, it needs to be inserted into the environment before you create or load a session:

```
Environment env = EnvironmentFactory.newEnvironment();
env.set(EnvironmentName.ENTITY_MANAGER_FACTORY, emf);
env.set(EnvironmentName.TRANSACTION_MANAGER, new
ContainerManagedTransactionManager());
env.set(EnvironmentName.PERSISTENCE_CONTEXT_MANAGER, new
JpaProcessPersistenceContextManager(env));
```

Next, setup the JPA Provider in your **persistence.xml** file. For example, if using IBM WebSphere:

```
<property name="hibernate.transaction.factory_class"
value="org.hibernate.transaction.CMTTransactionFactory"/>
<property name="hibernate.transaction.manager_lookup_class"
value="org.hibernate.transaction.WebSphereExtendedJTATransactionLookup"/>
```

## Disposing the KSession in a CMT

In a CMT, you should not dispose the ksession directly (by using the **dispose()** method). Doing so will cause exceptions on transaction completion as the Process Engine needs to clean up the state after the invocation has finished.

Instead, use the specialized class

**org.jbpm.persistence.jta.ContainerManagedTransactionDisposeCommand's execute()** method. Using this command ensures that the ksession will be disposed when the transaction is actually complete.

This method checks to see if the transaction is active. If it is, it delegates the actual disposal to the **afterDisposal** phase of the transaction instead of executing it directly. If there is no active transaction, the ksession is disposed immediately.

## CHAPTER 19. LOGGING

The logging mechanism allows you to store information about the execution of a process instance. It is provided by a special event listener that listens to the Process Engine for any relevant events to be logged, so that the information can be stored separately from other non-log information stored either in the server built-in database (H2) or a connected data source using JPA or Hibernate.

The **jbpmm-audit** module provides the event listener and also allows you to store process-related information directly in a database using JPA or Hibernate. The data of the following entities is stored as follows:

- Process instance as **processinstancetype**
- Element instance as **nodeinstancetype**
- Variable instance as **variableinstancetype**

**Table 19.1. Fields of the ProcessInstanceLog table**

| Field                   | Description   | Nullable |
|-------------------------|---|----------|
| id                      | The primary key of the log entity   | No       |
| end_date                | The end date of the process instance  | Yes      |
| processid               | The name (id) of the underlying process   | Yes      |
| processinstanceid       | The id of the process instance  | No       |
| start_date              | The start date of the process instance  | Yes      |
| status                  | The status of the process instance  | Yes      |
| parentProcessInstanceid | The process instance id of the parent process instance if applicable                    | Yes      |
| outcome                 | The outcome of the process instance (details on the process finish, such as error code) | Yes      |

**Table 19.2. Fields of the NodeInstanceLog table**

| Field | Description                       | Nullable |
|-------|-----------------------------------|----------|
| id    | The primary key of the log entity | No       |

| Field             | Description  | Nullable |
|-------------------|--|----------|
| log_date          | The date of the event  | Yes      |
| nodeid            | The node id of the underlying Process Element                          | Yes      |
| nodeinstanceid    | The id of the node instance  | Yes      |
| nodename          | The name of the underlying node  | Yes      |
| processid         | The id of the underlying process                                       | Yes      |
| processinstanceid | The id of the parent process instance                                  | No       |
| type              | The type of the event ( <b>0</b> = enter event, <b>1</b> = exit event) | No       |

**Table 19.3. Fields of the VariableInstanceLog table**

| Field              | Description   | Nullable |
|--------------------|---|----------|
| id                 | The primary key of the log entity   | No       |
| log_date           | The date of the event   | Yes      |
| processid          | The name (id) of the underlying process   | Yes      |
| processinstanceid  | The id of the process instance  | No       |
| value              | The value of the variable at log time   | Yes      |
| variableid         | The variable id as defined in the process definition                                    | Yes      |
| variableinstanceid | The id of the variable instance   | Yes      |
| outcome            | The outcome of the process instance (details on the process finish, such as error code) | Yes      |

If necessary, define your own data model of custom information and use the process event listeners to extract the information.

## 19.1. LOGGING EVENTS TO DATABASE

To log an event that occurs on runtime in a Process instance, an Element instance, or a variable instance, you need to do the following:

1. Map the Log classes to the data source, so that the given data source accepts the log entries. On Red Hat JBoss EAP, edit the data source properties in the `persistence.xml` file.

### Example 19.1. The `ProcessInstanceLog`, `NodeInstanceLog` and `VariableInstanceLog` classes enabled for `processInstanceDS`

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<persistence version="1.0" xsi:schemaLocation=
  "http://java.sun.com/xml/ns/persistence
  http://java.sun.com/xml/ns/persistence/persistence_1_0.xsd
  http://java.sun.com/xml/ns/persistence/orm
  http://java.sun.com/xml/ns/persistence/orm_1_0.xsd"
  xmlns:orm="http://java.sun.com/xml/ns/persistence/orm"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns="http://java.sun.com/xml/ns/persistence">

  <persistence-unit name="org.jbpm.persistence.jpa">
    <provider>org.hibernate.ejb.HibernatePersistence</provider>
    <jta-data-source>jdbc/processInstanceDS</jta-data-source>
    <class>org.drools.persistence.info.SessionInfo</class>

    <class>org.jbpm.persistence.processinstance.ProcessInstanceInfo</c
    lass>
    <class>org.drools.persistence.info.WorkItemInfo</class>
    <class>org.jbpm.process.audit.ProcessInstanceLog</class>
    <class>org.jbpm.process.audit.NodeInstanceLog</class>
    <class>org.jbpm.process.audit.VariableInstanceLog</class>

    <properties>
      <property name="hibernate.dialect"
value="org.hibernate.dialect.H2Dialect"/>
      <property name="hibernate.max_fetch_depth" value="3"/>
      <property name="hibernate.hbm2ddl.auto" value="update"/>
      <property name="hibernate.show_sql" value="true"/>
      <property name="hibernate.transaction.manager_lookup_class"

value="org.hibernate.transaction.BTMTransactionManagerLookup"/>
    </properties>
  </persistence-unit>
</persistence>
```

2. Register a logger on your Kie Session.

### Example 19.2. Import the Loggers

```
import org.jbpm.process.audit.AuditLogService;
import org.jbpm.process.audit.AuditLoggerFactory;
import org.jbpm.process.audit.AuditLoggerFactory.Type;
import org.jbpm.process.audit.JPAAuditLogService;
...
```



**Example 19.3. Registering a Logger to a Kie Session**

```

@PersistenceUnit(unitName = PERSISTENCE_UNIT_NAME)
private EntityManagerFactory emf;

private AuditLogService auditLogService;
@PostConstruct
public void configure() {

    auditLogService = new JPAAuditLogService(emf);
    ((JPAAuditLogService)
auditLogService).setPersistenceUnitName(PERSISTENCE_UNIT_NAME);

    RuntimeEngine runtime =
singletonManager.getRuntimeEngine(EmptyContext.get());
    KieSession ksession = runtime.getKieSession();
    AuditLoggerFactory.newInstance(Type.JPA, ksession, null);

}

```

3. Optionally, call the method **addFilter** on the logger to filter out irrelevant information. Only information accepted by all filters appears in the database.
4. Logger classes can be viewed in the Audit View:

```

<dependency>
  <groupId>org.jbpm</groupId>
  <artifactId>jbpm-audit</artifactId>
  <version>6.5.0.Final-redhat-2</version>
</dependency>

```

## 19.2. LOGBACK FUNCTIONALITY

Red Hat JBoss BPM Suite provides **logback** functionality for logging configuration.

Accordingly, everything configured is logged to the *Simple Logging Facade for Java* [SLF4J](#), which delegates any log to Logback, Apache Commons Logging, Log4j or java.util.logging. Add a dependency to the logging adaptor for your logging framework of choice. If you are not using any logging framework yet, you can use Logback by adding this Maven dependency:

```

<dependency>
  <groupId>ch.qos.logback</groupId>
  <artifactId>logback-classic</artifactId>
  <version>1.x</version>
</dependency>

```

**NOTE**

**slf4j-nop** and **slf4j-simple** are ideal for a light environment.

## 19.3. CONFIGURING LOGGING

To configure the logging level of the packages, create a **logback.xml** file in **business-central.war/WEB-INF/classes/logback.xml**. To set the logging level of the **org.drools** package to "debug" for verbose logging, you would need to add the following line to the file:

```
<configuration>
  <logger name="org.drools" level="debug"/>

  ...
</configuration>
```

Similarly, you can configure logging for packages such as the following:

- **org.guvnor**
- **org.jbpm**
- **org.kie**
- **org.slf4j**
- **org.dashbuilder**
- **org.uberfire**
- **org.errai**
- etc...

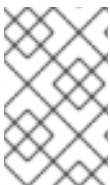
If configuring with **log4j**, the **log4j.xml** can be located at **business-central.war/WEB-INF/classes/log4j.xml** and can be configured in the following way:

```
<log4j:configuration xmlns:log4j="http://jakarta.apache.org/log4j/">

  <category name="org.drools">
    <priority value="debug" />
  </category>

  ...

</log4j:configuration>
```



### NOTE

Additional logging can be configured in the individual container. To configure logging for JBoss Enterprise Application Platform, please refer to the Red Hat JBoss Enterprise Application Platform Administration and Configuration Guide.

## 19.4. MANAGING LOG FILES

Red Hat JBoss BPM Suite manages most of the required maintenance. Automatically cleaned runtime data includes:

- Process instances data, which is removed upon process instance completion.
- Work items data, which is removed upon work item completion.
- Task instances data, which is removed upon completion of a process to which given task belongs.

Runtime data, which may not be automatically cleaned, includes session information data. This depends on the selected runtime strategy:

- Singleton strategy ensures that session information runtime data will not be automatically removed.
- Per request strategy allows automatic removal when a given request terminates.
- Per process instances will be automatically removed when process instance mapped to a given session completes or is aborted.

Red Hat JBoss BPM Suite does not remove executor request and error information.

In order not to lose track of process instances, Red Hat JBoss BPM Suite offers audit data tables. These are used by default and keep track of the BPM Suite environment. JBoss BPM Suite offers two ways of how to manage and maintain the audit data tables:

- Automatic clean-up
- Manual clean-up

### 19.4.1. Automatic Clean-Up

Automatic clean-up uses the **LogCleanupCommand** executor command, which consists of logic to clean up all or selected data automatically. An advantage of the automatic clean-up method is the ability to schedule repeated clean-ups by using reoccurring job feature of the JBoss BPM Suite executor. This means that when one job completes, it provides information to the JBoss BPM Suite executor if and when the next instance of this job should be executed. By default, **LogCleanupCommand** is executed once a day but can be reconfigured to run on different intervals.

There are several important configuration options that can be used with the **LogCleanupCommand** command:

**Table 19.4. LogCleanupCommand parameters table**

| Name           | Description   | Is Exclusive                          |
|----------------|---|---------------------------------------|
| SkipProcessLog | Indicates if the clean-up of process instances, node instances and variables log cleanup should be omitted (default: false) | No, can be used with other parameters |
| SkipTaskLog    | Indicates if the task audit and the task event log clean-up should be omitted (default: false)                              | No, can be used with other parameters |

| Name            | Description   | Is Exclusive   |
|-----------------|---|--|
| SkipExecutorLog | Indicates if the JBoss BPM Suite executor entries clean-up should be omitted (default: false)   | No, can be used with other parameters                          |
| SingleRun       | Indicates if the job routine should run only once (default: false)  | No, can be used with other parameters                          |
| NextRun         | Sets a date for the next run.<br><br>For example, 12h is set for jobs to be executed every 12 hours. If the option is not given, the next job will run 24 hours after the completion of the current job | Yes, cannot be used when the OlderThanPeriod parameter is used |
| OlderThan       | Causes logs older than the given date to be removed. The date format is <b>YYYY-MM-DD</b> . Usually, this parameter is used for single run jobs   | Yes, cannot be used when the NextRun parameter is used         |
| OlderThanPeriod | Causes logs older than the given timer expression should be removed. For example, set 30d to remove logs older than 30 day from current time  | No, can be used with other parameters                          |
| ForProcess      | Specifies process definition ID for which logs should be removed  | No, can be used with other parameters                          |
| ForDeployment   | Specifies deployment ID for which logs should be removed  | No, can be used with other parameters                          |
| EmfName         | Persistence unit name that shall be used to perform operation deletion  | N/A  |

**NOTE**

LogCleanupCommand does not remove any active instances, such as running process instances, task instances, or executor jobs.

**WARNING**

While all audit tables have a time stamp, some may be missing other parameters, such as process id, or deployment id. For that reason, it is recommended to use the date parameter when managing the clean-up job routine.

### 19.4.2. Setting up Automatic Clean-up Job

To set up automatic clean-up job, do the following:

1. Open Business Central in your web browser (if running locally `http://localhost:8080/business-central`) and log in as a user with the **admin** role.

2. Go to **Deploy** → **Jobs**.

3. Click  in the top right hand corner of the page.

4. Enter a name, due date and time. Enter the following into the *Type* text field:

```
org.jbpm.executor.commands.LogCleanupCommand
```

5. Click on **Add Parameter** if you wish to use parameters listed above. In the key section, enter a parameter name. In the value section, enter true or false, depending on the desired outcome.
6. Click **Create** to finalize the job creation wizard. You have successfully created an automatic clean-up job.

### 19.4.3. Manual Clean-Up

You may make use of audit API to do the clean-up manually with more control over parameters and thus more control over what will be removed. Audit API is divided into following areas:

- Process audit, which is used to clean up process, node and variables logs, accessible in the **jbpm-audit** module
- Task audit, which is used to clean up tasks and task events, accessible in the **jbpm-human-task-audit** module
- Executor jobs, which is used to clean up executor jobs and errors, accessible in the **jbpm-executor** module

Modules are sorted hierarchically and can be accessed as follows:

- `org.jbpm.process.audit.JPAAuditLogService`
- `org.jbpm.services.task.audit.service.TaskJPAAuditService`
- `org.jbpm.executor.impl.jpa.ExecutorJPAAuditService`

Several examples of manual clean-up follow:

**Example 19.4. Removal of completed process instance logs**

```
import org.jbpm.process.audit.JPAAuditLogService;
import
org.kie.internal.runtime.manager.audit.query.ProcessInstanceLogDeleteBuilder;
import org.kie.api.runtime.process.ProcessInstance;

JPAAuditLogService auditService = new JPAAuditLogService(emf);
ProcessInstanceLogDeleteBuilder updateBuilder =
auditService.processInstanceLogDelete().status(ProcessInstance.STATE_COMPLETED);
int result = updateBuilder.build().execute();
```

**Example 19.5. Task audit logs removal for the org.jbpm:HR:1.0 deployment**

```
import org.jbpm.services.task.audit.service.TaskJPAAuditService;
import org.kie.internal.task.query.AuditTaskDeleteBuilder;

TaskJPAAuditService auditService = new TaskJPAAuditService(emf);
AuditTaskDeleteBuilder updateBuilder =
auditService.auditTaskDelete().deploymentId("org.jbpm:HR:1.0");
int result = updateBuilder.build().execute();
```

**Example 19.6. Executor error and requests removal**

```
import org.jbpm.executor.impl.jpa.ExecutorJPAAuditService;
import
org.kie.internal.runtime.manager.audit.query.ErrorInfoDeleteBuilder;
import
org.kie.internal.runtime.manager.audit.query.RequestInfoLogDeleteBuilder;

ExecutorJPAAuditService auditService = new ExecutorJPAAuditService(emf);
ErrorInfoDeleteBuilder updateBuilder =
auditService.errorInfoLogDeleteBuilder().dateRangeEnd(new Date());
int result = updateBuilder.build().execute();

RequestInfoLogDeleteBuilder updateBuilder2 =
auditService.requestInfoLogDeleteBuilder().dateRangeEnd(new Date());
result = updateBuilder2.build().execute();
```

**NOTE**

When removing executor entries, ensure that the error information is removed before the request information because of constraints setup on database.

**WARNING**

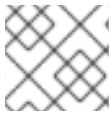
Parts of the code utilize internal API. While this does not have any direct impact on the functionality of our product, internal API is subject to change and Red Hat cannot guarantee backward compatibility.

## CHAPTER 20. LOCALIZATION AND CUSTOMIZATION

### 20.1. AVAILABLE LANGUAGES

The Red Hat JBoss BPM Suite web user interface can be viewed in multiple languages:

- United States English (**en\_US**)
- Spanish (**es\_ES**)
- Japanese (**ja\_JP**)
- Simplified Chinese (**zh\_CN**)
- Traditional Chinese (**zh\_TW**)
- Portuguese (**pt\_BR**)
- French (**fr\_CA**)
- German (**de\_DE**)



#### NOTE

If a language is not specified, US English is used by default.



#### NOTE

Dashbuilder does not support Traditional Chinese (**zh\_TW**).

### 20.2. CHANGING LANGUAGE SETTINGS

#### Changing the User Interface Language in Business Central

By default, Business Central uses the system locale. If you need to change it, then append the required locale code at the end of the Business Central URL. For example, the following URL will set the locale to Portuguese (pt\_BR).

**`http://localhost:8080/business-central/?locale=pt_BR`**

#### Changing the User Interface Language in Dashbuilder

To change the user interface language in dashbuilder, do the following:

1. Log into the dashbuilder after the server has been successfully started by navigating to `http://localhost:8080/dashbuilder` in a web browser.
2. Select the language of your choice by clicking on the available locales on the top center of the dashbuilder user interface to change the language.

#### Setting a Default User Interface Language in Dashbuilder

Following is an example to set the default user interface language in dashbuilder:

#### Procedure: Setting the Default Language as French

1. Navigate to **`jboss-eap-6.4/standalone/configuration`** and define the following in the



**standalone.xml** file.

```
<system-properties>
  <property
    name="org.jboss.dashboard.LocaleManager.installedLocaleIds"
    value="en,es,de,fr,ja,pt,zh"/>
    <property name="org.jboss.dashboard.LocaleManager.defaultLocaleId"
    value="fr"/>
  </system-properties>
```

2. The default user interface language of the dashbuilder is now set to French.

## Defining the Installed Locales in Dashbuilder

Following is an example to define the installed locales in dashbuilder:

### Procedure: Defining the Installed Locale

1. Navigate to **jboss-eap-6.4/standalone/configuration** and define the following in the **standalone.xml** file:

```
<system-properties>
  <property
    name="org.jboss.dashboard.LocaleManager.installedLocaleIds"
    value="en,es,de,fr,ja,pt"/>
    <property
    name="org.jboss.dashboard.LocaleManager.defaultLocaleId"
    value="fr"/>
  </system-properties>
```

In this example, the Chinese language (zh) has been removed from the list of installed locales so users will not be able to switch the dashbuilder to Chinese. Dashbuilder will show content in French, which is the default locale. Users will be able to select other languages that are defined (en, es, de, ja, pt) in this file.



### NOTE

Within Business Central, the application server does not need to be restarted after changing locale if you append the "locale" parameter to the URL of Business Central. However, with Dashbuilder, the application server should be restarted after the configuration files have been changed.

## 20.3. RUNNING THE JVM WITH UTF-8 ENCODING

Red Hat JBoss BPM Suite is designed to work with UTF-8 encoding. If a different encoding system is being used by the JVM, unexpected errors might occur.

To ensure UTF-8 is used by the JVM, use the JVM option **-Dfile.encoding=UTF-8**.

## PART IV. EXECUTION

## CHAPTER 21. PROCESS EXECUTION SERVER CONFIGURATION

### 21.1. ASSIGNMENT RULES

Assignment rules are rules executed automatically when a Human Task is created or completed. This mechanism can be used to assign a Human Task automatically to a particular user or group or prevent a user from completing a task in case of missing data.

#### 21.1.1. Defining Assignment Rules

To define assignment rules:

1. In the **`DEPLOY_DIR/standalone/deployments/business-central.war/WEB-INF/classes/`** directory, create one or both of the following files and define the assignment rules in these files:
  - **`default-add-task.drl`**: In this file, define the rules to be checked when the Human Task is created.
  - **`default-complete-task.drl`**: In this file, define the rules to be checked when the Human Task is completed.

#### Example 21.1. Example default-complete-task.drl File

```
package defaultPackage

import org.kie.api.task.model.Task;
import org.kie.api.task.model.User;
import org.kie.api.task.model.Status;
import org.kie.api.task.model.PeopleAssignments;
import org.jbpm.services.task.rule.TaskServiceRequest;
import org.jbpm.services.task.exception.PermissionDeniedException;
import org.jbpm.services.task.impl.model.*;
import java.util.HashMap;
import java.util.List;

global TaskServiceRequest request;

rule "Don't allow Mary to complete task when rejected"
when
    $task : Task()
    $actualOwner : User( id == 'mary') from
    $task.getTaskData().getActualOwner()
    $params : HashMap(this["approved"] == false)
then
    request.setAllowed(false);
    request.setExceptionClass(PermissionDeniedException.class);
    request.addReason("Mary is not allowed to complete task without
approval.");
end
```

If user **mary** is one of the potential owners of a Human Task, the task will be automatically assigned to this user.

## 21.2. MAIL SESSION

A mail session defines mail server properties and is used for sending emails, for example when using an Email Service Task or sending and receiving email notifications of Human Task escalation.

For more information, see the [Email Task Attributes](#) section of the *Red Hat JBoss BPM Suite User Guide*.

### 21.2.1. Setting up Mail Session

To set up a mail session for the execution engine:

1. Open the appropriate profile configuration file, **standalone.xml** or **host.xml**.
2. Add the mail session to the **urn:jboss:domain:mail:1.2** subsystem:

```
<subsystem xmlns="urn:jboss:domain:mail:1.2">
  <!-- omitted code -->

  <mail-session jndi-name="mail/jbpmMailSession" debug="true"
    from="bpms@company.com">
    <smtp-server outbound-socket-binding-ref="bpmsMail"/>
  </mail-session>
</subsystem>
```

3. Define the session outbound socket:

```
<outbound-socket-binding name="bpmsMail">
  <remote-destination host="localhost" port="12345"/>
</outbound-socket-binding>
```

## PART V. MONITORING

## CHAPTER 22. PROCESS MONITORING

### 22.1. JBOSS OPERATIONS NETWORK

A JBoss Operations Network plug-in can be used to monitor rules sessions for Red Hat JBoss BPM Suite.

Due to a limitation of passing the JVM monitoring arguments via the Maven command line, all `com.sun.management.jmxremote.*` parameters must be passed to the Red Hat JBoss BPM Suite application via the `pom.xml` configuration file.

See the [Installation Guide](#) of *Red Hat JBoss Operations Network* for installation instructions on the Red Hat JBoss ON server.

### 22.2. INSTALLING THE JBOSS BRMS PLUG-IN INTO JBOSS ON

Red Hat JBoss BRMS plug-in for JBoss Operations Network can be installed by either copying the plug-in JAR files to the JBoss Operations Network plug-in directory or through the JBoss Operations Network GUI.

To copy the plug-in JAR files to the JBoss Operations Network plug-in directory, follow the following procedure:

#### Procedure: Copying the JBoss BRMS plug-in JAR files

1. Extract the JBoss BRMS plug-in pack archive to a temporary location. This creates a subdirectory with the name **jon-plugin-pack-brms-bpms-3.3.0.GA**. For example:

```
[root@server rhq-agent]# unzip jon-plugin-pack-brms-bpms-3.3.0.GA.zip -d /tmp
```

2. Copy the extracted JBoss BRMS plug-in JAR files from the **jon-plugin-pack-brms-bpms-3.3.0.GA/** directory to the JBoss ON server plug-in directory. For example:

```
[root@server rhq-agent]# cp /tmp/jon-plugin-pack-brms-bpms-3.3.0.GA/*.jar /opt/jon/jon-server-3.3.0.GA/plugins
```

3. Start the JBoss Operations Network server to update the JBoss BRMS plug-in.

To upload the JBoss BRMS plug-in through the JBoss Operations Network GUI, follow this procedure:

#### Procedure: Uploading the JBoss BRMS plug-in through GUI

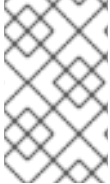
1. Start the JBoss Operations Network Server and Log in to access the GUI.
2. In the top navigation of the GUI, open the **Administration** menu.
3. In the **Configuration** area on the left, select the **Agent Plugins** link.
4. At the bottom of the list of loaded agent plug-ins, click the **Upload a plugin** button and choose the BRMS plugin.
5. The JBoss BRMS plug-in for JBoss Operations Network is now uploaded.

## 22.3. MONITORING KIE BASES AND KIE SESSIONS

In order for JBoss Operations Network to monitor KieBases and KieSessions, MBeans must be enabled.

MBeans can be enabled either by passing the parameter: **-kie.mbeans = enabled** or via the API:

```
KieBaseConfiguration kbconf =  
KieServices.Factory.get().newKieBaseConfiguration();  
kbconf.setOption(MBeansOption.ENABLED);
```



### NOTE

**Kie Services** have been implemented for JBoss BRMS 6; for JBoss BRMS 5, **Drools Services** was the naming convention used and it had different measurements on sessions. For example, **activation** → **match** renaming occurred in the updated version.

Please refer to the [Resource Monitoring and Operations Reference guide](#) of the *Red Hat JBoss Operations Network* for information on importing Kie Sessions into the Inventory View for monitoring purposes.

## CHAPTER 23. MANAGING SECURITY FOR RED HAT JBOSS BPM SUITE DASHBUILDER

### 23.1. ACCESSING RED HAT JBOSS BPM SUITE DASHBUILDER

Dashbuilder is the Red Hat JBoss BPM Suite web-based user interface for Business Activity Monitoring. To access the Dashbuilder from Business Central, go to **Dashboards** → **Process & Task Dashboards**.

The displayed dashboard provides statistics on runtime data selected on the left. You can create your own dashboard in the Dashbuilder. To do so, display the Dashbuilder by clicking **Dashboards** → **Business Dashboards**.

### 23.2. MANAGING SECURITY

To manage security, you can define custom authorization policies to grant or deny access to workspace, page, or panel instances per role.

Defined below is a list of the available roles for Dashbuilder:

- **admin**: Administrates the Red Hat JBoss BPM Suite system. Has full access rights to make any changes necessary. Also has the ability to add and remove users from the system.
- **developer**: Implements code required for process to work. Mostly uses the JBDS connection to view processes, but may use the web tool occasionally.:
- **analyst**: Responsible for creating and designing processes into the system. Creates process flows and handles process change requests. Needs to test processes that they create. Also creates forms and dashboards.
- **user**: Daily user of the system to take actions on business tasks that are required for the processes to continue forward. Works primarily with the task lists.
- **manager**: Viewer of the system that is interested in statistics around the business processes and their performance, business indicators, and other reporting of the system and people who interact with the system.

Thanks to the permissions system, you can build a workspace structure with several pages, menus, and panels and define what pages and panels within a page will be visible for each role. You can also define special types of users and give them restricted access to certain tooling features, or even restricted access to a page subset.

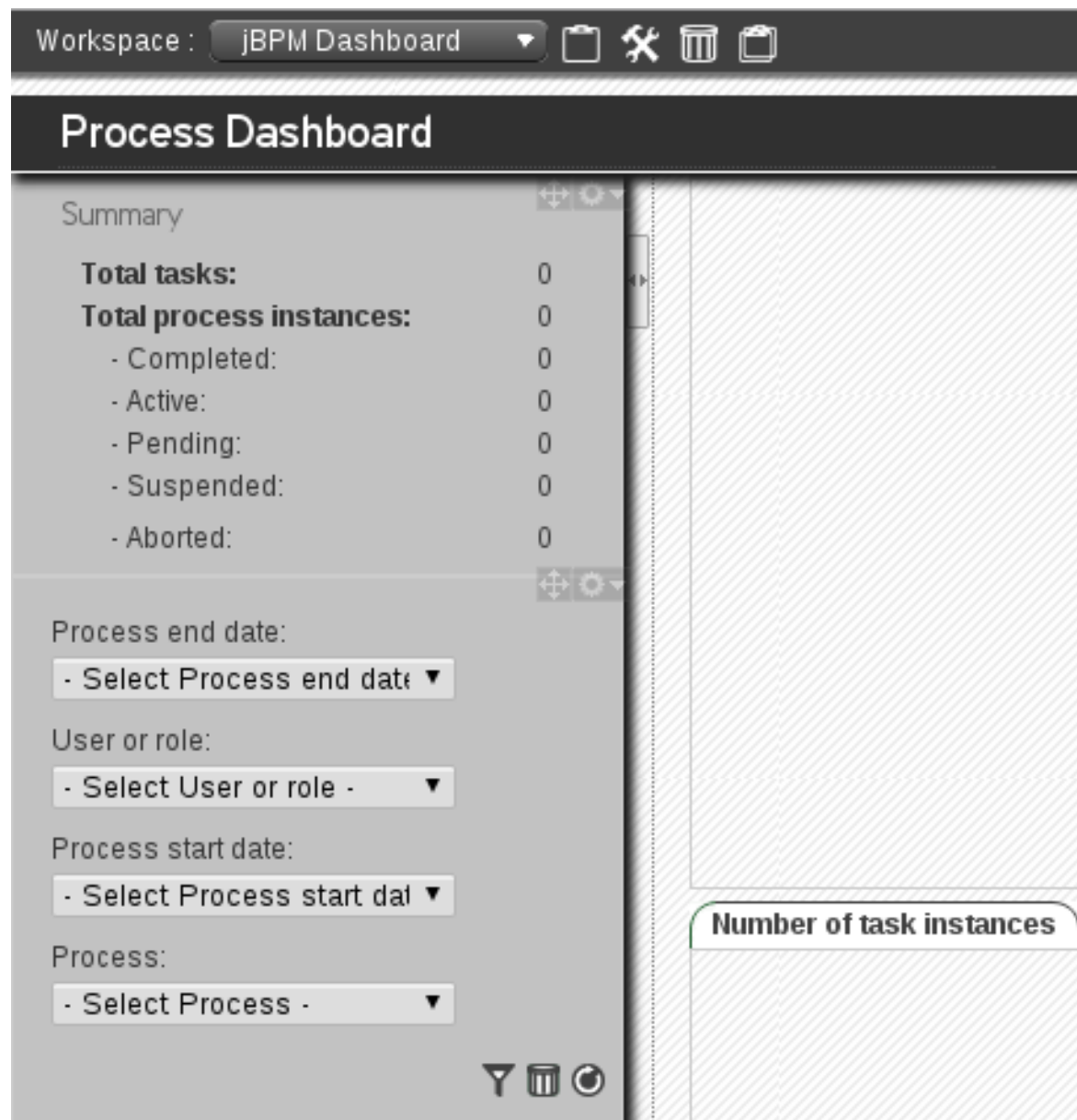
### 23.3. WORKSPACE PERMISSIONS

#### Procedure: Accessing Workspace Permissions

1. Log into Business Dashboards from Business Central (as described in the Accessing Red Hat JBoss BPM Suite Dashbuilder topic).
2. Select the appropriate Dashboard from the Wokspace drop-down:



Figure 23.1. Dashbuilder Workspace




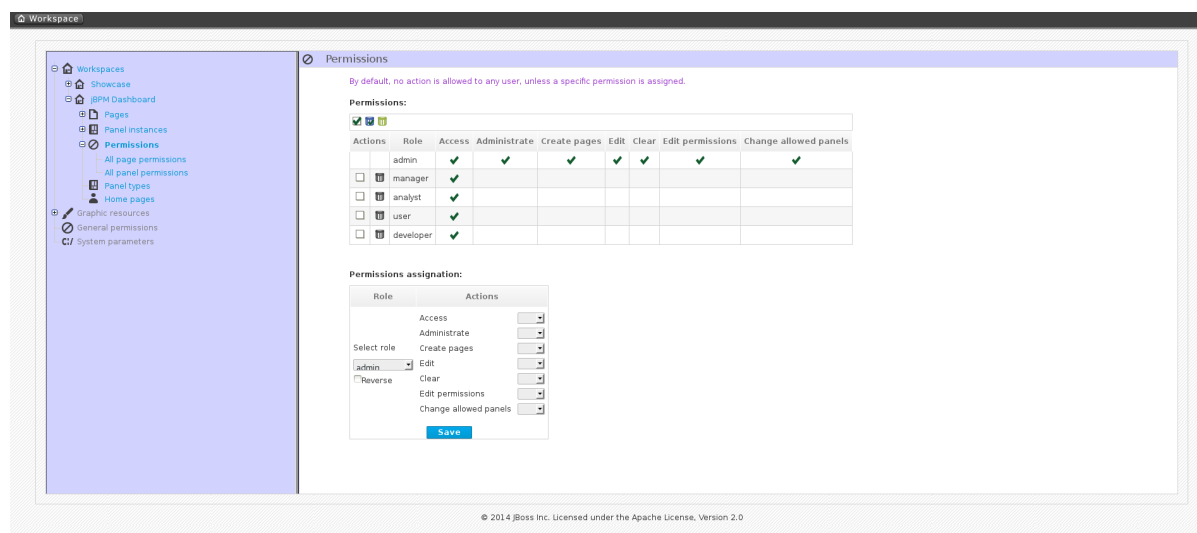
3. Click the  button to access the Workspace Dashboard.
4. Click the *Permissions* label to view the permission management screen.

Figure 23.2. Permissions Screen



Under the **Permissions** section is a list of allowed actions that are applied to the selected role:

- **Access:** Permission to login into the application.
- **Administrate:** Permission to access the toolbar and system configuration features.
- **Create pages:** Ability to create new project pages.
- **Edit:** Permission to change the workspace properties.
- **Clear:** Ability to delete the workspace.
- **Edit permissions:** Ability to grant/deny permissions.
- **Change allowed panels:** Permission to restrict the type of panels that can be used in this workspace.

To assign a permission, you must select the target role and the list of actions allowed over the selected resource:

Figure 23.3. Permissions assignment

**Permissions assignation:**

| Role  | Actions  |
|---|--|
| Select role<br><input type="text" value="User"/> <input type="checkbox"/> Reverse | Access <input type="button" value="Yes"/>                |
|   | Administrate <input type="button" value="No"/>           |
|   | Create pages <input type="button" value="Yes"/>          |
|   | Edit <input type="button" value="Yes"/>                  |
|   | Clear <input type="button" value="No"/>                  |
|   | Edit permissions <input type="button" value="Yes"/>      |
|   | Change allowed panels <input type="button" value="Yes"/> |
| <input type="button" value="Save"/>   |  |

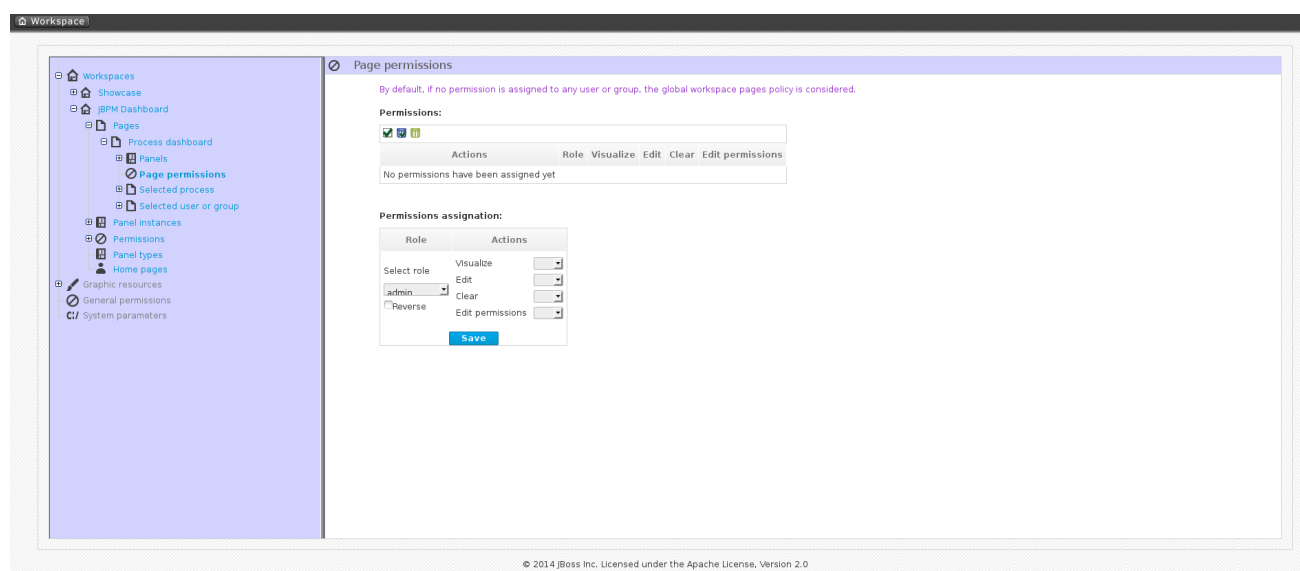
- *Target roles (who)*: What user will be granted/denied with the permissions defined.
- *Allowed actions*: Depending on the type of the resource we can enable/disable what the user can do on this resource.
- *Reverse (optional)*: When we have a set of roles and we want to grant/deny a permission to all the roles but one.

**NOTE**

By default, the full set of permissions go to the role **admin**. This makes it easy to create a user that can do everything as long as the role **admin** is assigned.

**23.4. PAGE PERMISSIONS**

1. To access **Page permissions**, locate the **Pages** drop-down under the jBPM Dashboard (or whatever Dashboard you selected).
2. After expanding **Pages**, expand the **Process dashboard** option.
3. Select the **Page permissions** option.

**Figure 23.4. Page Permissions**

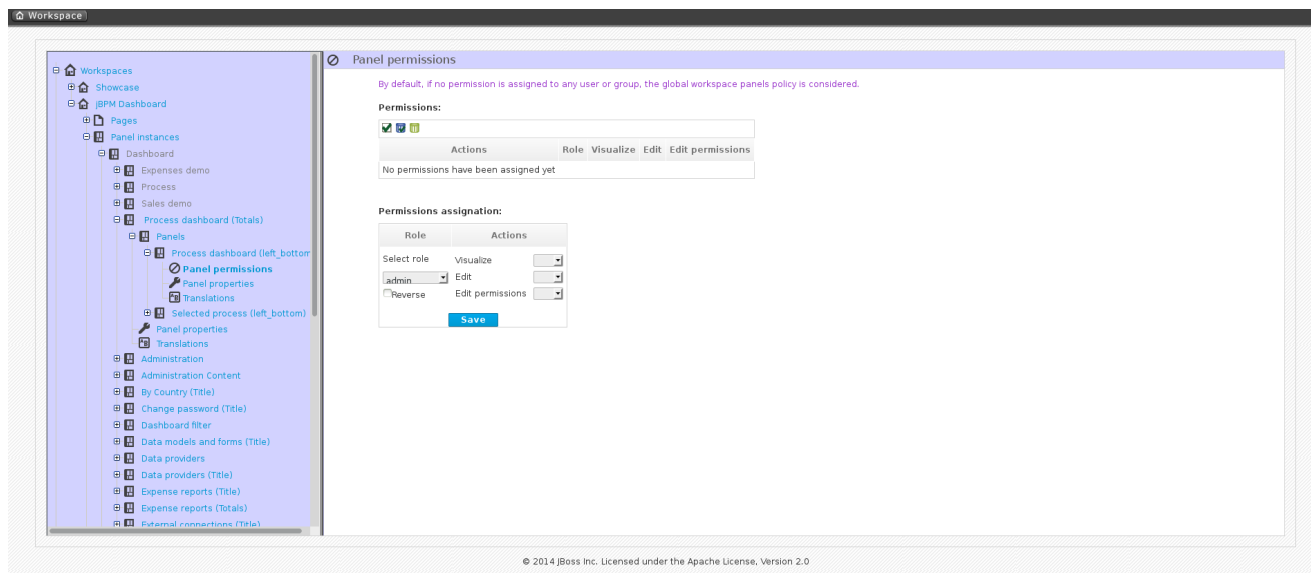
Under the **Permissions** section is a list of allowed actions that are applied to the selected role:

- **Visualize:** Permission to make the page visible.
- **Edit:** Ability to change the page properties.
- **Clear:** Ability to delete the page.
- **Edit permissions:** Ability to grant/deny permissions for the page.

## 23.5. PANEL PERMISSIONS

1. To access the **Panel permissions** page, expand the **Panel instances** option under the jBPM Dashboard (or whatever Dashboard you are using).
2. Expand the **Dashboard** option and then expand the **Process dashboard**.
3. Expand the **Panels** choice and select the appropriate process.
4. Open the **Panel permissions** page.

Below is a screenshot of the permission management screen for a given panel (in this example, the Process dashboard):

**Figure 23.5. Panel permissions configuration screen**

Allowed actions are the following:

- **Visualize:** Make the panel visible.
- **Edit:** Change the panel properties.
- **Edit permissions:** Ability to grant/deny permissions for the panel.

## APPENDIX A. CONFIGURATION PROPERTIES

This chapter contains all public system properties and KIE environment entries that you can use to configure your deployment of Red Hat JBoss BPM Suite.

### A.1. SYSTEM PROPERTIES

System properties configure the entire JVM Red Hat JBoss BPM Suite runs on. You can either provide them at runtime, or set them in the configuration XML file for your deployment.

#### A.1.1. Runtime Configuration

To set a particular property at runtime, add a flag **-D** with the property's name and value when starting the server. You can list multiple such properties at the same time.

##### Configuring System Properties at Runtime (Standalone deployments)

1. Navigate to **`SERVER_HOME/bin`**.
2. Run the server with the desired flags:

```
./standalone.sh -Dorg.kie.custom.property=value -
Dorg.uberfire.switch=false
```



#### NOTE

On Windows, run **`standalone.bat`** instead of **`standalone.sh`**.

#### A.1.2. XML Configuration

To set a property in Red Hat JBoss BPM Suite configuration, add an entry under the **`<system-properties>`** section in the **`standalone.xml`** file:

```
<system-properties>
  <property name="org.kie.custom.property" value="random_value"/>
  <property name="org.uberfire.switch" value="false"/>
  ...
</system-properties>
```

When running Red Hat JBoss BPM Suite in domain mode, add the entries in the **`<system-properties>`** element of the appropriate node in the **`host.xml`** file.

#### A.1.3. List of System Properties

This section contains the alphabetically sorted list of all recognized system properties in Red Hat JBoss BPM Suite 6.4.

##### Red Hat JBoss BPM Suite System Properties

###### **btm.root**

Root directory for Bitronix Transaction Manager. The discovery of configuration and other files starts in this location.

| Values | Default |
|--------|---------|
| String | N/A     |

**drools.propertySpecific**

Sets property reactivity behavior of the Red Hat JBoss BPM Suite engine. Options are following:

- **DISABLED**: Property reactivity turned off.
- **ALLOWED**: Property reactivity allowed.
- **ALWAYS**: Property reactivity always on.

| Values  | Default        |
|---|----------------|
| <b>DISABLED</b> , <b>ALLOWED</b> , or <b>ALWAYS</b> | <b>ALLOWED</b> |

**drools.ruleEngine**

Specifies which algorithm the Red Hat JBoss BPM Suite rule engine should use.

| Values                         | Default       |
|--------------------------------|---------------|
| <b>phreak</b> or <b>reteoo</b> | <b>phreak</b> |

**drools.sequential**

Enables sequential mode for stateless sessions.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

**drools.sequential.agenda**

Selects static or dynamic agenda with sequential mode.

| Values                          | Default   |
|---------------------------------|---|
| <b>static</b> or <b>dynamic</b> | <b>static</b> for standard mode, <b>dynamic</b> for sequential mode |

**jboss.node.name**

A node name unique in a Red Hat JBoss BPM Suite cluster.

| Values | Default |
|--------|---------|
| String | N/A     |

**jbpm.audit.jms.connection.factory**

A link to a JMS connection factory instance.

| Values  | Default |
|---|---------|
| A <code>javax.jms.ConnectionFactory</code> instance | N/A     |

**jbpm.audit.jms.connection.factory.jndi**

The JNDI name of the connection factory to look up.

| Values | Default |
|--------|---------|
| String | N/A     |

**jbpm.audit.jms.enabled**

Indicates if audit mode is set to JMS.

| Values   | Default |
|--|---------|
| <b>true</b> if Audit mode is set to JMS, otherwise<br><b>false</b> | N/A     |

**jbpm.audit.jms.queue**

A JMS Queue instance to be used when creating JMS AuditLogger.

| Values                                  | Default |
|---|---------|
| A <code>javax.jms.Queue</code> instance | N/A     |

**jbpm.audit.jms.queue.jndi**

The JNDI name of the JMS queue to look up.

| Values | Default |
|--------|---------|
| String | N/A     |

**jbpm.audit.jms.transacted**

Determines if the JMS session is transacted.

| Values                      | Default     |
|-----------------------------|-------------|
| <b>true</b> or <b>false</b> | <b>true</b> |

**jbpm.business.calendar.properties**

The location of the configuration file with Business Calendar properties.



| Values | Default   |
|--------|---|
| Path   | <code>/jbpm.business.calendar.properties</code> |

**jbpm.data.dir**

The location where data files produced by Red Hat JBoss BPM Suite must be stored.

| Values  | Default                         |
|---|---------------------------------|
| <code>\${jboss.server.data.dir}</code> if available,<br>otherwise <code>\${java.io.tmpdir}</code> | <code>\${java.io.tmpdir}</code> |

**org.jbpm.ejb.timer.tx**

Marks if the EJB timer service is transactional. If set to **true**, the EJB time service starts participating in the transactions. Note that this property is available only in Red Hat JBoss BPM Suite 6.4.2 and later.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

**jbpm.enable.multi.con**

Allows Web Designer to use multiple incoming or outgoing connections for tasks. If not enabled, the tasks are marked as invalid.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

**jbpm.loop.level.disabled**

Enables or disables loop iteration tracking to allow advanced loop support when using XOR gateways.

| Values                      | Default     |
|-----------------------------|-------------|
| <b>true</b> or <b>false</b> | <b>true</b> |

**jbpm.overdue.timer.delay**

Specifies the delay for overdue timers to allow proper initialization, in milliseconds.

| Values                 | Default |
|------------------------|---------|
| Number ( <b>Long</b> ) | 2000    |

**jbpm.overdue.timer.wait**

A time period in which the timer execution service allows overdue timers to start, in milliseconds.

| Values                 | Default |
|------------------------|---------|
| Number ( <b>Long</b> ) | 20000   |

### **jbpm.process.name.comparator**

An alternative comparator class to empower the Start Process by Name feature.

| Values               | Default   |
|----------------------|---|
| Fully qualified name | <b>org.jbpm.process.instance.StartProcessHelper.NumberVersionComparator</b> |

### **jbpm.tm.jndi.lookup**

Allows setting a specific **TransactionManager** JNDI lookup name as a fallback in case a standard JNDI name is not used. If **java:comp/UserTransaction** does not implement the **org.drools.persistence.TransactionManager** interface, these names are used, in this order:

1. **java:comp/TransactionManager**
2. **java:appserver/TransactionManager**
3. **java:pm/TransactionManager**
4. **java:TransactionManager**
5. Value of this property

| Values    | Default |
|-----------|---------|
| JNDI name | N/A     |

### **jbpm.usergroup.callback.properties**

The location of the usegroup callback property file when **org.jbpm.ht.callback** is set to **jaas** or **db**.

| Values | Default  |
|--------|--|
| Path   | <b>classpath:/jbpm.usergroup.callback.properties</b> |

### **jbpm.user.group.mapping**

An alternative classpath location of user info configuration (used by **LDAPUserInfoImpl**).

| Values | Default   |
|--------|---|
| Path   | <code>\${jboss.server.config.dir}/roles.properties</code> |

**jbpm.user.info.properties**

An alternative classpath location for user group callback implementation (LDAP, DB). For more information, see [org.jboss.org/jbpm/ht/userinfo](http://org.jboss.org/jbpm/ht/userinfo).

| Values | Default                                     |
|--------|---|
| Path   | <code>classpath:/userinfo.properties</code> |

**jbpm.ut.jndi.lookup**

An alternative JNDI name to be used when there is no access to the default one for user transactions (`java:comp/UserTransaction`).

| Values    | Default |
|-----------|---------|
| JNDI name | N/A     |

**jbpm.v5.id.strategy**

When enabled, Red Hat JBoss BPM Suite will use the process ID generation strategy from version 5 when migrating to version 6 and newer.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

**kie.maven.settings.custom**

The location of a custom `settings.xml` file for Maven configuration.

| Values | Default |
|--------|---------|
| Path   | N/A     |

**kie.server.jms.queues.response**

The JNDI name of response queue for JMS.

| Values | Default                                |
|--------|--|
| String | <code>queue/KIE.SERVER.RESPONSE</code> |

**org.drools.server.ext.disabled**

When set to **true**, disables the BRM support (for example rules support).

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

#### **org.drools.server.filter.classes**

When set to **true**, the Drools Intelligent Process Server extension accepts custom classes annotated by **XmlRootElement** or **Remotable** annotations only.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

#### **org.guvnor.inbox.disabled**

When set to **true**, this system property disables the Inbox feature and the Inbox mechanism of tracking changes to files is turned off. Doing this enables faster response to file system operations.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

#### **org.guvnor.m2repo.dir**

The location where Maven artifacts are stored. When you build and deploy a project, it is stored in this directory. Change the setting, for example, to allow easier backup of your maven repository.

| Values | Default                                 |
|--------|---|
| Path   | <b><i>EAP_HOME/repositories/kie</i></b> |

#### **org.guvnor.project.gav.check.disabled**

Disables a duplicate **GroupId**, **ArtifactId**, and **Version** (GAV) detection. When you build and deploy a project, Business Central scans the Maven repository for an artifact with the same GAV values. If set to **true**, Business Central silently overrides any previous project. If set to **false**, the user is required to confirm overriding the old project.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

#### **org.jbpm.deploy.sync.enabled**

When enabled, Red Hat JBoss BPM Suite synchronizes KJAR deployments across Business Central nodes in a cluster, and automatically loads previous deployments.

| Values                      | Default     |
|-----------------------------|-------------|
| <b>true</b> or <b>false</b> | <b>true</b> |

**org.jbpm.deploy.sync.int**

Interval of KJAR deployment synchronization, in seconds.

| Values                    | Default |
|---------------------------|---------|
| Number ( <b>Integer</b> ) | 3       |

**org.jbpm.executor.service.ejb-jndi**

Set this property in the application server in case your application uses EJBs. This property enables you to configure the executor service JNDI name. For example, to have executor available from **ejb-services** application (the deployed war application that uses EJBs), set this system property to **jndi:java:global/ejb-services/ExecutorServiceEJBImpl**.

| Values | Default  |
|--------|--|
| String | <b>jndi:java:module/ExecutorServiceEJBImpl</b> |

**org.jbpm.ht.callback**

Specifies the implementation of user group callback to be used:

- **mvel**: Default; mostly used for testing.
- **ldap**: LDAP; requires additional configuration in the [jbpm.usergroup.callback.properties](#) file.
- **db**: Database; requires additional configuration in the [jbpm.usergroup.callback.properties](#) file.
- **jaas**: JAAS; delegates to the container to fetch information about user data.
- **props**: A simple property file; requires additional file that will keep all information (users and groups).
- **custom**: A custom implementation; you must specify the fully qualified name of the class in the [org.jbpm.ht.custom.callback](#).

| Values  | Default     |
|---|-------------|
| <b>mvel</b> , <b>ldap</b> , <b>db</b> , <b>jaas</b> , <b>props</b> , or <b>custom</b> | <b>jaas</b> |

**org.jbpm.ht.custom.callback**

A custom implementation of the **UserGroupCallback** interface in case the [org.jbpm.ht.callback](#) property is set to **custom**.

| Values               | Default |
|----------------------|---------|
| Fully qualified name | N/A     |

#### org.jbpm.ht.custom.userinfo

A custom implementation of the **UserInfo** interface in case the [org.jbpm.ht.userinfo](#) property is set to **custom**.

| Values               | Default |
|----------------------|---------|
| Fully qualified name | N/A     |

#### org.jbpm.ht.userinfo

Specifies what implementation of the **UserInfo** interface to use for user or group information providers.

- **ldap**: LDAP; needs to be configured in the file specified in **jbpm-user.info.properties**.
- **db**: Database; needs to be configured in the file specified in **jbpm-user.info.properties**.
- **props**: A simple property file; set the property [jbpm.user.info.properties](#) to specify the path to the file.
- **custom**: A custom implementation; you must specify the fully qualified name of the class in the [org.jbpm.ht.custom.userinfo](#) property.

| Values  | Default |
|---|---------|
| <b>ldap</b> , <b>db</b> , <b>props</b> , or <b>custom</b> | N/A     |

#### org.jbpm.ht.user.separator

An alternative separator when loading actors and groups for user tasks from a **String**.

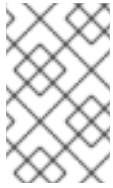
| Values | Default   |
|--------|-----------|
| String | , (comma) |

#### org.jbpm.rule.task.waitstate

When set to **false**, a business rule task automatically fires all rules instead of waiting to be triggered from the process event listener or an outside call. This behavior prevents errors during heavy multithreaded usage, however if **org.jbpm.rule.task.waitstate** is set to **false**, the business

task is no longer a safe point.

For information about safe points, see [Chapter 17, Persistence](#).



## NOTE

Starting with Red Hat JBoss BPM Suite 6.4 the default for **org.jbpm.rule.task.waitstate** is **false**. For more information, see the [Red Hat JBoss BPM Suite 6.4 Release Notes](#).

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

### org.jbpm.runtime.manager.class

A custom implementation of the **org.kie.api.runtime.manager.RuntimeManagerFactory** interface.

| Values               | Default  |
|----------------------|--|
| Fully qualified name | <b>org.jbpm.runtime.manager.impl.RuntimeManagerFactoryImpl</b> |

### org.jbpm.server.ext.disabled

When set to **true**, disables the BPM support (for example, processes support).

| Values                      | Default     |
|-----------------------------|-------------|
| <b>true</b> or <b>false</b> | <b>true</b> |

### org.jbpm.task.bam.enabled

Enables the **BAMTaskEventListener** class, which populates the **BAMTASKSUMMARY** table to allow the BAM module to query tasks.

| Values                      | Default     |
|-----------------------------|-------------|
| <b>true</b> or <b>false</b> | <b>true</b> |

### org.jbpm.task.cleanup.enabled

Enables the **TaskCleanUpProcessEventListener** class, which archives and removes completed tasks with the associated process ID.

| Values                      | Default     |
|-----------------------------|-------------|
| <b>true</b> or <b>false</b> | <b>true</b> |

**org.jbpm.ui.server.ext.disabled**

When set to **true**, disables the Intelligent Process Server UI extension.

| Values                      | Default     |
|-----------------------------|-------------|
| <b>true</b> or <b>false</b> | <b>true</b> |

**org.kie.auto.deploy.enabled**

When enabled, issuing a Build & Deploy operation in Business Central always deploys to runtime.

| Values                      | Default     |
|-----------------------------|-------------|
| <b>true</b> or <b>false</b> | <b>true</b> |

**org.kie.build.disable-project-explorer**

Disables automatic build of the selected project in Project Explorer.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

**org.kie.dd.mergemode**

Selects the method for overriding hierarchical merge mode behavior when managing deployment descriptors.

| Values  | Default                  |
|---|--------------------------|
| <b>MERGE_COLLECTIONS</b> , <b>KEEP_ALL</b> , <b>OVERRIDE_ALL</b> , or <b>OVERRIDE_EMPTY</b> | <b>MERGE_COLLECTIONS</b> |

**org.kie.demo**

Enables external cloning of a demo application from GitHub. This System Property takes precedence over **org.kie.example**.

| Values                      | Default     |
|-----------------------------|-------------|
| <b>true</b> or <b>false</b> | <b>true</b> |

**org.kie.example**

When set to **true**, creates an example organization unit and repository. This system property allows you to create projects and assets without creating your custom organization unit and repository. It is useful, for example, to simplify the getting started experience.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |



**org.kie.example.repositories**

Sets the path to the directory containing example repositories. If you set this system property, repositories in the specified directory are automatically cloned into Business Central during startup. This property overrides **org.kie.example** and **org.kie.demo**.

**WARNING**

You must download the example repositories from the [Customer Portal](#) and extract them to this directory before setting this system property.

| Values | Default |
|--------|---------|
| Path   | N/A     |

**org.kie.executor.disabled**

Disables the Red Hat JBoss BPM Suite executor.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

**org.kie.executor.initial.delay**

The initial delay before the Red Hat JBoss BPM Suite executor starts a job, in milliseconds.

| Values                    | Default |
|---------------------------|---------|
| Number ( <b>Integer</b> ) | 100     |

**org.kie.executor.interval**

The time between the moment the Red Hat JBoss BPM Suite executor finishes a job and the moment it starts a new one, in a time unit specified in [org.kie.executor.timeunit](#).

| Values                    | Default |
|---------------------------|---------|
| Number ( <b>Integer</b> ) | 3       |

**org.kie.executor.pool.size**

The number of threads used by the Red Hat JBoss BPM Suite executor.

| Values                    | Default |
|---------------------------|---------|
| Number ( <b>Integer</b> ) | 1       |

**org.kie.executor.retry.count**

The number of retries the Red Hat JBoss BPM Suite executor attempts on a failed job.

| Values                    | Default |
|---------------------------|---------|
| Number ( <b>Integer</b> ) | 3       |

**org.kie.executor.timeunit**

The time unit in which the [org.kie.executor.interval](#) is specified.

| Values   | Default        |
|--|----------------|
| A <a href="#">java.util.concurrent.TimeUnit</a> constant | <b>SECONDS</b> |

**org.kie.git.deployments.enabled**

When enabled, Red Hat JBoss BPM Suite uses a Git repository for storing deployments instead of a database.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

**org.kie.mail.debug**

When enabled, **EmailWorkItemHandler** produces debug logging for **javax.mail.Session**.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

**org.kie.mail.session**

The JNDI name of the mail session as registered in the application server, for use by **EmailWorkItemHandler**.

| Values | Default                     |
|--------|-----------------------------|
| String | <b>mail/jbpmMailSession</b> |

**org.kie.override.deploy.enabled**

Allows overwriting deployments with the same GAV (not allowed by default).

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

**org.kie.server.bypass.auth.user**

Allows to bypass the authenticated user for task-related operations, for example queries.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

**org.kie.server.controller**

A comma-separated list of URLs to controller REST endpoints, for example <http://localhost:8080/business-central/rest/controller>. This property is required when using a controller.

| Values               | Default |
|----------------------|---------|
| Comma-separated list | N/A     |

**org.kie.server.controller.connect**

The waiting time between repeated attempts to connect Intelligent Process Server to the controller when Intelligent Process Server starts up, in milliseconds.

| Values                 | Default      |
|------------------------|--------------|
| Number ( <b>Long</b> ) | <b>10000</b> |

**org.kie.server.controller.pwd**

The password to connect to the controller REST API. This property is required when using a controller.

| Values | Default            |
|--------|--------------------|
| String | <b>kieserver1!</b> |

**org.kie.server.controller.token**

This property allows you to use a token-based authentication between the KIE server and the controller instead of the basic user name/password authentication. The KIE server sends the token as a parameter in the request header. Note that long-lived access tokens are required as the tokens are not refreshed.

| Values | Default |
|--------|---------|
| String | N/A     |

**org.kie.server.controller.user**

The user name to connect to the controller REST API. This property is required when using a controller.

| Values | Default          |
|--------|------------------|
| String | <b>kieserver</b> |

**org.kie.server.domain**

The JAAS **LoginContext** domain used to authenticate users when using JMS.

| Values | Default |
|--------|---------|
| String | N/A     |

**org.kie.server.id**

An arbitrary ID to be assigned to this server. If a remote controller is configured, this is the ID under which the server will connect to the controller to fetch the KIE container configurations. If not provided, the ID is automatically generated.

| Values | Default |
|--------|---------|
| String | N/A     |

**org.kie.server.location**

The URL of the Intelligent Process Server instance used by the controller to call back on this server, for example: <http://localhost:8230/kie-server/services/rest/server>. This property is required when using a controller.

| Values | Default |
|--------|---------|
| URL    | N/A     |

**org.kie.server.persistence.dialect**

The Hibernate dialect to be used. You must set this property when enabling BPM support.

| Values | Default |
|--------|---------|
| String | N/A     |

**org.kie.server.persistence.ds**

A data source JNDI name. You must set this property when enabling BPM support.

| Values | Default |
|--------|---------|
| String | N/A     |

**org.kie.server.persistence.schema**

The database schema to be used.

| Values | Default |
|--------|---------|
| String | N/A     |

**org.kie.server.persistence.tm**

A transaction manager platform for Hibernate properties set. You must set this property when enabling BPM support.

| Values | Default |
|--------|---------|
| String | N/A     |

**org.kie.server.pwd**

The password used to connect with the KIE server from the controller, required when running in managed mode. You must set this property in Business Central system properties, and it is required when using a controller.

| Values | Default            |
|--------|--------------------|
| String | <b>kieserver1!</b> |

**org.kie.server.repo**

The location where Intelligent Process Server state files will be stored.

| Values | Default |
|--------|---------|
| Path   | .       |

**org.kie.server.sync.deploy**

Instructs the KIE server to hold the deployment until the controller provides the containers deployment configuration. This property affects only the KIE servers running in managed mode. The options are as follows:

- **false**; the connection to the controller is asynchronous. The application starts, connects to the controller and once successful, deploys the containers. The application accepts requests even before the containers are available.
- **true**; the deployment of the KIE server application joins the 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 instance. It is strongly recommended to use only one application (the KIE server) on one server instance.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

**org.kie.server.token**

This property allows you to use a token-based authentication between the controller and the KIE server instead of the basic user name/password authentication. The controller sends the token as a parameter in the request header. Note that long-lived access tokens are required as the tokens are not refreshed.

| Values | Default |
|--------|---------|
| String | N/A     |

**org.kie.server.user**

The user name used to connect with the KIE server from the controller, required when running in managed mode. This property need to be set in Business Central system properties and is required when using a controller.

| Values | Default          |
|--------|------------------|
| String | <b>kieserver</b> |

**org.kie.task.insecure**

Allows an authenticated user to work on tasks on behalf of other users through the Business Central runtime remote API.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

**org.kie.timer.ejb.disabled**

If you select the Singleton runtime strategy and use the EJB executor of your application server to handle timer events, a race condition may occur since the EJB executor completes a transaction outside the **KieSession**. Set this property to **true** to use the EJB executor bundled with Red Hat JBoss BPM Suite, which prevents this situation from happening.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

**org.kie.tx.lock.enabled**

When enabled, Red Hat JBoss BPM Suite uses an interceptor that locks the **KieSession** to a single thread for the duration of a transaction, which prevents concurrency errors in Container Managed Transaction (CMT) environments.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

**org.kie.verificaton.disable-dtable-realtime-verification**

Disables Business Central's decision table verification and validation feature.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

**org.optaplanner.server.ext.disabled**

When set to **true**, disables the BRP support (for example planner support).

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

**org.quartz.properties**

The location of the Quartz configuration file to activate the Quartz timer service.

| Values | Default |
|--------|---------|
| Path   | N/A     |

**org.uberfire.cluster.autostart**

Delays VFS clustering until the application is fully initialized to avoid conflicts when all cluster members create local clones.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

**org.uberfire.cluster.id**

The name of the Helix cluster, for example: **kie-cluster**. You must set this property to the same value as defined in the Helix Controller.

| Values | Default |
|--------|---------|
| String | N/A     |

**org.uberfire.cluster.local.id**

The unique ID of the Helix cluster node. Note that ':' is replaced with '\_', for example **node1\_12345**.

| Values | Default |
|--------|---------|
| String | N/A     |

**org.uberfire.cluster.vfs.lock**

The name of the resource defined on the Helix cluster, for example: **kie-vfs**.

| Values | Default |
|--------|---------|
| String | N/A     |

**org.uberfire.cluster.zk**

The location of the Zookeeper servers.

| Values   | Default |
|--|---------|
| String of the form<br><b>host1:port1,host2:port2,host3:port3,</b><br>... | N/A     |

**org.uberfire.domain**

The security domain name for Business Central. For more information about security domains, see chapter [Use a Security Domain in Your Application](#) of the *Red Hat JBoss EAP Security Guide*.

| Values | Default                 |
|--------|-------------------------|
| String | <b>ApplicationRealm</b> |

**org.uberfire.metadata.index.dir**

The location of the **.index** directory, which Apache Lucene uses when indexing and searching.

| Values | Default                   |
|--------|---------------------------|
| Path   | Current working directory |

**org.uberfire.nio.git.daemon.enabled**

Enables the Git daemon.

| Values                      | Default     |
|-----------------------------|-------------|
| <b>true</b> or <b>false</b> | <b>true</b> |

**org.uberfire.nio.git.daemon.host**

If the Git daemon is enabled, it uses this property as the localhost identifier.



| Values | Default          |
|--------|------------------|
| URL    | <b>localhost</b> |

**org.uberfire.nio.git.daemon.port**

If the Git daemon is enabled, it uses this property as the port number.

| Values      | Default     |
|-------------|-------------|
| Port number | <b>9418</b> |

**org.uberfire.nio.git.dir**

The location of the directory **.niogit**. Change the value for example for backup purposes.

| Values | Default                   |
|--------|---------------------------|
| Path   | Current working directory |

**org.uberfire.nio.git.hooks**

The location where default Git hook files are stored. These files will be copied to newly created Git repositories.

| Values | Default |
|--------|---------|
| Path   | N/A     |

**org.uberfire.nio.git.ssh.cert.dir**

The location of the directory **.security**. Local certificates are stored here.

| Values | Default                   |
|--------|---------------------------|
| Path   | Current working directory |

**org.uberfire.nio.git.ssh.enabled**

Enables the SSH daemon.

| Values                      | Default     |
|-----------------------------|-------------|
| <b>true</b> or <b>false</b> | <b>true</b> |

**org.uberfire.nio.git.ssh.host**

If the SSH daemon is enabled, it uses this property as the localhost identifier.

| Values | Default          |
|--------|------------------|
| URL    | <b>localhost</b> |

**org.uberfire.nio.git.ssh.passphrase**

The passphrase to access your operating system's public keystore when cloning Git repositories with scp-style URLs, for example **git@github.com:user/repository.git**.

| Values | Default |
|--------|---------|
| String | N/A     |

**org.uberfire.nio.git.ssh.port**

If the SSH daemon is enabled, it uses this property as the port number.

| Values      | Default     |
|-------------|-------------|
| Port number | <b>8001</b> |

**org.uberfire.secure.alg**

The crypto algorithm used by password encryption.

| Values | Default                 |
|--------|-------------------------|
| String | <b>PBEWithMD5AndDES</b> |

**org.uberfire.secure.key**

A secret password used by password encryption.

| Values | Default                   |
|--------|---------------------------|
| String | <b>org.uberfire.admin</b> |

**org.uberfire.sys.repo.monitor.disabled**

Disables the configuration monitor.

**WARNING**

Do not use unless you are certain what you are doing.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

## A.2. ENVIRONMENT PROPERTIES

As opposed to [system properties](#), environment properties are passed to an individual **KieSession**, allowing you to control its behaviour independently on the rest of the deployment.

The properties available to you are the constants of the class `org.kie.api.runtime.EnvironmentName`.

### A.2.1. Configuration

To set the environment properties on a **KieSession**, you can create a new session with an instance of the **Environment** or **RuntimeEnvironment** interface:

#### Setting Environment Property using Environment interface

```
Environment env = EnvironmentFactory.newEnvironment();
env.set(EnvironmentName.SAMPLE_PROPERTY, true);
kbase.newKieSession(null, env);
```

#### Setting Environment Property using RuntimeEnvironment interface

```
RuntimeEnvironment environment = RuntimeEnvironmentBuilder.Factory.get()
    .newDefaultBuilder()
    ....

environment.getEnvironment().set(EnvironmentName.SAMPLE_PROPERTY, true);
singletonManager =
    RuntimeManagerFactory.Factory.get().newSingletonRuntimeManager(environment
    );
```

### A.2.2. List of Environment Properties

This section contains the alphabetically sorted list of all recognized environment properties in Red Hat JBoss BPM Suite 6.4.

#### Red Hat JBoss BPM Suite Environment Properties

##### APP\_SCOPED\_ENTITY\_MANAGER

The entity manager used for persistence of **SessionInfo**. You can specify it when using Spring with local transactions and a shared entity manager.

| Values                              | Default   |
|-------------------------------------|---|
| An instance of <b>EntityManager</b> | Automatically created from the provided <b>EntityManagerFactory</b> |

## CALENDARS

This property is not used.

## CMD\_SCOPED\_ENTITY\_MANAGER

The entity manager used for persistence of entities (process instances, tasks, work items). You can specify it when using Spring with local transactions and a shared entity manager.

| Values                              | Default   |
|-------------------------------------|---|
| An instance of <b>EntityManager</b> | Automatically created from the provided <b>EntityManagerFactory</b> |

## DATE\_FORMATS

This property is not used.

## ENTITY\_MANAGER\_FACTORY

The **EntityManagerFactory** used in the Red Hat JBoss BPM Suite engine.

| Values                                     | Default |
|--|---------|
| An instance of <b>EntityManagerFactory</b> | N/A     |

## GLOBALS

| Values                             | Default |
|------------------------------------|---------|
| Any object declared in DRL or BPMN | N/A     |

## OBJECT\_MARSHALLING\_STRATEGIES

Enable use of pluggable variable persistence strategies. Allows storing variables in different data stores.

| Values  | Default   |
|---|---|
| An instance of <b>org.kie.api.marshalling.ObjectMarshallingStrategy</b> | Dependent on the engine configuration. If no other strategy is available, <b>org.drools.core.marshalling.impl.SerializablePlaceholderResolvingStrategy</b> is used. |

## PERSISTENCE\_CONTEXT\_MANAGER

The **ProcessPersistenceContextManager** instance used for process persistence.

| Values  | Default  |
|---|--|
| An instance of <b>org.jbpm.persistence.ProcessPersistenceContextManager</b> | An instance of <b>org.jbpm.persistence.JpaProcessPersistenceContextManager</b> |

## TASK\_PERSISTENCE\_CONTEXT\_MANAGER

The **TaskPersistenceContextManager** instance used for task persistence.

| Values  | Default   |
|---|---|
| An instance of <b>org.kie.internal.task.api.TaskPersistenceContextManager</b> | An instance of <b>org.jbpm.services.task.persistence.JPATaskPersistenceContextManager</b> |

## TASK\_USER\_GROUP\_CALLBACK

Get the **UserGroupCallback** instance from the environment or context. For example:

```
callback = context.get(EnvironmentName.TASK_USER_GROUP_CALLBACK)
```

| Values                                | Default   |
|---------------------------------------|---|
| Configured by Red Hat JBoss BPM Suite | An instance of <b>org.kie.internal.task.api.UserGroupCallback</b> |

## TASK\_USER\_INFO

Get the **UserInfo** instance from the environment or context. For example:

```
info = context.get(EnvironmentName.TASK_USER_INFO)
```

| Values                                | Default  |
|---------------------------------------|--|
| Configured by Red Hat JBoss BPM Suite | An instance of <b>org.kie.internal.task.api.UserInfo</b> |

## TRANSACTION

Optional property if **UserTransaction** can not be obtained using JNDI lookup.

| Values                                | Default     |
|---------------------------------------|-------------|
| An instance of <b>UserTransaction</b> | <b>null</b> |

## TRANSACTION\_MANAGER

Get the **TransactionManager** instance from the environment or context. For example:

```
info = context.get(EnvironmentName.TRANSACTION_MANAGER)
```

| Values                                   | Default                       |
|--|-------------------------------|
| An instance of <b>TransactionManager</b> | Depends on your configuration |

## TRANSACTION\_SYNCHRONIZATION\_REGISTRY

Allows access to and control of the active transaction. Used by Red Hat JBoss BPM Suite to efficiently manage persistence.

| Values   | Default  |
|--|--|
| An instance of <b>TransactionSynchronizationRegistry</b> | Taken from the environment—usually JNDI lookup in JTA environments |

## USE\_LOCAL\_TRANSACTIONS

When enabled, Red Hat JBoss BPM Suite uses local transactions as opposed to JTA.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

## USE\_PESSIMISTIC\_LOCKING

When enabled, a database resource can only be accessed by one transaction at a time.

| Values                      | Default      |
|-----------------------------|--------------|
| <b>true</b> or <b>false</b> | <b>false</b> |

## APPENDIX B. VERSIONING INFORMATION

Documentation last updated on: Friday August 31, 2018.