Red Hat Process Automation Manager 7.2

Interacting with Red Hat Process Automation Manager using KIE APIs

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Red Hat Process Automation Manager 7.2 Interacting with Red Hat Process Automation Manager using KIE APIs

Red Hat Customer Content Services
brms-docs@redhat.com

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Abstract

This document describes how to use KIE APIs to interact with Process Servers, KIE containers, and business assets in Red Hat Process Automation Manager 7.2.

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PREFACE

As a business rules developer or systems administrator, you can use KIE APIs to interact with Process Servers, KIE containers, and business assets in Red Hat Process Automation Manager. You can use the Process Server REST API and Java client API to interact with KIE containers and business assets (such as business rules, processes, and solvers), the Process Automation Manager controller REST API and Java client API to interact with Process Server templates and instances, and the Knowledge Store REST API to interact with spaces and projects in Business Central.

REST API ENDPOINTS FOR PROCESS SERVER AND THE PROCESS AUTOMATION MANAGER CONTROLLER

The lists of REST API endpoints for Process Server and the Process Automation Manager controller are published separately from this document and maintained dynamically to ensure that endpoint options and data are as current as possible. Use this document to understand what the Process Server and Process Automation Manager controller REST APIs enable you to do and how to use them, and use the separately maintained lists of REST API endpoints for specific endpoint details.

For the full list of Process Server REST API endpoints and descriptions, use one of the following resources:

- Execution Server REST API on the jBPM Documentation page (static)
- Swagger UI for the Process Server REST API at **http://SERVER:PORT/kie-server/docs** (dynamic, requires running Process Server)

For the full list of Process Automation Manager controller REST API endpoints and descriptions, use one of the following resources:

- Controller REST API on the jBPM Documentation page (static)
- Swagger UI for the Process Automation Manager controller REST API at **http://SERVER:PORT/CONTROLLER/docs** (dynamic, requires running Process Automation Manager controller)

Prerequisites

- Red Hat Process Automation Manager is installed and running. For installation and startup options, see *Planning a Red Hat Process Automation Manager installation* .
- You have access to Red Hat Process Automation Manager with the following user roles:
  - **kie-server**: For access to Process Server API capabilities, and access to headless Process Automation Manager controller API capabilities without Business Central (if applicable)
  - **rest-all**: For access to Business Central API capabilities for the built-in Process Automation Manager controller and for the Business Central Knowledge Store
  - **admin**: For full administrative access to Red Hat Process Automation Manager
    Although these user roles are not all required for every KIE API, consider acquiring all of them to ensure that you can access any KIE API without disruption. For more information about user roles, see *Planning a Red Hat Process Automation Manager installation* .

CHAPTER 1. PROCESS SERVER REST API FOR KIE CONTAINERS AND BUSINESS ASSETS

Red Hat Process Automation Manager provides a Process Server REST API that you can use to interact with your KIE containers and business assets (such as business rules, processes, and solvers) in Red Hat Process Automation Manager without using the Business Central user interface. This API support enables you to maintain your Red Hat Process Automation Manager resources more efficiently and optimize your integration and development with Red Hat Process Automation Manager.

With the Process Server REST API, you can perform the following actions:

- Deploy or dispose KIE containers
- Retrieve and update KIE container information
- Return Process Server status and basic information
- Retrieve and update business asset information
- Execute business assets (such as rules and processes)

Process Server REST API requests require the following components:

Authentication

The Process Server REST API requires HTTP Basic authentication or token-based authentication for the user role **kie-server**. To view configured user roles for your Red Hat Process Automation Manager distribution, navigate to **~/$SERVER_HOME/standalone/configuration/application-roles.properties** and **~/application-users.properties**.
To add a user with the **kie-server** role, navigate to **~/$SERVER_HOME/bin** and run the following command:

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

For more information about user roles and Red Hat Process Automation Manager installation options, see *Planning a Red Hat Process Automation Manager installation* .

HTTP headers

The Process Server REST API requires the following HTTP headers for API requests:

- **Accept**: Data format accepted by your requesting client:
  - **application/json** (JSON)
  - **application/xml** (XML, for JAXB or XSTREAM)
- **Content-Type**: Data format of your **POST** or **PUT** API request data:
  - **application/json** (JSON)
  - **application/xml** (XML, for JAXB or XSTREAM)
- **X-KIE-ContentType**: Required header for **application/xml** XSTREAM API requests and responses:
  - **XSTREAM**

HTTP methods

The Process Server REST API supports the following HTTP methods for API requests:

- **GET**: Retrieves specified information from a specified resource endpoint
- **POST**: Updates a resource or resource instance
- **PUT**: Updates or creates a resource or resource instance
- **DELETE**: Deletes a resource or resource instance

Base URL

The base URL for Process Server REST API requests is **http://SERVER:PORT/kie-server/services/rest/**, such as **http://localhost:8080/kie-server/services/rest/**.

Endpoints

Process Server REST API endpoints, such as **/server/containers/{containerId}** for a specified KIE container, are the URIs that you append to the Process Server REST API base URL to access the corresponding resource or type of resource in Red Hat Process Automation Manager.

Example request URL for /server/containers/{containerId} endpoint

http://localhost:8080/kie-server/services/rest/server/containers/MyContainer

Request parameters and request data

Many Process Server REST API requests require specific parameters in the request URL path to identify or filter specific resources and to perform specific actions. You can append URL parameters to the endpoint in the format **?<PARAM>=<VALUE>&<PARAM>=<VALUE>**.

Example GET request URL with parameters

http://localhost:8080/kie-server/services/rest/server/containers?groupId=com.redhat&artifactId=Project1&version=1.0&status=STARTED

HTTP **POST** and **PUT** requests may additionally require a request body or file with data to accompany the request.

Example POST request URL and JSON request body data

http://localhost:8080/kie-server/services/rest/server/containers/MyContainer/release-id

```
{
  "release-id": {
    "artifact-id": "Project1",
    "group-id": "com.redhat",
    "version": "1.1"
  }
}
```

1.1. SENDING REQUESTS WITH THE PROCESS SERVER REST API USING A REST CLIENT OR CURL UTILITY

The Process Server REST API enables you to interact with your KIE containers and business assets (such as business rules, processes, and solvers) in Red Hat Process Automation Manager without using

the Business Central user interface. You can send Process Server REST API requests using any REST client or curl utility.

Prerequisites

- Process Server is installed and running.
- You have **kie-server** user role access to Process Server.

Procedure

1. Identify the relevant API endpoint to which you want to send a request, such as **[GET] /server/containers** to retrieve KIE containers from Process Server.
2. In a REST client or curl utility, enter the following components for a **GET** request to **/server/containers**. Adjust any request details according to your use case.
   For REST client:
   - **Authentication**: Enter the user name and password of the Process Server user with the **kie-server** role.
   - **HTTP Headers**: Set the following header:
     - **Accept**: **application/json**
   - **HTTP method**: Set to **GET**.
   - **URL**: Enter the Process Server REST API base URL and endpoint, such as **http://localhost:8080/kie-server/services/rest/server/containers**.

   For curl utility:
   - **-u**: Enter the user name and password of the Process Server user with the **kie-server** role.
   - **-H**: Set the following header:
     - **Accept**: **application/json**
   - **-X**: Set to **GET**.
   - **URL**: Enter the Process Server REST API base URL and endpoint, such as **http://localhost:8080/kie-server/services/rest/server/containers**.

   ```
   curl -u 'baAdmin:password@1' -H "Accept: application/json" -X GET
   "http://localhost:8080/kie-server/services/rest/server/containers"
   ```
3. Execute the request and review the Process Server response.
   Example server response (JSON):

   ```
   {
     "type": "SUCCESS",
     "msg": "List of created containers",
     "result": {
       "kie-containers": {
         "kie-container": [
           {
   ```

```
        "container-id": "itorders_1.0.0-SNAPSHOT",
        "release-id": {
          "group-id": "itorders",
          "artifact-id": "itorders",
          "version": "1.0.0-SNAPSHOT"
        },
        "resolved-release-id": {
          "group-id": "itorders",
          "artifact-id": "itorders",
          "version": "1.0.0-SNAPSHOT"
        },
        "status": "STARTED",
        "scanner": {
          "status": "DISPOSED",
          "poll-interval": null
        },
        "config-items": [],
        "container-alias": "itorders"
      }
    ]
  }
 }
}
```


4. For this example, copy or note the project **group-id**, **artifact-id**, and **version** (GAV) data from one of the deployed KIE containers returned in the response.

5. In your REST client or curl utility, send another API request with the following components for a **PUT** request to **/server/containers/{containerId}** to deploy a new KIE container with the copied project GAV data. Adjust any request details according to your use case.
   For REST client:

   - **Authentication**: Enter the user name and password of the Process Server user with the **kie-server** role.
   - **HTTP Headers**: Set the following headers:
     - **Accept**: **application/json**
     - **Content-Type**: **application/json**
   - **HTTP method**: Set to **PUT**.
   - **URL**: Enter the Process Server REST API base URL and endpoint, such as **http://localhost:8080/kie-server/services/rest/server/containers/MyContainer**.
   - **Request body**: Add a JSON request body with the configuration items for the new KIE container:


```
{
 "config-items": [
  {
   "itemName": "RuntimeStrategy",
   "itemValue": "SINGLETON",
   "itemType": "java.lang.String"
  },
```

```
    {
      "itemName": "MergeMode",
      "itemValue": "MERGE_COLLECTIONS",
      "itemType": "java.lang.String"
    },
    {
      "itemName": "KBase",
      "itemValue": "",
      "itemType": "java.lang.String"
    },
    {
      "itemName": "KSession",
      "itemValue": "",
      "itemType": "java.lang.String"
    }
  ],
  "release-id": {
    "group-id": "itorders",
    "artifact-id": "itorders",
    "version": "1.0.0-SNAPSHOT"
  },
  "scanner": {
    "poll-interval": "5000",
    "status": "STARTED"
  }
}
```

For curl utility:

- **-u**: Enter the user name and password of the Process Server user with the **kie-server** role.
- **-H**: Set the following headers:
  - **Accept**: **application/json**
  - **Content-Type**: **application/json**
- **-X**: Set to **PUT**.
- **URL**: Enter the Process Server REST API base URL and endpoint, such as **http://localhost:8080/kie-server/services/rest/server/containers/MyContainer**.
- **-d**: Add a JSON request body or file (**@file.json**) with the configuration items for the new KIE container:

```
curl -u 'baAdmin:password@1' -H "Accept: application/json" -H "Content-Type: application/json" -X PUT "http://localhost:8080/kie-server/services/rest/server/containers/MyContainer" -d "{ \"config-items\": [ { \"itemName\": \"RuntimeStrategy\", \"itemValue\": \"SINGLETON\", \"itemType\": \"java.lang.String\" }, { \"itemName\": \"MergeMode\", \"itemValue\": \"MERGE_COLLECTIONS\", \"itemType\": \"java.lang.String\" }, { \"itemName\": \"KBase\", \"itemValue\": \"\", \"itemType\": \"java.lang.String\" }, { \"itemName\": \"KSession\", \"itemValue\": \"\", \"itemType\": \"java.lang.String\" } ], \"release-id\": { \"group-id\": \"itorders\", \"artifact-id\": \"itorders\", \"version\": \"1.0.0-SNAPSHOT\" }, \"scanner\": { \"poll-interval\": \"5000\", \"status\": \"STARTED\" }}"
```

```
curl -u 'baAdmin:password@1' -H "Accept: application/json" -H "Content-Type:
application/json" -X PUT "http://localhost:8080/kie-
server/services/rest/server/containers/MyContainer" -d @my-container-configs.json
```

6. Execute the request and review the Process Server response.
Example server response (JSON):


```
{
  "type": "SUCCESS",
  "msg": "Container MyContainer successfully deployed with module itorders:itorders:1.0.0-
SNAPSHOT.",
  "result": {
    "kie-container": {
      "container-id": "MyContainer",
      "release-id": {
        "group-id": "itorders",
        "artifact-id": "itorders",
        "version": "1.0.0-SNAPSHOT"
      },
      "resolved-release-id": {
        "group-id": "itorders",
        "artifact-id": "itorders",
        "version": "1.0.0-SNAPSHOT"
      },
      "status": "STARTED",
      "scanner": {
        "status": "STARTED",
        "poll-interval": 5000
      },
      "config-items": [],
      "messages": [
        {
          "severity": "INFO",
          "timestamp": {
            "java.util.Date": 1540584717937
          },
          "content": [
            "Container MyContainer successfully created with module itorders:itorders:1.0.0-
SNAPSHOT."
          ]
        }
      ],
      "container-alias": null
    }
  }
}
```


If you encounter request errors, review the returned error code messages and adjust your request accordingly.

REST API REQUESTS FOR PROCESS INSTANCES

For REST API requests that send complex data objects to the process instance endpoint **/server/containers/{containerId}/processes/{processId}/instances**, ensure that you include either the fully qualified class name (such as **com.myspace.Person**) or the simple class name (such as **Person**) in the request body. The class name is required for the request body to be mapped to the correct business object in Red Hat Process Automation Manager. If you exclude the class name from the request, Process Server does not unmarshall the object to the expected type.

Correct request body for process instance

```
{
  "id": 4,
  "lease": {
    "com.myspace.restcall.LeaseModel": {
      "annualRent": 109608,
      "isAutoApproved": false
    }
  }
}
```

Incorrect request body for process instance

```
{
  "id": 4,
  "lease": {
    "annualRent": 109608,
    "isAutoApproved": false
  }
}
```

1.2. SENDING REQUESTS WITH THE PROCESS SERVER REST API USING THE SWAGGER INTERFACE

The Process Server REST API supports a Swagger web interface that you can use instead of a standalone REST client or curl utility to interact with your KIE containers and business assets (such as business rules, processes, and solvers) in Red Hat Process Automation Manager without using the Business Central user interface.

Prerequisites

- Process Server is installed and running.
- You have **kie-server** user role access to Process Server.

Procedure

1. In a web browser, navigate to **http://SERVER:PORT/kie-server/docs**, such as **http://localhost:8080/kie-server/docs**, and log in with the user name and password of the Process Server user with the **kie-server** role.

2. In the Swagger page, select the relevant API endpoint to which you want to send a request, such as **KIE Server :: Core→ [GET] /server/containers** to retrieve KIE containers from Process Server.

3. Click **Try it out** and provide any optional parameters by which you want to filter results, if needed.

4. In the **Response content type** drop-down menu, select the desired format of the server response, such as **application/json** for JSON format.

5. Click **Execute** and review the Process Server response.
Example server response (JSON):


```
{
  "type": "SUCCESS",
  "msg": "List of created containers",
  "result": {
    "kie-containers": {
      "kie-container": [
        {
          "container-id": "itorders_1.0.0-SNAPSHOT",
          "release-id": {
            "group-id": "itorders",
            "artifact-id": "itorders",
            "version": "1.0.0-SNAPSHOT"
          },
          "resolved-release-id": {
            "group-id": "itorders",
            "artifact-id": "itorders",
            "version": "1.0.0-SNAPSHOT"
          },
          "status": "STARTED",
          "scanner": {
            "status": "DISPOSED",
            "poll-interval": null
          },
          "config-items": [],
          "container-alias": "itorders"
        }
      ]
    }
  }
}
```


6. For this example, copy or note the project **group-id**, **artifact-id**, and **version** (GAV) data from one of the deployed KIE containers returned in the response.

7. In the Swagger page, navigate to the **KIE Server :: Core→ [PUT] /server/containers/{containerId}** endpoint to send another request to deploy a new KIE container with the copied project GAV data. Adjust any request details according to your use case.

8. Click **Try it out** and enter the following components for the request:

   - **containerId**: Enter the ID of the new KIE container, such as **MyContainer**.

- **body**: Set the **Parameter content type** to the desired request body format, such as **application/json** for JSON format, and add a request body with the configuration items for the new KIE container:

```
{
  "config-items": [
    {
      "itemName": "RuntimeStrategy",
      "itemValue": "SINGLETON",
      "itemType": "java.lang.String"
    },
    {
      "itemName": "MergeMode",
      "itemValue": "MERGE_COLLECTIONS",
      "itemType": "java.lang.String"
    },
    {
      "itemName": "KBase",
      "itemValue": "",
      "itemType": "java.lang.String"
    },
    {
      "itemName": "KSession",
      "itemValue": "",
      "itemType": "java.lang.String"
    }
  ],
  "release-id": {
    "group-id": "itorders",
    "artifact-id": "itorders",
    "version": "1.0.0-SNAPSHOT"
  },
  "scanner": {
    "poll-interval": "5000",
    "status": "STARTED"
  }
}
```

9. In the **Response content type** drop-down menu, select the desired format of the server response, such as **application/json** for JSON format.

10. Click **Execute** and review the Process Server response.
Example server response (JSON):

```
{
  "type": "SUCCESS",
  "msg": "Container MyContainer successfully deployed with module itorders:itorders:1.0.0-SNAPSHOT.",
  "result": {
    "kie-container": {
      "container-id": "MyContainer",
      "release-id": {
        "group-id": "itorders",
        "artifact-id": "itorders",
        "version": "1.0.0-SNAPSHOT"
```

```
      },
      "resolved-release-id": {
        "group-id": "itorders",
        "artifact-id": "itorders",
        "version": "1.0.0-SNAPSHOT"
      },
      "status": "STARTED",
      "scanner": {
        "status": "STARTED",
        "poll-interval": 5000
      },
      "config-items": [],
      "messages": [
        {
          "severity": "INFO",
          "timestamp": {
            "java.util.Date": 1540584717937
          },
          "content": [
            "Container MyContainer successfully created with module itorders:itorders:1.0.0-
SNAPSHOT."
          ]
        }
      ],
      "container-alias": null
    }
  }
}
```


If you encounter request errors, review the returned error code messages and adjust your request accordingly.

REST API REQUESTS FOR PROCESS INSTANCES

For REST API requests that send complex data objects to the process instance endpoint **/server/containers/{containerId}/processes/{processId}/instances**, ensure that you include either the fully qualified class name (such as **com.myspace.Person**) or the simple class name (such as **Person**) in the request body. The class name is required for the request body to be mapped to the correct business object in Red Hat Process Automation Manager. If you exclude the class name from the request, Process Server does not unmarshall the object to the expected type.

Correct request body for process instance

```
{
  "id": 4,
  "lease": {
    "com.myspace.restcall.LeaseModel": {
      "annualRent": 109608,
      "isAutoApproved": false
    }
  }
}
```

Incorrect request body for process instance

```
{
  "id": 4,
  "lease": {
    "annualRent": 109608,
    "isAutoApproved": false
  }
}
```

1.3. SUPPORTED PROCESS SERVER REST API ENDPOINTS

The Process Server REST API provides endpoints for the following types of resources in Red Hat Process Automation Manager:

- Process Server and KIE containers
- KIE session assets (for runtime commands)
- DMN assets
- Planning solvers
- Processes
- Process images
- Process and task forms
- Tasks
- Cases

- Documents
- Jobs
- Queries for processes, tasks, and cases
- Custom queries

The Process Server REST API base URL is **http://SERVER:PORT/kie-server/services/rest/**. All requests require HTTP Basic authentication or token-based authentication for the **kie-server** user role.

For the full list of Process Server REST API endpoints and descriptions, use one of the following resources:

- Execution Server REST API on the jBPM Documentation page (static)
- Swagger UI for the Process Server REST API at **http://SERVER:PORT/kie-server/docs** (dynamic, requires running Process Server)

Endpoint requirements

Note the following requirements for some of the Process Server REST API endpoints:

- **Process images:** For API access to process images, the system property **<storesvgonsave enabled="true"/>** must be configured for your Red Hat Process Automation Manager project in **$SERVER_HOME/standalone/deployments/business-central.war/org.kie.workbench.KIEWebapp/profiles/jbpm.xml**. This property is set to **true** by default. If the API is not working with process images, set it to **true** in the file, restart your Process Server, modify the relevant process and save it, and then build and deploy your project. This property enables SVG images to be stored so that they can be retrieved by the Process Server REST API.

- **Custom queries:** Some custom query requests with the Process Server REST API require a query **mapper** definition to map the query results to concrete objects. You can implement your own query result mappers or use the mappers provided with Red Hat Process Automation Manager. The query mappers in Red Hat Process Automation Manager are similar to other object-relational mapping (ORM) providers, such as Hibernate, which maps tables to entities. For example, you can use the **org.jbpm.kie.services.impl.query.mapper.ProcessInstanceQueryMapper**, also registered as **ProcessInstances**, in custom query endpoints for returning process instance data.
  Example POST endpoint with **ProcessInstances** mapper parameter:

  ```
  http://localhost:8080/kie-server/services/rest/server/queries/definitions/jbpmProcessInstances?mapper=ProcessInstances
  ```

  For a list of available query mappers in Red Hat Process Automation Manager, download and extract the **Red Hat Process Automation Manager 7.2 Source Distribution** from the Red Hat Customer Portal and navigate to **~/jbpm-$VERSION/jbpm-services/jbpm-kie-services/src/main/java/org/jbpm/kie/services/impl/query/mapper**.

CHAPTER 2. PROCESS SERVER JAVA CLIENT API FOR KIE CONTAINERS AND BUSINESS ASSETS

Red Hat Process Automation Manager provides a Process Server Java client API that enables you to connect to Process Server using REST protocol from your Java client application. You can use the Process Server Java client API as an alternative to the Process Server REST API to interact with your KIE containers and business assets (such as business rules, processes, and solvers) in Red Hat Process Automation Manager without using the Business Central user interface. This API support enables you to maintain your Red Hat Process Automation Manager resources more efficiently and optimize your integration and development with Red Hat Process Automation Manager.

With the Process Server Java client API, you can perform the following actions also supported by the Process Server REST API:

- Deploy or dispose KIE containers
- Retrieve and update KIE container information
- Return Process Server status and basic information
- Retrieve and update business asset information
- Execute business assets (such as rules and processes)

Process Server Java client API requests require the following components:

Authentication

The Process Server Java client API requires HTTP Basic authentication for the user role **kie-server**. To view configured user roles for your Red Hat Process Automation Manager distribution, navigate to **~/$SERVER_HOME/standalone/configuration/application-roles.properties** and **~/application-users.properties**.
To add a user with the **kie-server** role, navigate to **~/$SERVER_HOME/bin** and run the following command:

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

For more information about user roles and Red Hat Process Automation Manager installation options, see *Planning a Red Hat Process Automation Manager installation* .

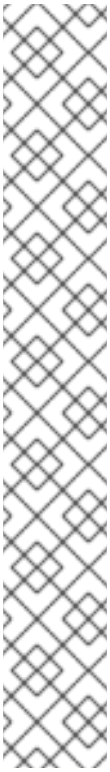
Project dependencies

The Process Server Java client API requires the following dependencies on the relevant classpath of your Java project:

```
<!-- For remote execution on Process Server -->
<dependency>
  <groupId>org.kie.server</groupId>
  <artifactId>kie-server-client</artifactId>
  <version>${rhpam.version}</version>
</dependency>

<!-- For runtime commands -->
<dependency>
  <groupId>org.drools</groupId>
  <artifactId>drools-compiler</artifactId>
```

```
  <scope>runtime</scope>
  <version>${rhpam.version}</version>
</dependency>

<!-- For debug logging (optional) -->
<dependency>
  <groupId>ch.qos.logback</groupId>
  <artifactId>logback-classic</artifactId>
  <version>${logback.version}</version>
</dependency>
```

The **<version>** for Red Hat Process Automation Manager dependencies is the Maven artifact version for Red Hat Process Automation Manager currently used in your project (for example, 7.14.0.Final-redhat-00002).



NOTE

Instead of specifying a Red Hat Process Automation Manager **<version>** for individual dependencies, consider adding the Red Hat Business Automation bill of materials (BOM) dependency to your project **pom.xml** file. The Red Hat Business Automation BOM applies to both Red Hat Decision Manager and Red Hat Process Automation Manager. When you add the BOM files, the correct versions of transitive dependencies from the provided Maven repositories are included in the project.

Example BOM dependency:

```
<dependency>
  <groupId>com.redhat.ba</groupId>
  <artifactId>ba-platform-bom</artifactId>
  <version>7.2.0.GA-redhat-00002</version>
  <scope>import</scope>
  <type>pom</type>
</dependency>
```

For more information about the Red Hat Business Automation BOM, see What is the mapping between RHPAM product and maven library version?.

Client request configuration

All Java client requests with the Process Server Java client API must define at least the following server communication components:

- Credentials of the **kie-server** user
- Process Server location, such as **http://localhost:8080/kie-server/services/rest/server**
- Marshalling format for API requests and responses (JSON, JAXB, or XSTREAM)
- A **KieServicesConfiguration** object and a **KieServicesClient** object, which serve as the entry point for starting the server communication using the Java client API
- A **KieServicesFactory** object defining REST protocol and user access
- Any other client services used, such as **RuleServicesClient**, **ProcessServicesClient**, or **QueryServicesClient**

The following are examples of basic and advanced client configurations with these components:

Basic client configuration example

```
import org.kie.server.api.marshalling.MarshallingFormat;
import org.kie.server.client.KieServicesClient;
import org.kie.server.client.KieServicesConfiguration;
import org.kie.server.client.KieServicesFactory;

public class MyConfigurationObject {

  private static final String URL = "http://localhost:8080/kie-server/services/rest/server";
  private static final String USER = "baAdmin";
  private static final String PASSWORD = "password@1";

  private static final MarshallingFormat FORMAT = MarshallingFormat.JSON;

  private static KieServicesConfiguration conf;
  private static KieServicesClient kieServicesClient;

  public static void initialize() {
    conf = KieServicesFactory.newRestConfiguration(URL, USER, PASSWORD);

    //If you use custom classes, such as Obj.class, add them to the configuration.
    Set<Class<?>> extraClassList = new HashSet<Class<?>>();
    extraClassList.add(Obj.class);
    conf.addExtraClasses(extraClassList);

    conf.setMarshallingFormat(FORMAT);
    kieServicesClient = KieServicesFactory.newKieServicesClient(conf);
  }
}
```

Advanced client configuration example with additional client services

```
import org.kie.server.api.marshalling.MarshallingFormat;
import org.kie.server.client.CaseServicesClient;
import org.kie.server.client.DMNServicesClient;
import org.kie.server.client.DocumentServicesClient;
import org.kie.server.client.JobServicesClient;
import org.kie.server.client.KieServicesClient;
import org.kie.server.client.KieServicesConfiguration;
import org.kie.server.client.KieServicesFactory;
import org.kie.server.client.ProcessServicesClient;
import org.kie.server.client.QueryServicesClient;
import org.kie.server.client.RuleServicesClient;
import org.kie.server.client.SolverServicesClient;
import org.kie.server.client.UIServicesClient;
import org.kie.server.client.UserTaskServicesClient;
import org.kie.server.api.model.instance.ProcessInstance;
import org.kie.server.api.model.KieContainerResource;
import org.kie.server.api.model.ReleaseId;

public class MyAdvancedConfigurationObject {
```

```
// REST API base URL, credentials, and marshalling format
private static final String URL = "http://localhost:8080/kie-server/services/rest/server";
private static final String USER = "baAdmin";
private static final String PASSWORD = "password@1";;

private static final MarshallingFormat FORMAT = MarshallingFormat.JSON;

private static KieServicesConfiguration conf;

// KIE client for common operations
private static KieServicesClient kieServicesClient;

// Rules client
private static RuleServicesClient ruleClient;

// Process automation clients
private static CaseServicesClient caseClient;
private static DocumentServicesClient documentClient;
private static JobServicesClient jobClient;
private static ProcessServicesClient processClient;
private static QueryServicesClient queryClient;
private static UIServicesClient uiClient;
private static UserTaskServicesClient userTaskClient;

// DMN client
private static DMNServicesClient dmnClient;

// Planning client
private static SolverServicesClient solverClient;

public static void main(String[] args) {
    initializeKieServerClient();
    initializeDroolsServiceClients();
    initializeJbpmServiceClients();
    initializeSolverServiceClients();
}

public static void initializeKieServerClient() {
    conf = KieServicesFactory.newRestConfiguration(URL, USER, PASSWORD);
    conf.setMarshallingFormat(FORMAT);
    kieServicesClient = KieServicesFactory.newKieServicesClient(conf);
}

public static void initializeDroolsServiceClients() {
    ruleClient = kieServicesClient.getServicesClient(RuleServicesClient.class);
    dmnClient = kieServicesClient.getServicesClient(DMNServicesClient.class);
}

public static void initializeJbpmServiceClients() {
    caseClient = kieServicesClient.getServicesClient(CaseServicesClient.class);
    documentClient = kieServicesClient.getServicesClient(DocumentServicesClient.class);
    jobClient = kieServicesClient.getServicesClient(JobServicesClient.class);
    processClient = kieServicesClient.getServicesClient(ProcessServicesClient.class);
    queryClient = kieServicesClient.getServicesClient(QueryServicesClient.class);
    uiClient = kieServicesClient.getServicesClient(UIServicesClient.class);
    userTaskClient = kieServicesClient.getServicesClient(UserTaskServicesClient.class);
```

```
    }

    public static void initializeSolverServiceClients() {
        solverClient = kieServicesClient.getServicesClient(SolverServicesClient.class);
    }
}
```

2.1. SENDING REQUESTS WITH THE PROCESS SERVER JAVA CLIENT API

The Process Server Java client API enables you to connect to Process Server using REST protocol from your Java client application. You can use the Process Server Java client API as an alternative to the Process Server REST API to interact with your KIE containers and business assets (such as business rules, processes, and solvers) in Red Hat Process Automation Manager without using the Business Central user interface.

Prerequisites

- Process Server is installed and running.
- You have **kie-server** user role access to Process Server.
- You have a Java project with Red Hat Process Automation Manager resources.

Procedure

1. In your client application, ensure that the following dependencies have been added to the relevant classpath of your Java project:

```
<!-- For remote execution on Process Server -->
<dependency>
  <groupId>org.kie.server</groupId>
  <artifactId>kie-server-client</artifactId>
  <version>${rhpam.version}</version>
</dependency>

<!-- For runtime commands -->
<dependency>
  <groupId>org.drools</groupId>
  <artifactId>drools-compiler</artifactId>
  <scope>runtime</scope>
  <version>${rhpam.version}</version>
</dependency>

<!-- For debug logging (optional) -->
<dependency>
  <groupId>ch.qos.logback</groupId>
  <artifactId>logback-classic</artifactId>
  <version>${logback.version}</version>
</dependency>
```

2. Download the **Red Hat Process Automation Manager 7.2.0 Source Distribution** from the Red Hat Customer Portal and navigate to **~/rhpam-7.2.0-sources/src/droolsjbpm-integration-**

$VERSION/kie-server-parent/kie-server-remote/kie-server-client/src/main/java/org/kie/server/client to access the Process Server Java clients.

3. In the ~/**kie**/**server**/**client** folder , identify the relevant Java client for the request you want to send, such as **KieServicesClient** to access client services for KIE containers and other assets in Process Server.

4. In your client application, create a **.java** class for the API request. The class must contain the necessary imports, Process Server location and user credentials, a **KieServicesClient** object, and the client method to execute, such as **createContainer** and **disposeContainer** from the **KieServicesClient** client. Adjust any configuration details according to your use case.

Creating and disposing a container

```
import org.kie.server.api.marshalling.MarshallingFormat;
import org.kie.server.client.KieServicesClient;
import org.kie.server.client.KieServicesConfiguration;
import org.kie.server.client.KieServicesFactory;
import org.kie.server.api.model.KieContainerResource;
import org.kie.server.api.model.ServiceResponse;

public class MyConfigurationObject {

  private static final String URL = "http://localhost:8080/kie-server/services/rest/server";
  private static final String USER = "baAdmin";
  private static final String PASSWORD = "password@1";

  private static final MarshallingFormat FORMAT = MarshallingFormat.JSON;

  private static KieServicesConfiguration conf;
  private static KieServicesClient kieServicesClient;

  public static void initialize() {
    conf = KieServicesFactory.newRestConfiguration(URL, USER, PASSWORD);

  public void disposeAndCreateContainer() {
      System.out.println("== Disposing and creating containers ==");

      // Retrieve list of KIE containers
      List<KieContainerResource> kieContainers =
kieServicesClient.listContainers().getResult().getContainers();
      if (kieContainers.size() == 0) {
          System.out.println("No containers available...");
          return;
      }

      // Dispose KIE container
      KieContainerResource container = kieContainers.get(0);
      String containerId = container.getContainerId();
      ServiceResponse<Void> responseDispose =
kieServicesClient.disposeContainer(containerId);
      if (responseDispose.getType() == ResponseType.FAILURE) {
          System.out.println("Error disposing " + containerId + ". Message: ");
          System.out.println(responseDispose.getMsg());
          return;
      }
```

```
        System.out.println("Success Disposing container " + containerId);
        System.out.println("Trying to recreate the container...");

        // Re-create KIE container
        ServiceResponse<KieContainerResource> createResponse =
kieServicesClient.createContainer(containerId, container);
        if(createResponse.getType() == ResponseType.FAILURE) {
            System.out.println("Error creating " + containerId + ". Message: ");
            System.out.println(responseDispose.getMsg());
            return;
        }
        System.out.println("Container recreated with success!");
        }
    }
}
```

You define service responses using the **org.kie.server.api.model.ServiceResponse<T>** object, where **T** represents the type of returned response. The **ServiceResponse** object has the following attributes:

- **String *message***: Returns the response message
- **ResponseType *type***: Returns either **SUCCESS** or **FAILURE**
- **T *result***: Returns the requested object

In this example, when you dispose a container, the **ServiceResponse** returns a **Void** response. When you create a container, the **ServiceResponse** returns a **KieContainerResource** object.

NOTE

A conversation between a client and a specific Process Server container in a clustered environment is secured by a unique **conversationID**. The **conversationID** is transferred using the **X-KIE-ConversationId** REST header. If you update the container, unset the previous **conversationID**. Use **KieServiesClient.completeConversation()** to unset the **conversationID** for Java API.

5. Run the configured **.java** class from your project directory to execute the request, and review the Process Server response.
   If you enabled debug logging, Process Server responds with a detailed response according to your configured marshalling format, such as JSON.

   Example server response for a new KIE container (log):

```
10:23:35.194 [main] INFO  o.k.s.a.m.MarshallerFactory - Marshaller extensions init
10:23:35.396 [main] DEBUG o.k.s.client.balancer.LoadBalancer - Load balancer
RoundRobinBalancerStrategy{availableEndpoints=[http://localhost:8080/kie-
server/services/rest/server]} selected url 'http://localhost:8080/kie-server/services/rest/server'
10:23:35.398 [main] DEBUG o.k.s.c.i.AbstractKieServicesClientImpl - About to send GET
request to 'http://localhost:8080/kie-server/services/rest/server'
10:23:35.440 [main] DEBUG o.k.s.c.i.AbstractKieServicesClientImpl - About to deserialize
content:
 '{
  "type" : "SUCCESS",
```

```
  "msg" : "Kie Server info",
  "result" : {
    "kie-server-info" : {
      "id" : "default-kieserver",
      "version" : "7.11.0.Final-redhat-00003",
      "name" : "default-kieserver",
      "location" : "http://localhost:8080/kie-server/services/rest/server",
      "capabilities" : [ "KieServer", "BRM", "BPM", "CaseMgmt", "BPM-UI", "BRP", "DMN",
"Swagger" ],
      "messages" : [ {
        "severity" : "INFO",
        "timestamp" : {
  "java.util.Date" : 1540814906533
},
        "content" : [ "Server KieServerInfo{serverId='default-kieserver', version='7.11.0.Final-
redhat-00003', name='default-kieserver', location='http://localhost:8080/kie-
server/services/rest/server', capabilities=[KieServer, BRM, BPM, CaseMgmt, BPM-UI, BRP,
DMN, Swagger], messages=null}started successfully at Mon Oct 29 08:08:26 EDT 2018" ]
      } ]
    }
  }
}'
 into type: 'class org.kie.server.api.model.ServiceResponse'
10:23:35.653 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - KieServicesClient
connected to: default-kieserver version 7.11.0.Final-redhat-00003
10:23:35.653 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Supported capabilities by
the server: [KieServer, BRM, BPM, CaseMgmt, BPM-UI, BRP, DMN, Swagger]
10:23:35.653 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Building services client for
server capability KieServer
10:23:35.653 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - No builder found for
'KieServer' capability
10:23:35.654 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Building services client for
server capability BRM
10:23:35.654 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Builder
'org.kie.server.client.helper.DroolsServicesClientBuilder@6b927fb' for capability 'BRM'
10:23:35.655 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Capability implemented by
{interface
org.kie.server.client.RuleServicesClient=org.kie.server.client.impl.RuleServicesClientImpl@4a94
ee4}
10:23:35.655 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Building services client for
server capability BPM
10:23:35.656 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Builder
'org.kie.server.client.helper.JBPMServicesClientBuilder@4cc451f2' for capability 'BPM'
10:23:35.672 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Capability implemented by
{interface
org.kie.server.client.JobServicesClient=org.kie.server.client.impl.JobServicesClientImpl@1189d
52, interface
org.kie.server.client.admin.ProcessAdminServicesClient=org.kie.server.client.admin.impl.Proces
sAdminServicesClientImpl@36bc55de, interface
org.kie.server.client.DocumentServicesClient=org.kie.server.client.impl.DocumentServicesClient
mpl@564fabc8, interface
org.kie.server.client.admin.UserTaskAdminServicesClient=org.kie.server.client.admin.impl.User
TaskAdminServicesClientImpl@16d04d3d, interface
org.kie.server.client.QueryServicesClient=org.kie.server.client.impl.QueryServicesClientImpl@4
9ec71f8, interface
org.kie.server.client.ProcessServicesClient=org.kie.server.client.impl.ProcessServicesClientImp
```

```
@1d2adfbe, interface
org.kie.server.client.UserTaskServicesClient=org.kie.server.client.impl.UserTaskServicesClientI
mpl@36902638}
10:23:35.672 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Building services client for
server capability CaseMgmt
10:23:35.672 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Builder
'org.kie.server.client.helper.CaseServicesClientBuilder@223d2c72' for capability 'CaseMgmt'
10:23:35.676 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Capability implemented by
{interface
org.kie.server.client.admin.CaseAdminServicesClient=org.kie.server.client.admin.impl.CaseAdm
nServicesClientImpl@2b662a77, interface
org.kie.server.client.CaseServicesClient=org.kie.server.client.impl.CaseServicesClientImpl@7f0
eb4b4}
10:23:35.676 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Building services client for
server capability BPM-UI
10:23:35.676 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Builder
'org.kie.server.client.helper.JBPMUIServicesClientBuilder@5c33f1a9' for capability 'BPM-UI'
10:23:35.677 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Capability implemented by
{interface
org.kie.server.client.UIServicesClient=org.kie.server.client.impl.UIServicesClientImpl@223191a
}
10:23:35.678 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Building services client for
server capability BRP
10:23:35.678 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Builder
'org.kie.server.client.helper.OptaplannerServicesClientBuilder@49139829' for capability
'BRP'
10:23:35.679 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Capability implemented by
{interface
org.kie.server.client.SolverServicesClient=org.kie.server.client.impl.SolverServicesClientImpl@7
7fbd92c}
10:23:35.679 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Building services client for
server capability DMN
10:23:35.679 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Builder
'org.kie.server.client.helper.DMNServicesClientBuilder@67c27493' for capability 'DMN'
10:23:35.680 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Capability implemented by
{interface
org.kie.server.client.DMNServicesClient=org.kie.server.client.impl.DMNServicesClientImpl@35e
2d654}
10:23:35.680 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - Building services client for
server capability Swagger
10:23:35.680 [main] DEBUG o.k.s.c.impl.KieServicesClientImpl - No builder found for
'Swagger' capability
10:23:35.681 [main] DEBUG o.k.s.client.balancer.LoadBalancer - Load balancer
RoundRobinBalancerStrategy{availableEndpoints=[http://localhost:8080/kie-
server/services/rest/server]} selected url 'http://localhost:8080/kie-server/services/rest/server'
10:23:35.701 [main] DEBUG o.k.s.c.i.AbstractKieServicesClientImpl - About to send PUT
request to 'http://localhost:8080/kie-server/services/rest/server/containers/employee-
rostering3' with payload '{
  "container-id" : null,
  "release-id" : {
    "group-id" : "employeerostering",
    "artifact-id" : "employeerostering",
    "version" : "1.0.0-SNAPSHOT"
  },
  "resolved-release-id" : null,
  "status" : null,
```

```
  "scanner" : null,
  "config-items" : [ ],
  "messages" : [ ],
  "container-alias" : null
}'
10:23:38.071 [main] DEBUG o.k.s.c.i.AbstractKieServicesClientImpl - About to deserialize
content:
 '{
  "type" : "SUCCESS",
  "msg" : "Container employee-rostering3 successfully deployed with module
employeerostering:employeerostering:1.0.0-SNAPSHOT.",
  "result" : {
    "kie-container" : {
      "container-id" : "employee-rostering3",
      "release-id" : {
        "group-id" : "employeerostering",
        "artifact-id" : "employeerostering",
        "version" : "1.0.0-SNAPSHOT"
      },
      "resolved-release-id" : {
        "group-id" : "employeerostering",
        "artifact-id" : "employeerostering",
        "version" : "1.0.0-SNAPSHOT"
      },
      "status" : "STARTED",
      "scanner" : {
        "status" : "DISPOSED",
        "poll-interval" : null
      },
      "config-items" : [ ],
      "messages" : [ {
        "severity" : "INFO",
        "timestamp" : {
  "java.util.Date" : 1540909418069
},
        "content" : [ "Container employee-rostering3 successfully created with module
employeerostering:employeerostering:1.0.0-SNAPSHOT." ]
      } ],
      "container-alias" : null
    }
  }
}'
 into type: 'class org.kie.server.api.model.ServiceResponse'
```

If you encounter request errors, review the returned error code messages and adjust your Java configurations accordingly.

2.2. SUPPORTED PROCESS SERVER JAVA CLIENTS

The following are some of the Java client services available in the **org.kie.server.client** package of your Red Hat Process Automation Manager distribution. You can use these services to interact with related resources in Process Server similarly to the Process Server REST API.

- **KieServicesClient**: Used as the entry point for other Process Server Java clients, and used to interact with KIE containers

- **JobServicesClient**: Used to schedule, cancel, re-queue, and get job requests
- **RuleServicesClient**: Used to send commands to the server to perform rule-related operations, such as executing rules or inserting objects into the KIE session
- **SolverServicesClient**: Used to perform all Red Hat Business Optimizer operations, such as getting the solver state and the best solution, or disposing a solver
- **ProcessServicesClient**: Used to start, signal, and abort processes or work items
- **QueryServicesClient**: Used to query processes, process nodes, and process variables
- **UserTaskServicesClient**: Used to perform all user-task operations, such as starting, claiming, or canceling a task, and to query tasks by a specified field, such as by user or by process instances ID
- **UIServicesClient**: Used to get String representation of forms (XML or JSON) and of a process image (SVG)
- **ProcessAdminServicesClient**: Provides an interface for operations with process instances (found in **~/org/kie/server/client/admin**)
- **UserTaskAdminServicesClient**: Provides an interface for operations with user tasks (found in **~/org/kie/server/client/admin**)

The **getServicesClient** method provides access to any of these clients:

```
RuleServicesClient rulesClient = kieServicesClient.getServicesClient(RuleServicesClient.class);
```

For the full list of available Process Server Java clients, download the **Red Hat Process Automation Manager 7.2.0 Source Distribution** from the Red Hat Customer Portal and navigate to **~/rhpam-7.2.0-sources/src/droolsjbpm-integration-$VERSION/kie-server-parent/kie-server-remote/kie-server-client/src/main/java/org/kie/server/client**.

2.3. EXAMPLE REQUESTS WITH THE PROCESS SERVER JAVA CLIENT API

The following are examples of Process Server Java client API requests for basic interactions with Process Server. For the full list of available Process Server Java clients, download the **Red Hat Process Automation Manager 7.2.0 Source Distribution** from the Red Hat Customer Portal and navigate to **~/rhpam-7.2.0-sources/src/droolsjbpm-integration-$VERSION/kie-server-parent/kie-server-remote/kie-server-client/src/main/java/org/kie/server/client**.

Listing Process Server capabilities

You can use the **org.kie.server.api.model.KieServerInfo** object to identify server capabilities. The **KieServicesClient** client requires the server capability information to correctly produce service clients. You can specify the capabilities globally in **KieServicesConfiguration**; otherwise they are automatically retrieved from Process Server.

Example request to return Process Server capabilities

```
public void listCapabilities() {

  KieServerInfo serverInfo = kieServicesClient.getServerInfo().getResult();
  System.out.print("Server capabilities:");
```

```
  for (String capability : serverInfo.getCapabilities()) {
    System.out.print(" " + capability);
  }

  System.out.println();
}
```

Listing KIE containers in Process Server

KIE containers are represented by the **org.kie.server.api.model.KieContainerResource** object. The list of resources is represented by the **org.kie.server.api.model.KieContainerResourceList** object.

Example request to return KIE containers from Process Server

```
public void listContainers() {
    KieContainerResourceList containersList = kieServicesClient.listContainers().getResult();
    List<KieContainerResource> kieContainers = containersList.getContainers();
    System.out.println("Available containers: ");
    for (KieContainerResource container : kieContainers) {
        System.out.println("\t" + container.getContainerId() + " (" + container.getReleaseId() + ")");
    }
}
```

You can optionally filter the KIE container results using an instance of the **org.kie.server.api.model.KieContainerResourceFilter** class, which is passed to the **org.kie.server.client.KieServicesClient.listContainers()** method.

Example request to return KIE containers by release ID and status

```
public void listContainersWithFilter() {

    // Filter containers by releaseId "org.example:container:1.0.0.Final" and status FAILED
    KieContainerResourceFilter filter = new KieContainerResourceFilter.Builder()
            .releaseId("org.example", "container", "1.0.0.Final")
            .status(KieContainerStatus.FAILED)
            .build();

    // Using previously created KieServicesClient
    KieContainerResourceList containersList = kieServicesClient.listContainers(filter).getResult();
    List<KieContainerResource> kieContainers = containersList.getContainers();

    System.out.println("Available containers: ");

    for (KieContainerResource container : kieContainers) {
        System.out.println("\t" + container.getContainerId() + " (" + container.getReleaseId() + ")");
    }
}
```

Creating and disposing KIE containers in Process Server

You can use the **createContainer** and **disposeContainer** methods in the **KieServicesClient** client to dispose and create KIE containers. In this example, when you dispose a container, the **ServiceResponse** returns a **Void** response. When you create a container, the **ServiceResponse** returns a **KieContainerResource** object.

Example request to dispose and re-create a KIE container

```
public void disposeAndCreateContainer() {
    System.out.println("== Disposing and creating containers ==");

    // Retrieve list of KIE containers
    List<KieContainerResource> kieContainers =
kieServicesClient.listContainers().getResult().getContainers();
    if (kieContainers.size() == 0) {
        System.out.println("No containers available...");
        return;
    }

    // Dispose KIE container
    KieContainerResource container = kieContainers.get(0);
    String containerId = container.getContainerId();
    ServiceResponse<Void> responseDispose = kieServicesClient.disposeContainer(containerId);
    if (responseDispose.getType() == ResponseType.FAILURE) {
        System.out.println("Error disposing " + containerId + ". Message: ");
        System.out.println(responseDispose.getMsg());
        return;
    }
    System.out.println("Success Disposing container " + containerId);
    System.out.println("Trying to recreate the container...");

    // Re-create KIE container
    ServiceResponse<KieContainerResource> createResponse =
kieServicesClient.createContainer(containerId, container);
    if(createResponse.getType() == ResponseType.FAILURE) {
        System.out.println("Error creating " + containerId + ". Message: ");
        System.out.println(responseDispose.getMsg());
        return;
    }
    System.out.println("Container recreated with success!");
}
```

Executing runtime commands in Process Server

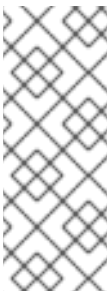
Red Hat Process Automation Manager supports runtime commands that you can send to Process Server for asset-related operations, such as inserting or retracting objects in a KIE session or firing all rules. The full list of supported runtime commands is located in the **org.drools.core.command.runtime** package in your Red Hat Process Automation Manager instance.

You can use the **org.kie.api.command.KieCommands** class to insert commands, and use **org.kie.api.KieServices.get().getCommands()** to instantiate the **KieCommands** class. If you want to add multiple commands, use the **BatchExecutionCommand** wrapper.

Example request to insert an object and fire all rules

```
import org.kie.api.command.Command;
import org.kie.api.command.KieCommands;
import org.kie.server.api.model.ServiceResponse;
import org.kie.server.client.RuleServicesClient;
import org.kie.server.client.KieServicesClient;
import org.kie.api.KieServices;
```

```
import java.util.Arrays;

...

public void executeCommands() {

  String containerId = "hello";
  System.out.println("== Sending commands to the server ==");
  RuleServicesClient rulesClient = kieServicesClient.getServicesClient(RuleServicesClient.class);
  KieCommands commandsFactory = KieServices.Factory.get().getCommands();

  Command<?> insert = commandsFactory.newInsert("Some String OBJ");
  Command<?> fireAllRules = commandsFactory.newFireAllRules();
  Command<?> batchCommand = commandsFactory.newBatchExecution(Arrays.asList(insert,
fireAllRules));

  ServiceResponse<String> executeResponse = rulesClient.executeCommands(containerId,
batchCommand);

  if(executeResponse.getType() == ResponseType.SUCCESS) {
    System.out.println("Commands executed with success! Response: ");
    System.out.println(executeResponse.getResult());
  } else {
    System.out.println("Error executing rules. Message: ");
    System.out.println(executeResponse.getMsg());
  }
}
```



NOTE

A conversation between a client and a specific Process Server container in a clustered environment is secured by a unique **conversationID**. The **conversationID** is transferred using the **X-KIE-ConversationId** REST header. If you update the container, unset the previous **conversationID**. Use **KieServiesClient.completeConversation()** to unset the **conversationID** for Java API.

Listing available business processes in a KIE container

You can use the **QueryServicesClient** client to list available process definitions. The **QueryServicesClient** methods use pagination, so in addition to the query you make, you must provide the current page and the number of results per page. In this example, the query starts on page **0** and lists the first **1000** results.

Example request to list business processes in Process Server

```
public void listProcesses() {
    System.out.println("== Listing Business Processes ==");
    QueryServicesClient queryClient =
kieServicesClient.getServicesClient(QueryServicesClient.class);
    List<ProcessDefinition> findProcessesByContainerId =
queryClient.findProcessesByContainerId("rewards", 0, 1000);
    for (ProcessDefinition def : findProcessesByContainerId) {
```

```
            System.out.println(def.getName() + " - " + def.getId() + " v" + def.getVersion());
        }
    }
```

Starting a business process in a KIE container

You can use the **ProcessServicesClient** client to start a business process. Ensure that any custom classes that you require for your process are added into the **KieServicesConfiguration** object, using the **addExtraClasses()** method.

Example request to start a business process

```
import java.util.HashMap;
import java.util.HashSet;
import java.util.Map;
import java.util.Set;

import javax.xml.bind.JAXBContext;
import javax.xml.bind.JAXBException;
import javax.xml.bind.Marshaller;

import org.kie.server.api.marshalling.MarshallingFormat;
import org.kie.server.client.KieServicesClient;
import org.kie.server.client.KieServicesConfiguration;
import org.kie.server.client.KieServicesFactory;
import org.kie.server.client.ProcessServicesClient;
...

public static void startProcess() {

  //Client configuration setup
  KieServicesConfiguration config = KieServicesFactory.newRestConfiguration(SERVER_URL,
LOGIN, PASSWORD);

  //Add custom classes, such as Obj.class, to the configuration
  Set<Class<?>> extraClassList = new HashSet<Class<?>>();
  extraClassList.add(Obj.class);
  config.addExtraClasses(extraClassList);
  config.setMarshallingFormat(MarshallingFormat.JSON);

  // ProcessServicesClient setup
  KieServicesClient client = KieServicesFactory.newKieServicesClient(config);
  ProcessServicesClient processServicesClient =
client.getServicesClient(ProcessServicesClient.class);

  // Create an instance of the custom class
  Obj obj = new Obj();
  obj.setOk("ok");

  Map<String, Object> variables = new HashMap<String, Object>();
  variables.put("test", obj);

  // Start the process with custom class
  processServicesClient.startProcess(CONTAINER, processId, variables);
}
```

Running a custom query

You can use the **QueryDefinition** object of the **QueryServicesClient** client to register and execute custom queries in Process Server.

Example request to register and execute a custom query in Process Server

```
// Client setup
KieServicesConfiguration conf = KieServicesFactory.newRestConfiguration(SERVER_URL,
LOGIN, PASSWORD);
KieServicesClient client = KieServicesFactory.newKieServicesClient(conf);

// Get the QueryServicesClient
QueryServicesClient queryClient = client.getServicesClient(QueryServicesClient.class);

// Build the query
QueryDefinition queryDefinition = QueryDefinition.builder().name(QUERY_NAME)
        .expression("select * from Task t")
        .source("java:jboss/datasources/ExampleDS")
        .target("TASK").build();

// Specify that two queries cannot have the same name
queryClient.unregisterQuery(QUERY_NAME);

// Register the query
queryClient.registerQuery(queryDefinition);

// Execute the query with parameters: query name, mapping type (to map the fields to an object),
page number, page size, and return type
List<TaskInstance> query = queryClient.query(QUERY_NAME,
QueryServicesClient.QUERY_MAP_TASK, 0, 100, TaskInstance.class);

// Read the result
for (TaskInstance taskInstance : query) {
    System.out.println(taskInstance);
}
```

In this example, the **target** instructs the query service to apply default filters. Alternatively, you can set filter parameters manually. The **Target** class supports the following values:

```
public enum Target {
    PROCESS,
    TASK,
    BA_TASK,
    PO_TASK,
    JOBS,
    CUSTOM;
}
```

CHAPTER 3. PROCESS SERVER AND KIE CONTAINER COMMANDS IN RED HAT PROCESS AUTOMATION MANAGER

Red Hat Process Automation Manager supports server commands that you can send to Process Server for server-related or container-related operations, such as retrieving server information or creating or deleting a container. The full list of supported Process Server configuration commands is located in the **org.kie.server.api.commands** package in your Red Hat Process Automation Manager instance.

In the Process Server REST API, you use the **org.kie.server.api.commands** commands as the request body for **POST** requests to **http://SERVER:PORT/kie-server/services/rest/server/config**. For more information about using the Process Server REST API, see Chapter 1, *Process Server REST API for KIE containers and business assets*.

In the Process Server Java client API, you use the corresponding method in the parent **KieServicesClient** Java client as an embedded API request in your Java application. All Process Server commands are executed by methods provided in the Java client API, so you do not need to embed the actual Process Server commands in your Java application. For more information about using the Process Server Java client API, see Chapter 2, *Process Server Java client API for KIE containers and business assets*.

3.1. SAMPLE PROCESS SERVER AND KIE CONTAINER COMMANDS

The following are sample Process Server commands that you can use with the Process Server REST API or Java client API for server-related or container-related operations in Process Server:

- **GetServerInfoCommand**
- **GetServerStateCommand**
- **CreateContainerCommand**
- **GetContainerInfoCommand**
- **ListContainersCommand**
- **CallContainerCommand**
- **DisposeContainerCommand**
- **GetScannerInfoCommand**
- **UpdateScannerCommand**
- **UpdateReleaseIdCommand**

For the full list of supported Process Server configuration and management commands, see the **org.kie.server.api.commands** package in your Red Hat Process Automation Manager instance.

You can run Process Server commands individually or together as a batch REST API request or batch Java API request:

Batch REST API request to create, call, and dispose a KIE container (JSON)

```
{
  "commands": [
```

```
    {
      "create-container": {
        "container": {
          "status": "STARTED",
          "container-id": "command-script-container",
          "release-id": {
            "version": "1.0",
            "group-id": "com.redhat",
            "artifact-id": "Project1"
          }
        }
      }
    },
    {
      "call-container": {
        "payload": "{\n  \"commands\" : [ {\n    \"fire-all-rules\" : {\n      \"max\" : -1,\n      \"out-identifier\" :
null\n    }\n  } ]\n}",
        "container-id": "command-script-container"
      }
    },
    {
      "dispose-container": {
        "container-id": "command-script-container"
      }
    }
  ]
}
```

Batch Java API request to retrieve, dispose, and re-create a KIE container

```
public void disposeAndCreateContainer() {
    System.out.println("== Disposing and creating containers ==");

    // Retrieve list of KIE containers
    List<KieContainerResource> kieContainers =
kieServicesClient.listContainers().getResult().getContainers();
    if (kieContainers.size() == 0) {
        System.out.println("No containers available...");
        return;
    }

    // Dispose KIE container
    KieContainerResource container = kieContainers.get(0);
    String containerId = container.getContainerId();
    ServiceResponse<Void> responseDispose = kieServicesClient.disposeContainer(containerId);
    if (responseDispose.getType() == ResponseType.FAILURE) {
        System.out.println("Error disposing " + containerId + ". Message: ");
        System.out.println(responseDispose.getMsg());
        return;
    }
    System.out.println("Success Disposing container " + containerId);
    System.out.println("Trying to recreate the container...");

    // Re-create KIE container
    ServiceResponse<KieContainerResource> createResponse =
kieServicesClient.createContainer(containerId, container);
```

```
    if(createResponse.getType() == ResponseType.FAILURE) {
        System.out.println("Error creating " + containerId + ". Message: ");
        System.out.println(responseDispose.getMsg());
        return;
    }
    System.out.println("Container recreated with success!");
}
```

Each command in this section includes a REST request body example (JSON) for the Process Server REST API and an embedded method example from the **KieServicesClient** Java client for the Process Server Java client API.

GetServerInfoCommand

Returns information about the Process Server.

Example REST request body (JSON)

```
{
  "commands" : [ {
    "get-server-info" : { }
  } ]
}
```

Example Java client method

```
KieServerInfo serverInfo = kieServicesClient.getServerInfo();
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Kie Server info",
      "result": {
        "kie-server-info": {
          "id": "default-kieserver",
          "version": "7.11.0.Final-redhat-00001",
          "name": "default-kieserver",
          "location": "http://localhost:8080/kie-server/services/rest/server",
          "capabilities": [
            "KieServer",
            "BRM",
            "BPM",
            "CaseMgmt",
            "BPM-UI",
            "BRP",
            "DMN",
            "Swagger"
          ],
          "messages": [
            {
              "severity": "INFO",
              "timestamp": {
```

```
            "java.util.Date": 1538502533321
          },
          "content": [
            "Server KieServerInfo{serverId='default-kieserver', version='7.11.0.Final-redhat-00001',
name='default-kieserver', location='http://localhost:8080/kie-server/services/rest/server',
capabilities=[KieServer, BRM, BPM, CaseMgmt, BPM-UI, BRP, DMN, Swagger],
messages=null}started successfully at Tue Oct 02 13:48:53 EDT 2018"
          ]
        }
      ]
    }
  }
 ]
}
```

GetServerStateCommand

Returns information about the current state and configurations of the Process Server.

Example REST request body (JSON)

```
{
  "commands" : [ {
    "get-server-state" : { }
  } ]
}
```

Example Java client method

```
KieServerStateInfo serverStateInfo = kieServicesClient.getServerState();
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Successfully loaded server state for server id default-kieserver",
      "result": {
        "kie-server-state-info": {
          "controller": [
            "http://localhost:8080/business-central/rest/controller"
          ],
          "config": {
            "config-items": [
              {
                "itemName": "org.kie.server.location",
                "itemValue": "http://localhost:8080/kie-server/services/rest/server",
                "itemType": "java.lang.String"
              },
              {
                "itemName": "org.kie.server.controller.user",
                "itemValue": "controllerUser",
                "itemType": "java.lang.String"
```

```
            },
            {
              "itemName": "org.kie.server.controller",
              "itemValue": "http://localhost:8080/business-central/rest/controller",
              "itemType": "java.lang.String"
            }
          ]
        },
        "containers": [
          {
            "container-id": "employee-rostering",
            "release-id": {
              "group-id": "employeerostering",
              "artifact-id": "employeerostering",
              "version": "1.0.0-SNAPSHOT"
            },
            "resolved-release-id": null,
            "status": "STARTED",
            "scanner": {
              "status": "STOPPED",
              "poll-interval": null
            },
            "config-items": [
              {
                "itemName": "KBase",
                "itemValue": "",
                "itemType": "BPM"
              },
              {
                "itemName": "KSession",
                "itemValue": "",
                "itemType": "BPM"
              },
              {
                "itemName": "MergeMode",
                "itemValue": "MERGE_COLLECTIONS",
                "itemType": "BPM"
              },
              {
                "itemName": "RuntimeStrategy",
                "itemValue": "SINGLETON",
                "itemType": "BPM"
              }
            ],
            "messages": [],
            "container-alias": "employeerostering"
          }
        ]
      }
    }
  ]
}
```


CreateContainerCommand

Creates a KIE container in the Process Server.

Table 3.1. Command attributes

Name	Description	Requirement
container	Map containing the **container-id**, **release-id** data (group ID, artifact ID, version), **status**, and any other components of the new KIE container	Required

Example REST request body (JSON)

```
{
  "commands" : [ {
    "create-container" : {
      "container" : {
        "status" : null,
        "messages" : [ ],
        "container-id" : "command-script-container",
        "release-id" : {
          "version" : "1.0",
          "group-id" : "com.redhat",
          "artifact-id" : "Project1"
        },
        "config-items" : [ ]
      }
    }
  } ]
}
```

Example Java client method

```
ServiceResponse<KieContainerResource> response =
kieServicesClient.createContainer("command-script-container", resource);
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Container command-script-container successfully deployed with module
com.redhat:Project1:1.0.",
      "result": {
        "kie-container": {
          "container-id": "command-script-container",
          "release-id": {
            "version" : "1.0",
            "group-id" : "com.redhat",
            "artifact-id" : "Project1"
          },
          "resolved-release-id": {
            "version" : "1.0",
```

```
            "group-id" : "com.redhat",
            "artifact-id" : "Project1"
          },
          "status": "STARTED",
          "scanner": {
            "status": "DISPOSED",
            "poll-interval": null
          },
          "config-items": [],
          "messages": [
            {
              "severity": "INFO",
              "timestamp": {
                "java.util.Date": 1538762455510
              },
              "content": [
                "Container command-script-container successfully created with module
com.redhat:Project1:1.0."
              ]
            }
          ],
          "container-alias": null
        }
      }
    }
  ]
}
```


GetContainerInfoCommand

Returns information about a specified KIE container in Process Server.

Table 3.2. Command attributes

Name	Description	Requirement
container-id	ID of the KIE container	Required

Example REST request body (JSON)


```
{
  "commands" : [ {
    "get-container-info" : {
      "container-id" : "command-script-container"
    }
  } ]
}
```


Example Java client method

```
ServiceResponse<KieContainerResource> response =
kieServicesClient.getContainerInfo("command-script-container");
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Info for container command-script-container",
      "result": {
        "kie-container": {
          "container-id": "command-script-container",
          "release-id": {
            "group-id": "com.redhat",
            "artifact-id": "Project1",
            "version": "1.0"
          },
          "resolved-release-id": {
            "group-id": "com.redhat",
            "artifact-id": "Project1",
            "version": "1.0"
          },
          "status": "STARTED",
          "scanner": {
            "status": "DISPOSED",
            "poll-interval": null
          },
          "config-items": [

          ],
          "container-alias": null
        }
      }
    }
  ]
}
```

ListContainersCommand

Returns a list of KIE containers that have been created in the Process Server.

Table 3.3. Command attributes

Name	Description	Requirement
kie-container-filter	Optional map containing **release-id-filter**, **container-status-filter**, and any other KIE container properties by which you want to filter results	Optional

Example REST request body (JSON)

```
{
  "commands" : [ {
    "list-containers" : {
      "kie-container-filter" : {
```

```
        "release-id-filter" : { },
        "container-status-filter" : {
          "accepted-status" : ["FAILED"]
        }
      }
    }
  } ]
}
```

Example Java client method

```
KieContainerResourceFilter filter = new KieContainerResourceFilter.Builder()
        .status(KieContainerStatus.FAILED)
        .build();

KieContainerResourceList containersList = kieServicesClient.listContainers(filter);
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "List of created containers",
      "result": {
        "kie-containers": {
          "kie-container": [
            {
              "container-id": "command-script-container",
              "release-id": {
                "group-id": "com.redhat",
                "artifact-id": "Project1",
                "version": "1.0"
              },
              "resolved-release-id": {
                "group-id": "com.redhat",
                "artifact-id": "Project1",
                "version": "1.0"
              },
              "status": "STARTED",
              "scanner": {
                "status": "STARTED",
                "poll-interval": 5000
              },
              "config-items": [
                {
                  "itemName": "RuntimeStrategy",
                  "itemValue": "SINGLETON",
                  "itemType": "java.lang.String"
                },
                {
                  "itemName": "MergeMode",
                  "itemValue": "MERGE_COLLECTIONS",
                  "itemType": "java.lang.String"
                },
```

```
            {
              "itemName": "KBase",
              "itemValue": "",
              "itemType": "java.lang.String"
            },
            {
              "itemName": "KSession",
              "itemValue": "",
              "itemType": "java.lang.String"
            }
          ],
          "messages": [
            {
              "severity": "INFO",
              "timestamp": {
                "java.util.Date": 1538504619749
              },
              "content": [
                "Container command-script-container successfully created with module
com.redhat:Project1:1.0."
              ]
            }
          ],
          "container-alias": null
        }
      ]
    }
  }
 ]
}
```


CallContainerCommand

Calls a KIE container and executes one or more runtime commands. For information about Red Hat Process Automation Manager runtime commands, see Chapter 4, *Runtime commands in Red Hat Process Automation Manager*.

Table 3.4. Command attributes

Name	Description	Requirement
container-id	ID of the KIE container to be called	Required
payload	One or more commands in a **BatchExecutionCommand** wrapper to be executed on the KIE container	Required

Example REST request body (JSON)


```
{
  "commands" : [ {
    "call-container" : {
      "payload" : "{\n  \"lookup\" : \"defaultKieSession\",\n  \"commands\" : [ {\n    \"fire-all-rules\" : {\n
```

```
\"max\" : -1,\n      \"out-identifier\" : null\n    }\n  } ]\n}",
      "container-id" : "command-script-container"
    }
  } ]
}
```

Example Java client method

```
List<Command<?>> commands = new ArrayList<Command<?>>();
      BatchExecutionCommand batchExecution1 =
commandsFactory.newBatchExecution(commands, "defaultKieSession");
      commands.add(commandsFactory.newFireAllRules());

      ServiceResponse<ExecutionResults> response1 =
ruleClient.executeCommandsWithResults("command-script-container", batchExecution1);
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Container command-script-container successfully called.",
      "result": "{\n  \"results\" : [ ],\n  \"facts\" : [ ]\n}"
    }
  ]
}
```

DisposeContainerCommand

Disposes a specified KIE container in the Process Server.

Table 3.5. Command attributes

Name	Description	Requirement
container-id	ID of the KIE container to be disposed	Required

Example REST request body (JSON)

```
{
  "commands" : [ {
    "dispose-container" : {
      "container-id" : "command-script-container"
    }
  } ]
}
```

Example Java client method

```
ServiceResponse<Void> response = kieServicesClient.disposeContainer("command-script-
container");
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Container command-script-container successfully disposed.",
      "result": null
    }
  ]
}
```

GetScannerInfoCommand

Returns information about the KIE scanner used for automatic updates in a specified KIE container, if applicable.

Table 3.6. Command attributes

Name	Description	Requirement
container-id	ID of the KIE container where the KIE scanner is used	Required

Example REST request body (JSON)

```
{
  "commands" : [ {
    "get-scanner-info" : {
      "container-id" : "command-script-container"
    }
  } ]
}
```

Example Java client method

```
ServiceResponse<KieScannerResource> response =
kieServicesClient.getScannerInfo("command-script-container");
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Scanner info successfully retrieved",
      "result": {
        "kie-scanner": {
          "status": "DISPOSED",
          "poll-interval": null
        }
      }
```

```
    }
  ]
}
```

UpdateScannerCommand

Starts or stops a KIE scanner that controls polling for updated KIE container deployments.

NOTE

Avoid using a KIE scanner with business processes. Using a KIE scanner with processes can lead to unforeseen updates that can then cause errors in long-running processes when changes are not compatible with running process instances.

Table 3.7. Command attributes

Name	Description	Requirement
container-id	ID of the KIE container where the KIE scanner is used	Required
status	Status to be set on the KIE scanner (**STARTED**, **STOPPED**)	Required
poll-interval	Permitted polling duration in milliseconds	Required only when starting scanner

Example REST request body (JSON)

```
{
  "commands" : [ {
    "update-scanner" : {
      "scanner" : {
        "status" : "STARTED",
        "poll-interval" : 10000
      },
      "container-id" : "command-script-container"
    }
  } ]
}
```

Example Java client method

```
KieScannerResource scannerResource = new KieScannerResource();
scannerResource.setPollInterval(10000);
scannerResource.setStatus(KieScannerStatus. STARTED);

ServiceResponse<KieScannerResource> response =
kieServicesClient.updateScanner("command-script-container", scannerResource);
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Kie scanner successfully created.",
      "result": {
        "kie-scanner": {
          "status": "STARTED",
          "poll-interval": 10000
        }
      }
    }
  ]
}
```

UpdateReleaseIdCommand

Updates the release ID data (group ID, artifact ID, version) for a specified KIE container.

Table 3.8. Command attributes

Name	Description	Requirement
container-id	ID of the KIE container to be updated	Required
releaseId	Updated GAV (group ID, artifact ID, version) data to be applied to the KIE container	Required

Example REST request body (JSON)

```
{
  "commands" : [ {
    "update-release-id" : {
      "releaseId" : {
        "version" : "1.1",
        "group-id" : "com.redhat",
        "artifact-id" : "Project1"
      },
      "container-id" : "command-script-container"
    }
  } ]
}
```

Example Java client method

```
ServiceResponse<ReleaseId> response = kieServicesClient.updateReleaseId("command-script-container", "com.redhat:Project1:1.1");
```

Example server response (JSON)

```
{
  "response": [
```

```
    {
      "type": "SUCCESS",
      "msg": "Release id successfully updated",
      "result": {
        "release-id": {
          "group-id": "com.redhat",
          "artifact-id": "Project1",
          "version": "1.1"
        }
      }
    }
  ]
}
```

CHAPTER 4. RUNTIME COMMANDS IN RED HAT PROCESS AUTOMATION MANAGER

Red Hat Process Automation Manager supports runtime commands that you can send to Process Server for asset-related operations, such as executing all rules or inserting or retracting objects in a KIE session. The full list of supported runtime commands is located in the **org.drools.core.command.runtime** package in your Red Hat Process Automation Manager instance.

In the Process Server REST API, you use the global **org.drools.core.command.runtime** commands or the rule-specific **org.drools.core.command.runtime.rule** commands as the request body for **POST** requests to **http://SERVER:PORT/kie-server/services/rest/server/containers/instances/{containerId}**. For more information about using the Process Server REST API, see Chapter 1, *Process Server REST API for KIE containers and business assets*.

In the Process Server Java client API, you can embed these commands in your Java application along with the relevant Java client. For example, for rule-related commands, you use the **RuleServicesClient** Java client with the embedded commands. For more information about using the Process Server Java client API, see Chapter 2, *Process Server Java client API for KIE containers and business assets* .

4.1. SAMPLE RUNTIME COMMANDS IN RED HAT PROCESS AUTOMATION MANAGER

The following are sample runtime commands that you can use with the Process Server REST API or Java client API for asset-related operations in Process Server:

- **BatchExecutionCommand**
- **InsertObjectCommand**
- **RetractCommand**
- **ModifyCommand**
- **GetObjectCommand**
- **GetObjectsCommand**
- **InsertElementsCommand**
- **FireAllRulesCommand**
- **StartProcessCommand**
- **SignalEventCommand**
- **CompleteWorkItemCommand**
- **AbortWorkItemCommand**
- **QueryCommand**
- **SetGlobalCommand**
- **GetGlobalCommand**

For the full list of supported runtime commands, see the **org.drools.core.command.runtime** package in your Red Hat Process Automation Manager instance.

Each command in this section includes a REST request body example (JSON) for the Process Server REST API and an embedded Java command example for the Process Server Java client API. The Java examples use an object **org.drools.compiler.test.Person** with the fields **name** (String) and **age** (Integer).

BatchExecutionCommand

Contains multiple commands to be executed together.

Table 4.1. Command attributes

Name	Description	Requirement
commands	List of commands to be executed.	Required
lookup	Sets the KIE session ID on which the commands will be executed. For stateless KIE sessions, this attribute is required. For stateful KIE sessions, this attribute is optional and if not specified, the default KIE session is used.	Required for stateless KIE session, optional for stateful KIE session

NOTE

KIE session IDs are in the **kmodule.xml** file of your Red Hat Process Automation Manager project. To view or add a KIE session ID in Business Central to use with the **lookup** command attribute, navigate to the relevant project in Business Central and go to project **Settings → KIE bases → KIE sessions**. If no KIE bases exist, click **Add KIE base → KIE sessions** to define the new KIE base and KIE sessions.

Example JSON request body

```
{
  "lookup": "ksession1",
  "commands": [ {
     "insert": {
       "object": {
         "org.drools.compiler.test.Person": {
           "name": "john",
           "age": 25
         }
       }
     }
    },
    {
      "fire-all-rules": {
        "max": 10,
        "out-identifier": "firedActivations"
      }
    }
  ]
}
```

Example Java command

```
InsertObjectCommand insertCommand = new InsertObjectCommand(new Person("john", 25));
FireAllRulesCommand fireCommand = new FireAllRulesCommand();

BatchExecutionCommand batch = new
BatchExecutionCommandImpl(Arrays.asList(insertCommand, fireCommand), "ksession1");
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Container command-script-container successfully called.",
      "result": {
        "execution-results": {
          "results": [
            {
              "value": 0,
              "key": "firedActivations"
            }
          ],
          "facts": []
        }
      }
    }
  ]
}
```

InsertObjectCommand

Inserts an object into the KIE session.

Table 4.2. Command attributes

Name	Description	Requirement
object	The object to be inserted	Required
out-identifier	ID of the **FactHandle** created from the object insertion and added to the execution results	Optional
return-object	Boolean to determine whether the object must be returned in the execution results (default: **true**)	Optional
entry-point	Entry point for the insertion	Optional

Example JSON request body

```
{
  "commands": [ {
```

```
      "insert": {
        "entry-point": "my stream",
        "object": {
          "org.drools.compiler.test.Person": {
            "age": 25,
            "name": "john"
          }
        },
        "out-identifier": "john",
        "return-object": false
      }
    }
  ]
}
```

Example Java command

```
Command insertObjectCommand =
  CommandFactory.newInsert(new Person("john", 25), "john", false, null);

ksession.execute(insertObjectCommand);
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Container command-script-container successfully called.",
      "result": {
        "execution-results": {
          "results": [],
          "facts": [
            {
              "value": {
                "org.drools.core.common.DefaultFactHandle": {
                  "external-form": "0:4:436792766:-
2127720265:4:DEFAULT:NON_TRAIT:java.util.LinkedHashMap"
                }
              },
              "key": "john"
            }
          ]
        }
      }
    }
  ]
}
```

RetractCommand

Retracts an object from the KIE session.

Table 4.3. Command attributes

Name	Description	Requirement
fact-handle	The **FactHandle** associated with the object to be retracted	Required

Example JSON request body

```
{
  "commands": [ {
     "retract": {
       "fact-handle": "0:4:436792766:-
2127720265:4:DEFAULT:NON_TRAIT:java.util.LinkedHashMap"
     }
    }
  ]
}
```

Example Java command: Use FactHandleFromString

```
RetractCommand retractCommand = new RetractCommand();
retractCommand.setFactHandleFromString("123:234:345:456:567");
```

Example Java command: Use FactHandle from inserted object

```
RetractCommand retractCommand = new RetractCommand(factHandle);
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Container employee-rostering successfully called.",
      "result": {
        "execution-results": {
          "results": [],
          "facts": []
        }
      }
    }
  ]
}
```

ModifyCommand

Modifies a previously inserted object in the KIE session.

Table 4.4. Command attributes

Name	Description	Requirement
fact-handle	The **FactHandle** associated with the object to be modified	Required
setters	List of setters for object modifications	Required

Example JSON request body

```
{
  "commands": [ {
     "modify": {
       "fact-handle": "0:4:436792766:-
2127720265:4:DEFAULT:NON_TRAIT:java.util.LinkedHashMap",
       "setters": {
         "accessor": "age",
         "value": 25
       }
     }
   }
  ]
}
```

Example Java command

```
ModifyCommand modifyCommand = new ModifyCommand(factHandle);

List<Setter> setters = new ArrayList<Setter>();
setters.add(new SetterImpl("age", "25"));

modifyCommand.setSetters(setters);
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Container employee-rostering successfully called.",
      "result": {
        "execution-results": {
          "results": [],
          "facts": []
        }
      }
    }
  ]
}
```

GetObjectCommand

Retrieves an object from a KIE session.

Table 4.5. Command attributes

Name	Description	Requirement
fact-handle	The **FactHandle** associated with the object to be retrieved	Required
out-identifier	ID of the **FactHandle** created from the object insertion and added to the execution results	Optional

Example JSON request body

```
{
  "commands": [ {
     "get-object": {
       "fact-handle": "0:4:436792766:-
2127720265:4:DEFAULT:NON_TRAIT:java.util.LinkedHashMap",
       "out-identifier": "john"
     }
   }
  ]
}
```

Example Java command

```
GetObjectCommand getObjectCommand = new GetObjectCommand();
getObjectCommand.setFactHandleFromString("123:234:345:456:567");
getObjectCommand.setOutIdentifier("john");
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Container command-script-container successfully called.",
      "result": {
        "execution-results": {
          "results": [
            {
              "value": null,
              "key": "john"
            }
          ],
          "facts": []
        }
      }
    }
  ]
}
```

GetObjectsCommand

Retrieves all objects from the KIE session as a collection.

Table 4.6. Command attributes

Name	Description	Requirement
object-filter	Filter for the objects returned from the KIE session	Optional
out-identifier	Identifier to be used in the execution results	Optional

Example JSON request body

```
{
  "commands": [ {
     "get-objects": {
       "out-identifier": "objects"
     }
   }
  ]
}
```

Example Java command

```
GetObjectsCommand getObjectsCommand = new GetObjectsCommand();
getObjectsCommand.setOutIdentifier("objects");
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Container command-script-container successfully called.",
      "result": {
        "execution-results": {
          "results": [
            {
              "value": [
                {
                  "org.apache.xerces.dom.ElementNSImpl": "<?xml version=\"1.0\" encoding=\"UTF-
16\"?>\n<object xmlns:xsi=\"http://www.w3.org/2001/XMLSchema-instance\" xsi:type=\"person\">
<age>25</age><name>john</name>\n <\/object>"
                },
                {
                  "org.drools.compiler.test.Person": {
                    "name": "john",
                    "age": 25
                  }
                }
              ],
              "key": "objects"
            }
          ],
```

```
          "facts": []
        }
      }
    }
  ]
}
```

InsertElementsCommand

Inserts a list of objects into the KIE session.

Table 4.7. Command attributes

Name	Description	Requirement
objects	The list of objects to be inserted into the KIE session	Required
out-identifier	ID of the **FactHandle** created from the object insertion and added to the execution results	Optional
return-object	Boolean to determine whether the object must be returned in the execution results. Default value: **true**.	Optional
entry-point	Entry point for the insertion	Optional

Example JSON request body

```
{
  "commands": [ {
    "insert-elements": {
        "objects": [
            {
                "containedObject": {
                    "@class": "org.drools.compiler.test.Person",
                    "age": 25,
                    "name": "john"
                }
            },
            {
                "containedObject": {
                    "@class": "Person",
                    "age": 35,
                    "name": "sarah"
                }
            }
        ]
    }
  }
]
}
```

Example Java command

```
List<Object> objects = new ArrayList<Object>();
objects.add(new Person("john", 25));
objects.add(new Person("sarah", 35));

Command insertElementsCommand = CommandFactory.newInsertElements(objects);
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Container command-script-container successfully called.",
      "result": {
        "execution-results": {
          "results": [],
          "facts": [
            {
              "value": {
                "org.drools.core.common.DefaultFactHandle": {
                  "external-form": "0:4:436792766:-
2127720265:4:DEFAULT:NON_TRAIT:java.util.LinkedHashMap"
                }
              },
              "key": "john"
            },
            {
              "value": {
                "org.drools.core.common.DefaultFactHandle": {
                  "external-form": "0:4:436792766:-
2127720266:4:DEFAULT:NON_TRAIT:java.util.LinkedHashMap"
                }
              },
              "key": "sarah"
            }
          ]
        }
      }
    }
  ]
}
```

FireAllRulesCommand

Executes all rules in the KIE session.

Table 4.8. Command attributes

Name	Description	Requirement

Name	Description	Requirement
max	Maximum number of rules to be executed. The default is **-1** and does not put any restriction on execution.	Optional
out-identifier	ID to be used for retrieving the number of fired rules in execution results.	Optional
agenda-filter	Agenda Filter to be used for rule execution.	Optional

Example JSON request body

```
{
  "commands" : [ {
    "fire-all-rules": {
        "max": 10,
        "out-identifier": "firedActivations"
    }
  } ]
}
```

Example Java command

```
FireAllRulesCommand fireAllRulesCommand = new FireAllRulesCommand();
fireAllRulesCommand.setMax(10);
fireAllRulesCommand.setOutIdentifier("firedActivations");
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Container command-script-container successfully called.",
      "result": {
        "execution-results": {
          "results": [
            {
              "value": 0,
              "key": "firedActivations"
            }
          ],
          "facts": []
        }
      }
    }
  ]
}
```

StartProcessCommand

Starts a process using the process ID. You can also pass parameters and initial data to be inserted.

Table 4.9. Command attributes

Name	Description	Requirement
processId	ID of the process to be started	Required
parameters	A **Map <String,Object>** argument to pass parameters in the process startup	Optional
data	List of objects to be inserted into the KIE session before the process startup	Optional

Example JSON request body

```
{
  "commands": [
    {
      "start-process": {
        "processId": "myProject.myProcess",
        "data": null,
        "parameter": [],
        "out-identifier": null
      }
    }
  ]
}
```

Example Java command

```
StartProcessCommand startProcessCommand = new StartProcessCommand();
startProcessCommand.setProcessId("org.drools.task.processOne");
```

Example server response (JSON)

```
{
  "type": "SUCCESS",
  "msg": "Container stateful-session successfully called.",
  "result": {
    "execution-results": {
      "results": [],
      "facts": []
    }
  }
}
```

SignalEventCommand

Sends a signal event to the KIE session.

Table 4.10. Command attributes

Name	Description	Requirement
event-type	Type of the incoming event	Required
process-instance-id	ID of the process instance to be signalled	Optional
event	Data of the incoming event	Optional

Example JSON request body

```
{
  "commands": [
    {
      "signal-event": {
        "process-instance-id": 1001,
        "correlation-key": null,
        "event-type": "start",
        "event": {
          "org.kie.server.testing.Person": {
            "fullname": "john",
            "age": 25
          }
        }
      }
    }
  ]
}
```

Example Java command

```
SignalEventCommand signalEventCommand = new SignalEventCommand();
signalEventCommand.setProcessInstanceId(1001);
signalEventCommand.setEventType("start");
signalEventCommand.setEvent(new Person("john", 25));
```

Example server response (JSON)

```
{
  "type": "SUCCESS",
  "msg": "Container stateful-session successfully called.",
  "result": {
    "execution-results": {
      "results": [],
      "facts": []
    }
  }
}
```

CompleteWorkItemCommand

Completes a work item in the KIE session.

Table 4.11. Command attributes

Table 4.11. Command attributes

Name	Description	Requirement
workItemId	ID of the work item to be completed	Required
results	Result of the work item	Optional

Example JSON request body

```
{
  "commands": [ {
    "complete-work-item": {
        "id": 1001
    }
  }
]
}
```

Example Java command

```
CompleteWorkItemCommand completeWorkItemCommand = new
CompleteWorkItemCommand();
completeWorkItemCommand.setWorkItemId(1001);
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Container employee-rostering successfully called.",
      "result": {
        "execution-results": {
          "results": [],
          "facts": []
        }
      }
    }
  ]
}
```

AbortWorkItemCommand

Aborts a work item in the KIE session in the same way as **ksession.getWorkItemManager().abortWorkItem(workItemId)**.

Table 4.12. Command attributes

Name	Description	Requirement
workItemId	ID of the work item to be aborted	Required

Example JSON request body

```
{
  "commands": [ {
     "abort-work-item": {
       "id": 1001
     }
   }
  ]
}
```

Example Java command

```
AbortWorkItemCommand abortWorkItemCommand = new AbortWorkItemCommand();
abortWorkItemCommand.setWorkItemId(1001);
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Container employee-rostering successfully called.",
      "result": {
        "execution-results": {
          "results": [],
          "facts": []
        }
      }
    }
  ]
}
```

QueryCommand

Executes a query defined in the KIE base.

Table 4.13. Command attributes

Name	Description	Requirement
name	Query name.	Required
out-identifier	ID of the query results. The query results are added in the execution results with this identifier.	Optional
arguments	List of objects to be passed as a query parameter.	Optional

Example JSON request body

```
{
  "commands": [
```

```
    {
      "query": {
        "name": "persons",
        "arguments": [],
        "out-identifier": "persons"
      }
    }
  ]
}
```

Example Java command

```
QueryCommand queryCommand = new QueryCommand();
queryCommand.setName("persons");
queryCommand.setOutIdentifier("persons");
```

Example server response (JSON)

```
{
  "type": "SUCCESS",
  "msg": "Container stateful-session successfully called.",
  "result": {
    "execution-results": {
      "results": [
        {
          "value": {
            "org.drools.core.runtime.rule.impl.FlatQueryResults": {
              "idFactHandleMaps": {
                "type": "LIST",
                "componentType": null,
                "element": [
                  {
                    "type": "MAP",
                    "componentType": null,
                    "element": [
                      {
                        "value": {
                          "org.drools.core.common.DisconnectedFactHandle": {
                            "id": 1,
                            "identityHashCode": 1809949690,
                            "objectHashCode": 1809949690,
                            "recency": 1,
                            "object": {
                              "org.kie.server.testing.Person": {
                                "fullname": "John Doe",
                                "age": 47
                              }
                            },
                            "entryPointId": "DEFAULT",
                            "traitType": "NON_TRAIT",
                            "external-form":
"0:1:1809949690:1809949690:1:DEFAULT:NON_TRAIT:org.kie.server.testing.Person"
                          }
                        },
                        "key": "$person"
```

```
                    }
                  ]
                }
              ]
            },
            "idResultMaps": {
              "type": "LIST",
              "componentType": null,
              "element": [
                {
                  "type": "MAP",
                  "componentType": null,
                  "element": [
                    {
                      "value": {
                        "org.kie.server.testing.Person": {
                          "fullname": "John Doe",
                          "age": 47
                        }
                      },
                      "key": "$person"
                    }
                  ]
                }
              ]
            },
            "identifiers": {
              "type": "SET",
              "componentType": null,
              "element": [
                "$person"
              ]
            }
          }
        },
        "key": "persons"
      }
    ],
    "facts": []
  }
 }
}
```


SetGlobalCommand

Sets an object to a global state.

Table 4.14. Command attributes

Name	Description	Requirement
identifier	ID of the global variable defined in the KIE base	Required
object	Object to be set into the global variable	Optional

Name	Description	Requirement
out	Boolean to exclude the global variable you set from the execution results	Optional
out-identifier	ID of the global execution result	Optional

Example JSON request body

```
{
  "commands": [
    {
      "set-global": {
        "identifier": "helper",
        "object": {
          "org.kie.server.testing.Person": {
            "fullname": "kyle",
            "age": 30
          }
        },
        "out-identifier": "output"
      }
    }
  ]
}
```

Example Java command

```
SetGlobalCommand setGlobalCommand = new SetGlobalCommand();
setGlobalCommand.setIdentifier("helper");
setGlobalCommand.setObject(new Person("kyle", 30));
setGlobalCommand.setOut(true);
setGlobalCommand.setOutIdentifier("output");
```

Example server response (JSON)

```
{
  "type": "SUCCESS",
  "msg": "Container stateful-session successfully called.",
  "result": {
    "execution-results": {
      "results": [
        {
          "value": {
            "org.kie.server.testing.Person": {
              "fullname": "kyle",
              "age": 30
            }
          },
          "key": "output"
        }
      ],
```

```
      "facts": []
    }
  }
}
```

GetGlobalCommand

Retrieves a previously defined global object.

Table 4.15. Command attributes

Name	Description	Requirement
identifier	ID of the global variable defined in the KIE base	Required
out-identifier	ID to be used in the execution results	Optional

Example JSON request body

```
{
  "commands": [ {
    "get-global": {
      "identifier": "helper",
      "out-identifier": "helperOutput"
    }
  }
 ]
}
```

Example Java command

```
GetGlobalCommand getGlobalCommand = new GetGlobalCommand();
getGlobalCommand.setIdentifier("helper");
getGlobalCommand.setOutIdentifier("helperOutput");
```

Example server response (JSON)

```
{
  "response": [
    {
      "type": "SUCCESS",
      "msg": "Container command-script-container successfully called.",
      "result": {
        "execution-results": {
          "results": [
            {
              "value": null,
              "key": "helperOutput"
            }
          ],
          "facts": []
        }
      }
```

```
    }
  ]
}
```

CHAPTER 5. PROCESS AUTOMATION MANAGER CONTROLLER REST API FOR PROCESS SERVER TEMPLATES AND INSTANCES

Red Hat Process Automation Manager provides a Process Automation Manager controller REST API that you can use to interact with your Process Server templates (configurations), Process Server instances (remote servers), and associated KIE containers (deployment units) in Red Hat Process Automation Manager without using the Business Central user interface. This API support enables you to maintain your Red Hat Process Automation Manager servers and resources more efficiently and optimize your integration and development with Red Hat Process Automation Manager.

With the Process Automation Manager controller REST API, you can perform the following actions:

- Retrieve information about Process Server templates, instances, and associated KIE containers
- Update, start, or stop KIE containers associated with Process Server templates and instances
- Create, update, or delete Process Server templates
- Create, update, or delete Process Server instances

Requests to the Process Automation Manager controller REST API require the following components:

Authentication

The Process Automation Manager controller REST API requires HTTP Basic authentication or token-based authentication for the following user roles, depending on controller type:

- **rest-all** user role if you installed Business Central and you want to use the built-in Process Automation Manager controller
- **kie-server** user role if you installed the headless Process Automation Manager controller separately from Business Central

To view configured user roles for your Red Hat Process Automation Manager distribution, navigate to **~/$SERVER_HOME/standalone/configuration/application-roles.properties** and **~/application-users.properties**.

To add a user with the **kie-server** role or the **rest-all** role or both, navigate to **~/$SERVER_HOME/bin** and run the following command with the role or roles specified:

```
$ ./add-user.sh -a --user <USERNAME> --password <PASSWORD> --role kie-server,rest-all
```

To configure the **kie-server** or **rest-all** user with Process Automation Manager controller access, navigate to **~/$SERVER_HOME/standalone/configuration/standalone-full.xml**, uncomment the **org.kie.server** properties (if applicable), and add the controller user login credentials and controller location (if needed):

```
<property name="org.kie.server.location" value="http://localhost:8080/kie-server/services/rest/server"/>
<property name="org.kie.server.controller" value="http://localhost:8080/business-central/rest/controller"/>
<property name="org.kie.server.controller.user" value="baAdmin"/>
<property name="org.kie.server.controller.pwd" value="password@1"/>
<property name="org.kie.server.id" value="default-kieserver"/>
```

For more information about user roles and Red Hat Process Automation Manager installation options, see *Planning a Red Hat Process Automation Manager installation* .

HTTP headers

The Process Automation Manager controller REST API requires the following HTTP headers for API requests:

- **Accept**: Data format accepted by your requesting client:
  - **application/json** (JSON)
  - **application/xml** (XML, for JAXB)
- **Content-Type**: Data format of your **POST** or **PUT** API request data:
  - **application/json** (JSON)
  - **application/xml** (XML, for JAXB)

HTTP methods

The Process Automation Manager controller REST API supports the following HTTP methods for API requests:

- **GET**: Retrieves specified information from a specified resource endpoint
- **POST**: Updates a resource or resource instance
- **PUT**: Creates a resource or resource instance
- **DELETE**: Deletes a resource or resource instance

Base URL

The base URL for Process Automation Manager controller REST API requests is **http://SERVER:PORT/CONTROLLER/rest/**, such as **http://localhost:8080/business-central/rest/** if you are using the Process Automation Manager controller built in to Business Central.

Endpoints

Process Automation Manager controller REST API endpoints, such as **/controller/management/servers/{serverId}** for a specified Process Server template, are the URIs that you append to the Process Automation Manager controller REST API base URL to access the corresponding server resource or type of server resource in Red Hat Process Automation Manager.

Example request URL for /controller/management/servers/{serverId} endpoint

http://localhost:8080/business-central/rest/controller/management/servers/default-kieserver

Request parameters and request data

Some Process Automation Manager controller REST API requests require specific parameters in the request URL path to identify or filter specific resources and to perform specific actions. You can append URL parameters to the endpoint in the format **?<PARAM>=<VALUE>&<PARAM>=<VALUE>**.

Example DELETE request URL with parameters

http://localhost:8080/business-central/rest/controller/server/new-kieserver-instance?location=http://localhost:8080/kie-server/services/rest/server

HTTP **POST** and **PUT** requests may additionally require a request body or file with data to accompany the request.

Example PUT request URL and JSON request body data

http://localhost:8080/business-central/rest/controller/management/servers/new-kieserver

```
{
  "server-id": "new-kieserver",
  "server-name": "new-kieserver",
  "container-specs": [],
  "server-config": {},
  "capabilities": [
    "RULE",
    "PROCESS",
    "PLANNING"
  ]
}
```

5.1. SENDING REQUESTS WITH THE PROCESS AUTOMATION MANAGER CONTROLLER REST API USING A REST CLIENT OR CURL UTILITY

The Process Automation Manager controller REST API enables you to interact with your Process Server templates (configurations), Process Server instances (remote servers), and associated KIE containers (deployment units) in Red Hat Process Automation Manager without using the Business Central user interface. You can send Process Automation Manager controller REST API requests using any REST client or curl utility.

Prerequisites

- Process Server is installed and running.
- The Process Automation Manager controller or headless Process Automation Manager controller is installed and running.
- You have **rest-all** user role access to the Process Automation Manager controller if you installed Business Central, or **kie-server** user role access to the headless Process Automation Manager controller installed separately from Business Central.

Procedure

1. Identify the relevant API endpoint to which you want to send a request, such as **[GET] /controller/management/servers** to retrieve Process Server templates from the Process Automation Manager controller.
2. In a REST client or curl utility, enter the following components for a **GET** request to **controller/management/servers**. Adjust any request details according to your use case.
   For REST client:
   - **Authentication**: Enter the user name and password of the Process Automation Manager controller user with the **rest-all** role or the headless Process Automation Manager controller user with the **kie-server** role.

- **HTTP Headers**: Set the following header:
  - **Accept**: **application/json**
- **HTTP method**: Set to **GET**.
- **URL**: Enter the Process Automation Manager controller REST API base URL and endpoint, such as **http://localhost:8080/business-central/rest/controller/management/servers**.

For curl utility:

- **-u**: Enter the user name and password of the Process Automation Manager controller user with the **rest-all** role or the headless Process Automation Manager controller user with the **kie-server** role.
- **-H**: Set the following header:
  - **Accept**: **application/json**
- **-X**: Set to **GET**.
- **URL**: Enter the Process Automation Manager controller REST API base URL and endpoint, such as **http://localhost:8080/business-central/rest/controller/management/servers**.

```
curl -u 'baAdmin:password@1' -H "Accept: application/json" -X GET
"http://localhost:8080/business-central/rest/controller/management/servers"
```

3. Execute the request and review the Process Automation Manager controller response. Example server response (JSON):


```
{
  "server-template": [
    {
      "server-id": "default-kieserver",
      "server-name": "default-kieserver",
      "container-specs": [
        {
          "container-id": "employeerostering_1.0.0-SNAPSHOT",
          "container-name": "employeerostering",
          "server-template-key": {
            "server-id": "default-kieserver",
            "server-name": "default-kieserver"
          },
          "release-id": {
            "group-id": "employeerostering",
            "artifact-id": "employeerostering",
            "version": "1.0.0-SNAPSHOT"
          },
          "configuration": {
            "RULE": {
              "org.kie.server.controller.api.model.spec.RuleConfig": {
                "pollInterval": null,
                "scannerStatus": "STOPPED"
              }
            },
            "PROCESS": {
```

```
          "org.kie.server.controller.api.model.spec.ProcessConfig": {
            "runtimeStrategy": "SINGLETON",
            "kbase": "",
            "ksession": "",
            "mergeMode": "MERGE_COLLECTIONS"
          }
        }
      },
      "status": "STARTED"
    },
    {
      "container-id": "mortgage-process_1.0.0-SNAPSHOT",
      "container-name": "mortgage-process",
      "server-template-key": {
        "server-id": "default-kieserver",
        "server-name": "default-kieserver"
      },
      "release-id": {
        "group-id": "mortgage-process",
        "artifact-id": "mortgage-process",
        "version": "1.0.0-SNAPSHOT"
      },
      "configuration": {
        "RULE": {
          "org.kie.server.controller.api.model.spec.RuleConfig": {
            "pollInterval": null,
            "scannerStatus": "STOPPED"
          }
        },
        "PROCESS": {
          "org.kie.server.controller.api.model.spec.ProcessConfig": {
            "runtimeStrategy": "PER_PROCESS_INSTANCE",
            "kbase": "",
            "ksession": "",
            "mergeMode": "MERGE_COLLECTIONS"
          }
        }
      },
      "status": "STARTED"
    }
  ],
  "server-config": {},
  "server-instances": [
    {
      "server-instance-id": "default-kieserver-instance@localhost:8080",
      "server-name": "default-kieserver-instance@localhost:8080",
      "server-template-id": "default-kieserver",
      "server-url": "http://localhost:8080/kie-server/services/rest/server"
    }
  ],
  "capabilities": [
    "RULE",
    "PROCESS",
    "PLANNING"
  ]
```

```
    }
  ]
}
```

4. In your REST client or curl utility, send another API request with the following components for a **PUT** request to **/controller/management/servers/{serverId}** to create a new Process Server template. Adjust any request details according to your use case.
For REST client:

- **Authentication**: Enter the user name and password of the Process Automation Manager controller user with the **rest-all** role or the headless Process Automation Manager controller user with the **kie-server** role.
- **HTTP Headers**: Set the following headers:
  - **Accept**: **application/json**
  - **Content-Type**: **application/json**
- **HTTP method**: Set to **PUT**.
- **URL**: Enter the Process Automation Manager controller REST API base URL and endpoint, such as **http://localhost:8080/business-central/rest/controller/management/servers/new-kieserver**.
- **Request body**: Add a JSON request body with the configurations for the new Process Server template:

```
{
  "server-id": "new-kieserver",
  "server-name": "new-kieserver",
  "container-specs": [],
  "server-config": {},
  "capabilities": [
    "RULE",
    "PROCESS",
    "PLANNING"
  ]
}
```

For curl utility:

- **-u**: Enter the user name and password of the Process Automation Manager controller user with the **rest-all** role or the headless Process Automation Manager controller user with the **kie-server** role.
- **-H**: Set the following headers:
  - **Accept**: **application/json**
  - **Content-Type**: **application/json**
- **-X**: Set to **PUT**.
- **URL**: Enter the Process Automation Manager controller REST API base URL and endpoint, such as **http://localhost:8080/business-central/rest/controller/management/servers/new-kieserver**.

- **-d**: Add a JSON request body or file (**@file.json**) with the configurations for the new Process Server template:

```
curl -u 'baAdmin:password@1' -H "Accept: application/json" -H "Content-Type: application/json" -X PUT "http://localhost:8080/business-central/rest/controller/management/servers/new-kieserver" -d "{ \"server-id\": \"new-kieserver\", \"server-name\": \"new-kieserver\", \"container-specs\": [], \"server-config\": {}, \"capabilities\": [ \"RULE\", \"PROCESS\", \"PLANNING\" ]}"
```

```
curl -u 'baAdmin:password@1' -H "Accept: application/json" -H "Content-Type: application/json" -X PUT "http://localhost:8080/business-central/rest/controller/management/servers/new-kieserver" -d @my-server-template-configs.json
```

5. Execute the request and confirm the successful Process Automation Manager controller response.
   If you encounter request errors, review the returned error code messages and adjust your request accordingly.

5.2. SENDING REQUESTS WITH THE PROCESS AUTOMATION MANAGER CONTROLLER REST API USING THE SWAGGER INTERFACE

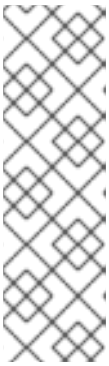
The Process Automation Manager controller REST API supports a Swagger web interface that you can use instead of a standalone REST client or curl utility to interact with your Process Server templates, instances, and associated KIE containers in Red Hat Process Automation Manager without using the Business Central user interface.

Prerequisites

- The Process Automation Manager controller is installed and running.
- You have **rest-all** user role access to the Process Automation Manager controller if you installed Business Central, or **kie-server** user role access to the headless Process Automation Manager controller installed separately from Business Central.

Procedure

1. In a web browser, navigate to **http://SERVER:PORT/CONTROLLER/docs**, such as **http://localhost:8080/business-central/docs**, and log in with the user name and password of the Process Automation Manager controller user with the **rest-all** role or the headless Process Automation Manager controller user with the **kie-server** role.



NOTE

If you are using the Process Automation Manager controller built in to Business Central, the Swagger page associated with the Process Automation Manager controller is identified as the "Business Central API" for Business Central REST services. If you are using the headless Process Automation Manager controller without Business Central, the Swagger page associated with the headless Process Automation Manager controller is identified as the "Controller API". The Process Automation Manager controller REST API endpoints in both cases are the same.

2. In the Swagger page, select the relevant API endpoint to which you want to send a request, such as **Controller :: Management→ [GET] /controller/management/servers** to retrieve Process Server templates from the Process Automation Manager controller.

3. Click **Try it out** and provide any optional parameters by which you want to filter results, if applicable.

4. In the **Response content type** drop-down menu, select the desired format of the server response, such as **application/json** for JSON format.

5. Click **Execute** and review the Process Server response.
Example server response (JSON):


```
{
  "server-template": [
    {
      "server-id": "default-kieserver",
      "server-name": "default-kieserver",
      "container-specs": [
        {
          "container-id": "employeerostering_1.0.0-SNAPSHOT",
          "container-name": "employeerostering",
          "server-template-key": {
            "server-id": "default-kieserver",
            "server-name": "default-kieserver"
          },
          "release-id": {
            "group-id": "employeerostering",
            "artifact-id": "employeerostering",
            "version": "1.0.0-SNAPSHOT"
          },
          "configuration": {
            "RULE": {
              "org.kie.server.controller.api.model.spec.RuleConfig": {
                "pollInterval": null,
                "scannerStatus": "STOPPED"
              }
            },
            "PROCESS": {
              "org.kie.server.controller.api.model.spec.ProcessConfig": {
                "runtimeStrategy": "SINGLETON",
                "kbase": "",
                "ksession": "",
                "mergeMode": "MERGE_COLLECTIONS"
              }
            }
          },
          "status": "STARTED"
        },
        {
          "container-id": "mortgage-process_1.0.0-SNAPSHOT",
          "container-name": "mortgage-process",
          "server-template-key": {
            "server-id": "default-kieserver",
            "server-name": "default-kieserver"
          },
```

```
        "release-id": {
          "group-id": "mortgage-process",
          "artifact-id": "mortgage-process",
          "version": "1.0.0-SNAPSHOT"
        },
        "configuration": {
          "RULE": {
            "org.kie.server.controller.api.model.spec.RuleConfig": {
              "pollInterval": null,
              "scannerStatus": "STOPPED"
            }
          },
          "PROCESS": {
            "org.kie.server.controller.api.model.spec.ProcessConfig": {
              "runtimeStrategy": "PER_PROCESS_INSTANCE",
              "kbase": "",
              "ksession": "",
              "mergeMode": "MERGE_COLLECTIONS"
            }
          }
        },
        "status": "STARTED"
      }
    ],
    "server-config": {},
    "server-instances": [
      {
        "server-instance-id": "default-kieserver-instance@localhost:8080",
        "server-name": "default-kieserver-instance@localhost:8080",
        "server-template-id": "default-kieserver",
        "server-url": "http://localhost:8080/kie-server/services/rest/server"
      }
    ],
    "capabilities": [
      "RULE",
      "PROCESS",
      "PLANNING"
    ]
  }
 ]
}
```


6. In the Swagger page, navigate to the **Controller :: Management→ [GET] /controller/management/servers/{serverId}** endpoint to send another request to create a new Process Server template. Adjust any request details according to your use case.

7. Click **Try it out** and enter the following components for the request:

   - **serverId**: Enter the ID of the new Process Server template, such as **new-kieserver**.

   - **body**: Set the **Parameter content type** to the desired request body format, such as **application/json** for JSON format, and add a request body with the configurations for the new Process Server template:


```
{
 "server-id": "new-kieserver",
```

```
  "server-name": "new-kieserver",
  "container-specs": [],
  "server-config": {},
  "capabilities": [
    "RULE",
    "PROCESS",
    "PLANNING"
  ]
}
```

8. In the **Response content type** drop-down menu, select the desired format of the server response, such as **application/json** for JSON format.

9. Click **Execute** and confirm the successful Process Automation Manager controller response. If you encounter request errors, review the returned error code messages and adjust your request accordingly.

5.3. SUPPORTED PROCESS AUTOMATION MANAGER CONTROLLER REST API ENDPOINTS

The Process Automation Manager controller REST API provides endpoints for interacting with Process Server templates (configurations), Process Server instances (remote servers), and associated KIE containers (deployment units). The Process Automation Manager controller REST API base URL is **http://SERVER:PORT/CONTROLLER/rest/**. All requests require HTTP Basic authentication or token-based authentication for the **rest-all** user role if you installed Business Central and you want to use the built-in Process Automation Manager controller, or the **kie-server** user role if you installed the headless Process Automation Manager controller separately from Business Central.

For the full list of Process Automation Manager controller REST API endpoints and descriptions, use one of the following resources:

- Controller REST API on the jBPM Documentation page (static)
- Swagger UI for the Process Automation Manager controller REST API at **http://SERVER:PORT/CONTROLLER/docs** (dynamic, requires running Process Automation Manager controller)

NOTE

If you are using the Process Automation Manager controller built in to Business Central, the Swagger page associated with the Process Automation Manager controller is identified as the "Business Central API" for Business Central REST services. If you are using the headless Process Automation Manager controller without Business Central, the Swagger page associated with the headless Process Automation Manager controller is identified as the "Controller API". The Process Automation Manager controller REST API endpoints in both cases are the same.

CHAPTER 6. PROCESS AUTOMATION MANAGER CONTROLLER JAVA CLIENT API FOR PROCESS SERVER TEMPLATES AND INSTANCES

Red Hat Process Automation Manager provides a Process Automation Manager controller Java client API that enables you to connect to the Process Automation Manager controller using REST or WebSocket protocol from your Java client application. You can use the Process Automation Manager controller Java client API as an alternative to the Process Automation Manager controller REST API to interact with your Process Server templates (configurations), Process Server instances (remote servers), and associated KIE containers (deployment units) in Red Hat Process Automation Manager without using the Business Central user interface. This API support enables you to maintain your Red Hat Process Automation Manager servers and resources more efficiently and optimize your integration and development with Red Hat Process Automation Manager.

With the Process Automation Manager controller Java client API, you can perform the following actions also supported by the Process Automation Manager controller REST API:

- Retrieve information about Process Server templates, instances, and associated KIE containers
- Update, start, or stop KIE containers associated with Process Server templates and instances
- Create, update, or delete Process Server templates
- Create, update, or delete Process Server instances

Process Automation Manager controller Java client API requests require the following components:

Authentication

The Process Automation Manager controller Java client API requires HTTP Basic authentication for the following user roles, depending on controller type:

- **rest-all** user role if you installed Business Central and you want to use the built-in Process Automation Manager controller
- **kie-server** user role if you installed the headless Process Automation Manager controller separately from Business Central

To view configured user roles for your Red Hat Process Automation Manager distribution, navigate to **~/$SERVER_HOME/standalone/configuration/application-roles.properties** and **~/application-users.properties**.

To add a user with the **kie-server** role or the **rest-all** role or both, navigate to **~/$SERVER_HOME/bin** and run the following command with the role or roles specified:

```
$ ./add-user.sh -a --user <USERNAME> --password <PASSWORD> --role kie-server,rest-all
```

To configure the **kie-server** or **rest-all** user with Process Automation Manager controller access, navigate to **~/$SERVER_HOME/standalone/configuration/standalone-full.xml**, uncomment the **org.kie.server** properties (if applicable), and add the controller user login credentials and controller location (if needed):

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

```
central/rest/controller"/>
<property name="org.kie.server.controller.user" value="baAdmin"/>
<property name="org.kie.server.controller.pwd" value="password@1"/>
<property name="org.kie.server.id" value="default-kieserver"/>
```

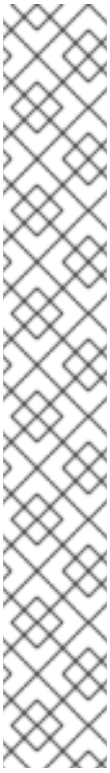
For more information about user roles and Red Hat Process Automation Manager installation options, see *Planning a Red Hat Process Automation Manager installation* .

Project dependencies

The Process Automation Manager controller Java client API requires the following dependencies on the relevant classpath of your Java project:

```
<!-- For remote execution on controller -->
<dependency>
  <groupId>org.kie.server</groupId>
  <artifactId>kie-server-controller-client</artifactId>
  <version>${rhpam.version}</version>
</dependency>

<!-- For REST client -->
<dependency>
  <groupId>org.jboss.resteasy</groupId>
  <artifactId>resteasy-client</artifactId>
  <version>${resteasy.version}</version>
</dependency>

<!-- For WebSocket client -->
<dependency>
  <groupId>io.undertow</groupId>
  <artifactId>undertow-websockets-jsr</artifactId>
  <version>${undertow.version}</version>
</dependency>

<!-- For debug logging (optional) -->
<dependency>
  <groupId>ch.qos.logback</groupId>
  <artifactId>logback-classic</artifactId>
  <version>${logback.version}</version>
</dependency>
```

The **<version>** for Red Hat Process Automation Manager dependencies is the Maven artifact version for Red Hat Process Automation Manager currently used in your project (for example, 7.14.0.Final-redhat-00002).



NOTE

Instead of specifying a Red Hat Process Automation Manager **<version>** for individual dependencies, consider adding the Red Hat Business Automation bill of materials (BOM) dependency to your project **pom.xml** file. The Red Hat Business Automation BOM applies to both Red Hat Decision Manager and Red Hat Process Automation Manager. When you add the BOM files, the correct versions of transitive dependencies from the provided Maven repositories are included in the project.

Example BOM dependency:

```
<dependency>
  <groupId>com.redhat.ba</groupId>
  <artifactId>ba-platform-bom</artifactId>
  <version>7.2.0.GA-redhat-00002</version>
  <scope>import</scope>
  <type>pom</type>
</dependency>
```

For more information about the Red Hat Business Automation BOM, see What is the mapping between RHPAM product and maven library version?.

Client request configuration

All Java client requests with the Process Automation Manager controller Java client API must define at least the following controller communication components:

- Credentials of the **rest-all** user if you installed Business Central, or the **kie-server** user if you installed the headless Process Automation Manager controller separately from Business Central
- Process Automation Manager controller location for REST or WebSocket protocol:
  - Example REST URL: **http://localhost:8080/business-central/rest/controller**
  - Example WebSocket URL: **ws://localhost:8080/headless-controller/websocket/controller**
- Marshalling format for API requests and responses (JSON or JAXB)
- A **KieServerControllerClient** object, which serves as the entry point for starting the server communication using the Java client API
- A **KieServerControllerClientFactory** defining REST or WebSocket protocol and user access
- The Process Automation Manager controller client service or services used, such as **listServerTemplates**, **getServerTemplate**, or **getServerInstances**

The following are examples of REST and WebSocket client configurations with these components:

Client configuration example with REST

```
import org.kie.server.api.marshalling.MarshallingFormat;
import org.kie.server.controller.api.model.spec.ServerTemplateList;
import org.kie.server.controller.client.KieServerControllerClient;
```

```
import org.kie.server.controller.client.KieServerControllerClientFactory;

public class ListServerTemplatesExample {

    private static final String URL = "http://localhost:8080/business-central/rest/controller";
    private static final String USER = "baAdmin";
    private static final String PASSWORD = "password@1";

    private static final MarshallingFormat FORMAT = MarshallingFormat.JSON;

    public static void main(String[] args) {
        KieServerControllerClient client = KieServerControllerClientFactory.newRestClient(URL,
                                                                                           USER,
                                                                                           PASSWORD);

        final ServerTemplateList serverTemplateList = client.listServerTemplates();
        System.out.println(String.format("Found %s server template(s) at controller url: %s",
                                         serverTemplateList.getServerTemplates().length,
                                         URL));
    }
}
```

Client configuration example with WebSocket

```
import org.kie.server.api.marshalling.MarshallingFormat;
import org.kie.server.controller.api.model.spec.ServerTemplateList;
import org.kie.server.controller.client.KieServerControllerClient;
import org.kie.server.controller.client.KieServerControllerClientFactory;

public class ListServerTemplatesExample {

    private static final String URL = "ws://localhost:8080/my-controller/websocket/controller";
    private static final String USER = "baAdmin";
    private static final String PASSWORD = "password@1";

    private static final MarshallingFormat FORMAT = MarshallingFormat.JSON;

    public static void main(String[] args) {
        KieServerControllerClient client =
KieServerControllerClientFactory.newWebSocketClient(URL,
                                                                                             USER,
                                                                                             PASSWORD);

        final ServerTemplateList serverTemplateList = client.listServerTemplates();
        System.out.println(String.format("Found %s server template(s) at controller url: %s",
                                         serverTemplateList.getServerTemplates().length,
                                         URL));
    }
}
```

6.1. SENDING REQUESTS WITH THE PROCESS AUTOMATION MANAGER CONTROLLER JAVA CLIENT API

The Process Automation Manager controller Java client API enables you to connect to the Process Automation Manager controller using REST or WebSocket protocols from your Java client application. You can use the Process Automation Manager controller Java client API as an alternative to the Process Automation Manager controller REST API to interact with your Process Server templates (configurations), Process Server instances (remote servers), and associated KIE containers (deployment units) in Red Hat Process Automation Manager without using the Business Central user interface.

Prerequisites

- Process Server is installed and running.
- The Process Automation Manager controller or headless Process Automation Manager controller is installed and running.
- You have **rest-all** user role access to the Process Automation Manager controller if you installed Business Central, or **kie-server** user role access to the headless Process Automation Manager controller installed separately from Business Central.
- You have a Java project with Red Hat Process Automation Manager resources.

Procedure

1. In your client application, ensure that the following dependencies have been added to the relevant classpath of your Java project:

```
<!-- For remote execution on controller -->
<dependency>
  <groupId>org.kie.server</groupId>
  <artifactId>kie-server-controller-client</artifactId>
  <version>${rhpam.version}</version>
</dependency>

<!-- For REST client -->
<dependency>
  <groupId>org.jboss.resteasy</groupId>
  <artifactId>resteasy-client</artifactId>
  <version>${resteasy.version}</version>
</dependency>

<!-- For WebSocket client -->
<dependency>
  <groupId>io.undertow</groupId>
  <artifactId>undertow-websockets-jsr</artifactId>
  <version>${undertow.version}</version>
</dependency>

<!-- For debug logging (optional) -->
<dependency>
  <groupId>ch.qos.logback</groupId>
  <artifactId>logback-classic</artifactId>
  <version>${logback.version}</version>
</dependency>
```

2. Download the **Red Hat Process Automation Manager 7.2.0 Source Distribution** from the Red Hat Customer Portal and navigate to **~/rhpam-7.2.0-sources/src/droolsjbpm-integration-**

$VERSION/kie-server-parent/kie-server-controller/kie-server-controller-client/src/main/java/org/kie/server/controller/client to access the Process Automation Manager controller Java clients.

3. In the **~/kie/server/controller/client** folder , identify the relevant Java client implementation for the request you want to send, such as the **RestKieServerControllerClient** implementation to access client services for Process Server templates and KIE containers in REST protocol.

4. In your client application, create a **.java** class for the API request. The class must contain the necessary imports, the Process Automation Manager controller location and user credentials, a **KieServerControllerClient** object, and the client method to execute, such as **createServerTemplate** and **createContainer** from the **RestKieServerControllerClient** implementation. Adjust any configuration details according to your use case.

Creating and interacting with a Process Server template and KIE containers

```
import java.util.Arrays;
import java.util.HashMap;
import java.util.Map;

import org.kie.server.api.marshalling.MarshallingFormat;
import org.kie.server.api.model.KieContainerStatus;
import org.kie.server.api.model.KieScannerStatus;
import org.kie.server.api.model.ReleaseId;
import org.kie.server.controller.api.model.spec.*;
import org.kie.server.controller.client.KieServerControllerClient;
import org.kie.server.controller.client.KieServerControllerClientFactory;

public class RestTemplateContainerExample {

  private static final String URL = "http://localhost:8080/business-central/rest/controller";
  private static final String USER = "baAdmin";
  private static final String PASSWORD = "password@1";

    private static KieServerControllerClient client;

    public static void main(String[] args) {
        KieServerControllerClient client = KieServerControllerClientFactory.newRestClient(URL,
                                                                USER,
                                                                PASSWORD,
                                                                MarshallingFormat.JSON);
        // Create server template and KIE container, start and stop KIE container, and delete
server template
        ServerTemplate serverTemplate = createServerTemplate();
        ContainerSpec container = createContainer(serverTemplate);
        client.startContainer(container);
        client.stopContainer(container);
        client.deleteServerTemplate(serverTemplate.getId());
    }

    // Re-create and configure server template
    protected static ServerTemplate createServerTemplate() {
        ServerTemplate serverTemplate = new ServerTemplate();
        serverTemplate.setId("example-client-id");
        serverTemplate.setName("example-client-name");
        serverTemplate.setCapabilities(Arrays.asList(Capability.PROCESS.name(),
```

```
                                        Capability.RULE.name(),
                                        Capability.PLANNING.name()));

        client.saveServerTemplate(serverTemplate);

        return serverTemplate;
    }

    // Re-create and configure KIE containers
    protected static ContainerSpec createContainer(ServerTemplate serverTemplate){
        Map<Capability, ContainerConfig> containerConfigMap = new HashMap();

        ProcessConfig processConfig = new ProcessConfig("PER_PROCESS_INSTANCE",
"kieBase", "kieSession", "MERGE_COLLECTION");
        containerConfigMap.put(Capability.PROCESS, processConfig);

        RuleConfig ruleConfig = new RuleConfig(500l, KieScannerStatus.SCANNING);
        containerConfigMap.put(Capability.RULE, ruleConfig);

        ReleaseId releaseId = new ReleaseId("org.kie.server.testing", "stateless-session-kjar",
"1.0.0-SNAPSHOT");

        ContainerSpec containerSpec = new ContainerSpec("example-container-id", "example-
client-name", serverTemplate, releaseId, KieContainerStatus.STOPPED,
containerConfigMap);
        client.saveContainerSpec(serverTemplate.getId(), containerSpec);

        return containerSpec;
    }
}
```

5. Run the configured **.java** class from your project directory to execute the request, and review the Process Automation Manager controller response.
   If you enabled debug logging, Process Server responds with a detailed response according to your configured marshalling format, such as JSON. If you encounter request errors, review the returned error code messages and adjust your Java configurations accordingly.

6.2. SUPPORTED PROCESS AUTOMATION MANAGER CONTROLLER JAVA CLIENTS

The following are some of the Java client services available in the **org.kie.server.controller.client** package of your Red Hat Process Automation Manager distribution. You can use these services to interact with related resources in the Process Automation Manager controller similarly to the Process Automation Manager controller REST API.

- **KieServerControllerClient**: Used as the entry point for communicating with the Process Automation Manager controller
- **RestKieServerControllerClient**: Implementation used to interact with Process Server templates and KIE containers in REST protocol (found in **~/org/kie/server/controller/client/rest**)
- **WebSocketKieServerControllerClient**: Implementation used to interact with Process Server templates and KIE containers in WebSocket protocol (found in **~/org/kie/server/controller/client/websocket**)

For the full list of available Process Automation Manager controller Java clients, download the **Red Hat Process Automation Manager 7.2.0 Source Distribution** from the Red Hat Customer Portal and navigate to **~/rhpam-7.2.0-sources/src/droolsjbpm-integration-$VERSION/kie-server-parent/kie-server-controller/kie-server-controller-client/src/main/java/org/kie/server/controller/client**.

6.3. EXAMPLE REQUESTS WITH THE PROCESS AUTOMATION MANAGER CONTROLLER JAVA CLIENT API

The following are examples of Process Automation Manager controller Java client API requests for basic interactions with the Process Automation Manager controller. For the full list of available Process Automation Manager controller Java clients, download the **Red Hat Process Automation Manager 7.2.0 Source Distribution** from the Red Hat Customer Portal and navigate to **~/rhpam-7.2.0-sources/src/droolsjbpm-integration-$VERSION/kie-server-parent/kie-server-controller/kie-server-controller-client/src/main/java/org/kie/server/controller/client**.

Creating and interacting with Process Server templates and KIE containers

You can use the **ServerTemplate** and **ContainerSpec** services in the REST or WebSocket Process Automation Manager controller clients to create, dispose, and update Process Server templates and KIE containers, and to start and stop KIE containers, as illustrated in this example.

Example request to create and interact with a Process Server template and KIE containers

```
import java.util.Arrays;
import java.util.HashMap;
import java.util.Map;

import org.kie.server.api.marshalling.MarshallingFormat;
import org.kie.server.api.model.KieContainerStatus;
import org.kie.server.api.model.KieScannerStatus;
import org.kie.server.api.model.ReleaseId;
import org.kie.server.controller.api.model.spec.*;
import org.kie.server.controller.client.KieServerControllerClient;
import org.kie.server.controller.client.KieServerControllerClientFactory;

public class RestTemplateContainerExample {

  private static final String URL = "http://localhost:8080/business-central/rest/controller";
  private static final String USER = "baAdmin";
  private static final String PASSWORD = "password@1";

    private static KieServerControllerClient client;

    public static void main(String[] args) {
        KieServerControllerClient client = KieServerControllerClientFactory.newRestClient(URL,
                                                                USER,
                                                                PASSWORD,
                                                                MarshallingFormat.JSON);
        // Create server template and KIE container, start and stop KIE container, and delete server
template
        ServerTemplate serverTemplate = createServerTemplate();
        ContainerSpec container = createContainer(serverTemplate);
        client.startContainer(container);
        client.stopContainer(container);
        client.deleteServerTemplate(serverTemplate.getId());
```

```
    }

    // Re-create and configure server template
    protected static ServerTemplate createServerTemplate() {
        ServerTemplate serverTemplate = new ServerTemplate();
        serverTemplate.setId("example-client-id");
        serverTemplate.setName("example-client-name");
        serverTemplate.setCapabilities(Arrays.asList(Capability.PROCESS.name(),
                                       Capability.RULE.name(),
                                       Capability.PLANNING.name()));

        client.saveServerTemplate(serverTemplate);

        return serverTemplate;
    }

    // Re-create and configure KIE containers
    protected static ContainerSpec createContainer(ServerTemplate serverTemplate){
        Map<Capability, ContainerConfig> containerConfigMap = new HashMap();

        ProcessConfig processConfig = new ProcessConfig("PER_PROCESS_INSTANCE",
"kieBase", "kieSession", "MERGE_COLLECTION");
        containerConfigMap.put(Capability.PROCESS, processConfig);

        RuleConfig ruleConfig = new RuleConfig(500l, KieScannerStatus.SCANNING);
        containerConfigMap.put(Capability.RULE, ruleConfig);

        ReleaseId releaseId = new ReleaseId("org.kie.server.testing", "stateless-session-kjar",
"1.0.0-SNAPSHOT");

        ContainerSpec containerSpec = new ContainerSpec("example-container-id", "example-client-
name", serverTemplate, releaseId, KieContainerStatus.STOPPED, containerConfigMap);
        client.saveContainerSpec(serverTemplate.getId(), containerSpec);

        return containerSpec;
    }
}
```

Listing Process Server templates and specifying connection timeout (REST)

When you use REST protocol for Process Automation Manager controller Java client API requests, you can provide your own **javax.ws.rs.core.Configuration** specification to modify the underlying REST client API, such as connection timeout.

Example REST request to return server templates and specify connection timeout

```
import java.util.concurrent.TimeUnit;
import javax.ws.rs.core.Configuration;
import org.jboss.resteasy.client.jaxrs.ResteasyClientBuilder;

import org.kie.server.api.marshalling.MarshallingFormat;
import org.kie.server.controller.api.model.spec.ServerTemplateList;
import org.kie.server.controller.client.KieServerControllerClient;
import org.kie.server.controller.client.KieServerControllerClientFactory;

public class RESTTimeoutExample {
```

```
  private static final String URL = "http://localhost:8080/business-central/rest/controller";
  private static final String USER = "baAdmin";
  private static final String PASSWORD = "password@1";

  public static void main(String[] args) {

    // Specify connection timeout
    final Configuration configuration =
          new ResteasyClientBuilder()
                .establishConnectionTimeout(10,
                                            TimeUnit.SECONDS)
                .socketTimeout(60,
                               TimeUnit.SECONDS)
                 .getConfiguration();
      KieServerControllerClient client = KieServerControllerClientFactory.newRestClient(URL,
                                                                                         USER,
                                                                                         PASSWORD,
                                                                                         MarshallingFormat.JSON,
                                                                                         configuration);

      // Retrieve list of server templates
      final ServerTemplateList serverTemplateList = client.listServerTemplates();
      System.out.println(String.format("Found %s server template(s) at controller url: %s",
                                       serverTemplateList.getServerTemplates().length,
                                       URL));
  }
}
```

Listing Process Server templates and specifying event notifications (WebSocket)

When you use WebSocket protocol for Process Automation Manager controller Java client API requests, you can enable event notifications based on changes that happen in the particular Process Automation Manager controller to which the client API is connected. For example, you can receive notifications when Process Server templates or instances are connected to or updated in the Process Automation Manager controller.

Example WebSocket request to return server templates and specify event notifications

```
import org.kie.server.api.marshalling.MarshallingFormat;
import org.kie.server.controller.api.model.events.*;
import org.kie.server.controller.api.model.spec.ServerTemplateList;
import org.kie.server.controller.client.KieServerControllerClient;
import org.kie.server.controller.client.KieServerControllerClientFactory;
import org.kie.server.controller.client.event.EventHandler;

public class WebSocketEventsExample {

  private static final String URL = "ws://localhost:8080/my-controller/websocket/controller";
  private static final String USER = "baAdmin";
  private static final String PASSWORD = "password@1";

  public static void main(String[] args) {
    KieServerControllerClient client =
KieServerControllerClientFactory.newWebSocketClient(URL,
                                                    USER,
```

```
                                                    PASSWORD,
                                                    MarshallingFormat.JSON,
                                                    new TestEventHandler());

        // Retrieve list of server templates
        final ServerTemplateList serverTemplateList = client.listServerTemplates();
        System.out.println(String.format("Found %s server template(s) at controller url: %s",
                                         serverTemplateList.getServerTemplates().length,
                                         URL));
        try {
            Thread.sleep(60 * 1000);
        } catch (Exception e) {
            e.printStackTrace();
        }
    }

    // Set up event notifications
    static class TestEventHandler implements EventHandler {

        @Override
        public void onServerInstanceConnected(ServerInstanceConnected
serverInstanceConnected) {
            System.out.println("serverInstanceConnected = " + serverInstanceConnected);
        }

        @Override
        public void onServerInstanceDeleted(ServerInstanceDeleted serverInstanceDeleted) {
            System.out.println("serverInstanceDeleted = " + serverInstanceDeleted);
        }

        @Override
        public void onServerInstanceDisconnected(ServerInstanceDisconnected
serverInstanceDisconnected) {
            System.out.println("serverInstanceDisconnected = " + serverInstanceDisconnected);
        }

        @Override
        public void onServerTemplateDeleted(ServerTemplateDeleted serverTemplateDeleted) {
            System.out.println("serverTemplateDeleted = " + serverTemplateDeleted);
        }

        @Override
        public void onServerTemplateUpdated(ServerTemplateUpdated serverTemplateUpdated) {
            System.out.println("serverTemplateUpdated = " + serverTemplateUpdated);
        }

        @Override
        public void onServerInstanceUpdated(ServerInstanceUpdated serverInstanceUpdated) {
            System.out.println("serverInstanceUpdated = " + serverInstanceUpdated);
        }

        @Override
        public void onContainerSpecUpdated(ContainerSpecUpdated containerSpecUpdated) {
            System.out.println("onContainerSpecUpdated = " + containerSpecUpdated);
```

```
        }
    }
}
```

CHAPTER 7. KNOWLEDGE STORE REST API FOR BUSINESS CENTRAL SPACES AND PROJECTS

Red Hat Process Automation Manager provides a Knowledge Store REST API that you can use to interact with your projects and spaces in Red Hat Process Automation Manager without using the Business Central user interface. The Knowledge Store is the artifact repository for assets in Red Hat Process Automation Manager. This API support enables you to facilitate and automate maintenance of Business Central projects and spaces.

With the Knowledge Store REST API, you can perform the following actions:

- Retrieve information about all projects and spaces
- Create, update, or delete projects and spaces
- Build, deploy, and test projects
- Retrieve information about previous Knowledge Store REST API requests, or *jobs*

Knowledge Store REST API requests require the following components:

Authentication

The Knowledge Store REST API requires HTTP Basic authentication or token-based authentication for the user role **rest-all**. To view configured user roles for your Red Hat Process Automation Manager distribution, navigate to **~/$SERVER_HOME/standalone/configuration/application-roles.properties** and **~/application-users.properties**.
To add a user with the **rest-all** role, navigate to **~/$SERVER_HOME/bin** and run the following command:

```
$ ./add-user.sh -a --user <USERNAME> --password <PASSWORD> --role rest-all
```

For more information about user roles and Red Hat Process Automation Manager installation options, see *Planning a Red Hat Process Automation Manager installation* .

HTTP headers

The Knowledge Store REST API requires the following HTTP headers for API requests:

- **Accept**: Data format accepted by your requesting client:
  - **application/json** (JSON)
- **Content-Type**: Data format of your **POST** or **PUT** API request data:
  - **application/json** (JSON)

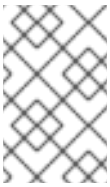
HTTP methods

The Knowledge Store REST API supports the following HTTP methods for API requests:

- **GET**: Retrieves specified information from a specified resource endpoint
- **POST**: Creates or updates a resource
- **DELETE**: Deletes a resource

Base URL

The base URL for Knowledge Store REST API requests is **http://SERVER:PORT/business-central/rest/**, such as **http://localhost:8080/business-central/rest/**.



NOTE

The REST API base URL for the Knowledge Store and for the Process Automation Manager controller built in to Business Central are the same because both are considered part of Business Central REST services.

Endpoints

Knowledge Store REST API endpoints, such as **/spaces/{spaceName}** for a specified space, are the URIs that you append to the Knowledge Store REST API base URL to access the corresponding resource or type of resource in Red Hat Process Automation Manager.

Example request URL for /spaces/{spaceName} endpoint

http://localhost:8080/business-central/rest/spaces/MySpace

Request data

HTTP **POST** requests in the Knowledge Store REST API may require a JSON request body with data to accompany the request.

Example POST request URL and JSON request body data

http://localhost:8080/business-central/rest/spaces/MySpace/projects

```
{
  "name": "Employee_Rostering",
  "groupId": "employeerostering",
  "version": "1.0.0-SNAPSHOT",
  "description": "Employee rostering problem optimisation using Planner. Assigns employees to shifts based on their skill."
}
```

7.1. SENDING REQUESTS WITH THE KNOWLEDGE STORE REST API USING A REST CLIENT OR CURL UTILITY

The Knowledge Store REST API enables you to interact with your projects and spaces in Red Hat Process Automation Manager without using the Business Central user interface. You can send Knowledge Store REST API requests using any REST client or curl utility.

Prerequisites

- Business Central is installed and running.
- You have **rest-all** user role access to Business Central.

Procedure

1. Identify the relevant API endpoint to which you want to send a request, such as **[GET] /spaces** to retrieve spaces in Business Central.

2. In a REST client or curl utility, enter the following components for a **GET** request to **/spaces**. Adjust any request details according to your use case.
   For REST client:

   - **Authentication**: Enter the user name and password of the Business Central user with the **rest-all** role.
   - **HTTP Headers**: Set the following header:
     - **Accept**: **application/json**
   - **HTTP method**: Set to **GET**.
   - **URL**: Enter the Knowledge Store REST API base URL and endpoint, such as **http://localhost:8080/business-central/rest/spaces**.

   For curl utility:

   - **-u**: Enter the user name and password of the Business Central user with the **rest-all** role.
   - **-H**: Set the following header:
     - **accept**: **application/json**
   - **-X**: Set to **GET**.
   - **URL**: Enter the Knowledge Store REST API base URL and endpoint, such as **http://localhost:8080/business-central/rest/spaces**.

```
curl -u 'baAdmin:password@1' -H "accept: application/json" -X GET
"http://localhost:8080/business-central/rest/spaces"
```

3. Execute the request and review the Process Server response.
   Example server response (JSON):


```
[
  {
    "name": "MySpace",
    "description": null,
    "projects": [
      {
        "name": "Employee_Rostering",
        "spaceName": "MySpace",
        "groupId": "employeerostering",
        "version": "1.0.0-SNAPSHOT",
        "description": "Employee rostering problem optimisation using Planner. Assigns
employees to shifts based on their skill.",
        "publicURIs": [
          {
            "protocol": "git",
            "uri": "git://localhost:9418/MySpace/example-Employee_Rostering"
          },
          {
            "protocol": "ssh",
            "uri": "ssh://localhost:8001/MySpace/example-Employee_Rostering"
          }
```

```
        ]
      },
      {
        "name": "Mortgage_Process",
        "spaceName": "MySpace",
        "groupId": "mortgage-process",
        "version": "1.0.0-SNAPSHOT",
        "description": "Getting started loan approval process in BPMN2, decision table, business
rules, and forms.",
        "publicURIs": [
          {
            "protocol": "git",
            "uri": "git://localhost:9418/MySpace/example-Mortgage_Process"
          },
          {
            "protocol": "ssh",
            "uri": "ssh://localhost:8001/MySpace/example-Mortgage_Process"
          }
        ]
      }
    ],
    "owner": "admin",
    "defaultGroupId": "com.myspace"
  },
  {
    "name": "MySpace2",
    "description": null,
    "projects": [
      {
        "name": "IT_Orders",
        "spaceName": "MySpace",
        "groupId": "itorders",
        "version": "1.0.0-SNAPSHOT",
        "description": "Case Management IT Orders project",
        "publicURIs": [
          {
            "protocol": "git",
            "uri": "git://localhost:9418/MySpace/example-IT_Orders-1"
          },
          {
            "protocol": "ssh",
            "uri": "ssh://localhost:8001/MySpace/example-IT_Orders-1"
          }
        ]
      }
    ],
    "owner": "admin",
    "defaultGroupId": "com.myspace"
  }
]
```


4. In your REST client or curl utility, send another API request with the following components for a **POST** request to **/spaces/{spaceName}/projects** to create a project within a space. Adjust any request details according to your use case.
   For REST client:

- **Authentication**: Enter the user name and password of the Business Central user with the **rest-all** role.
- **HTTP Headers**: Set the following header:
  - **Accept**: **application/json**
  - **Accept-Language**: **en-US**
  - **Content-Type**: **application/json**
- **HTTP method**: Set to **POST**.
- **URL**: Enter the Knowledge Store REST API base URL and endpoint, such as **http://localhost:8080/business-central/rest/spaces/MySpace/projects**.
- **Request body**: Add a JSON request body with the identification data for the new project:

```
{
  "name": "Employee_Rostering",
  "groupId": "employeerostering",
  "version": "1.0.0-SNAPSHOT",
  "description": "Employee rostering problem optimisation using Planner. Assigns employees to shifts based on their skill."
}
```

For curl utility:

- **-u**: Enter the user name and password of the Business Central user with the **rest-all** role.
- **-H**: Set the following headers:
  - **Accept**: **application/json**
  - **Accept-Language**: **en-US** (If not defined, the default locale from the JVM is reflected)
  - **Content-Type**: **application/json**
- **-X**: Set to **POST**.
- **URL**: Enter the Knowledge Store REST API base URL and endpoint, such as **http://localhost:8080/business-central/rest/spaces/MySpace/projects**.
- **-d**: Add a JSON request body or file (**@file.json**) with the identification data for the new project:

```
curl -u 'baAdmin:password@1' -H "Accept: application/json" -H "Accept-Language: en-US" -H "Content-Type: application/json" -X POST "http://localhost:8080/business-central/rest/spaces/MySpace/projects" -d "{ \"name\": \"Employee_Rostering\", \"groupId\": \"employeerostering\", \"version\": \"1.0.0-SNAPSHOT\", \"description\": \"Employee rostering problem optimisation using Planner. Assigns employees to shifts based on their skill.\"}"
```

```
curl -u 'baAdmin:password@1' -H "Accept: application/json" -H "Accept-Language: en-US" -H "Content-Type: application/json" -X POST "http://localhost:8080/business-central/rest/spaces/MySpace/projects" -d @my-project.json
```

5. Execute the request and review the Process Server response.
   Example server response (JSON):


```
{
  "jobId": "1541017411591-6",
  "status": "APPROVED",
  "spaceName": "MySpace",
  "projectName": "Employee_Rostering",
  "projectGroupId": "employeerostering",
  "projectVersion": "1.0.0-SNAPSHOT",
  "description": "Employee rostering problem optimisation using Planner. Assigns employees to shifts based on their skill."
}
```


   If you encounter request errors, review the returned error code messages and adjust your request accordingly.

7.2. SUPPORTED KNOWLEDGE STORE REST API ENDPOINTS

The Knowledge Store REST API provides endpoints for managing spaces and projects in Red Hat Process Automation Manager and for retrieving information about previous Knowledge Store REST API requests, or *jobs*.

7.2.1. Spaces

The Knowledge Store REST API supports the following endpoints for managing spaces in Business Central. The Knowledge Store REST API base URL is **http://SERVER:PORT/business-central/rest/**. All requests require HTTP Basic authentication or token-based authentication for the **rest-all** user role.

[GET] /spaces

Returns all spaces in Business Central.

Example server response (JSON)


```
[
  {
    "name": "MySpace",
    "description": null,
    "projects": [
      {
        "name": "Employee_Rostering",
        "spaceName": "MySpace",
        "groupId": "employeerostering",
        "version": "1.0.0-SNAPSHOT",
        "description": "Employee rostering problem optimisation using Planner. Assigns employees to shifts based on their skill.",
        "publicURIs": [
          {
            "protocol": "git",
            "uri": "git://localhost:9418/MySpace/example-Employee_Rostering"
          },
          {
            "protocol": "ssh",
            "uri": "ssh://localhost:8001/MySpace/example-Employee_Rostering"
```

```
        }
       ]
      },
      {
       "name": "Mortgage_Process",
       "spaceName": "MySpace",
       "groupId": "mortgage-process",
       "version": "1.0.0-SNAPSHOT",
       "description": "Getting started loan approval process in BPMN2, decision table, business
rules, and forms.",
       "publicURIs": [
        {
         "protocol": "git",
         "uri": "git://localhost:9418/MySpace/example-Mortgage_Process"
        },
        {
         "protocol": "ssh",
         "uri": "ssh://localhost:8001/MySpace/example-Mortgage_Process"
        }
       ]
      }
    ],
    "owner": "admin",
    "defaultGroupId": "com.myspace"
  },
  {
    "name": "MySpace2",
    "description": null,
    "projects": [
      {
       "name": "IT_Orders",
       "spaceName": "MySpace",
       "groupId": "itorders",
       "version": "1.0.0-SNAPSHOT",
       "description": "Case Management IT Orders project",
       "publicURIs": [
        {
         "protocol": "git",
         "uri": "git://localhost:9418/MySpace/example-IT_Orders-1"
        },
        {
         "protocol": "ssh",
         "uri": "ssh://localhost:8001/MySpace/example-IT_Orders-1"
        }
       ]
      }
    ],
    "owner": "admin",
    "defaultGroupId": "com.myspace"
  }
]
```


[GET] /spaces/{spaceName}

Returns information about a specified space.

Table 7.1. Request parameters

Name	Description	Type	Requirement
spaceName	Name of the space to be retrieved	String	Required

Example server response (JSON)


```
{
  "name": "MySpace",
  "description": null,
  "projects": [
    {
      "name": "Mortgage_Process",
      "spaceName": "MySpace",
      "groupId": "mortgage-process",
      "version": "1.0.0-SNAPSHOT",
      "description": "Getting started loan approval process in BPMN2, decision table, business rules, and forms.",
      "publicURIs": [
        {
          "protocol": "git",
          "uri": "git://localhost:9418/MySpace/example-Mortgage_Process"
        },
        {
          "protocol": "ssh",
          "uri": "ssh://localhost:8001/MySpace/example-Mortgage_Process"
        }
      ]
    },
    {
      "name": "Employee_Rostering",
      "spaceName": "MySpace",
      "groupId": "employeerostering",
      "version": "1.0.0-SNAPSHOT",
      "description": "Employee rostering problem optimisation using Planner. Assigns employees to shifts based on their skill.",
      "publicURIs": [
        {
          "protocol": "git",
          "uri": "git://localhost:9418/MySpace/example-Employee_Rostering"
        },
        {
          "protocol": "ssh",
          "uri": "ssh://localhost:8001/MySpace/example-Employee_Rostering"
        }
      ]
    },
    {
      "name": "Evaluation_Process",
      "spaceName": "MySpace",
      "groupId": "evaluation",
      "version": "1.0.0-SNAPSHOT",
```

```
      "description": "Getting started Business Process for evaluating employees",
      "publicURIs": [
        {
          "protocol": "git",
          "uri": "git://localhost:9418/MySpace/example-Evaluation_Process"
        },
        {
          "protocol": "ssh",
          "uri": "ssh://localhost:8001/MySpace/example-Evaluation_Process"
        }
      ]
    },
    {
      "name": "IT_Orders",
      "spaceName": "MySpace",
      "groupId": "itorders",
      "version": "1.0.0-SNAPSHOT",
      "description": "Case Management IT Orders project",
      "publicURIs": [
        {
          "protocol": "git",
          "uri": "git://localhost:9418/MySpace/example-IT_Orders"
        },
        {
          "protocol": "ssh",
          "uri": "ssh://localhost:8001/MySpace/example-IT_Orders"
        }
      ]
    }
  ],
  "owner": "admin",
  "defaultGroupId": "com.myspace"
}
```


[POST] /spaces

Creates a space in Business Central.

Table 7.2. Request parameters

Name	Description	Type	Requirement
body	The **name**, **description**, **owner**, **defaultGroupId**, and any other components of the new space	Request body	Required

Example request body (JSON)


```
{
  "name": "NewSpace",
  "description": "My new space.",
```

```
  "owner": "admin",
  "defaultGroupId": "com.newspace"
}
```

Example server response (JSON)

```
{
  "jobId": "1541016978154-3",
  "status": "APPROVED",
  "spaceName": "NewSpace",
  "owner": "admin",
  "defaultGroupId": "com.newspace",
  "description": "My new space."
}
```

[DELETE] /spaces/{spaceName}

Deletes a specified space from Business Central.

Table 7.3. Request parameters

Name	Description	Type	Requirement
spaceName	Name of the space to be deleted	String	Required

Example server response (JSON)

```
{
  "jobId": "1541127032997-8",
  "status": "APPROVED",
  "spaceName": "MySpace",
  "owner": "admin",
  "description": "My deleted space.",
  "repositories": null
}
```

7.2.2. Projects

The Knowledge Store REST API supports the following endpoints for managing, building, and deploying projects in Business Central. The Knowledge Store REST API base URL is **http://SERVER:PORT/business-central/rest/**. All requests require HTTP Basic authentication or token-based authentication for the **rest-all** user role.

[GET] /spaces/{spaceName}/projects

Returns projects in a specified space.

Table 7.4. Request parameters

Name	Description	Type	Requirement
spaceName	Name of the space for which you are retrieving projects	String	Required

Example server response (JSON)


```
[
  {
    "name": "Mortgage_Process",
    "spaceName": "MySpace",
    "groupId": "mortgage-process",
    "version": "1.0.0-SNAPSHOT",
    "description": "Getting started loan approval process in BPMN2, decision table, business rules, and forms.",
    "publicURIs": [
      {
        "protocol": "git",
        "uri": "git://localhost:9418/MySpace/example-Mortgage_Process"
      },
      {
        "protocol": "ssh",
        "uri": "ssh://localhost:8001/MySpace/example-Mortgage_Process"
      }
    ]
  },
  {
    "name": "Employee_Rostering",
    "spaceName": "MySpace",
    "groupId": "employeerostering",
    "version": "1.0.0-SNAPSHOT",
    "description": "Employee rostering problem optimisation using Planner. Assigns employees to shifts based on their skill.",
    "publicURIs": [
      {
        "protocol": "git",
        "uri": "git://localhost:9418/MySpace/example-Employee_Rostering"
      },
      {
        "protocol": "ssh",
        "uri": "ssh://localhost:8001/MySpace/example-Employee_Rostering"
      }
    ]
  },
  {
    "name": "Evaluation_Process",
    "spaceName": "MySpace",
    "groupId": "evaluation",
    "version": "1.0.0-SNAPSHOT",
    "description": "Getting started Business Process for evaluating employees",
    "publicURIs": [
      {
        "protocol": "git",
```

```
        "uri": "git://localhost:9418/MySpace/example-Evaluation_Process"
      },
      {
        "protocol": "ssh",
        "uri": "ssh://localhost:8001/MySpace/example-Evaluation_Process"
      }
    ]
  },
  {
    "name": "IT_Orders",
    "spaceName": "MySpace",
    "groupId": "itorders",
    "version": "1.0.0-SNAPSHOT",
    "description": "Case Management IT Orders project",
    "publicURIs": [
      {
        "protocol": "git",
        "uri": "git://localhost:9418/MySpace/example-IT_Orders"
      },
      {
        "protocol": "ssh",
        "uri": "ssh://localhost:8001/MySpace/example-IT_Orders"
      }
    ]
  }
]
```


[GET] /spaces/{spaceName}/projects/{projectName}

Returns information about a specified project in a specified space.

Table 7.5. Request parameters

Name	Description	Type	Requirement
spaceName	Name of the space where the project is located	String	Required
projectName	Name of the project to be retrieved	String	Required

Example server response (JSON)


```
{
  "name": "Employee_Rostering",
  "spaceName": "MySpace",
  "groupId": "employeerostering",
  "version": "1.0.0-SNAPSHOT",
  "description": "Employee rostering problem optimisation using Planner. Assigns employees to shifts based on their skill.",
  "publicURIs": [
    {
      "protocol": "git",
      "uri": "git://localhost:9418/MySpace/example-Employee_Rostering"
```

```
    },
    {
      "protocol": "ssh",
      "uri": "ssh://localhost:8001/MySpace/example-Employee_Rostering"
    }
  ]
}
```

[POST] /spaces/{spaceName}/projects

Creates a project in a specified space.

Table 7.6. Request parameters

Name	Description	Type	Requirement
spaceName	Name of the space in which the new project will be created	String	Required
body	The **name**, **groupId**, **version**, **description**, and any other components of the new project	Request body	Required

Example request body (JSON)

```
{
  "name": "Employee_Rostering",
  "groupId": "employeerostering",
  "version": "1.0.0-SNAPSHOT",
  "description": "Employee rostering problem optimisation using Planner. Assigns employees to shifts based on their skill."
}
```

Example server response (JSON)

```
{
  "jobId": "1541017411591-6",
  "status": "APPROVED",
  "spaceName": "MySpace",
  "projectName": "Employee_Rostering",
  "projectGroupId": "employeerostering",
  "projectVersion": "1.0.0-SNAPSHOT",
  "description": "Employee rostering problem optimisation using Planner. Assigns employees to shifts based on their skill."
}
```

[DELETE] /spaces/{spaceName}/projects/{projectName}

Deletes a specified project from a specified space.

Table 7.7. Request parameters

Name	Description	Type	Requirement
spaceName	Name of the space where the project is located	String	Required
projectName	Name of the project to be deleted	String	Required

Example server response (JSON)

```
{
  "jobId": "1541128617727-10",
  "status": "APPROVED",
  "projectName": "Employee_Rostering",
  "spaceName": "MySpace"
}
```

[POST] /spaces/{spaceName}/git/clone

Clones a project into a specified space from a specified Git address.

Table 7.8. Request parameters

Name	Description	Type	Requirement
spaceName	Name of the space to which you are cloning a project	String	Required
body	The **name**, **description**, and Git repository **userName**, **password**, and **gitURL** for the project to be cloned	Request body	Required

Example request body (JSON)

```
{
  "name": "Employee_Rostering",
  "description": "Employee rostering problem optimisation using Planner. Assigns employees to shifts based on their skill.",
  "userName": "baAdmin",
  "password": "password@1",
  "gitURL": "git://localhost:9418/MySpace/example-Employee_Rostering"
}
```

Example server response (JSON)

```
{
  "jobId": "1541129488547-13",
  "status": "APPROVED",
  "cloneProjectRequest": {
    "name": "Employee_Rostering",
```

```
    "description": "Employee rostering problem optimisation using Planner. Assigns employees to shifts based on their skill.",
    "userName": "baAdmin",
    "password": "password@1",
    "gitURL": "git://localhost:9418/MySpace/example-Employee_Rostering"
  },
  "spaceName": "MySpace2"
}
```


[POST] /spaces/{spaceName}/projects/{projectName}/maven/compile

Compiles a specified project in a specified space (equivalent to **mvn compile**).

Table 7.9. Request parameters

Name	Description	Type	Requirement
spaceName	Name of the space where the project is located	String	Required
projectName	Name of the project to be compiled	String	Required

Example server response (JSON)


```
{
  "jobId": "1541128617727-10",
  "status": "APPROVED",
  "projectName": "Employee_Rostering",
  "spaceName": "MySpace"
}
```


[POST] /spaces/{spaceName}/projects/{projectName}/maven/test

Tests a specified project in a specified space (equivalent to **mvn test**).

Table 7.10. Request parameters

Name	Description	Type	Requirement
spaceName	Name of the space where the project is located	String	Required
projectName	Name of the project to be tested	String	Required

Example server response (JSON)


```
{
  "jobId": "1541132591595-19",
  "status": "APPROVED",
```

```
  "projectName": "Employee_Rostering",
  "spaceName": "MySpace"
}
```


[POST] /spaces/{spaceName}/projects/{projectName}/maven/install

Installs a specified project in a specified space (equivalent to **mvn install**).

Table 7.11. Request parameters

Name	Description	Type	Requirement
spaceName	Name of the space where the project is located	String	Required
projectName	Name of the project to be installed	String	Required

Example server response (JSON)


```
{
  "jobId": "1541132668987-20",
  "status": "APPROVED",
  "projectName": "Employee_Rostering",
  "spaceName": "MySpace"
}
```


[POST] /spaces/{spaceName}/projects/{projectName}/maven/deploy

Deploys a specified project in a specified space (equivalent to **mvn deploy**).

Table 7.12. Request parameters

Name	Description	Type	Requirement
spaceName	Name of the space where the project is located	String	Required
projectName	Name of the project to be deployed	String	Required

Example server response (JSON)


```
{
  "jobId": "1541132816435-21",
  "status": "APPROVED",
  "projectName": "Employee_Rostering",
  "spaceName": "MySpace"
}
```

7.2.3. Jobs (API requests)

All **POST** and **DELETE** requests in the Knowledge Store REST API return a job ID associated with each request, in addition to the returned request details. You can use a job ID to view the request status or delete a sent request.

Knowledge Store REST API requests, or *jobs*, can have the following statuses:

Table 7.13. Job statuses (API request statuses)

Status	Description
ACCEPTED	The request was accepted and is being processed.
BAD_REQUEST	The request contained incorrect content and was not accepted.
RESOURCE_NOT_EXIST	The requested resource (path) does not exist.
DUPLICATE_RESOURCE	The resource already exists.
SERVER_ERROR	An error occurred in Process Server.
SUCCESS	The request finished successfully.
FAIL	The request failed.
APPROVED	The request was approved.
DENIED	The request was denied.
GONE	The job ID for the request could not be found due to one of the following reasons: • The request was explicitly removed. • The request finished and has been deleted from a status cache. A request is removed from a status cache after the cache has reached its maximum capacity. • The request never existed.

The Knowledge Store REST API supports the following endpoints for retrieving or deleting sent API requests. The Knowledge Store REST API base URL is **http://SERVER:PORT/business-central/rest/**. All requests require HTTP Basic authentication or token-based authentication for the **rest-all** user role.

[GET] /jobs/{jobId}

Returns the status of a specified job (a previously sent API request).

Table 7.14. Request parameters

Name	Description	Type	Requirement
jobId	ID of the job to be retrieved (example: **1541010216919-1**)	String	Required

Example server response (JSON)

```
{
  "status": "SUCCESS",
  "jobId": "1541010216919-1",
  "result": null,
  "lastModified": 1541010218352,
  "detailedResult": [
    "level:INFO, path:null, text:Build of module 'Mortgage_Process' (requested by system) completed.\n Build: SUCCESSFUL"
  ]
}
```

[DELETE] /jobs/{jobId}

Deletes a specified job (a previously sent API request). If the job is not being processed yet, this request removes the job from the job queue. This request does not cancel or stop an ongoing job.

Table 7.15. Request parameters

Name	Description	Type	Requirement
jobId	ID of the job to be deleted (example: **1541010216919-1**)	String	Required

Example server response (JSON)

```
{
  "status": "GONE",
  "jobId": "1541010216919-1",
  "result": null,
  "lastModified": 1541132054916,
  "detailedResult": [
    "level:INFO, path:null, text:Build of module 'Mortgage_Process' (requested by system) completed.\n Build: SUCCESSFUL"
  ]
}
```

CHAPTER 8. EJB API FOR KIE SESSIONS AND TASK SERVICES

Red Hat Process Automation Manager provides an Enterprise JavaBeans (EJB) API that you can use for embedded use cases to access **KieSession** and **TaskService** objects remotely from an application. The EJB API enables close transaction integration between the process engine in Red Hat Process Automation Manager and remote customer applications.

Although Process Server does not support EJB, you can use EJB as a remote protocol for the process engine similar to remote REST or JMS operations with Process Server.

The implementation of the EJB interface is a single framework-independent and container-agnostic API that you can use with framework-specific code. The EJB services are exposed through the **org.jbpm.services.api** and **org.jbpm.services.ejb** packages in Red Hat Process Automation Manager. The implementation does not support the **RuleService** class, but the **ProcessService** class exposes an **execute** method that enables you to use various rule-related commands, such as **InsertCommand** and **FireAllRulesCommand**.

NOTE

Contexts and Dependency Injection (CDI) is also supported through the **org.jbpm.services.cdi** package in Red Hat Process Automation Manager. However, to avoid conflicts in your EJB integration, do not use EJB and CDI together.

8.1. SUPPORTED EJB SERVICES

For the full list of available Enterprise JavaBeans (EJB) services in Red Hat Process Automation Manager, download the **Red Hat Process Automation Manager 7.2.0 Maven Repository** from the Red Hat Customer Portal and navigate to **~/jboss-rhba-7.2.0.GA-maven-repository/maven-repository/org/jbpm/jbpm-services-ejb-***.

The artifacts that provide the EJB interface to the jBPM services are in the following packages:

- **org.jbpm.services.ejb.api**: Contains extensions of the jBPM services API for the EJB interface
- **org.jbpm.services.ejb.impl**: Contains EJB wrappers on top of the core service implementation
- **org.jbpm.services.ejb.client**: Contains the EJB remote client implementation, supported on Red Hat JBoss EAP only

The **org.jbpm.services.ejb.api** package contains the following service interfaces that you can use with remote EJB clients:

- **DefinitionServiceEJBRemote**: Use this interface to gather information about processes (ID, name, and version), process variables (name and type), defined reusable subprocesses, domain-specific services, user tasks, and user task inputs and outputs.
- **DeploymentServiceEJBRemote**: Use this interface to initiate deployments and undeployments. The interface includes the methods **deploy**, **undeploy**, **getRuntimeManager**, **getDeployedUnits**, **isDeployed**, **activate**, **deactivate**, and **getDeployedUnit**. Calling the **deploy** method with an instance of **DeploymentUnit** deploys the unit into the runtime engine by building a **RuntimeManager** instance. After a successful deployment, an instance of **DeployedUnit** is created and cached for further use. (To use these methods, you must install the artifacts of the project in a Maven repository.)
- **ProcessServiceEJBRemote**: Use this interface to control the life cycle of one or more processes and work items.

- **RuntimeDataServiceEJBRemote**: Use this interface to retrieve data related to the run time, such as process instances, process definitions, node instance information, and variable information. The interface includes several convenience methods for gathering task information based on owner, status, and time.
- **UserTaskServiceEJBRemote**: Use this interface to control the life cycle of a user task. The interface includes several convenience methods for interacting with user tasks, such as **activate**, **start**, **stop**, and **execute**.
- **QueryServiceEJBRemote**: Use this interface for advanced queries.
- **ProcessInstanceMigrationServiceEJBRemote**: Use this interface to migrate process instances when a new version of a process definition is deployed.

If you run EJB applications and Business Central on the same Process Server instance, you can synchronize the information between EJB and Business Central at a specified interval by setting the **org.jbpm.deploy.sync.int** system property. After the service finishes the synchronization, you can access the updated information using REST operations.

NOTE

EJB services in Red Hat Process Automation Manager are intended for embedded use cases. If you run EJB applications and Business Central on the same Process Server instance, you must also add the **kie-services** package on the class path of your EJB application.

8.2. DEPLOYING AN EJB SERVICES WAR FILE

You can use the Enterprise JavaBeans (EJB) interface to create and deploy an EJB services WAR file that you want to use as part of your Red Hat Process Automation Manager distribution.

Procedure

1. Register a human task callback using a startup Java class, such as the following example:

```
@Singleton
@Startup
public class StartupBean {

  @PostConstruct
  public void init()
  { System.setProperty("org.jbpm.ht.callback", "jaas"); }

}
```

2. Build your EJB project to generate the WAR file according to your project configuration.
3. Deploy the generated file on the Red Hat JBoss EAP instance where Red Hat Process Automation Manager is running.
   Avoid using the **Singleton** strategy for your runtime sessions. The **Singleton** strategy can cause applications to load the same **ksession** instance multiple times from the underlying file system and cause optimistic lock exceptions.

If you want to deploy the EJB WAR file on a Red Hat JBoss EAP instance separate from the one where Red Hat Process Automation Manager is running, configure your application or the application server to invoke a remote EJB and to propagate the security context.

If you are using Hibernate to create a database schema for Red Hat Process Automation Manager, update the **persistence.xml** file in Business Central and set the value of the **hibernate.hbm2ddl.auto** property to **update** instead of **create**.

4. Test the deployment locally by creating a basic web application and injecting the EJB services, as shown in the following example:

```
@EJB(lookup = "ejb:/sample-war-ejb-
app/ProcessServiceEJBImpl!org.jbpm.services.ejb.api.ProcessServiceEJBRemote")
private ProcessServiceEJBRemote processService;

@EJB(lookup = "ejb:/sample-war-ejb-
app/UserTaskServiceEJBImpl!org.jbpm.services.ejb.api.UserTaskServiceEJBRemote")
private UserTaskServiceEJBRemote userTaskService;

@EJB(lookup = "ejb:/sample-war-ejb-
app/RuntimeDataServiceEJBImpl!org.jbpm.services.ejb.api.RuntimeDataServiceEJBRemote")

private RuntimeDataServiceEJBRemote runtimeDataService;
```

For more information about developing and deploying EJB applications with Red Hat JBoss EAP, see *Developing EJB Applications*.

CHAPTER 9. ADDITIONAL RESOURCES

- *Managing and monitoring Process Server*
- *Packaging and deploying a Red Hat Process Automation Manager project*

APPENDIX A. VERSIONING INFORMATION

Documentation last updated on Monday, November 15, 2021.