Progress FUSE™

FUSE™ Mediation Router

Deployment Guide

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Deployment Guide

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Chapter 1. Deploying a Standalone Router

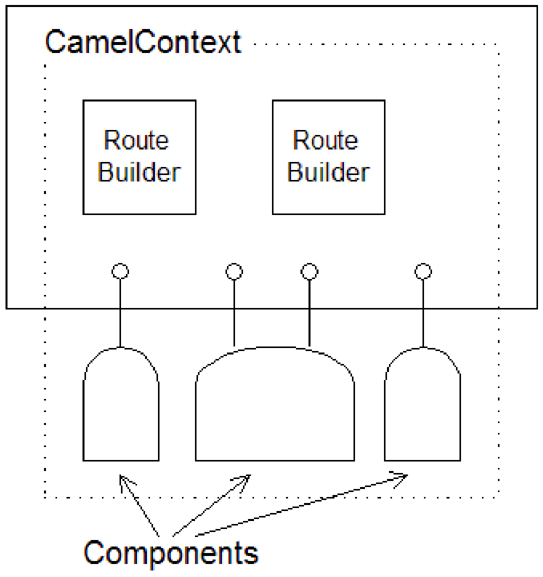
This chapter describes how to deploy FUSE Mediation Router in standalone mode. Standalone mode indicates the router can be deployed independent of any container. However, some extra programming steps are required.

Introduction to Standalone Deployment

Overview

Figure 1.1 on page 10 shows an overview of the architecture for a router deployed in standalone mode.

Figure 1.1. Standalone Router



CamelContext

The CamelContext represents the router service itself. In contrast to most container deployment modes (where the CamelContext instance is normally hidden), the standalone deployment requires you to explicitly create and initialize the CamelContext in your application code. As part of the initialization procedure, you explicitly create components and route builders and add them to the CamelContext.

Components

Components represent connections to particular kinds of destination—for example, a file system, a Web service, a JMS broker, or a CORBA service. In order to read and write messages to and from various destinations, you must configure and register components by adding them to the CamelContext.

RouteBuilder

The `RouteBuilder` classes represent the core of a router application, because they define the routing rules. In a standalone deployment, the developer is responsible for managing the lifecycle of `RouteBuilder` objects. In particular, the developer must create instances of the `RouteBuilder` objects and register them by adding them to the CamelContext.

Defining a Standalone Main Method

Overview

In the case of a standalone deployment, the application developer to creates, configures and starts a CamelContext instance (which encapsulates the core of the router functionality). For this purpose, you should define a `main()` method that performs the following key tasks:

1. Create a `CamelContext` instance.
2. Add components to the `CamelContext` instance.
3. Add `RouteBuilder` objects to the `CamelContext` instance.
4. Start the `CamelContext` instance, so that it activates the routing rules you defined.

Example of a standalone main method

Example 1.1 on page 12 shows the standard outline of a standalone `main()` method, which is defined in an example class, `CamelJmsToFileExample`. This example shows how to initialize and activate a `CamelContext` instance.

Example 1.1. Standalone Main Method

```
package org.apache.camel.example.jmstofile;

import javax.jms.ConnectionFactory;

import org.apache.activemq.ActiveMQConnectionFactory;
import org.apache.camel.CamelContext;
import org.apache.camel.CamelTemplate;
import org.apache.camel.Exchange;
import org.apache.camel.Processor;
import org.apache.camel.builder.RouteBuilder;
import org.apache.camel.component.jms.JmsComponent;
import org.apache.camel.impl.DefaultCamelContext;

public final class CamelJmsToFileExample {

    private CamelJmsToFileExample() {
    }

    public static void main(String args[]) throws Exception
{ ❶
```

```
        CamelContext context = new DefaultCamelContext(); ❷

        // Add components to the CamelContext. ❸
        // ... (not shown)

        // Add routes to the CamelContext. ❹
        // ... (not shown)

        // Start the context.
        context.start(); ❺

        // End of main thread.
    }
}
```

The code in Example 1.1 on page 12 does the following:

❶ Define a static `main()` method to serve as the entry point for running the standalone router.

❷ Instantiates a `CamelContext` instance explicitly. There is just one implementation of `CamelContext` currently available, the `DefaultCamelContext` class.

❸ Adds any components that are required to the `CamelContext` (see "Adding Components to the Camel Context" on page 14).

❹ Adds the `RouteBuilder` objects to the `CamelContext` (see "Adding RouteBuilders to the CamelContext" on page 16).

❺ The `CamelContext.start()` method creates a new thread and starts to process incoming messages using the registered routing rules. If the main thread now exits, the `CamelContext` sub-thread remains active and continues to process messages. Typically, you can stop the router by typing **Ctrl**+**C** in the window where you launched the router application (or by sending a `kill` signal in UNIX). If you want more control over stopping the router process, you can use the `CamelContext.stop()` method in combination with an instrumentation library (such as JMX).

Adding Components to the Camel Context

Relationship between components and endpoints

The essential difference between components and endpoints is that, when configuring a component, you provide concrete connection details (for example, hostname and IP port), whereas, when specifying an endpoint URI, you provide abstract identifiers (for example, queue name and service name). It is also possible to define *multiple* endpoints for each component. For example, a single message broker (represented by a component) can support connections to multiple different queues (represented by endpoints).

The relationship between an endpoint and a component is established through a *URI prefix*. Whenever you add a component to a `CamelContext` instance, the component gets associated with a particular URI prefix (specified as the first argument to the `CamelContext.addComponent()` method). Endpoint URIs that start with that prefix are then automatically parsed by the associated component.

Example of adding a component

Example 1.2 on page 14 shows the outline of the standalone `main()` method, highlighting the details of how to add a JMS component to the `CamelContext` instance.

Example 1.2. Adding a Component to the CamelContext

```
public final class CamelJmsToFileExample {
    ...
    public static void main(String args[]) throws Exception {
        CamelContext context = new DefaultCamelContext();

        // Add components to the CamelContext.
        ConnectionFactory connectionFactory = new ActiveMQConnectionFactory("vm://local
host?broker.persistent=false"); ❶
        context.addComponent("test-jms", JmsComponent.jmsComponentAutoAcknowledge(connec
tionFactory)); ❷

        // Add routes to the CamelContext.
        // ... (not shown)

        // Start the context.
        context.start();

        // End of main thread.
    }
}
```

Where the preceding code can be explained as follows:

❶ Before you can add a JMS component to the `CamelContext` instance, you must create a JMS connection factory (an implementation of `javax.jms.ConnectionFactory`). In this example, the JMS connection factory is implemented by the FUSE Message Broker class, `ActiveMQConnectionFactory`. The broker URL, `vm://localhost`, specifies a broker that is co-located in the same Java Virtual Machine (JVM) as the router. The broker library automatically instantiates the new broker when you try to send it a message.

❷ Add a JMS component named `test-jms` to the `CamelContext` instance. This example uses a JMS componenet with the *auto-acknowledge* option set to true. This implies that messages received from a JMS queue will automatically be acknowledged (receipt confirmed) by the JMS component.

Adding RouteBuilders to the CamelContext

Overview

`RouteBuilder` objects represent the core of a router application, because they embody the routing rules you want to implement. In the case of a standalone deployment, you must manage the lifecycle of your `RouteBuilder` objects explicitly, which involves instantiating the `RouteBuilder` classes and adding them to the `CamelContext` instance.

Example of adding a RouteBuilder

Example 1.3 on page 16 shows the outline of the standalone `main()` method, highlighting details of how to add a `RouteBuilder` object to a `CamelContext` instance.

Example 1.3. Adding a RouteBuilder to the CamelContext

```
package org.apache.camel.example.jmstofile;
...
public class JmsToFileRoute extends RouteBuilder { ❶
    public void configure() {
        from("test-jms:queue:test.queue").to("file://test"); ❷
        // set up a listener on the file component
        from("file://test").process(new Processor() { ❸
            public void process(Exchange e) {
                System.out.println("Received exchange: " + e.getIn());
            }
        });
    }
}

public final class CamelJmsToFileExample {
    ...
    public static void main(String args[]) throws Exception {
        CamelContext context = new DefaultCamelContext();

        // Add components to the CamelContext.
        // ... (not shown)

        // Add routes to the CamelContext.
        context.addRoutes(new JmsToFileRoute()); ❹

        // Start the context.
        context.start();

        // End of main thread.
    }
}
```

Where the preceding code can be explained as follows:

❶ Define a class that extends `org.apache.camel.builder.RouteBuilder` to define the routing rules. If required, you can define multiple `RouteBuilder` classes.

> **Note**
>
> When defining routes that include transactional components, you must extend `org.apache.camel.spring.SpringRouteBuilder` instead of `RouteBuilder`. See "Transactional Client" in *Implementing Enterprise Integration Patterns*.

❷ The first route implements a hop from a JMS queue to the file system. That is, messages are read from the JMS queue, `test.queue`, and then written to files in the `test` directory. The JMS endpoint, which has a URI prefixed by `test-jms`, uses the JMS component registered in Example 1.2 on page 14.

❸ The second route reads (and deletes) the messages from the `test` directory and displays the messages in the console window. To display the messages, the route implements a custom processor (implemented inline).

❹ Call the `CamelContext.addRoutes()` method to add a `RouteBuilder` object to the `CamelContext` instance.

Running a Standalone Application

Setting the environment

You configure your application's environment by adding all of the JAR files in *RouterRoot*/lib and *RouterRoot*/lib/optional to your CLASSPATH. This step can be simplified if you use a general-purpose build tool such as Apache Maven[1] or Apache Ant[2] to build your application.

Running the application

Assuming that you have coded a main() method, as described in "Defining a Standalone Main Method" on page 12, you can run your application using Sun's J2SE interpreter with the following command:

```
java org.apache.camel.example.jmstofile.CamelJmsToFileExample
```

If you are developing the application using a Java IDE (for example, Eclipse[3] or IntelliJ[4]), you can typically run your application by selecting the CamelJmsToFileExample class and directing the IDE to run the class. Normally, an IDE automatically chooses the static main() method as the entry point to run the class.

[1] http://maven.apache.org/
[2] http://ant.apache.org/
[3] http://www.eclipse.org/
[4] http://www.jetbrains.com/idea/

Chapter 2. Deploying into a Spring Container

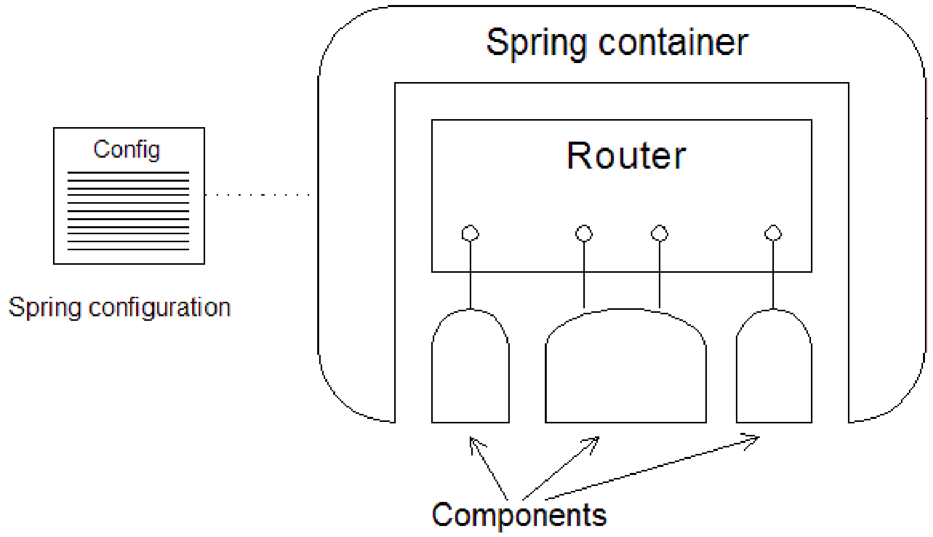
This chapter describes how to deploy the FUSE Mediation Router into a Spring container. A notable feature of the Spring container deployment is that it enables you to specify routing rules in an XML configuration file.

Introduction to Spring Deployment

Overview

Figure 2.1 on page 20 shows an overview of the architecture for a router deployed into a Spring container.

Figure 2.1. Router Deployed in a Spring Container



Spring wrapper class

To instantiate a Spring container, FUSE Mediation Router provides the Spring wrapper class, `org.apache.camel.spring.Main`, which exposes methods for creating a Spring container. The wrapper class simplifies the procedure for creating a Spring container because it includes a lot of boilerplate code required for the router. For example, the wrapper class specifies a default location for the Spring configuration file and adds the Camel context schema to the Spring configuration, enabling you to specify routes using the `camelContext` XML element.

Lifecycle of RouteBuilder objects

The Spring container is responsible for managing the lifecycle of `RouteBuilder` objects. In practice, this means that the router developer only defines the `RouteBuilder` classes. The Spring container finds and instantiates the `RouteBuilder` objects after it starts (see "Spring Configuration" on page 23).

Spring configuration file

The Spring configuration file is a key feature of the Spring container. Through the Spring configuration file you can instantiate and link together Java objects. You can also configure any Java object using the dependency injection feature.

In addition to these generic features of the Spring configuration file, FUSE Mediation Router defines an extension schema that enables you to define routing rules in XML.

Component configuration

In order to use certain transport protocols in your routes, you must configure the corresponding component and add it to the Camel context. You can add components to the Camel context by defining `bean` elements in the Spring configuration file (see "Configuring components" on page 24).

Defining a Spring Main Method

Overview

FUSE Mediation Router defines a convenient wrapper class for the Spring container. To instantiate a Spring container instance, you simply write a short `main()` method that delegates creation of the container to the wrapper class.

Example of a Spring main method

Example 2.1 on page 22 shows how to define a Spring `main()` method for your router application.

Example 2.1. Spring Main Method

```
package my.package.name;

public class Main {
    public static void main(String[] args) {
        org.apache.camel.spring.Main.main(args);
    }
}
```

Where `org.apache.camel.spring.Main` is the Spring wrapper class, which defines a static `main()` method that instantiates the Spring container.

Spring Configuration

Overview

You can use a Spring configuration file to configure the following basic aspects of a router application:

- Specify the Java packages that contain `RouteBuilder` classes
- Define routing rules in XML
- Configure components

In addition to these core aspects of router configuration you can take advantage of the generic Spring mechanisms for configuring and linking together Java objects within the Spring container.

Location of the Spring configuration file

The Spring configuration file for your router application must be stored in the following directory, relative to your `CLASSPATH` (that is, the parent of `META-INF` must appear on your `CLASSPATH`):

```
META-INF/spring/
```

The Spring container reads *any* file that matches the pattern `META-INF/spring/*.xml` and, there can be more than one such file. For the examples discussed here, the Spring configuration is stored in a single file, which is called `camel-context.xml`.

Basic Spring configuration

Example 2.2 on page 23 shows a basic Spring XML configuration file that instantiates and activates `RouteBuilder` objects defined in the *`my.package.name`* Java package.

Example 2.2. Basic Spring XML Configuration

```
<?xml version="1.0" encoding="UTF-8"?>

<!-- Configures the Camel Context-->
<beans xmlns="http://www.springframework.org/schema/beans"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xsi:schemaLocation="
       http://www.springframework.org/schema/beans http://www.springframe
work.org/schema/beans/spring-beans-2.0.xsd ❶
       http://activemq.apache.org/camel/schema/spring http://act
ivemq.apache.org/camel/schema/spring/camel-spring.xsd"> ❷
```

```
  <camelContext xmlns="http://activemq.apache.org/camel/schema/spring"> ❸
    <package>my.package.name</package> ❹
  </camelContext>
</beans>
```

Where the preceding configuration can be explained as follows:

❶ This line specifies the location of the Spring framework schema. The URL should represent a real, physical location from where you can download the schema. The version of the Spring schema currenlty supported by FUSE Mediation Router is Spring 2.0.

❷ This line specifies the location of the Camel context schema. The URL shown in this example always points to the latest version of the schema.

❸ Define a `camelContext` element, which belongs to the namespace, http://activemq.apache.org/camel/schema/spring.

❹ Use the `package` element to specify one or more Java package names. As it starts up, the Spring wrapper automatically instantiates and activates any `RouteBuilder` classes that it finds in the specified packages.

Configuring components

To configure router components, use the generic Spring bean configuration mechanism (which implements a *dependency injection* configuration pattern). That is, you define a Spring `bean` element to create a component instance, where the `class` attribute specifies the full class name of the relevant FUSE Mediation Router component, and the `properties` element is used to set Bean properties on the component class.

Example 2.3 on page 24 shows how to configure a JMS component using Spring configuration. This component configuration enables you to access endpoints of the format `jms:[queue|topic]:QueueOrTopicName` in your routing rules.

Example 2.3. Configuring Components in Spring

```
<?xml version="1.0" encoding="UTF-8"?>

<beans ... >

  <camelContext useJmx="true" xmlns="http://activemq.apache.org/camel/schema/spring">
    <!-- Java packages (not shown) ... -->
  </camelContext>

  <!-- Configure the default ActiveMQ broker URL -->
  <bean id="jms" class="org.apache.camel.component.jms.JmsComponent"> ❶
```

```
    <property name="connectionFactory"> ❷
       <bean class="org.apache.activemq.ActiveMQConnectionFactory"> ❸
         <property name="brokerURL" value="vm://localhost?broker.persist
ent=false&amp;broker.useJmx=false"/> ❹
       </bean>
    </property>
  </bean>

</beans>
```

Where the preceding configuration can be explained as follows:

❶ Use the `class` attribute to specify the name of the component class—in this example, the JMS component class is being used. The `id` attribute specifies the prefix to use for JMS endpoint URIs. For example, with the `id` equal to `jms` you can connect to an endpoint like `jms:queue:FOO.BAR` in your application code.

❷ When you set the property named, connectionFactory, Spring implicitly calls the `JmsComponent.setConnectionFactory()` method to initialize the JMS component at run time.

❸ The connection factory property is initialized to be an instance of `ActiveMQConnectionFactory` (that is, an instance of a FUSE Message Broker message queue).

❹ When you set the brokerURL property on `ActiveMQConnectionFactory`, Spring implicitly calls the `setBrokerURL()` method on the connection factory instance. In this example the broker URL, `vm://localhost`, specifies a broker that is co-located in the same Java Virtual Machine (JVM) as the router. The broker library automatically instantiates the new broker when you try to send it a message.

For more details about configuring components in Spring, see "List of Components" in *Component Reference*.

Running a Spring Application

Setting the CLASSPATH

Configure your application's `CLASSPATH` as follows:

1. Add all of the JAR files in `*RouterRoot*/lib` and `*RouterRoot*/lib/optional` to your `CLASSPATH`. This step can be simplified if you use a general-purpose build tool such as Apache Maven[1] or Apache Ant[2] to build your application.
2. Add the directory containing `META-INF/spring/*.xml` to your `CLASSPATH`.

Running the application

If you coded a `main()` method, as described in "Defining a Spring Main Method" on page 22, you can run your application using Sun's J2SE interpreter with the following command:

```
java my.package.name.Main
```

If you are developing the application using a Java IDE (for example, Eclipse[3] or IntelliJ[4]), you can typically run your application by selecting the `*my.package.name*.Main` class and directing the IDE to run the class. Normally, an IDE automatically chooses the static `main()` method as the entry point to run the class.

[1] http://maven.apache.org/
[2] http://ant.apache.org/
[3] http://www.eclipse.org/
[4] http://www.jetbrains.com/idea/