Installing and configuring KIE Server on IBM WebSphere Application Server
Red Hat Process Automation Manager 7.8 Installing and configuring KIE Server on IBM WebSphere Application Server

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Abstract

This document describes how to configure IBM WebSphere Application Server for KIE Server and how to install KIE Server on that IBM server instance.
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As a system administrator, you can configure your IBM WebSphere Application Server for Red Hat KIE Server and install KIE Server on that IBM server instance.

Prerequisites

- An IBM WebSphere Application Server instance version 9.0 or later is installed. For complete installation instructions, see the IBM WebSphere Application Server product page.

- You have access to the WebSphere Integrated Solutions Console, usually at http://<HOST>:9060.ibm/console.
CHAPTER 1. KIE SERVER

KIE Server is the server where the rules and other artifacts for Red Hat Process Automation Manager are stored and run. KIE Server is a standalone built-in component that can be used to instantiate and execute rules through interfaces available for REST, Java Message Service (JMS), or Java client-side applications, as well as to manage processes, jobs, and Red Hat Business Optimizer functionality through solvers.

Created as a web deployable WAR file, KIE Server can be deployed on any web container. The current version of the KIE Server is included with default extensions for both Red Hat Decision Manager and Red Hat Process Automation Manager.

KIE 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 containers, which enables you to execute multiple rule services in parallel.

KIE Server can be integrated with other application servers, such as Oracle WebLogic Server or IBM WebSphere Application Server, to streamline Red Hat Process Automation Manager application management.
CHAPTER 2. IBM WEBSPHERE APPLICATION SERVER

IBM WebSphere Application Server is a flexible and secure web application server that hosts Java-based web applications and provides Java EE-certified run time environments. IBM WebSphere 9.0 supports Java SE 8 and is fully compliant with Java EE 7.
CHAPTER 3. INSTALLING AND RUNNING IBM WEBSPHERE
APPLICATION SERVER

IBM WebSphere Application Server must be installed and running for you to apply many of the configurations that accommodate KIE Server. This section describes how to install and start IBM WebSphere.

For the most up-to-date and detailed installation instructions, see the IBM Knowledge Center.

Procedure

1. Download IBM Installation Manager version 1.8.5 or later from the IBM Installation Manager and Packaging Utility download links page. IBM Installation Manager is required for installing IBM WebSphere.

2. Extract the downloaded archive and run the following command as the root user in the new directory:

   ```
   sudo ./install
   ```

   The IBM Installation Manager opens.

3. Go to File → Preferences and click Add Repository.

4. In the Add Repository window, enter the repository URL for IBM WebSphere 9.0. You can find all the repository URLs in the Online product repositories for IBM WebSphere Application Server offerings page of the IBM Knowledge Center.

5. In your command terminal, navigate to the IBM WebSphere Application Server folder location that you specified during the installation.

6. Change to the /bin directory and run a command similar to the following example to create an IBM WebSphere profile, user name, and password. A profile defines the run time environment. The profile includes all the files that the server processes in the runtime environment and that you can change. The user is required for login.

   ```
   sudo ./manageprofiles.sh -create -profileName testprofile -profilePath /profiles/testprofile -adminUserName websphere -adminPassword password123
   ```

7. In your command terminal, navigate to the bin directory within the profile that you created (for example, /profiles/testprofile/bin) and run the following command to start the IBM WebSphere Application Server instance:

   ```
   sudo ./startServer.sh <SERVER_NAME>
   ```

   `<SERVER_NAME>` is the IBM WebSphere Application Server name defined in Servers → Server Types → IBM WebSphere Application Servers of the WebSphere Integrated Solutions Console.

8. Open the following URL in a web browser:

   ```
   http://<HOST>:9060/ibm/console
   ```

   `<HOST>` is the system name or IP address of the target server.
For example, to start the WebSphere Integrated Solutions Console for a local instance of IBM WebSphere running on your system, enter the following URL in a web browser:

http://localhost:9060/ibm/console

9. When the login page of the WebSphere Integrated Solutions Console appears, enter your administrative credentials.
CHAPTER 4. CONFIGURING IBM WEBSPHERE APPLICATION SERVER FOR KIE SERVER

Before you deploy KIE Server with IBM WebSphere Application Server, you must configure system properties, security settings, JMS requirements, and other properties on IBM WebSphere. These configurations promote an optimal integration with KIE Server.

Prerequisites

- IBM WebSphere Application Server is installed and running.
- You are logged in to the WebSphere Integrated Solutions Console.

4.1. ENABLING ADMINISTRATIVE SECURITY

You must enable administrative security in the WebSphere Integrated Solutions Console so that you have the required permissions to create users and groups.

Procedure

1. In the WebSphere Integrated Solutions Console, click **Security → Global Security** and ensure that the option **Enable Application Security** is selected. This may already be selected and overridden at the server level.

2. Click **Security Configuration Wizard** and click **Next**.

3. Select the repository that contains the user information. For example, select **Federated repositories** for local configurations.

4. Click **Next**

5. Enter the **Primary administrative user name** and **Password**.

6. Click **Next** and then click **Finish**.

7. Click **Save** in the **Messages** window to save your changes to the master configuration.

Figure 4.1. Save security changes

8. In your command terminal, navigate to the IBM WebSphere Application Server `/bin` directory location that you specified during installation, and run the following commands to stop and restart IBM WebSphere to apply the security changes:

   ```bash
   sudo ./stopServer.sh <SERVER_NAME>
   ```
sudosudo ./startServer.sh <SERVER_NAME>

<SERVER_NAME> is the IBM WebSphere Application Server name defined in Servers → Server Types → IBM WebSphere Application Servers of the WebSphere Integrated Solutions Console.

### 4.2. CONFIGURING JDBC DATA SOURCES IN IBM WEBSHHERE APPLICATION SERVER

A data source is an object that enables a Java Database Connectivity (JDBC) client, such as an application server, to establish a connection with a database. Applications look up the data source on the Java Naming and Directory Interface (JNDI) tree or in the local application context and request a database connection to retrieve data. You must configure data sources for IBM WebSphere Application Server to ensure proper data exchange between the servers and the designated database.

**Prerequisites**

- The JDBC providers that you want to use to create database connections are configured on all servers on which you want to deploy the data source. For more information about JDBC providers, see Configuring a JDBC provider in the IBM Knowledge Center.

**Procedure**

1. Navigate to the Software Downloads page in the Red Hat Customer Portal (login required), and select the product and version from the drop-down options:
   - **Product**: Process Automation Manager
   - **Version**: 7.8

2. Download Red Hat Process Automation Manager 7.8.0 Add-Ons

3. Complete the following steps to prepare your database:
   
   a. Extract rhpam-7.8.0-add-ons.zip in a temporary directory, for example TEMP_DIR.
   

   c. Change your current directory to the TEMP_DIR/rhpam-7.8.0-migration-tool/ddl-scripts directory. This directory contains DDL scripts for several database types.

   d. Import the DDL script for your database type into the database that you want to use, for example:

   ```
   psql jbpm < /ddl-scripts/postgresql/postgresql-jbpm-schema.sql
   ```

   **NOTE**

   If you are using PostgreSQL or Oracle in conjunction with Spring Boot, you must import the respective Spring Boot DDL script, for example /ddl-scripts/oracle/oracle-springboot-jbpm-schema.sql or /ddl-scripts/postgresql/postgresql-springboot-jbpm-schema.sql.
4. In the WebSphere Integrated Solutions Console, navigate to Resources → JDBC → Data sources.

5. Select the scope at which applications can use the data source. You can choose a cell, node, cluster, or server.

6. Click New to open the Create a data source wizard.

7. Enter a unique name in the Data source name field and a Java Naming and Directory Interface (JNDI) name in the JNDI name field. The application server uses the JNDI name to bind resource references for an application to this data source. Do not assign duplicate JNDI names across different resource types, such as data sources versus J2C connection factories or JMS connection factories.

8. Click Next and choose Select an existing JDBC provider if the provider has been created, or choose Create new JDBC provider to define details for a new provider. (Creating the JDBC provider before this point is recommended, as a prerequisite to adding data sources.)

9. On the Enter database specific properties for the data source panel, click Use this data source in container managed persistence (CMP) if container managed persistence (CMP) enterprise beans must access this data source. Then fill in any other database-specific properties.

10. Optionally, configure the security aliases for the data source. You can select None for any of the authentication methods, or choose one of the following types:

   - **Component-managed authentication alias**: Specifies an authentication alias to use when the component resource reference res-auth value is Application. To define a new alias, navigate to Related Items → J2EE Connector Architecture (J2C) authentication data entries. A component-managed alias represents a combination of ID and password that is specified in an application for data source authentication. Therefore, the alias that you set on the data source must be identical to the alias in the application code.

   - **Mapping-configuration alias**: Used only in the absence of a login configuration on the component resource reference. The specification of a login configuration and the associated properties on the component resource reference is the preferred way to define the authentication strategy when the res-auth value is set to Container. If you specify the DefaultPrincipalMapping login configuration, the associated property is a JAAS - J2C authentication data entry alias.

   - **Container-managed authentication alias**: Used only in the absence of a login configuration on the component resource reference. The specification of a login configuration and the associated properties on the component resource reference determines the container-managed authentication strategy when the res-auth value is set to Container.

11. Click Next, review the information for the data source, and click Finish to save the configuration and exit the wizard.

   The Data sources panel displays your new configuration in a table along with any other data sources that are configured for the same scope.

For more information about IBM WebSphere Application Server data sources, see Configuring a JDBC provider and data source in the IBM Knowledge Center.
4.3. CONFIGURING JAVA MESSAGE SERVICE (JMS)

The Java Message Service (JMS) is a Java API that KIE Server uses to exchange messages with other application servers such as Oracle WebLogic Server and IBM WebSphere Application Server. You must configure your application server to send and receive JMS messages through KIE Server to ensure proper collaboration between the two servers.

4.3.1. Create a service bus and add IBM WebSphere

You must create a service bus and add the IBM WebSphere Application Server as a member of it in order to use JMS.

Procedure

1. In the WebSphere Integrated Solutions Console, navigate to Service Integration → Buses → New.
2. Enter a new bus name and clear the Bus Security option.
3. Click Next and then Finish to create the service bus.
4. Select the service bus that you have created.
6. In the Add a New Bus Member wizard, choose the IBM WebSphere Application Server and the type of message store for persistence. You can also specify the properties of the message store.
7. Click Finish to add the new bus member.

4.3.2. Create JMS connection factories

To enable messaging with KIE Server, you must create certain JMS connection factories for sending and receiving messages.

Prerequisites

- You have created a service bus for IBM WebSphere Application Server.

Procedure

1. In the WebSphere Integrated Solutions Console, navigate to Resources → JMS → Connection Factories.
2. Select the correct scope and click New.
3. Select the Default Messaging Provider option and click OK.
4. For each of the following required connection factories, enter the name of the connection factory (for example, KIE.SERVER.REQUEST) and the JNDI name (for example, jms/cf/KIE.SERVER.REQUEST), and then select the service bus from the Bus Name drop-down list. Leave the default values for the remaining options.
5. Click **Apply** and **Save** to save the changes to the master configuration, and repeat for each required factory.

### 4.3.2.1. JMS connection factories for KIE Server

The following are the required Java Message Service (JMS) connection factories that enable JMS messaging with KIE Server:

**Table 4.1. Required JMS connection factories for KIE Server**

<table>
<thead>
<tr>
<th>Name</th>
<th>Default value</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>KIE.SERVER.REQUEST</td>
<td>jms/cf/KIE.SERVER.REQUEST</td>
<td>Sending all requests to KIE Server</td>
</tr>
<tr>
<td>KIE.SERVER.RESPONSE</td>
<td>jms/cf/KIE.SERVER.RESPONSE</td>
<td>Receiving all responses produced by KIE Server</td>
</tr>
<tr>
<td>KIE.SERVER.EXECUTOR</td>
<td>jms/cf/KIE.SERVER.EXECUTOR</td>
<td>KIE Server executor services</td>
</tr>
</tbody>
</table>

### 4.3.3. Create JMS queues

JMS queues are the destination end points for point-to-point messaging. You must create certain JMS queues to enable JMS messaging with KIE Server.

**Prerequisites**

- You have created a service bus for IBM WebSphere Application Server.

**Procedure**

1. In the WebSphere Integrated Solutions Console, navigate to **Resources → JMS → Queues**.

2. Select the correct scope and click **New**.

3. Select the **Default Messaging Provider** option and click **OK**.

4. For each of the following required queues, enter the name of the queue (for example, `KIE.SERVER.REQUEST`) and the JNDI name (for example, `jms/KIE.SERVER.REQUEST`), and then select the service bus from the **Bus Name** drop-down list.

5. From the **Queue Name** drop-down list, select the **Create Service Integration Bus Destination** enter a unique identifier, and select the bus member that you created previously.

6. Click **Apply** and **Save** to save the changes to the master configuration, and repeat for each required queue.

### 4.3.3.1. JMS queues for KIE Server

The following are the required Java Message Service (JMS) queues that enable JMS messaging with KIE Server:
<table>
<thead>
<tr>
<th>Name</th>
<th>Default value</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>KIE.SERVER.REQUEST</td>
<td>jms/KIE.SERVER.REQUEST</td>
<td>Sending all requests to KIE Server</td>
</tr>
<tr>
<td>KIE.SERVER.RESPONSE</td>
<td>jms/KIE.SERVER.RESPONSE</td>
<td>Receiving all responses produced by KIE Server</td>
</tr>
<tr>
<td>KIE.SERVER.EXECUTOR</td>
<td>jms/KIE.SERVER.EXECUTOR</td>
<td>KIE Server executor services</td>
</tr>
</tbody>
</table>

### 4.3.4. Create JMS activation specifications

A JMS activation specification is required in order to bridge the queue and the message-driven bean that enables JMS.

**Prerequisites**

- You have created a service bus for IBM WebSphere Application Server.
- You have created JMS queues.

**Procedure**

1. In the WebSphere Integrated Solutions Console, navigate to Resources → JMS → Activation Specifications.
2. Select the correct scope and click New.
3. Select the Default Messaging Provider option and click OK.
4. For each of the following required activation specifications, enter the name of the activation specification (for example, KIE.SERVER.REQUEST) and the JNDI name (for example, jms/activation/KIE.SERVER.REQUEST), and then select the service bus from the Bus Name drop-down list.
5. From the Destination Type drop-down list, select Queue and enter the name of the corresponding queue as a Destination lookup (for example, jms/KIE.SERVER.REQUEST).
6. Click Apply and Save to save the changes to the master configuration, and repeat for each required activation specification.

### 4.3.4.1. JMS activation specifications for KIE Server

The following are the required Java Message Service (JMS) activation specifications that enable JMS messaging with KIE Server:

Table 4.3. Required JMS activation specifications for KIE Server
<table>
<thead>
<tr>
<th>Name</th>
<th>Default value</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>KIE.SERVER.REQUEST</td>
<td>jms/activation/KIE.SERVER.REQUEST</td>
<td>Sending all requests to KIE Server</td>
</tr>
<tr>
<td>KIE.SERVER.RESPONSE</td>
<td>jms/activation/KIE.SERVER.RESPONSE</td>
<td>Receiving all responses produced by KIE Server</td>
</tr>
<tr>
<td>KIE.SERVER.EXECUTOR</td>
<td>jms/activation/KIE.SERVER.EXECUTOR</td>
<td>KIE Server executor services</td>
</tr>
</tbody>
</table>

### 4.4. SETTING SYSTEM PROPERTIES IN IBM WEBSHHERE APPLICATION SERVER

Set the system properties listed in this section on your IBM WebSphere Application Server before you deploy KIE Server.

**Procedure**

1. In the WebSphere Integrated Solutions Console, navigate to **Servers → Server Types → IBM WebSphere Application Servers**.

2. In the list of application servers, choose the server on which you are going to deploy KIE Server.

3. Under the **Server Infrastructure**, click **Java and Process Management → Process Definition**.
4. Under **Additional Properties**, click **Java Virtual Machine**
This opens the configuration properties for the JVM that is used to start IBM WebSphere.

5. Set both the Initial heap size and Maximum heap size to 2048 and click Apply to increase the Java Virtual Machine (JVM) memory size. KIE Server has been tested with these values. If you do not increase the JVM memory size, IBM WebSphere Application Server freezes or causes deployment errors when deploying KIE Server.


7. Click New → Custom JVM Properties and add the following properties to IBM WebSphere:

Table 4.4. System properties for KIE Server

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>kie.server.jms.queues.response</td>
<td>jms/KIE.SERVER.RESPONSE</td>
<td>The JNDI name of JMS queue for responses used by KIE Server.</td>
</tr>
<tr>
<td>org.kie.server.domain</td>
<td>WSLogin</td>
<td>JAAS LoginContext domain used to authenticate users when using JMS.</td>
</tr>
<tr>
<td>Name</td>
<td>Value</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>org.kie.server.persistence.ds</td>
<td>jdbc/jbpm</td>
<td>Data source JNDI name for KIE Server.</td>
</tr>
<tr>
<td>org.kie.server.persistence.tm</td>
<td>org.hibernate.engine.transaction.jta.platform.internal.WebSphereJtaPlatform</td>
<td>Transaction manager platform for setting Hibernate properties.</td>
</tr>
<tr>
<td>org.kie.server.persistence.dialect</td>
<td>Example: org.hibernate.dialect.H2Dialect</td>
<td>Specifies the Hibernate dialect to be used. Set according to data source.</td>
</tr>
<tr>
<td>org.kie.executor.jms.queue</td>
<td>jms/KIE SERVER.EXECUTOR</td>
<td>Job executor JMS queue for KIE Server.</td>
</tr>
<tr>
<td>org.kie.executor.jms.cf</td>
<td>jms/cf/KIE SERVER.EXECUTOR</td>
<td>Job executor JMS connection factory for KIE Server.</td>
</tr>
<tr>
<td>org.kie.server.router</td>
<td>Example: <a href="http://localhost:9000">http://localhost:9000</a></td>
<td>(Optional) Specifies one or more URLs for one or more KIE Server routers (Smart Routers) that the application server is a part of in a clustered KIE Server environment.</td>
</tr>
<tr>
<td>org.jboss.logging.provider</td>
<td>jdk</td>
<td>This property is only required where a CA SiteMinder TAI (SMTAI) is installed in the environment. Using this property forces Hibernate to use JDK instead of log4j for logging within Dashbuilder. CA SiteMinder TAI (SMTAI) contains an old version of log4j, which causes conflicts.</td>
</tr>
</tbody>
</table>

8. Click **Save** to save the changes to the master configuration.

4.5. STOPPING AND RESTARTING IBM WEBSPHERE APPLICATION SERVER

After you have configured all required system properties in IBM WebSphere Application Server, stop and restart the IBM server to ensure that the configurations are applied.

Procedure
In your command terminal, navigate to the IBM WebSphere Application Server `/bin` directory location that you specified during installation, and run the following commands to stop and restart IBM WebSphere to apply the configuration changes:

```
sudo ./stopServer.sh <SERVER_NAME>
```

```
sudo ./startServer.sh <SERVER_NAME>
```

`<SERVER_NAME>` is the IBM WebSphere Application Server name defined in `Servers → Server Types → IBM WebSphere Application Servers` of the WebSphere Integrated Solutions Console.
CHAPTER 5. INSTALLING AND RUNNING KIE SERVER WITH IBM WEBSPHERE APPLICATION SERVER

After you have configured all required system properties in IBM WebSphere Application Server, you can install KIE Server with IBM WebSphere to streamline Red Hat Process Automation Manager application management.

Prerequisites

- An IBM WebSphere Application Server instance is configured as described in Chapter 4, Configuring IBM WebSphere Application Server for KIE Server.

Procedure

1. Navigate to the Software Downloads page in the Red Hat Customer Portal (login required), and select the product and version from the drop-down options:
   - **Product**: Process Automation Manager
   - **Version**: 7.8
2. Download Red Hat Process Automation Manager 7.8.0 KIE Server for All Supported EE7 Containers.
3. Extract the rhpam-7.8.0-kie-server-ee7.zip archive to a temporary directory. In the following examples this directory is called TEMP_DIR.
4. Repackage the kie-server.war directory:
   b. Select the contents of the TEMP_DIR/rhpam-7.8.0-kie-server-ee7/kie-server.war directory and create the kie-server.zip file.
   c. Rename kie-server.zip to kie-server.war. This is the file that you will use to deploy KIE Server.
   d. Optionally, copy the new kie-server.war file to a location that is more convenient to deploy from.
5. In the WebSphere Integrated Solutions Console, navigate to Applications → Application Types → WebSphere Enterprise Applications.
6. Click Install.
7. Navigate to the kie-server.war file that you repackaged and select it to upload.
8. Select Fast Path and click Next.
   The Install New Application wizard opens.
9. Change the Application Name to kie-server and click Next.
10. Map the KIE Server modules to servers according to your specific requirements and click Next.
11. For Bind Listeners for Message-Driven Beans, select Activation Specification for both beans, enter jms/activation/KIE.SERVER.REQUEST in the Target Resource JNDI Name.
field, and enter the jms/cf/KIE.SERVER.REQUEST JNDI name for the KIE.SERVER.REQUEST connection factory.

12. In the Map Virtual Hosts for Web Modules section, keep the default values and click Next.

13. Set the context root to kie-server.

14. In the Metadata for Modules section, keep the default values and click Next.

15. Click Finish to install KIE Server and click Save to save the changes to the master configuration.

5.1. CREATING THE KIE SERVER GROUP AND ROLE

After KIE Server is installed, you must create the kie-server group and a user.

Prerequisites

- KIE Server is installed on the IBM WebSphere Application Server instance.

Procedure

1. In the WebSphere Integrated Solutions Console, click Users and Groups → Manage Groups.

2. In the Manage Groups screen, click Create.

3. In the Create a Group screen, enter kie-server in the Group name box, then click Create.

4. To create a user to add to the kie-server group, click Users and Groups → Manage Users.

5. In the Create a User screen, complete the required information.

6. Click Group Membership.

7. In the Group Membership screen, click kie-server, move it to Mapped To, and click Close.

8. On the Create a User screen click Create.

5.2. MAPPING THE KIE SERVER GROUP AND ROLE

After KIE Server is installed, you must map the kie-server role to the kie-server group in the WebSphere Integrated Solutions Console to run KIE Server.

Prerequisites

- KIE Server is installed on the IBM WebSphere Application Server instance.

- IBM WebSphere Application Server has the kie-server group with at least one user.

Procedure

1. In the WebSphere Integrated Solutions Console, navigate to Applications → Application Types → WebSphere Enterprise Applications and select the newly installed kie-server application.

2. Under Detail Properties, click Security Role to User/Group Mapping
3. Select the kie-server role and click Map Groups to search for the kie-server group.

4. Move the kie-server group from the Available list to the Selected list and click OK. This mapping gives users in the IBM WebSphere Application Server kie-server group access to KIE Server.

5. Click Save to complete the mapping.

### 5.3. CONFIGURING CLASS LOADING FOR KIE SERVER

After KIE Server is installed, you must configure class loading to set parent classes to load last.

**Procedure**

1. Navigate to Applications → Application Types → WebSphere Enterprise Applications and click kie-server.

2. Click Class Loading and Update Detection under the Detail Properties heading on the left.

3. In the properties, change Class Loader Order to Classes loaded with local class loader first (parent last) and WAR Class Loader Policy to Single class loader for application.

4. Save the changes to the master configuration.

### 5.4. VERIFYING THE INSTALLATION

After you install KIE Server and define the KIE Server group mapping, verify that the server is running.

**Prerequisites**

- KIE Server is installed on the IBM WebSphere Application Server instance.
- You have set all required system properties for the headless Process Automation Manager controller.
- You have defined the KIE Server group mapping in IBM WebSphere Application Server.

**Procedure**

Navigate to the KIE Server URL http://<HOST>:<PORT>/kie-server to verify that the server is running, or send a GET request to http://<HOST>:<PORT>/kie-server/services/rest/server to check whether the KIE Server REST API responds.

<HOST> is the ID or name of the KIE Server host, for example, localhost or 192.7.8.9.

<PORT> is the port of the KIE Server host, for example, 9060.

If KIE Server is not running, stop and restart the IBM WebSphere Application Server instance and try again to access the KIE Server URL or API.
CHAPTER 6. INSTALLING AND RUNNING THE HEADLESS PROCESS AUTOMATION MANAGER CONTROLLER WITH IBM WEBSPHERE APPLICATION SERVER

To use the KIE Server REST API or Java Client API to interact with KIE Server, install the headless Process Automation Manager controller with IBM WebSphere Application Server. The headless Process Automation Manager controller manages KIE Server configuration in a centralized way so that you can use the headless Process Automation Manager controller to create and maintain containers and perform other server-level tasks.

NOTE

For optimal results, install KIE Server and the headless Process Automation Manager controller on different servers in production environments. In development environments, you can install KIE Server and the headless Process Automation Manager controller on the same server.

Prerequisites

- The IBM WebSphere Application Server instance is configured as described in Chapter 4, Configuring IBM WebSphere Application Server for KIE Server.
- KIE Server is installed on the IBM WebSphere Application Server instance.
- You have sufficient user permissions to complete the installation.

Procedure

1. Navigate to the Software Downloads page in the Red Hat Customer Portal (login required), and select the product and version from the drop-down options:
   - **Product**: Process Automation Manager
   - **Version**: 7.8

2. Download Red Hat Process Automation Manager 7.8.0 Add-Ons

3. Extract the downloaded rhpam-7.8.0-add-ons.zip file to a temporary directory.

4. Extract the rhpam-7.8.0-add-ons.zip file to a temporary directory. In the following examples this directory is called TEMP_DIR.


6. Repackage the controller.war directory:
   b. Select the contents of the TEMP_DIR/rhpam-7.8.0-add-ons/rhpam-7.8.0-controller-ee7/controller.war directory and create the controller.zip file.
   c. Rename controller.zip to controller.war. This is the file that you will use to deploy the headless Process Automation Manager controller.
d. Optionally, copy the new `controller.war` file to a location that is more convenient to deploy from.

7. In the WebSphere Integrated Solutions Console, navigate to Applications → Application Types → WebSphere Enterprise Applications.

8. Click Install.

9. Navigate to the `controller.war` file that you repackaged and select it to upload.

10. Select Fast Path and click Next.

The Install New Application wizard opens.

11. Change the Application Name to `controller` and click Next.

12. Map the headless Process Automation Manager controller modules to servers according to your specific requirements and click Next.

13. For Bind Listeners for Message-Driven Beans, select Activation Specification for both beans, enter `jms/activation/KIE.SERVER.REQUEST` in the Target Resource JNDI Name field, and enter the `jms/cf/KIE.SERVER.REQUEST` JNDI name for the KIE.SERVER.REQUEST connection factory.

14. In the Map Virtual Hosts for Web Modules section, keep the default values and click Next.

15. Set the context root to `controller`.

16. In the Metadata for Modules section, keep the default values and click Next.

17. Click Finish to install the headless Process Automation Manager controller and click Save to save the changes to the master configuration.

### 6.1. CONFIGURING CLASS LOADING FOR THE HEADLESS PROCESS AUTOMATION MANAGER CONTROLLER

After the headless Process Automation Manager controller is installed, you must configure KIE Server class loading to set parent classes to load last.

**Procedure**

1. Navigate to Applications → Application Types → WebSphere Enterprise Applications and click kie-server.

2. Click Class Loading and Update Detection under the Detail Properties heading on the left.

3. In the properties, change Class Loader Order to Classes loaded with local class loader first (parent last) and WAR Class Loader Policy to Single class loader for application

4. Save the changes to the master configuration.

### 6.2. SETTING SYSTEM PROPERTIES FOR THE HEADLESS PROCESS AUTOMATION MANAGER CONTROLLER

...
After you install the headless Process Automation Manager controller, set the system properties listed in this section on your application server or servers to enable proper interaction with the headless Process Automation Manager controller.

**NOTE**

For optimal results, install KIE Server and the headless Process Automation Manager controller on different servers in production environments. In development environments, you can install KIE Server and the headless Process Automation Manager controller on the same server. In either case, be sure to make these property changes on all application servers where the headless Process Automation Manager controller is installed.

**Prerequisites**

- KIE Server and the headless Process Automation Manager controller are installed on the application server instance.

**Procedure**

1. Specify the following JVM property values on the application server instance where the headless Process Automation Manager controller is installed:

   **Table 6.1. Required properties for the headless Process Automation Manager controller**

<table>
<thead>
<tr>
<th>Name</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>org.kie.server.user</td>
<td>A user with the <strong>kie-server</strong> role</td>
</tr>
<tr>
<td>org.kie.server.pwd</td>
<td>The password for the user specified in the <strong>org.kie.server.user</strong> property</td>
</tr>
</tbody>
</table>

2. Specify the following JVM property values on the application server instance where KIE Server is installed:

   **Table 6.2. Required properties for KIE Server when headless Process Automation Manager controller is installed**

<table>
<thead>
<tr>
<th>Name</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>org.kie.server.controller.user</td>
<td>A user with the <strong>kie-server</strong> role</td>
</tr>
<tr>
<td>org.kie.server.controller.pwd</td>
<td>The password for the user specified for the <strong>org.kie.server.controller.user</strong> property</td>
</tr>
<tr>
<td>org.kie.server.id</td>
<td>The ID or name of the KIE Server installation, such as <strong>rhdm700-decision-server-1</strong></td>
</tr>
</tbody>
</table>
### 6.3. MAPPING THE HEADLESS PROCESS AUTOMATION MANAGER CONTROLLER GROUP AND ROLE

After the headless Process Automation Manager controller is installed, in the WebSphere Integrated Solutions Console, you must create the `kie-server` group and then map the `kie-server` role to the `kie-server` group.

#### Prerequisites
- The headless Process Automation Manager controller is installed on the IBM WebSphere Application Server instance.

#### Procedure

1. In the WebSphere Integrated Solutions Console, create the `kie-server` group and a user for that group, as described in Creating the KIE Server group and role.

2. Navigate to Applications → Application Types → WebSphere Enterprise Applications and select the newly installed headless Process Automation Manager controller.


4. Select the `kie-server` role and click Map Groups to search for the `kie-server` group.

5. Move the `kie-server` group from the Available list to the Selected list and click OK. This mapping gives the previously created administrator user access to Process Automation Manager.

6. Click Save to complete the mapping.

### 6.4. VERIFYING THE INSTALLATION

After you install the headless Process Automation Manager controller and define the required system properties and role requirements on the application server, verify that the headless Process Automation Manager controller works correctly.

#### Prerequisites
- KIE Server and the headless Process Automation Manager controller are installed on the application server instance.
You have set all required system properties and role requirements for the headless Process Automation Manager controller on the application server.

Procedure

In your command terminal, enter the following command to verify that the headless Process Automation Manager controller is working:

```
```

- `<HOST>` is the ID or name of the KIE Server host, for example, `localhost` or `192.7.8.9`.
- `<PORT>` is the port of the KIE Server host, for example, `7001`.
- `<CONTROLLER>` and `<CONTROLLER_PWD>` are the user credentials that you created in this section.

The command should return information about the KIE Server instance.

**NOTE**

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

If the headless Process Automation Manager controller is not running, stop and restart the application server instance and try again to access the headless Process Automation Manager controller URL or API.
CHAPTER 7. CONFIGURING AN EMBEDDED PROCESS ENGINE AND DECISION ENGINE IN IBM WEBSPHERE APPLICATION SERVER

An embedded engine is a light-weight workflow and rule engine that enables you to execute your decisions and business processes. An embedded engine can be part of a Red Hat Process Automation Manager application or it can be deployed as a service through OpenShift, Kubernetes, and Docker. You can embed an engine in a Red Hat Process Automation Manager application through the API or as a set of contexts and dependency injection (CDI) services.

If you intend to use an embedded engine with your Red Hat Process Automation Manager application, you must add Maven dependencies to your project by adding the Red Hat Business Automation bill of materials (BOM) files to the project’s `pom.xml` file. The Red Hat Business Automation BOM applies to both Red Hat Decision Manager and Red Hat Process Automation Manager. For more information about the Red Hat Business Automation BOM, see What is the mapping between Red Hat Process Automation Manager and the Maven library version?.

Procedure

1. Declare the Red Hat Business Automation BOM in the `pom.xml` file:

   ```xml
   <dependencyManagement>
   <dependencies>
   <dependency>
   <groupId>com.redhat.ba</groupId>
   <artifactId>ba-platform-bom</artifactId>
   <version>7.8.0.redhat-00005</version>
   <type>pom</type>
   <scope>import</scope>
   </dependency>
   <dependencies>
   </dependencyManagement>

   <!-- Public KIE API -->
   <dependency>
   <groupId>org.kie</groupId>
   <artifactId>kie-api</artifactId>
   </dependency>

   <!-- Core dependencies for process engine -->
   ```

2. Declare dependencies required for your project in the `<dependencies>` tag. After you import the product BOM into your project, the versions of the user-facing product dependencies are defined so you do not need to specify the `<version>` sub-element of these `<dependency>` elements. However, you must use the `<dependency>` element to declare dependencies which you want to use in your project.

   - For a basic Red Hat Process Automation Manager project, declare the following dependencies, depending on the features that you want to use:

   ```xml
   <!-- Public KIE API -->
   <dependency>
   <groupId>org.kie</groupId>
   <artifactId>kie-api</artifactId>
   </dependency>

   <!-- Core dependencies for process engine -->
   ```
For a Red Hat Process Automation Manager project that uses CDI, you typically declare the following dependencies:

```xml
<dependency>
  <groupId>org.jbpm</groupId>
  <artifactId>jbpm-flow</artifactId>
</dependency>

<dependency>
  <groupId>org.jbpm</groupId>
  <artifactId>jbpm-flow-builder</artifactId>
</dependency>

<dependency>
  <groupId>org.jbpm</groupId>
  <artifactId>jbpm-bpmn2</artifactId>
</dependency>

<dependency>
  <groupId>org.jbpm</groupId>
  <artifactId>jbpm-runtime-manager</artifactId>
</dependency>

<dependency>
  <groupId>org.jbpm</groupId>
  <artifactId>jbpm-persistence-jpa</artifactId>
</dependency>

<dependency>
  <groupId>org.jbpm</groupId>
  <artifactId>jbpm-query-jpa</artifactId>
</dependency>

<dependency>
  <groupId>org.jbpm</groupId>
  <artifactId>jbpm-audit</artifactId>
</dependency>

<dependency>
  <groupId>org.jbpm</groupId>
  <artifactId>jbpm-kie-services</artifactId>
</dependency>

<!-- Dependency needed for default WorkItemHandler implementations. -->
<dependency>
  <groupId>org.jbpm</groupId>
  <artifactId>jbpm-workitems-core</artifactId>
</dependency>

<!-- Logging dependency. You can use any logging framework compatible with slf4j. -->
<dependency>
  <groupId>ch.qos.logback</groupId>
  <artifactId>logback-classic</artifactId>
  <version>${logback.version}</version>
</dependency>
```

- For a Red Hat Process Automation Manager project that uses CDI, you typically declare the following dependencies:
CDI-enabled process engine dependencies

<dependency>
  <groupId>org.kie</groupId>
  <artifactId>kie-api</artifactId>
</dependency>

<dependency>
  <groupId>org.jbpm</groupId>
  <artifactId>jbpm-kie-services</artifactId>
</dependency>

<dependency>
  <groupId>org.jbpm</groupId>
  <artifactId>jbpm-services-cdi</artifactId>
</dependency>

Embedded decision engine dependencies

<dependency>
  <groupId>org.drools</groupId>
  <artifactId>drools-compiler</artifactId>
</dependency>

<dependency>
  <groupId>org.drools</groupId>
  <artifactId>drools-persistence-jpa</artifactId>
</dependency>

<dependency>
  <groupId>org.drools</groupId>
  <artifactId>drools-decisiontables</artifactId>
</dependency>

<dependency>
  <groupId>org.drools</groupId>
  <artifactId>drools-templates</artifactId>
</dependency>

<dependency>
  <groupId>org.drools</groupId>
  <artifactId>drools-scorecards</artifactId>
</dependency>

<dependency>
  <groupId>org.kie</groupId>
  <artifactId>kie-ci</artifactId>
</dependency>

To use the KIE Server, declare the following dependencies:

Client application KIE Server dependencies
To create a remote client for Red Hat Process Automation Manager, declare the following dependency:

**Client dependency**

```xml
<dependency>
  <groupId>org.kie.server</groupId>
  <artifactId>kie-server-client</artifactId>
</dependency>
```

- When creating a JAR file that includes assets, such as rules and process definitions, specify the packaging type for your Maven project as `kjar` and use `org.kie:kie-maven-plugin` to process the `kjar` packaging type located under the `<project>` element. In the following example, `#{kie.version}` is the Maven library version listed in What is the mapping between Red Hat Process Automation Manager and the Maven library version?:

```xml
<packaging>kjar</packaging>
<build>
  <plugins>
    <plugin>
      <groupId>org.kie</groupId>
      <artifactId>kie-maven-plugin</artifactId>
      <version>${kie.version}</version>
      <extensions>true</extensions>
    </plugin>
  </plugins>
</build>
```

3. If you use a process engine or decision engine with persistence support in your project, you must declare the following hibernate dependencies in the `dependencyManagement` section of your `pom.xml` file by copying the `version.org.hibernate-4ee7` property from the Red Hat Business Automation BOM file:

**Hibernate dependencies**

```xml
<!-- hibernate dependencies -->
<dependencyManagement>
  <dependencies>
    <dependency>
      <groupId>org.hibernate</groupId>
      <artifactId>hibernate-entitymanager</artifactId>
      <version>${version.org.hibernate-4ee7}</version>
    </dependency>
  </dependencies>
</dependencyManagement>
```
</dependency>
</dependencies>
</dependencyManagement>
CHAPTER 8. SECURING PASSWORDS WITH A KEYSTORE

You can use a keystore to encrypt passwords that are used for communication between Business Central and KIE Server. You should encrypt both controller and KIE Server passwords. If Business Central and KIE Server are deployed to different application servers, then both application servers should use the keystore.

Use Java Cryptography Extension KeyStore (JCEKS) for your keystore because it supports symmetric keys.

NOTE

If KIE Server is not configured with JCEKS, KIE Server passwords are stored in system properties in plain text form.

Prerequisites

- KIE Server is installed in IBM WebSphere Application Server.
- A KIE Server user with the kie-server role has been created, as described in Section 5.1, "Creating the KIE Server group and role".
- Java 8 or higher is installed.

Procedure

1. Create a JCEKS keystore.
2. When prompted, enter the password for the KIE Server user that you created.
3. Set the system properties listed in the following table:

<table>
<thead>
<tr>
<th>System property</th>
<th>Placeholder</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>kie.keystore.keyStoreURL</td>
<td>&lt;KEYSTORE_URL&gt;</td>
<td>URL for the JCEKS that you want to use, for example file:///home/kie/keystores/key store.jceks</td>
</tr>
<tr>
<td>kie.keystore.keyStorePwd</td>
<td>&lt;KEYSTORE_PWD&gt;</td>
<td>Password for the JCEKS</td>
</tr>
<tr>
<td>kie.keystore.key.server.alias</td>
<td>&lt;KEY_SERVER_ALIAS&gt;</td>
<td>Alias of the key for REST services where the password is stored</td>
</tr>
<tr>
<td>kie.keystore.key.server.pwd</td>
<td>&lt;KEY_SERVER_PWD&gt;</td>
<td>Password of the alias for REST services with the stored password</td>
</tr>
<tr>
<td>kie.keystore.key.ctrl.alias</td>
<td>&lt;KEY_CONTROL_ALIAS&gt;</td>
<td>Alias of the key for default REST Process Automation Controller where the password is stored</td>
</tr>
</tbody>
</table>
### System property | Placeholder | Description
--- | --- | ---
kie.keystore.key.ctrl.pwd | <KEY_CONTROL_PWD> | Password of the alias for default REST Process Automation Controller with the stored password

4. Start KIE Server to verify the configuration.
CHAPTER 9. NEXT STEPS

- Getting started with decision services
- Designing a decision service using guided decision tables
APPENDIX A. VERSIONING INFORMATION

Documentation last updated on Thursday, September 08, 2020.