Tutorial-JmsRemoting

Tutorial on Spring Remoting with JMS

Thanks
This tutorial was kindly donated to Apache Camel by Martin Gilday.

Preface

This tutorial aims to guide the reader through the stages of creating a project which uses Camel to facilitate the routing of messages from a JMS queue to a Spring service. The route works in a synchronous fashion returning a response to the client.

Prerequisites

This tutorial uses Maven to setup the Camel project and for dependencies for artifacts.

Distribution

This sample is distributed with the Camel distribution as `examples/camel-example-spring-jms`.

About

This tutorial is a simple example that demonstrates more the fact how well Camel is seamless integrated with Spring to leverage the best of both worlds. This sample is client server solution using JMS messaging as the transport. The sample has two flavors of servers and also for clients demonstrating different techniques for easy communication.

The Server is a JMS message broker that routes incoming messages to a business service that does computations on the received message and returns a response.
The EIP patterns used in this sample are:

Pattern	Description
Message Channel	We need a channel so the Clients can communicate with the server.
Message	The information is exchanged using the Camel Message interface.
Message Translator	This is where Camel shines as the message exchange between the Server and the Clients are text based strings with numbers. However our business service uses int for numbers. So Camel can do the message translation automatically.
Message Endpoint	It should be easy to send messages to the Server from the the clients. This is achieved with Camel's powerful Endpoint pattern that even can be more powerful combined with Spring remoting. The tutorial has clients using each kind of technique for this.
Point to Point Channel	The client and server exchange data using point to point using a JMS queue.
Event Driven Consumer	The JMS broker is event driven and is invoked when the client sends a message to the server.

We use the following Camel components:

Component	Description
ActiveMQ	We use Apache ActiveMQ as the JMS broker on the Server side
Bean	We use the bean binding to easily route the messages to our business service. This is a very powerful component in Camel.
File	In the AOP enabled Server we store audit trails as files.
JMS	Used for the JMS messaging

Create the Camel Project

For the purposes of the tutorial a single Maven project will be used for both the client and server. Ideally you would break your application down into the appropriate components.
mvn archetype:generate -DgroupId=org.example -DartifactId=CamelWithJmsAndSpring

Update the POM with Dependencies

First we need to have dependencies for the core Camel jars, spring, jms components, and finally ActiveMQ as the message broker.{snippet:id=e1|lang=xml|url=camel/trunk/examples/camel-example-spring-jms/pom.xml}As we use spring xml configuration for the ActiveMQ JMS broker we need this dependency:{snippet:id=e2|lang=xml|url=camel/trunk/examples/camel-example-spring-jms/pom.xml}

Writing the Server

Create the Spring Service

For this example the Spring service (our business service) on the server will be a simple multiplier which trebles in the received value.{snippet:id=e1|lang=java|url=camel/trunk/examples/camel-example-spring-jms/src/main/java/org/apache/camel/example/server/Multiplier.java}And the implementation of this service is:{snippet:id=e1|lang=java|url=camel/trunk/examples/camel-example-spring-jms/src/main/java/org/apache/camel/example/server/Treble.java}Notice that this class has been annotated with the @Service spring annotation. This ensures that this class is registered as a bean in the registry with the given name **multiplier**.

Define the Camel Routes

{snippet:id=e1|lang=java|url=camel/trunk/examples/camel-example-spring-jms/src/main/java/org/apache/camel/example/server/ServerRoutes.java}This defines a Camel route *from* the JMS queue named **numbers** *to* the Spring bean named **multiplier**. Camel will create a consumer to the JMS queue which forwards all received messages onto the the Spring bean, using the method named **multiply**.

Configure Spring

The Spring config file is placed under `META-INF/spring` as this is the default location used by the Camel Maven Plugin, which we will later use to run our server.
First we need to do the standard scheme declarations in the top. In the camel-server.xml we are using spring beans as the default **bean:** namespace and springs **context:**. For configuring ActiveMQ we use **broker:** and for Camel we of course have **camel:**. Notice that we don't use version numbers for the camel-spring schema. At runtime the schema is resolved in the Camel bundle. If we use a specific version number such as 1.4 then its IDE friendly as it would be able to import it and provide smart completion etc. See Xml Reference for further details.{snippet:id=e1|lang=xml|url=camel/trunk/examples/camel-example-spring-jms/src/main/resources/META-INF/spring/camel-server.xml}We use Spring annotations for doing IoC dependencies and its component-scan features comes to the rescue as it scans for spring annotations in the given package name:{snippet:id=e2|lang=xml|url=camel/trunk/examples/camel-example-spring-jms/src/main/resources/META-INF/spring/camel-server.xml}Camel will of course not be less than Spring in this regard so it supports a similar feature for scanning of Routes. This is configured as shown below.
Notice that we also have enabled the JMXAgent so we will be able to introspect the Camel Server with a JMX Console.{snippet:id=e3|lang=xml|url=camel/trunk/examples/camel-example-spring-jms/src/main/resources/META-INF/spring/camel-server.xml}The ActiveMQ JMS broker is also configured in this xml file. We set it up to listen on TCP port 61610.{snippet:id=e4|lang=xml|url=camel/trunk/examples/camel-example-spring-jms/src/main/resources/META-INF/spring/camel-server.xml}As this examples uses JMS then Camel needs a JMS component that is connected with the ActiveMQ broker. This is configured as shown below:{snippet:id=e5|lang=xml|url=camel/trunk/examples/camel-example-spring-jms/src/main/resources/META-INF/spring/camel-server.xml}**Notice:** The JMS component is configured in standard Spring beans, but the gem is that the bean id can be referenced from Camel routes - meaning we can do routing using the JMS Component by just using **jms:** prefix in the route URI. What happens is that Camel will find in the Spring Registry for a bean with the id="jms". Since the bean id can have arbitrary name you could have named it id="jmsbroker" and then referenced to it in the routing as `from="jmsbroker:queue:numbers).to("multiplier");`
We use the vm protocol to connect to the ActiveMQ server as its embedded in this application.

component-scan	Defines the package to be scanned for Spring stereotype annotations, in this case, to load the "multiplier" bean
camel-context	Defines the package to be scanned for Camel routes. Will find the `ServerRoutes` class and create the routes contained within it
jms bean	Creates the Camel JMS component

Run the Server

The Server is started using the `org.apache.camel.spring.Main` class that can start camel-spring application out-of-the-box. The Server can be started in several flavors:

- as a standard java main application - just start the `org.apache.camel.spring.Main` class
- using maven jave:exec
- using camel:run

In this sample as there are two servers (with and without AOP) we have prepared some profiles in maven to start the Server of your choice.
The server is started with:
`mvn compile exec:java -PCamelServer`

Writing The Clients

This sample has three clients demonstrating different Camel techniques for communication

- CamelClient using the ProducerTemplate for Spring template style coding
- CamelRemoting using Spring Remoting
- CamelEndpoint using the Message Endpoint EIP pattern using a neutral Camel API

Client Using The ProducerTemplate

We will initially create a client by directly using `ProducerTemplate`. We will later create a client which uses Spring remoting to hide the fact that messaging is being used.{snippet:id=e1|lang=xml|url=camel/trunk/examples/camel-example-spring-jms/src/main/resources/camel-client.xml}{snippet:id=e2|lang=xml|url=camel/trunk/examples/camel-example-spring-jms/src/main/resources/camel-client.xml}{snippet:id=e3|lang=xml|url=camel/trunk/examples/camel-example-spring-jms/src/main/resources/camel-client.xml}The client will not use the Camel Maven Plugin so the Spring XML has been placed in *src/main/resources* to not conflict with the server configs.

camelContext	The Camel context is defined but does not contain any routes
template	The `ProducerTemplate` is used to place messages onto the JMS queue
jms bean	This initialises the Camel JMS component, allowing us to place messages onto the queue

And the CamelClient source code:{snippet:id=e1|lang=java|url=camel/trunk/examples/camel-example-spring-jms/src/main/java/org/apache/camel/example/client/CamelClient.java}The `ProducerTemplate` is retrieved from a Spring `ApplicationContext` and used to manually place a message on the "numbers" JMS queue. The `requestBody` method will use the exchange pattern InOut, which states that the call should be synchronous, and that the caller expects a response.

Before running the client be sure that both the ActiveMQ broker and the `CamelServer` are running.

Client Using Spring Remoting

Spring Remoting "eases the development of remote-enabled services". It does this by allowing you to invoke remote services through your regular Java interface, masking that a remote service is being called.{snippet:id=e1|lang=xml|url=camel/trunk/examples/camel-example-spring-jms/src/main/resources/camel-client-remoting.xml}The snippet above only illustrates the different and how Camel easily can setup and use Spring Remoting in one line configurations.

The **proxy** will create a proxy service bean for you to use to make the remote invocations. The **serviceInterface** property details which Java interface is to be implemented by the proxy. The **serviceUrl** defines where messages sent to this proxy bean will be directed. Here we define the JMS endpoint with the "numbers" queue we used when working with Camel template directly. The value of the **id** property is the name that will be the given to the bean when it is exposed through the Spring `ApplicationContext`. We will use this name to retrieve the service in our client. I have named the bean *multiplierProxy* simply to highlight that it is not the same multiplier bean as is being used by `CamelServer`. They are in completely independent contexts and have no knowledge of each other. As you are trying to mask the fact that remoting is being used in a real application you would generally not include proxy in the name.

And the Java client source code:{snippet:id=e1|lang=java|url=camel/trunk/examples/camel-example-spring-jms/src/main/java/org/apache/camel/example/client/CamelClientRemoting.java}Again, the client is similar to the original client, but with some important differences.

1. The Spring context is created with the new *camel-client-remoting.xml*
2. We retrieve the proxy bean instead of a `ProducerTemplate`. In a non-trivial example you would have the bean injected as in the standard Spring manner.
3. The multiply method is then called directly. In the client we are now working to an interface. There is no mention of Camel or JMS inside our Java code.

Client Using Message Endpoint EIP Pattern

This client uses the Message Endpoint EIP pattern to hide the complexity to communicate to the Server. The Client uses the same simple API to get hold of the endpoint, create an exchange that holds the message, set the payload and create a producer that does the send and receive. All done using the same neutral Camel API for **all** the components in Camel. So if the communication was socket TCP based you just get hold of a different endpoint and all the java code stays the same. That is really powerful.

Okay enough talk, show me the code!{snippet:id=e1|lang=java|url=camel/trunk/examples/camel-example-spring-jms/src/main/java/org/apache/camel/example/client/CamelClientEndpoint.java}Switching to a different component is just a matter of using the correct endpoint. So if we had defined a TCP endpoint as: `"mina:tcp://localhost:61610"` then its just a matter of getting hold of this endpoint instead of the JMS and all the rest of the java code is exactly the same.

Run the Clients

The Clients is started using their main class respectively.

- as a standard java main application - just start their main class
- using maven jave:exec

In this sample we start the clients using maven:
```
mvn compile exec:java -PCamelClient
mvn compile exec:java -PCamelClientRemoting
mvn compile exec:java -PCamelClientEndpoint
```

Also see the Maven `pom.xml` file how the profiles for the clients is defined.

Using the Camel Maven Plugin

The Camel Maven Plugin allows you to run your Camel routes directly from Maven. This negates the need to create a host application, as we did with Camel server, simply to start up the container. This can be very useful during development to get Camel routes running quickly.

pom.xml<build> <plugins> <plugin> <groupId>org.apache.camel</groupId> <artifactId>camel-maven-plugin</artifactId> </plugin> </plugins> </build>

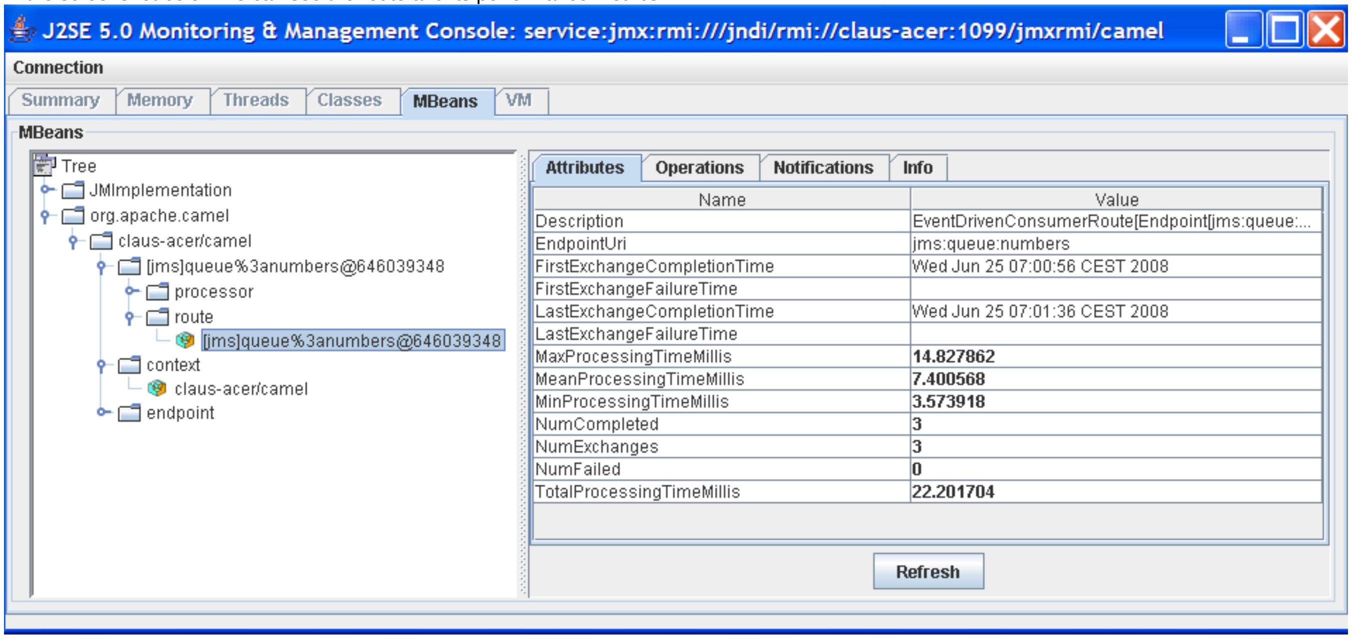
All that is required is a new plugin definition in your Maven POM. As we have already placed our Camel config in the default location (camel-server.xml has been placed in META-INF/spring/) we do not need to tell the plugin where the route definitions are located. Simply run `mvn camel:run`.

Using Camel JMX

Camel has extensive support for JMX and allows us to inspect the Camel Server at runtime. As we have enabled the JMXAgent in our tutorial we can fire up the jconsole and connect to the following service URI: `service:jmx:rmi:///jndi/rmi://localhost:1099/jmxrmi/camel`. Notice that Camel will log at INFO level the JMX Connector URI:

... DefaultInstrumentationAgent INFO JMX connector thread started on service:jmx:rmi:///jndi/rmi://claus-acer:1099/jmxrmi/camel ...

In the screenshot below we can see the route and its performance metrics:



Name	Value
Description	EventDrivenConsumerRoute[Endpoint[jms:queue:...
EndpointUri	jms:queue:numbers
FirstExchangeCompletionTime	Wed Jun 25 07:00:56 CEST 2008
FirstExchangeFailureTime	
LastExchangeCompletionTime	Wed Jun 25 07:01:36 CEST 2008
LastExchangeFailureTime	
MaxProcessingTimeMillis	14.827862
MeanProcessingTimeMillis	7.400568
MinProcessingTimeMillis	3.573918
NumCompleted	3
NumExchanges	3
NumFailed	0
TotalProcessingTimeMillis	22.201704

See Also

- Spring Remoting with JMS Example on Amin Abbaspour's Weblog