Fuse ESB Enterprise

Using Java Business Integration

Version 7.1
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Integration Everywhere

Using Java Business Integration

Version 7.1

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Part I. Overview of Java Business Integration

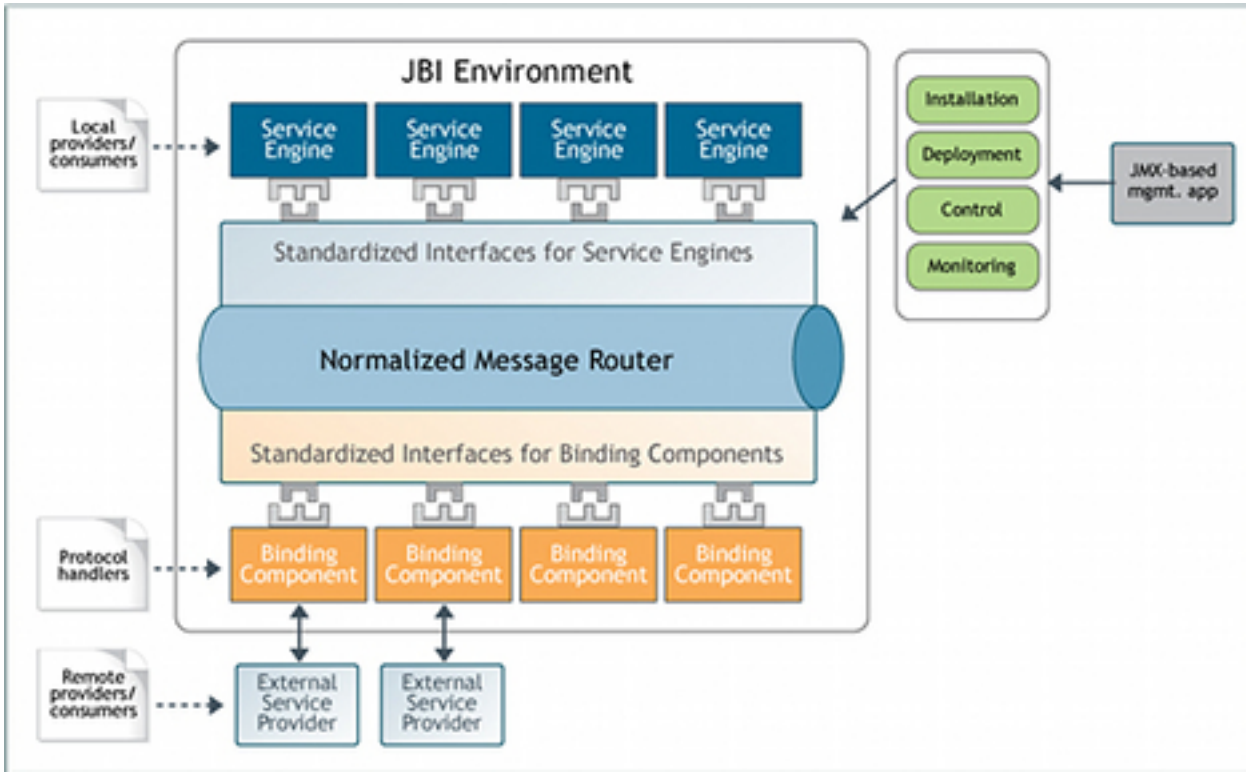
Chapter 1. Introduction to JBI

Java Business Integration (JBI) defines an architecture for integrating systems through components that interoperate by exchanging normalized messages through a router.

The Java Business Integration (JBI) specification defines an integration architecture based on service-oriented concepts. Applications are divided into decoupled functional units. The functional units are deployed into JBI components that are hosted within the JBI environment. The JBI environment provides message normalization and message mediation among the JBI components.

The JBI environment is made up of the following parts, as shown in Figure 1.1 on page 14.

Figure 1.1. The JBI architecture



- The JBI component framework hosts and manages the JBI components. For more information see "The Component Framework" on page 15.
- The normalized message router provides message mediation among the JBI components. For more information see "The Normalized Message Router" on page 17.
- The management structure controls the life-cycle of the JBI components and the functional units deployed into the JBI components. It also provides mechanisms for monitoring the artifacts that are deployed into the JBI environment. For more information see "Management Structure" on page 21.

Chapter 2. The Component Framework

The JBI component framework is the structure into which JBI components plug into the ESB.

Overview

The JBI component framework provides a pluggable interface between the functional units installed into the JBI environment and the infrastructure services offered by the JBI environment. The framework divides JBI components into two types based on their functionality. The framework also defines a packaging mechanism for deploying functional units into JBI components.

Component types

JBI defines two types of components:

- **Service Engine** — Component that provides some of the logic required to provide services inside of the JBI environment. For example:
  - message transformation
  - orchestration
  - advanced message routing

  A service engine can communicate only with other components inside of the JBI environment. Service engines act as containers for the functional units deployed into the Fuse ESB Enterprise.
- **Binding Component** — Provides access to services outside the JBI environment using a particular protocol. Binding components implement the logic required to connect to a transport, and consume the messages received over that transport. Binding components are also responsible for the normalization of messages as they enter the JBI environment.

The distinction between the two types of components is a matter of convention, and this distinction makes the decoupling of business logic and integration logic more explicit.

Packaging

JBI defines a common packaging model for all of the artifacts that can be deployed into the JBI environment. Each type of package is a ZIP archive that includes a JBI descriptor in the file `META-INF/jbi.xml`. The packages differ based on the root element of the JBI descriptor and the contents of the package. The JBI environment uses four types of packaging to install and

deploy functionality. The two most common types used by an application developer are:

- **Service Assembly** — A collection of service units. The root element of the JBI descriptor is a `service-assembly` element. The contents of the package is a collection of ZIP archives containing service units. The JBI descriptor specifies the target JBI component for each of the bundled service units.
- **Service Unit** — A package that contains functionality to be deployed into a JBI component. For example, a service unit intended for a routing service engine contains the definition for one or more routes. Note that service units are packaged as a ZIP file. The root element of the JBI descriptor is a `service-unit` element. The contents of the package are specific to the service engine for which the service unit is intended.

Important

Service units cannot be installed without being bundled into a service assembly.

Component roles

Once configured by one or more service units, a JBI component implements the functionality described in the service unit. The JBI component then takes on one of the following roles:

- **Service Provider** — Receives request messages and returns response messages, when required.
- **Service Consumer** — Initiates message exchanges by sending requests to a service provider.

Depending on both the number and the type of service units deployed into a JBI component, a single component can play one or both roles. For example, the HTTP binding component could host a service unit that acts as a proxy to consumers running outside of the Fuse ESB Enterprise. In this instance, the HTTP component is playing the role of a service provider because it is receiving requests from the external consumer, and passing the responses back to the external consumer. If the service unit also configures the HTTP component to forward the requests to another process running inside of the JBI environment, then the HTTP component also plays the role of a service consumer because it is making requests on another service unit.

Chapter 3. The Normalized Message Router

The normalized message router is a bus that shuttles messages between the endpoints deployed on the ESB.

Overview

The *normalized message router*(NMR) is the part of the JBI environment that is responsible for mediating messages between JBI components. The JBI components never send messages directly to each other; instead, they pass messages to the NMR, which is responsible for delivering the messages to the correct JBI endpoints. This allows the JBI components, and the functionality they expose, to be location independent. It also frees the application developer from concerns about the connection details between the different parts of an application.

Message exchange patterns

The NMR uses a WSDL-based messaging model to mediate the message exchanges between JBI components. Using a WSDL-based model provides the necessary level of abstraction to ensure that the JBI components are fully decoupled. The WSDL-based model defines operations as a message exchange between a service provider and a service consumer. The message exchanges are defined from the point of view of the service provider and fit into one of four message exchange patterns:

in-out

A consumer sends a request message to a provider, which then responds to the request with a response message. The provider might also respond with a fault message if an error occured during processing.

in-optional-out

A consumer sends a request message to a provider. The provider might send a response message back to the consumer, but the consumer does not require a response. The provider might also respond with a fault message if an error occurred during processing. The consumer can also send a fault message to the provider.

in-only

A consumer sends a message to a provider, but the provider does not send a response, and, if an error occurs, the provider does not send fault messages back to the consumer.

robust-in-only

A consumer sends a message to a provider. The provider does not respond to the consumer except to send a fault message back to the consumer to signal an error condition.

Normalized messages

To completely decouple the entities involved in message exchanges, JBI uses *normalized messages*. A normalized message is a genericized format used to represent all of the message data passed through the NMR and consists of the following three parts:

meta-data, **properties**
Holds information about the message. This information can include transaction contexts, security information, or other QoS information. The meta-data can also hold transport headers.

payload
An XML document that conforms to the XML Schema definition in the WSDL document that defines the message exchange. The XML document holds the substance of the message.

attachments
Hold any binary data associated with the message. For example, an attachment can be an image file sent as an attachment to a SOAP message.

security `Subject`

Holds security information associated with the message, such as authentication credentials. For more information about the security `Sublect`, see Sun's API documentation[1].

JBI binding components are responsible for normalizing all of the messages placed into the NMR. Binding components normalize messages received from external sources before passing them to the NMR. The binding component

[1] http://java.sun.com/j2se/1.5.0/docs/api/javax/security/auth/Subject.html

also denormalizes the message so that it is in the appropriate format for the external source.

Chapter 4. Management Structure

The JBI specification mandates that most parts of the environment are managed through JMX.

Overview

The JBI environment is managed using JMX (Java Management Extensions). The internal components of the JBI environment provide a set of MBeans that facilitate the management of the JBI environment and the deployed components. The JBI environment also supplies a number of Apache Ant tasks to manage the JBI environment.

The management of the JBI environment largely consists of:

- Installing and uninstalling artifacts into the JBI container
- Managing the life-cycle of JBI components
- Managing the life-cycle of service units

In addition to the JMX interface, all JBI environments provide a number of Ant tasks, which make it possible to automate many of the common management tasks.

JMX

Java Management Extensions (JMX) is a standard technology for monitoring and managing Java applications. The foundations for using JMX are provided as part of the standard Java 5 JVM, and can be used by any Java application. JMX provides a lightweight way of providing monitoring and management capabilities to any Java application that implements the `MBean` interface.

JBI implementations provide MBeans that can be used to manage the components installed into the container and the service units deployed into the components. In addition, application developers can add MBeans to their service units to add additional management touch points.

The MBeans can be accessed using any management console that uses JMX. JConsole, the JMX console provided with the Java 5 JRE, is an easy to use, free tool for managing a JBI environment. Fuse HQ (http://fusesource.com/products/fuse-hq/) is a more robust management console.

Installing and uninstalling artifacts into the JBI Environment

There are four basic types of artifacts that can be installed into a JBI environment:

- JBI components
- Shared libraries
- Service assemblies
- Service units

JBI components and shared libraries are installed using the `InstallationService` MBean that is exposed through the JMX console. In addition, the following Ant tasks are provided for installing and uninstalling JBI components and shared libraries:

- **InstallComponentTask**
- **UninstallComponentTask**
- **InstallSharedLibraryTask**
- **UninstallSharedLibraryTask**

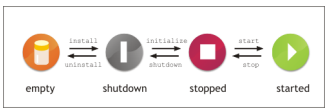
When a service assembly is installed into a JBI environment, all service units contained within the assembly are deployed to their respective JBI components. Service assemblies and service units are installed using the `DeploymentService` MBean that is exposed through the JMX console. In addition to the MBean, the following Ant tasks are provided for installing service assemblies and service units:

- **DeployServiceAssemblyTask**
- **UndeployServiceAssemblyTask**

Managing JBI components

Figure 4.1 shows the life-cycle of a JBI component.

Figure 4.1. JBI component life-cycle



Components begin life in an *empty* state. The component and the JBI environment have no knowledge of each other. Once the component is installed into the JBI environment, the component enters the *shutdown* state. In this state, the JBI environment initializes any resources required by the component.

From the shutdown state a component can be initialized and moved into the *stopped* state. In the stopped state, a component is fully initialized and all of its resources are loaded into the JBI environment. When a component is ready to process messages, it is moved into the *started* state. In this state the component, and any service units deployed into the component, can participate in message exchanges.

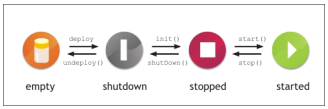
Components can be moved back and forth through the shutdown, stopped, and started states without being uninstalled. You can manage the lifecycle of an installed JBI component using the `InstallationService` MBean and the component's `ComponentLifeCycle` MBean. In addition, you can manage a component's lifecycle using the following Ant tasks:

- **StartComponentTask**
- **StopComponentTask**
- **ShutDownComponentTask**

Managing service units

Figure 4.2 shows the life-cycle of a service unit.

Figure 4.2. Service unit life-cycle



Service units must first be deployed into the appropriate JBI component. The JBI component is the container that will provide the runtime resources necessary to implement the functionality defined by the service unit. When a service unit is in the *shutdown* state, the JBI component has not provisioned any resources for the service unit. When a service unit is moved into the *stopped* state, the JBI component has provisioned the resources for the service unit but the service unit cannot use any of the provisioned resources. When a service unit is in the *started* state, it is using the resources provisioned for it by the JBI container. In the started state, the functionality defined by the service unit is accessible.

A service can be moved through the different states while deployed. You manage the lifecycle of a service unit using the JBI environment's `DeploymentService` MBean. In addition, you can manage service units using the following Ant tasks:

- **DeployServiceAssemblyTask**
- **UndeployServiceAssemblyTask**
- **StartServiceAssemblyTask**
- **StopServiceAssemblyTask**
- **ShutDownServiceAssemblyTask**
- **ListServiceAssembliesTask**

Part II. Deploying JBI Artifacts into the Fuse ESB Enterprise Runtime

The Fuse ESB Enterprise runtime is a container into which you deploy services. You must also deploy components to the container to support those services. Fuse ESB Enterprise supports the JBI packaging and deployment model for deploying functionality into the runtime.

Chapter 5. Clustering JBI Endpoints

Overview

Fuse ESB Enterprise provides a clustering engine that enables you to use Apache ActiveMQ, or any other JMS broker, to specify the endpoints to cluster in a JBI application. The Fuse ESB Enterprise clustering engine works in conjunction with the normalized message router (NMR), and uses Apache ActiveMQ and specifically configured JBI endpoints to build clusters.

A cluster is defined as two or more JBI containers networked together. Implementing clustering between JBI containers gives you access to features including load balancing and high availability, rollback and redelivery, and remote container awareness.

Features

Clustering provides the following features that can be implemented in your applications:

- Connect JBI containers to form a network, and dynamically add and remove the containers from the network.
- Enable rollback and redelivery when a JBI exchange fails.
- Implement load balancing among JBI containers capable of handling a given exchange. For example:
  - Install the same component in multiple JBI containers to provide increased capacity and high availability (if one container fails, the same component in another container can service the request).
  - Partition the workload among multiple JBI container instances to enable different containers to handle different tasks, spreading the workload across multiple containers.
- Remote component awareness means each clustered JBI container is aware of the components in its peer containers. Networked containers listen for remote component registration/deregistration events and can route requests to those components.

Steps to set up clustering

Complete the following steps to set up JBI endpoint clustering:

1. Install the jbi-cluster feature included in Fuse ESB Enterprise. See "Installing the clustering feature" on page 28.
2. Optionally, configure the clustering engine with a JMS broker other than the Apache ActiveMQ. See "Changing the JMS broker" on page 30.
3. Optionally, change the default clustering engine configuration to specify different cluster and destination names. See "Changing the default configuration" on page 30.
4. Add endpoints and register the endpoint definition in the Spring configuration. See "Using clustering in an application" on page 30.

See the following sections for additional information:

- "Establishing network connections between containers" on page 31
- "High availability" on page 32
- "Cluster configuration conventions" on page 33

Installing the clustering feature

To install the jbi-cluster feature, use the install command from the command console:

1. Start Fuse ESB Enterprise.
2. At the `karaf@root>` prompt, type:

   ```
   features:install jbi-cluster
   ```

3. Type **`featuresL:list`** to list the existing features and their installation state. Verify that the jbi-cluster feature is installed.

The cluster configuration bundle is automatically installed when you install the jbi-cluster feature.

Default clustering engine configuration

Fuse ESB Enterprise has a pre-installed clustering engine that is configured to use the included Apache ActiveMQ. The default configuration for the Fuse ESB Enterprise cluster engine is defined in the `jbi-cluster.xml` file in the `org.apache.servicemix.jbi.cluster.config` bundle. This bundle is located in the installation directory in `\system\org\apache\servicemix\jbi\cluster`.

The default cluster engine configuration, shown in Example 5.1, is designed to meet most basic requirements.

Example 5.1. Default cluster engine configuration

```
<bean id="clusterEngine" class="org.apache.servicemix.jbi.cluster.engine.ClusterEngine">
  <property name="pool">
    <bean class="org.apache.servicemix.jbi.cluster.requestor.ActiveMQJmsRequestorPool">
     <property name="connectionFactory" ref="connectionFactory" />
     <property name="destinationName" value="${destinationName}" />
    </bean>
  </property>
  <property name="name" value="${clusterName}" />
</bean>
<osgi:list id="clusterRegistrations"
      interface="org.apache.servicemix.jbi.cluster.engine.ClusterRegistration"
      cardinality="0..N">
  <osgi:listener ref="clusterEngine" bind-method="register" unbind-method="unregister" />
</osgi:list>
<osgi:reference id="connectionFactory" interface="javax.jms.ConnectionFactory" />
<osgi:service ref="clusterEngine">
  <osgi:interfaces>
    <value>org.apache.servicemix.nmr.api.Endpoint</value>
    <value>org.apache.servicemix.nmr.api.event.Listener</value>
    <value>org.apache.servicemix.nmr.api.event.EndpointListener</value>
    <value>org.apache.servicemix.nmr.api.event.ExchangeListener</value>
  </osgi:interfaces>
  <osgi:service-properties>
    <entry key="NAME" value="${clusterName}" />
  </osgi:service-properties>
</osgi:service>
<osgix:cm-properties id="clusterProps"
        persistent-id="org.apache.servicemix.jbi.cluster.config">
  <prop key="clusterName">${servicemix.name}</prop>
  <prop key="destinationName">org.apache.servicemix.jbi.cluster</prop>
</osgix:cm-properties>
<ctx:property-placeholder properties-ref="clusterProps" />
</beans>
```

Fuse ESB Enterprise has a preconfigured Apache ActiveMQ instance that automatically starts when the container is started. This means you do not have to start a broker instance for the clustering engine to work.

Changing the default configuration

You can alter the default configuration by adding a configuration file to the bundle `org.apache.servicemix.jbi.cluster.config`. This added configuration file enables you to change both the `clusterName` and the `destinationName`.

Changing the JMS broker

You can configure the cluster engine with another JMS broker by adding a Spring XML file containing the full configuration to the *`InstallDir`*`\deploy` directory.

Using clustering in an application

When using an OSGi packaged JBI service assembly, you can include the clustered endpoints definitions directly in the Spring configuration. In addition to the endpoint definition, you must add a bean that registers the endpoint with the clustering engine.

Example 5.2 shows an OSGi packaged HTTP consumer endpoint that is part of a cluster.

Example 5.2. OSGi packaged JBI endpoint

```
<http:consumer id="myHttpConsumer" service="test:myService" endpoint="myEndpoint" />
<bean class="org.apache.servicemix.jbi.cluster.engine.OsgiSimpleClusterRegistration">
  <property name="endpoint" ref="myHttpConsumer" />
</bean>
```

When using a JBI packaged service assembly, you must create a Spring application to register the endpoint as a clustered endpoint. This configuration requires that you provide additional information about the endpoint.

Example 5.3 shows a JBI packaged HTTP consumer endpoint that is part of a cluster.

Example 5.3. JBI packaged endpoint

```
<http:consumer id="myHttpConsumer" service="test:myService" endpoint="myEndpoint" />
<bean class="org.apache.servicemix.jbi.cluster.engine.OsgiSimpleClusterRegistration">
  <property name="serviceName" value="test:myService" />
  <property name="endpointName" value="myEndpoint" />
</bean>
```

Establishing network connections between containers

To create a network of JBI containers, you must establish network connections between each of the containers in the network, and then establish a network connection between the active containers. You can configure these network connections as either **static** or **multicast** connections.

- **Static network connections** — Configure each `networkConnector` in the cluster in the broker configuration file `install_dir/conf/activemq.xml`.

  Example 5.4 shows an example of a static `networkConnector` discovery configuration.

Example 5.4. Static configuration

```
<!-- Set the brokerName to be unique for this container -->
<amq:broker id="broker" brokerName="host1_broker1" depends-on="jmxServer">

              ....

  <networkConnectors>
           <networkConnector name="host1_to_host2" uri="static://(tcp://host2:61616)"/>

    <!-- A three container network would look like this -->
    <!-- (Note it is not necessary to list the hostname in the uri list) -->
    <!-- networkConnector name="host1_to_host2_host3"
          uri="static://(tcp://host2:61616,tcp://host3:61616)"/ -->

  </networkConnectors>

</amq:broker>
```

- **Multicast network connections** — Enable multicast on your network and configure multicast in the broker configuration file `installation_directory/conf/activemq.xml` for each container in the network. When the containers start they detect each other and transparently connect to one another.

  Example 5.5 shows an example of a multicast `networkConnector` discovery configuration.

Example 5.5. Multicast configuration

```
<networkConnectors>
  <!-- by default just auto discover the other brokers -->
           <networkConnector name="default-nc" uri="multicast://default"/>
    </networkConnectors>
```

When a network connection is established, each container discovers the other containers' remote components and can route to them.

High availability

You can cluster JBI containers to implement high availability by configuring two distinct Fuse ESB Enterprise container instances in a master-slave configuration. In all cases, the master is in `ACTIVE` mode and the slave is in `STANDBY` mode waiting for a failover event to trigger the slave to take over.

You can configure the master and the slave one of the following ways:

- **Shared file system master-slave** — In a shared database master-slave configuration, two containers use the same physical data store for the container state. You should ensure that the file system supports file level locking, as this is the mechanism used to elect the master. If the master process exits, the database lock is released and the slave acquires it. The slave then becomes the master.
- **JDBC master-slave** — In a JDBC master-slave configuration, the master locks a table in the backend database. The failover event in this case is that the lock is released from the database.
- **Pure master-slave** — A pure master-slave configuration can use either a shared database or a shared file system. The master replicates all state changes to the slave so additional overhead is incurred. The failover trigger in a pure master-slave configuration is that the slave loses its network connection to its master. Because of the additional overhead and maintenance involved, this option is less desirable than the other two options.

Cluster configuration conventions

The following conventions apply to configuring clustering:

- Don't use static and multicast `networkConnectors` at the same time. If you enable static `networkConnectors`, then you should disable any multicast `networkConnectors`, and vice versa.
- When configuring a network of containers in `installation_directory/conf/activemq.xml`, ensure that the `brokerName` attribute is unique for each node in the cluster. This will enable the instances in the network to uniquely identify each other.
- When configuring a network of containers you must ensure that you have unique persistent stores for each `ACTIVE` instance. If you have a JDBC data source, you must use a separate database for each `ACTIVE` instance. For example:

```
<property name="url"
          value="jdbc:mysql://localhost/broker_activemq_host1?relaxAutoCommit=true"/>
```

- You can setup a network of containers on the same host. To do this, you must change the JMS ports and `transportConnector` ports to avoid any port conflicts. Edit the `installation_directory/conf/activemq.xml` file, changing the `rmi.port` and `activemq.port` as appropriate. For example:

```
rmi.port        = 1098
rmi.host        = localhost
jmx.url         = service:jmx:rmi:///jndi/rmi://${rmi.host}:${rmi.port}/jmxrmi

activemq.port   = 61616
activemq.host   = localhost
activemq.url    = tcp://${activemq.host}:${activemq.port}
```

Chapter 6. Using the JBI Ant Tasks

The JBI specification defines a number of Ant tasks that can be used to manage JBI components. These tasks allow you to install, start, stop, and uninstall components in the Fuse ESB Enterprise container. You can use the JBI Ant tasks as either command line commands or as part of an Ant build file.

Using the tasks as commands

Usage

This is the basic usage statement for the Fuse ESB Enterprise Ant tasks when used from the command line:

`ant` -f *`InstallDir`*/ant/servicemix-ant-tasks.xml [-D*`option`*=*`value`*...] *`task`*

The *`task`* argument is the name of the Ant task you are calling. Each task supports a number of options that are specified using the `-D`*`option`*`=`*`value`* flag.

Installing a component

The Ant task used to install a component to the Fuse ESB Enterprise container is **install-component**. Its options are described in Table 6.1.

Table 6.1. Options for installing a JBI component with an Ant command

Option	Required	Description
`sm.username`	no	Specifies the username used to access the management features of the Fuse ESB Enterprise container
`sm.password`	no	Specifies the password used to access the management features of the Fuse ESB Enterprise container
`sm.host`	no	Specifies the host name where the container is running; the default value is `localhost`
`sm.port`	no	Specifies the port where the container's RMI registry is listening; the default value is `1099`
`sm.install.file`	yes	Specifies the name of the installer file for the component

Example 6.1 shows an example of using **install-component** to install the Camel component to a container listening on port 1000.

Example 6.1. Installing a component using an Ant command

```
>ant -f ant/servicemix-ant-task.xml -Dsm.port=1000 -Dsm.in
stall.file=servicemix-camel-3.3.0.6-fuse-installer.zip install-com
ponent
```

```
Buildfile: ant\servicemix-ant-task.xml

install-component:
[echo]  install-component
[echo]  Installing a service engine or binding component.
[echo]     host=localhost
[echo]     port=1000
[echo]    file=hotdeploy\servicemix-camel-3.3.0.6-fuse-installer.zip

BUILD SUCCESSFUL
Total time: 7 seconds
```

Removing a component

The Ant task used to remove a component from the Fuse ESB Enterprise container is **uninstall-component**. Its options are described in Table 6.2.

Table 6.2. Options for removing a JBI component with an Ant command

Option	Required	Description
`sm.username`	no	Specifies the username used to access the management features of the Fuse ESB Enterprise container
`sm.password`	no	Specifies the password used to access the management features of the Fuse ESB Enterprise container
`sm.host`	no	Specifies the host name where the container is running; the default value is `localhost`
`sm.port`	no	Specifies the port where the container's RMI registry is listening; the default value is `1099`
`sm.component.name`	yes	Specifies the name of the JBI component

Example 6.2 shows an example of using **uninstall-component** to remove the drools component from a container listening on port 1000.

Example 6.2. Removing a component using an Ant command

```
>ant -f ant\servicemix-ant-task.xml -Dsm.port=1000 -Dsm.compon
ent.name=servicemix-drools uninstall-component
Buildfile: ant\servicemix-ant-task.xml
```

```
uninstall-component:
[echo]  uninstall-component
[echo]  Uninstalling a Service Engine or Binding Component.
[echo]     host=localhost
[echo]     port=1000
[echo]     name=servicemix-drools

BUILD SUCCESSFUL
Total time: 1 second
```

Starting a component

The Ant task used to start a component is **start-component**. Its options are described in Table 6.3.

Table 6.3. Options for starting a JBI component with an Ant command

Option	Required	Description
`sm.username`		Specifies the username used to access the management features of the Fuse ESB Enterprise container
`sm.password`	no	Specifies the password used to access the management features of the Fuse ESB Enterprise container.
`sm.host`	no	Specifies the host name where the container is running; the default value is `localhost`
`sm.port`	no	Specifies the port where the container's RMI registry is listening; the default value is `1099`
`sm.component.name`	yes	Specifies the name of the JBI component

Example 6.3 shows an example of using **start-component** to start the cxf-se component in a container listening on port 1000.

Example 6.3. Starting a component using an Ant command

```
>ant -f ant\servicemix-ant-task.xml -Dsm.port=1000 -Dsm.compon
ent.name=servicemix-cxf-se start-component
Buildfile: ant\servicemix-ant-task.xml

start-component:
[echo]  start-component
```

```
[echo]  starts a particular component (service engine or binding
component) in Servicemix
[echo]     host=localhost
[echo]     port=1000
[echo]     name=servicemix-cxf-se

BUILD SUCCESSFUL
Total time: 1 second
```

Stopping a component

The Ant task used to stop a component is **stop-component**. Its options are described in Table 6.4.

Table 6.4. Options for stopping a JBI component with an Ant command

Option	Required	Description
`sm.username`	no	Specifies the username used to access the management features of the Fuse ESB Enterprise container
`sm.password`	no	Specifies the password used to access the management features of the Fuse ESB Enterprise container
`sm.host`	no	Specifies the host name where the container is running; the default value is `localhost`
`sm.port`	no	Specifies the port where the container's RMI registry is listening; the default value is `1099`
`sm.component.name`	yes	Specifies the name of the JBI component

Example 6.4 shows an example of using **stop-component** to stop the cxf-se component in a container listening on port 1000.

Example 6.4. Stopping a component using an Ant command

```
>ant -f ant\servicemix-ant-task.xml -Dsm.port=1000 -Dsm.compon
ent.name=servicemix-cxf-se stop-component
                  Buildfile: ant\servicemix-ant-task.xml

stop-component:
[echo]  stop-component
[echo]  stops a particular component (service engine or binding
```

```
component) in Servicemix
[echo]     host=localhost
[echo]     port=1000
[echo]     name=servicemix-cxf-se

BUILD SUCCESSFUL
Total time: 1 second
```

Shutting down a component

The Ant task used to shutdown a component is **shutdown-component**. Its options are described in Table 6.5.

Table 6.5. Options for shutting down a JBI component with an Ant command

Option	Required	Description
`sm.username`	no	Specifies the username used to access the management features of the Fuse ESB Enterprise container
`sm.password`	no	Specifies the password used to access the management features of the Fuse ESB Enterprise container
`sm.host`	no	Specifies the host name where the container is running; the default value is `localhost`
`sm.port`	no	Specifies the port where the container's RMI registry is listening; the default value is `1099`
`sm.component.name`	yes	Specifies the name of the JBI component

Installing a shared library

The Ant task used to install a shared library to the Fuse ESB Enterprise container is **install-shared-library**. Its options are described in Table 6.6.

Table 6.6. Options for installing a shared library with an Ant command

Option	Required	Description
`sm.username`	no	Specifies the username used to access the management features of the Fuse ESB Enterprise container

Option	Required	Description
sm.password	no	Specifies the password used to access the management features of the Fuse ESB Enterprise container
sm.host	no	Specifies the host name where the container is running; the default value is localhost
sm.port	no	Specifies the port where the container's RMI registry is listening; the default value is 1099
sm.install.file	yes	Specifies the name of the library's installer file

Removing a shared library

The Ant task used to remove a shared library from the Fuse ESB Enterprise container is **uninstall-shared-library**. Its options are described in Table 6.7.

Table 6.7. Options for removing a shared library with an Ant command

Option	Required	Description
sm.username	no	Specifies the username used to access the management features of the Fuse ESB Enterprise container
sm.password	no	Specifies the password used to access the management features of the Fuse ESB Enterprise container
sm.host	no	Specifies the host name where the container is running; the default value is localhost
sm.port	no	Specifies the port where the container's RMI registry is listening; the default value is 1099
sm.shared.library.name	yes	Specifies the name of the shared library

Using the tasks in build files

Adding the JBI tasks to build an Ant file

Before you can use the JBI tasks in an Ant build file, you must add the tasks using a `taskdef` element, as shown in Example 6.5.

Example 6.5. Adding the JBI tasks to an Ant build file

```
...
<property name="fuseesb.install_dir" value="/home/fuse_esb"/> ❶

<taskdef file="${fuseesb.install_dir}/ant/servicemix_ant_taskdef.properties"> ❷
  <classpath id="fuseesb.classpath"> ❸
    <fileset dir="${fuseesb.install_dir}">
       <include name="*.jar"/>
     </fileset>
     <fileset dir="${fuseesb.install_dir}/lib">
        <include name="*.jar"/>
      </fileset>
  </classpath>
</taskdef>
...
```

The build file fragment in Example 6.5 does the following:

❶ Sets a property, `fuseesb.install_dir`, the installation directory for Fuse ESB Enterprise

❷ Loads the tasks using the `ant/servicemix_ant_taskdef.properties`

❸ Sets the classpath to make all of the required jars from the Fuse ESB Enterprise installation available

Installing a component

The Ant task used to install a JBI component is `jbi-install-component`. Its attributes are listed in Table 6.8.

Table 6.8. Attributes for installing a JBI component using an Ant task

Attribute	Required	Description
`host`	no	Specifies the host name where the container is running; the default value is `localhost`

Attribute	Required	Description
port	no	Specifies the port where the container's RMI registry is listening; the default value is 1099
username	no	Specifies the username used to access the management features of the container
password	no	Specifies the password used to access the management features of the container
failOnError	no	Specifies if an error will cause the entire build to fail
file	yes	Specifies the name of the installer file for the component

Example 6.6 shows an Ant target that installs the drools component.

Example 6.6. Ant target that installs a JBI component

```
...
<target name="installDrools" description="Installs the drools engine.">
  <jbi-install-component port="1099"
                         file="servicemix-drools-3.3.0.6-fuse-installer.zip" />
</target>
...
```

Removing a component

The Ant task used to remove a JBI component is `jbi-uninstall-component`. Its attributes are listed in Table 6.9.

Table 6.9. Attributes for removing a JBI component using an Ant task

Attribute	Required	Description
host	no	Specifies the host name where the container is running; the default value is localhost
port	no	Specifies the port where the container's RMI registry is listening; the default value is 1099

Attribute	Required	Description
username	no	Specifies the username used to access the management features of the container
password	no	Specifies the password used to access the management features of the container
failOnError	no	Specifies if an error will cause the entire build to fail
name	yes	Specifies the component's name

Example 6.7 shows an Ant target that removes the drools component.

Example 6.7. Ant target that removes a JBI component

```
...
<target name="removeDrools" description="Removes the drools engine.">
  <jbi-uninstall-component port="1099"
                           name="servicemix-drools" />
</target>
...
```

Starting a component

The Ant task used to start a JBI component is `jbi-start-component`. Its attributes are listed in Table 6.10.

Table 6.10. Attributes for starting a JBI component using an Ant task

Attribute	Required	Description
host	no	Specifies the host name where the container is running; the default value is `localhost`
port	no	Specifies the port where the container's RMI registry is listening; the default value is `1099`.
username	no	Specifies the username used to access the management features of the container

Attribute	Required	Description
password	no	Specifies the password used to access the management features of the container
failOnError	no	Specifies if an error will cause the entire build to fail
name	yes	Specifies the component's name

Example 6.8 shows an Ant target that starts the drools component.

Example 6.8. Ant target that starts a JBI component

```
...
<target name="startDrools" description="Starts the drools engine.">
  <jbi-start-component port="1099" name="servicemix-drools" />
</target>
...
```

Stopping a component

The Ant task used to stop a JBI component is `jbi-start-component`. Its attributes are listed in Table 6.11.

Table 6.11. Attributes for stopping a JBI component using an Ant task

Attribute	Required	Description
host	no	Specifies the host name where the container is running; the default value is `localhost`
port	no	Specifies the port where the container's RMI registry is listening; the default value is `1099`
username	no	Specifies the username used to access the management features of the container
password	no	Specifies the password used to access the management features of the container
failOnError	no	Specifies if an error will cause the entire build to fail

Attribute	Required	Description
name	yes	Specifies the component's name

Example 6.9 shows an Ant target that stops the drools component.

Example 6.9. Ant target that stops a JBI component

```
...
<target name="stopDrools" description="Stops the drools engine.">
  <jbi-stop-component port="1099" name="servicemix-drools" />
</target>
...
```

Shutting down a component

The Ant task used to shut down a JBI component is `jbi-shut-down-component`. Its attributes are listed in Table 6.12.

Table 6.12. Attributes for shutting down a JBI component using an Ant task

Attribute	Required	Description
host	no	Specifies the host name where the container is running; the default value is `localhost`
port	no	Specifies the port where the container's RMI registry is listening; the default value is `1099`
username	no	Specifies the username used to access the management features of the container
password	no	Specifies the password used to access the management features of the container
failOnError	no	Specifies if an error will cause the entire build to fail
name	yes	Specifies the component's name

Example 6.10 shows an Ant target that shuts down the drools component.

Example 6.10. Ant target that shuts down a JBI component

```
...
<target name="shutdownDrools" description="Stops the drools engine.">
  <jbi-shut-down-component port="1099" name="servicemix-drools" />
</target>
...
```

Installing a shared library

The Ant task used to install a shared library is `jbi-install-shared-library`. Its attributes are listed in Table 6.13.

Table 6.13. Attributes for installing a shared library using an Ant task

Attribute	Required	Description
`host`	no	Specifies the host name where the container is running; the default value is `localhost`
`port`	no	Specifies the port where the container's RMI registry is listening; the default value is `1099`
`username`	no	Specifies the username used to access the management features of the container
`password`	no	Specifies the password used to access the management features of the container
`failOnError`	no	Specifies if an error will cause the entire build to fail
`file`	yes	Specifies the name of the installer file for the library

Removing a shared library

The Ant task used to remove a shared library is `jbi-uninstall-shared-library`. Its attributes are listed in Table 6.14.

Table 6.14. Attributes for removing a shared library using an Ant task

Attribute	Required	Description
`host`	no	Specifies the host name where the container is running; the default value is `localhost`
`port`	no	Specifies the port where the container's RMI registry is listening; the default value is `1099`
`username`	no	Specifies the username used to access the management features of the container
`password`	no	Specifies the password used to access the management features of the container
`failOnError`	no	Specifies if an error will cause the entire build to fail
`name`	yes	Specifies the name of the library

Chapter 7. Building JBI Components Using Maven

Overview

Fuse ESB Enterprise provides Maven tooling that simplifies the creation and deployment of JBI artifacts. Among the tools provided are:

- Plug-ins for packaging JBI components
- A plug-in for packaging shared libraries
- Archetypes that create starting point projects for JBI artifacts

The Fuse ESB Enterprise Maven tools also include plug-ins for creating service units and service assemblies. However, those plug-ins are not described in this book.

Setting up the Maven tools

In order to use the Fuse ESB Enterprise Maven tools, you add the elements shown in Example 7.1 to your POM file.

Example 7.1. POM elements for using Fuse ESB Enterprise Maven tools

```
...
<pluginRepositories>
  <pluginRepository>
    <id>fusesource.m2</id>
    <name> Open Source Community Release Repository</name>
    <url>http://repo.fusesource.com/maven2</url>
    <snapshots>
      <enabled>false</enabled>
    </snapshots>
    <releases>
      <enabled>true</enabled>
    </releases>
  </pluginRepository>
</pluginRepositories>
<repositories>
  <repository>
    <id>fusesource.m2</id>
    <name> Open Source Community Release Repository</name>
    <url>http://repo.fusesource.com/maven2</url>
    <snapshots>
       <enabled>false</enabled>
```

```
    </snapshots>
    <releases>
      <enabled>true</enabled>
    </releases>
  </repository>
  <repository>
    <id>fusesource.m2-snapshot</id>
    <name> Open Source Community Snapshot Repository</name>
    <url>http://repo.fusesource.com/maven2-snapshot</url>
    <snapshots>
      <enabled>true</enabled>
    </snapshots>
    <releases>
      <enabled>false</enabled>
    </releases>
  </repository>
</repositories>
  ...
<build>
  <plugins>
    <plugin>
      <groupId>org.apache.servicemix.tooling</groupId>
      <artifactId>jbi-maven-plugin</artifactId>
      <version>${servicemix-version}</version>
      <extensions>true</extensions>
    </plugin>
  </plugins>
</build>
  ...
```

These elements point Maven to the correct repositories to download the Fuse ESB Enterprise Maven tools and to load the plug-in that implements the tools.

Creating a JBI Maven project

The Fuse ESB Enterprise Maven tools provide a number of archetypes that can be used to seed a JBI project. The archetype generates the proper file structure for the project along with a POM file that contains the metadata required for the specified project type.

Example 7.2 shows the command for using the JBI archetypes.

Example 7.2. Command for JBI maven archetypes

```
mvn archetype:create -DarchetypeGroupId=org.apache.servicemix.tooling
-DarchetypeArtifactId=servicemix-archetype-name
-DarchetypeVersion=fuse-4.0.0.0
[-DgroupId=org.apache.servicemix.samples.embedded]
[-DartifactId=servicemix-embedded-example]
```

The value passed to the `-DarchetypeArtifactId` argument specifies the type of project you are creating.

JBI components

As shown in Example 7.3, you specify a value of `jbi-component` for the project's `packaging` element, which informs the Fuse ESB Enterprise Maven tooling that the project is for a JBI component.

Example 7.3. Specifying that a maven project results in a JBI component

```
<project ...>
  ...
  <groupId>org.apache.servicemix</groupId>
  <artifactId>MyBindingComponent</artifactId>
  <packaging>jbi-component</packaging>
  ...
</project>
```

The `plugin` element responsible for packaging the JBI component is shown in Example 7.4. The `groupId` element, the `artifactId` element, the `version` element, and the `extensions` element are common to all instances of the Fuse ESB Enterprise Maven plug-in. If you use the Maven archetypes to generate the project, you should not have to change them.

Example 7.4. Plug-in specification for packaging a JBI component

```
...
<plugin>
  <groupId>org.apache.servicemix.tooling</groupId>
  <artifactId>jbi-maven-plugin</artifactId>
  <version>${servicemix-version}</version>
  <extensions>true</extensions>
  <configuration>
    <type>service-engine</type>
    <bootstrap>org.apache.servicemix.samples.MyBootstrap</bootstrap>
    <component>org.apache.servicemix.samples.MyComponent</component>
  </configuration>
</plugin>
...
```

The `configuration` element, along with its children, provides the Fuse ESB Enterprise tooling with the metadata necessary to construct the `jbi.xml` file required by the component.

`type`

Specifies the type of JBI component the project is building. Valid values are:

- `service-engine` for creating a service engine
- `binding-component` for creating a binding component

`bootstrap`

Specifies the name of the class that implements the JBI `Bootstrap` interface for the component.

Tip

You can omit this element if you intend to use the default `Bootstrap` implementation provided with Fuse ESB Enterprise.

`component`

Specifies the name of the class that implements the JBI `Component` interface for that component.

Once the project is properly configured, you can build the JBI component by using the **mvn install** command. The Fuse ESB Enterprise Maven tooling will generate a standard jar containing both the component and an installable JBI package for the component.

Shared libraries

As shown in Example 7.5, to instruct the Fuse ESB Enterprise Maven tooling that the project is for a shared library you specify a value of `jbi-shared-library` for the project's `packaging` element.

Example 7.5. Specifying that a maven project results in a JBI shared library

```
<project ...>
  ...
  <groupId>org.apache.servicemix</groupId>
  <artifactId>MyBindingComponent</artifactId>
  <packaging>jbi-shared-library</packaging>
  ...
</project>
```

You build the shared library using the **mvn install** command. The Fuse ESB Enterprise Maven tooling generates a standard jar containing the shared library and an installable JBI package for the shared library.

Chapter 8. Deploying JBI Endpoints Using Maven

Fuse ESB Enterprise provides a Maven plug-in and a number of Maven archetypes that make developing, packaging, and deploying applications easier.

The tooling provides you with a number of benefits, including:

- Automatic generation of JBI descriptors
- Dependency checking
- Service assembly deployment

Because Fuse ESB Enterprise only allows you to deploy service assemblies, you must do the following when using Maven tooling:

1. Set up a top-level project to build all of the service units and the final service assembly (see "Setting up a Fuse ESB Enterprise JBI project" on page 56).
2. Create a project for each of your service units (see "A service unit project" on page 61).
3. Create a project for the service assembly (see "A service assembly project" on page 67).

Setting up a Fuse ESB Enterprise JBI project

Overview

When working with the Fuse ESB Enterprise JBI Maven tooling, you create a top-level project that can build all of the service units and then package them into a service assembly. Using a top-level project for this purpose has several advantages:

- It allows you to control the dependencies for all of the parts of an application in a central location.
- It limits the number of times you need to specify the proper repositories to load.
- It provides you a central location from which to build and deploy the application.

The top-level project is responsible for assembling the application. It uses the Maven assembly plug-in and lists your service units and the service assembly as modules of the project.

Directory structure

Your top-level project contains the following directories:

- A source directory containing the information required for the Maven assembly plug-in
- A directory to store the service assembly project
- At least one directory containing a service unit project

Tip

You will need a project folder for each service unit that is to be included in the generated service assembly.

Setting up the Maven tools

To use the Fuse ESB Enterprise JBI Maven tooling, add the elements shown in Example 8.1 to your top-level POM file.

Example 8.1. POM elements for using Fuse ESB Enterprise Maven tooling

```
...
<pluginRepositories>
```

```
  <pluginRepository>
    <id>fusesource.m2</id>
    <name> Open Source Community Release Repository</name>
    <url>http://repo.fusesource.com/maven2</url>
    <snapshots>
      <enabled>false</enabled>
    </snapshots>
    <releases>
      <enabled>true</enabled>
    </releases>
  </pluginRepository>
</pluginRepositories>
<repositories>
  <repository>
    <id>fusesource.m2</id>
    <name> Open Source Community Release Repository</name>
    <url>http://repo.fusesource.com/maven2</url>
    <snapshots>
       <enabled>false</enabled>
    </snapshots>
    <releases>
      <enabled>true</enabled>
    </releases>
  </repository>
  <repository>
    <id>fusesource.m2-snapshot</id>
    <name> Open Source Community Snapshot Repository</name>
    <url>http://repo.fusesource.com/maven2-snapshot</url>
    <snapshots>
      <enabled>true</enabled>
    </snapshots>
    <releases>
      <enabled>false</enabled>
    </releases>
  </repository>
</repositories>
  ...
<build>
  <plugins>
    <plugin>
      <groupId>org.apache.servicemix.tooling</groupId>
      <artifactId>jbi-maven-plugin</artifactId>
      <version>servicemix-version</version>
      <extensions>true</extensions>
    </plugin>
  </plugins>
</build>
  ...
```

These elements point Maven to the correct repositories to download the Fuse ESB Enterprise Maven tooling and to load the plug-in that implements the tooling.

Listing the sub-projects

The top-level POM lists all of the service units and the service assembly that is generated as modules. The modules are contained in a `modules` element. The `modules` element contains one `module` element for each service unit in the assembly. You also need a `module` element for the service assembly.

The modules are listed in the order in which they are built. This means that the service assembly module is listed after all of the service unit modules.

Example JBI project pOM

Example 8.2 shows a top-level POM for a project that contains a single service unit.

Example 8.2. Top-level POM for a Fuse ESB Enterprise JBI project

```
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
                             http://maven.apache.org/maven-v4_0_0.xsd">
  <modelVersion>4.0.0</modelVersion>

  <parent>
    <groupId>com.widgets</groupId>
    <artifactId>demos</artifactId>
    <version>1.0</version>
  </parent>

  <groupId>com.widgets.demo</groupId>
  <artifactId>cxf-wsdl-first</artifactId>
  <name>CXF WSDL Fisrt Demo</name>
  <packaging>pom</packaging>

  <pluginRepositories> ❶
    <pluginRepository>
      <id>fusesource.m2</id>
      <name> Open Source Community Release Repository</name>
      <url>http://repo.fusesource.com/maven2</url>
      <snapshots>
        <enabled>false</enabled>
      </snapshots>
      <releases>
        <enabled>true</enabled>
      </releases>
    </pluginRepository>
```

```
</pluginRepositories>
<repositories>
  <repository>
    <id>fusesource.m2</id>
    <name> Open Source Community Release Repository</name>
    <url>http://repo.fusesource.com/maven2</url>
    <snapshots>
       <enabled>false</enabled>
    </snapshots>
    <releases>
      <enabled>true</enabled>
    </releases>
  </repository>
  <repository>
    <id>fusesource.m2-snapshot</id>
    <name> Open Source Community Snapshot Repository</name>
    <url>http://repo.fusesource.com/maven2-snapshot</url>
    <snapshots>
      <enabled>true</enabled>
    </snapshots>
    <releases>
      <enabled>false</enabled>
    </releases>
  </repository>
</repositories>

<modules> ❷
  <module>wsdl-first-cxfse-su</module>
   <module>wsdl-first-cxf-sa</module>
</modules>

<build>
  <plugins>
    <plugin> ❸
      <groupId>org.apache.maven.plugins</groupId>
      <artifactId>maven-assembly-plugin</artifactId>
       <version>2.1</version>
       <inherited>false</inherited>
         <executions>
           <execution>
              <id>src</id>
              <phase>package</phase>
              <goals>
                <goal>single</goal>
              </goals>
              <configuration>
                <descriptors>
                  <descriptor>src/main/assembly/src.xml</descriptor>
                </descriptors>
```

```
                </configuration>
              </execution>
            </executions>
          </plugin>
          <plugin> ❹
            <groupId>org.apache.servicemix.tooling</groupId>
            <artifactId>jbi-maven-plugin</artifactId>
            <extensions>true</extensions>
          </plugin>
    </plugins>
  </build>
</project>
```

The top-level POM shown in Example 8.2 on page 58 does the following:

❶ Configures Maven to use the repositories for loading the Fuse ESB Enterprise plug-ins.

❷ Lists the sub-projects used for this application. The `wsdl-first-cxfse-su` module is the module for the service unit. The `wsdl-first-cxf-sa` module is the module for the service assembly

❸ Configures the Maven assembly plug-in.

❹ Loads the Fuse ESB Enterprise JBI plug-in.

A service unit project

Overview

Each service unit in the service assembly must be its own project. These projects are placed at the same level as the service assembly project. The contents of a service unit's project depends on the component at which the service unit is targeted. At the minimum, a service unit project contains a POM and an XML configuration file.

Seeding a project using a Maven artifact

Fuse ESB Enterprise provides Maven artifacts for a number of service unit types. They can be used to seed a project with the **smx-arch** command. As shown in Example 8.3, the **smx-arch** command takes three arguments. The `groupId` value and the `artifactId` values correspond to the project's group ID and artifact ID.

Example 8.3. Maven archetype command for service units

```
smx-arch su suArchetypeName ["-DgroupId=my.group.id"]
["-DartifactId=my.artifact.id"]
```

Important

The double quotes(") are required when using the `-DgroupId` argument and the `-DartifactId` argument.

The *suArchetypeName* specifies the type of service unit to seed. Table 8.1 lists the possible values and describes what type of project is seeded.

Table 8.1. Service unit archetypes

Name	Description
camel	Creates a project for using the Apache Camel service engine
cxf-se	Creates a project for developing a Java-first service using the Apache CXF service engine
cxf-se-wsdl-first	Creates a project for developing a WSDL-first service using the Apache CXF service engine
cxf-bc	Creates an endpoint project targeted at the Apache CXF binding component

Name	Description
http-consumer	Creates a consumer endpoint project targeted at the HTTP binding component
http-provider	Creates a provider endpoint project targeted at the HTTP binding component
jms-consumer	Creates a consumer endpoint project targeted at the JMS binding component (see *Using the JMS Binding Component*)
jms-provider	Creates a provider endpoint project targeted at the JMS binding component (see *Using the JMS Binding Component*)
file-poller	Creates a polling (consumer) endpoint project targeted at the file binding component (see "Using Poller Endpoints" in *Using the File Binding Component*)
file-sender	Creates a sender (provider) endpoint project targeted at the file binding component (see "Using Sender Endpoints" in *Using the File Binding Component*)
ftp-poller	Creates a polling (consumer) endpoint project targeted at the FTP binding component
ftp-sender	Creates a sender (provider) endpoint project targeted at the FTP binding component
jsr181-annotated	Creates a project for developing an annotated Java service to be run by the JSR181 service engine [a]
jsr181-wsdl-first	Creates a project for developing a WSDL generated Java service to be run by the JSR181 service engine [a]

Name	Description
saxon-xquery	Creates a project for executing xquery statements using the Saxon service engine
saxon-xslt	Creates a project for executing XSLT scripts using the Saxon service engine
eip	Creates a project for using the EIP service engine. [b]
lwcontainer	Creates a project for deploying functionality into the lightweight container [c]
bean	Creates a project for deploying a POJO to be executed by the bean service engine
ode	Create a project for deploying a BPEL process into the ODE service engine

[a]The JSR181 has been deprecated. The Apache CXF service engine has superseded it.

[b]The EIP service engine has been deprecated. The Apache Camel service engine has superseded it.

[c]The lightweight container has been deprecated.

Contents of a project

The contents of your service unit project change from service unit to service unit. Different components require different configuration. Some components, such as the Apache CXF service engine, require that you include Java classes.

At a minimum, a service unit project will contain two things:

- a POM file that configures the JBI plug-in to create a service unit
- an XML configuration file stored in `src/main/resources`

  For many of the components, the XML configuration file is called `xbean.xml`. The Apache Camel component uses a file called `camel-context.xml`.

Configuring the Maven plug-in

You configure the Maven plug-in to package the results of the project build as a service unit by changing the value of the project's `packaging` element to `jbi-service-unit` as shown in Example 8.4.

Example 8.4. Configuring the maven plug-in to build a service unit

```
<project ...>
  <modelVersion>4.0.0</modelVersion>

  ...
  <groupId>com.widgets.demo.cxf-wsdl-first</groupId>
  <artifactId>cxfse-wsdl-first-su</artifactId>
  <name>CXF WSDL Fisrt Demo :: SE Service Unit</name>
  <packaging>jbi-service-unit</packaging>
  ...
</project>
```

Specifying the target components

To correctly fill in the metadata required for packaging a service unit, the Maven plug-in must be told what component (or components) the service unit is targeting. If your service unit only has a single component dependency, you can specify it in one of two ways:

- List the targeted component as a dependency
- Add a `componentName` property specifying the targeted component

If your service unit has more than one component dependency, you must configure the project as follows:

1. Add a `componentName` property specifying the targeted component.
2. Add the remaining components to the list dependencies.

Example 8.5 shows the configuration for a service unit targeting the Apache CXF binding component.

Example 8.5. Specifying the target components for a service unit

```
...
<dependencies>
  <dependency>
    <groupId>org.apache.servicemix</groupId>
    <artifactId>servicemix-cxf-bc</artifactId>
    <version>3.3.1.0-fuse</version>[1]
  </dependency>
>/dependencies>
...
```

[1] You replace this with the version of Apache CXF you are using.

The advantage of using the Maven dependency mechanism is that it allows Maven to verify if the targeted component is deployed in the container. If one of the components is not deployed, Fuse ESB Enterprise will not hold off deploying the service unit until all of the required components are deployed.

Tip

Typically, a message identifying the missing component(s) is written to the log.

If your service unit's targeted component is not available as a Maven artifact, you can specify the targeted component using the `componentName` element. This element is added to the standard Maven properties block and it specifies the name of a targeted component, as specified in Example 8.6.

Example 8.6. Specifying a target component for a service unit

```
...
<properties>
  <componentName>servicemix-bean</componentName>
</properties>
...
```

When you use the `componentName` element, Maven does not check to see if the component is installed, nor does it download the required component.

Example

Example 8.7 shows the POM file for a project that is building a service unit targeted to the Apache CXF binding component.

Example 8.7. POM file for a service unit project

```
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
                             http://maven.apache.org/maven-v4_0_0.xsd">

    <modelVersion>4.0.0</modelVersion>

    <parent> ❶
        <groupId>com.widgets.demo</groupId>
        <artifactId>cxf-wsdl-first</artifactId>
        <version>1.0</version>
    </parent>

  <groupId>com.widgets.demo.cxf-wsdl-first</groupId>
  <artifactId>cxfse-wsdl-first-su</artifactId>
```

```
  <name>CXF WSDL Fisrt Demo :: SE Service Unit</name>
  <packaging>jbi-service-unit</packaging> ❷

  <dependencies> ❸
    <dependency>
      <groupId>org.apache.servicemix</groupId>
      <artifactId>servicemix-cxf-bc</artifactId>
      <version>3.3.1.0-fuse</version>
    </dependency>
  >/dependencies>

  <build>
    <plugins>
      <plugin> ❹
        <groupId>org.apache.servicemix.tooling</groupId>
        <artifactId>jbi-maven-plugin</artifactId>
        <extensions>true</extensions>
      </plugin>
    </plugins>
  </build>
</project>
```

The POM file in Example 8.7 on page 65 does the following:

❶ Specifies that it is a part of the top-level project shown in Example 8.2 on page 58

❷ Specifies that this project builds a service unit

❸ Specifies that the service unit targets the Apache CXF binding component

❹ Specifies to use the Fuse ESB Enterprise Maven plug-in

A service assembly project

Overview

Fuse ESB Enterprise requires that all service units are bundled into a service assembly before they can be deployed to a container. The Fuse ESB Enterprise Maven plug-in collects all of the service units to be bundled and the metadata necessary for packaging. It will then build a service assembly containing the service units.

Seeding a project using a Maven artifact

Fuse ESB Enterprise provides a Maven artifact for seeding a service assembly project. You can seed a project with the **smx-arch** command. As shown in Example 8.8, the **smx-arch** command takes two arguments: the `groupId` value and the `artifactId` values, which correspond to the project's group ID and artifact ID.

Example 8.8. Maven archetype command for service assemblies

`smx-arch` sa ["-DgroupId=*my.group.id*"] ["-DartifactId=*my.artifact.id*"]

Important

The double quotes(") are required when using the `-DgroupId` argument and the `-DartifactId` argument.

Contents of a project

A service assembly project typically only contains the POM file used by Maven.

Configuring the Maven plug-in

T configure the Maven plug-in to package the results of the project build as a service assembly, change the value of the project's `packaging` element to `jbi-service-assembly`, as shown in Example 8.9.

Example 8.9. Configuring the Maven plug-in to build a service assembly

```
<project ...>
  <modelVersion>4.0.0</modelVersion>

  ...
  <groupId>com.widgets.demo.cxf-wsdl-first</groupId>
  <artifactId>cxf-wsdl-first-sa</artifactId>
  <name>CXF WSDL Fisrt Demo :: Service Assembly</name>
  <packaging>jbi-service-assembly</packaging>
```

```
  ...
</project>
```

Specifying the target components

The Maven plug-in must know what service units are being bundled into the service assembly. This is done by specifying the service units as dependencies, using the standard Maven `dependencies` element. Add a `dependency` child element for each service unit. Example 8.10 shows the configuration for a service assembly that bundles two service units.

Example 8.10. Specifying the target components for a service unit

```
...
<dependencies>
  <dependency>
    <groupId>com.widgets.demo.cxf-wsdl-first</groupId>
    <artifactId>cxfse-wsdl-first-su</artifactId>
    <version>1.0</version>
  </dependency>
  <dependency>
    <groupId>com.widgets.demo.cxf-wsdl-first</groupId>
    <artifactId>cxfbc-wsdl-first-su</artifactId>
    <version>1.0</version>
  </dependency>
</dependencies>
...
```

Example

Example 8.11 shows a POM file for a project that is building a service assembly.

Example 8.11. POM for a service assembly project

```
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
                             http://maven.apache.org/maven-v4_0_0.xsd">

    <modelVersion>4.0.0</modelVersion>

    <parent> ❶
        <groupId>com.widgets.demo</groupId>
        <artifactId>cxf-wsdl-first</artifactId>
        <version>1.0</version>
    </parent>

  <groupId>com.widgets.demo.cxf-wsdl-first</groupId>
```

```
  <artifactId>cxf-wsdl-first-sa</artifactId>
  <name>CXF WSDL Fisrt Demo ::  Service Assemby</name>
  <packaging>jbi-service-assembly</packaging> ❷

  <dependencies> ❸
    <dependency>
      <groupId>com.widgets.demo.cxf-wsdl-first</groupId>
      <artifactId>cxfse-wsdl-first-su</artifactId>
      <version>1.0</version>
    </dependency>
    <dependency>
      <groupId>com.widgets.demo.cxf-wsdl-first</groupId>
      <artifactId>cxfbc-wsdl-first-su</artifactId>
      <version>1.0</version>
    </dependency>
  </dependencies>

  <build>
    <plugins>
      <plugin> ❹
        <groupId>org.apache.servicemix.tooling</groupId>
        <artifactId>jbi-maven-plugin</artifactId>
        <extensions>true</extensions>
      </plugin>
    </plugins>
  </build>
</project>
```

The POM in Example 8.11 on page 68 does the following:

❶ Specifies that it is a part of the top-level project shown in Example 8.2 on page 58

❷ Specifies that this project builds a service assembly

❸ Specifies the service units being bundled by the service assembly

❹ Specifies to use the Fuse ESB Enterprise Maven plug-in

Appendix A. Using the JBI Console Commands

Accessing the JBI commands

The **jbi** commands allow you to manage JBI artifacts that are deployed in the Fuse ESB Enterprise runtime.

Type `jbi:` then press **Tab** at the `karaf@root>` prompt to view the available commands.

Commands

Table A.1 describes the **jbi** commands available . For detailed information about the console commands in Fuse ESB Enterprise, see the *Console Reference*.

Table A.1. JBI Commands

Command	Description
jbi:list	Lists all of the JBI artifacts deployed into the Fuse ESB Enterprise container. The list is separated into JBI components and JBI service assemblies. It displays the name of the artifact and its life-cycle state.
jbi:shutdown *artifact*	Moves the specified artifact from the stopped state to the shutdown state.
jbi:stop *artifact*	Moves the specified artifact into the stopped state.
jbi:start *artifact*	Moves the specified artifact into the started state.

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