Apache Camel

Willem Jiang
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2010-08

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Who is Willem Jiang ?

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- Senior Software Engineer at Progress Software

  Working on Apache project for about 5 years

  Full time Apache Camel and CXF committer and PMC member

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Agenda

BUSINESS MAKING PROGRESS

- What is Apache Camel
- EIP examples
- Some cool features of Camel
- Riding tips of camel
- Q and A

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What is Camel?

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A Little History of Camel

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- Camel is found as a sub project of ActiveMQ
- The first code is committed
  - r519901 | jstrachan | 2007-03-19 11:54:57 +0100 (Mon, 19 Mar 2007) | 1 line
  - Initial checkin of Camel routing library
- Some codes were came from ServiceMix
  - ServiceMix EIP component
  - some other ServiceMix components
- Apache Camel 1.0 released June 2007
- Apache Camel 2.0 released August 2009
- Apache Camel 2.4 released July 2010
- Apache Camel is more than 3 years old

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ServiceMix, ActiveMQ, CXF and Camel

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ServiceMix, ActiveMQ, CXF and Camel

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- ServiceMix is an open source ESB.

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ServiceMix, ActiveMQ, CXF and Camel

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ServiceMix, ActiveMQ, CXF and Camel

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ServiceMix, ActiveMQ, CXF and Camel

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- ActiveMQ is an open source messaging provider.
- CXF is an open source service framework.

Camel is an open source integration framework based on known Enterprise Integration Patterns.

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Integration Framework

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Integration Framework

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- Why we need to do the integration?

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Integration Framework

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- Why we need to do the integration?
  - Application is built on different tech stacks

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Integration Framework

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- How can we do it ?

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Integration Framework

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Integration Framework

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Integration Framework

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Integration Framework

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  - Your application code will not touch with any middleware API

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Integration Framework

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A Camel can carry 4 times as much load as other beasts of burden!

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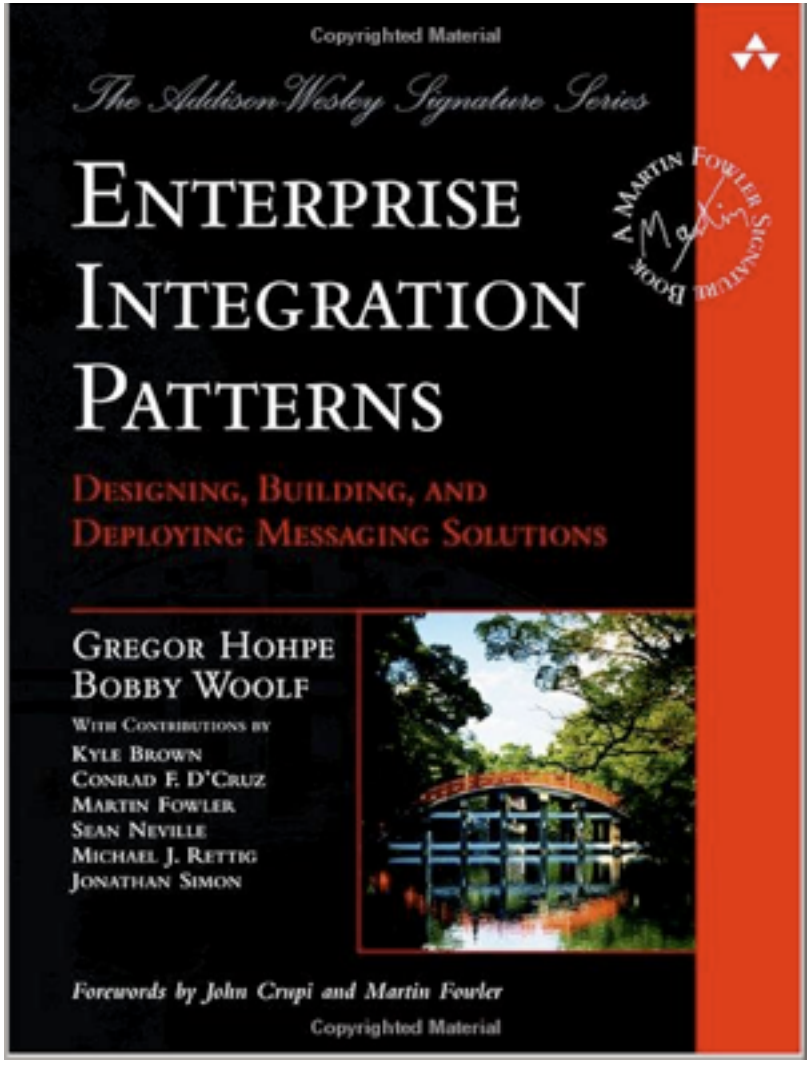
Book by Gregor & Bobby!



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Message Routing

Message Routing in EIP

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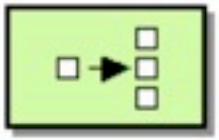
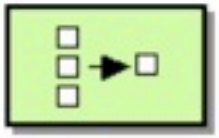
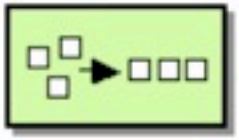
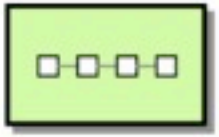
	Content Based Router	How do we handle a situation where the implementation of a single logical function (e.g., inventory check) is spread across multiple physical systems?
	Message Filter	How can a component avoid receiving uninteresting messages?
	Dynamic Router	How can you avoid the dependency of the router on all possible destinations while maintaining its efficiency?
	Recipient List	How do we route a message to a list of dynamically specified recipients?
	Splitter	How can we process a message if it contains multiple elements, each of which may have to be processed in a different way?
	Aggregator	How do we combine the results of individual, but related messages so that they can be processed as a whole?
	Resequencer	How can we get a stream of related but out-of-sequence messages back into the correct order?
	Routing Slip	How do we route a message consecutively through a series of processing steps when the sequence of steps is not known at design-time and may vary for each message?
	Throttler	How can I throttle messages to ensure that a specific endpoint does not get overloaded, or we don't exceed an agreed SLA with some external service?
	Delayer	How can I delay the sending of a message?
	Load Balancer	How can I balance load across a number of endpoints?
	Multicast	How can I route a message to a number of endpoints at the same time?
	Loop	How can I repeat processing a message in a loop?

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Simple Routing

Simple Routing


```
from("file:src/data?noop=true").
    to("jms:queue:myqueue");
```

More Simple Routing

More Simple Routing


```
from("rmi://localhost:1099/patch/to/service").
    to("netty:tcp://remotehost:1234");
```

Camel Components

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ActiveMQ	File	JBI	MINA	RMI	TCP
ActiveMQ Journal	FIX	JCR	Mock	RNC	Test
AMQP	Flatpack	JDBC	MSMQ	RNG	Timer
Atom	FTP	Jetty	MSV	SEDA	UDP
Bean	Hibernate	JMS	Multicast	SFTP	Validation
CXF	HTTP	JPA	POJO	SMTP	Velocity
DataSet	iBATIS	JT/400	POP	Spring Integration	VM
Direct	IMAP	List	Quartz	SQL	XMPP
Esper	IRC	Log	Queue	Stream	XQuery
Event	JavaSpace	Mail	Ref	String Template	XSLT

http://camel.apache.org/components.html

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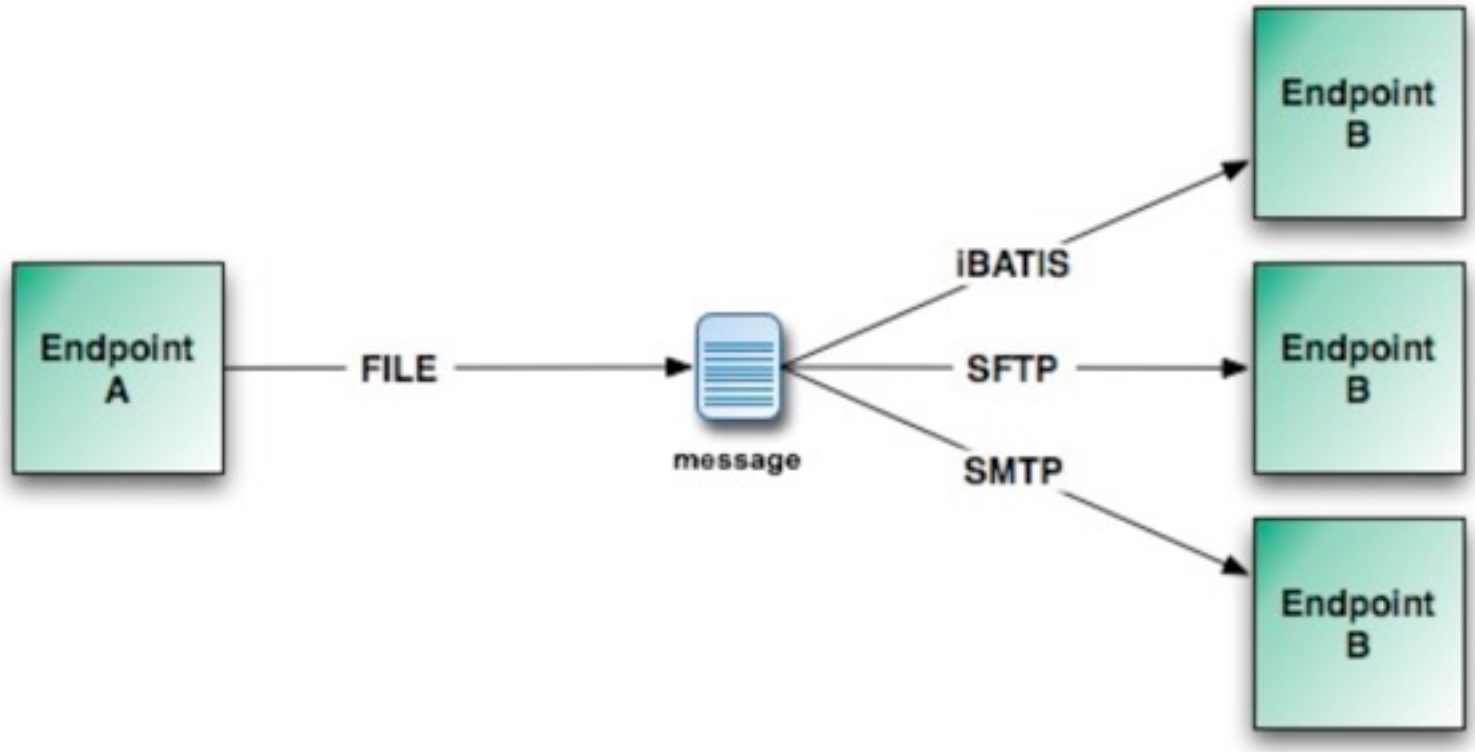
Pipeline

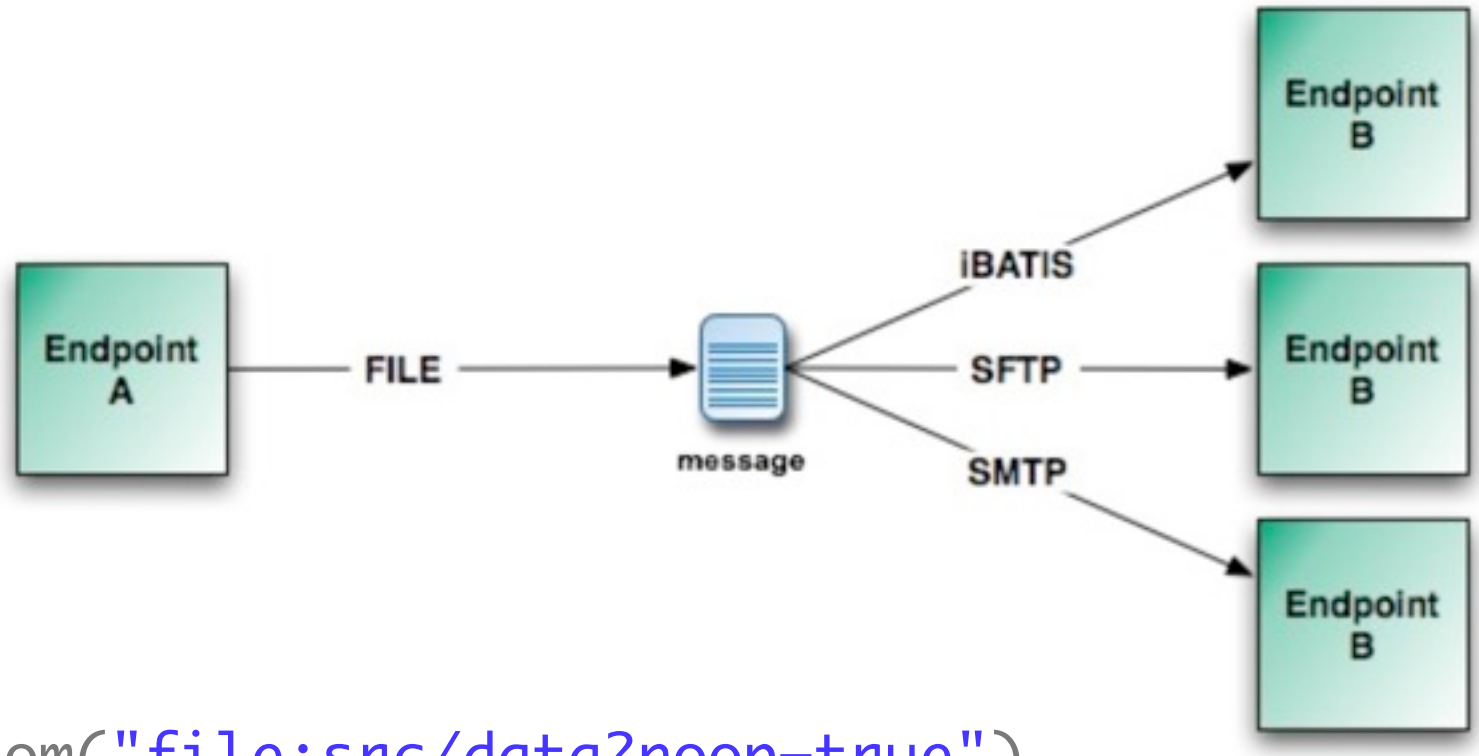
Pipeline


```
from("EndpointA").
    pipleline("EndpointB", "EndpointQ",
"EndpointR");
```

Multicast Routing



Multicast Routing




```
from("file:src/data?noop=true").
   multicast("ibatis://xxx", "sftp://xxx",
"smtp://xxx");
```

Some examples of the EIP implementation

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	Content Based Router	How do we handle a situation where the implementation of a single logical function (e.g., inventory check) is spread across multiple physical systems?
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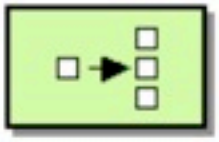
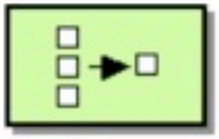
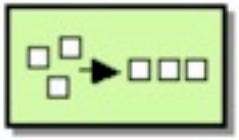
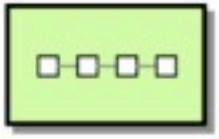
	Splitter	How can we process a message if it contains multiple elements, each of which may have to be processed in a different way?
	Aggregator	How do we combine the results of individual, but related messages so that they can be processed as a whole?
	Resequencer	How can we get a stream of related but out-of-sequence messages back into the correct order?
	Routing Slip	How do we route a message consecutively through a series of processing steps when the sequence of steps is not known at design-time and may vary for each message?
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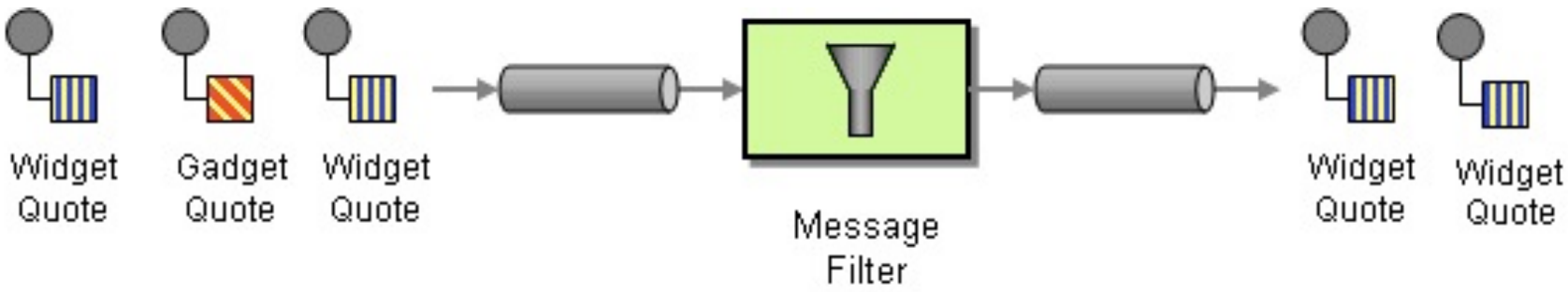
Message Filter



Message Filter

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```
<camelContext xmlns="http://camle.apache.org/schema/spring">
  <route>
    <from uri="activemq:topic:Quotes"/>
    <filter>
      <xpath>/quote/product = ‘widget’</xpath>
      <to uri="mqseries:WidgetQuotes"/>
    </filter>
  </route>
</camelContext>
```

```
from("activemq:topic:Quotes).
  filter().xpath("/quote/product = ‘widget’").
    to("mqseries:WidgetQuotes");
```


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Language Support For Message Processing

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- BeanShell
- Javascript
- Groovy
- Python
- PHP
- Ruby
- JSP EL
- OGNL
- SQL
- Xpath
- XQuery
- Simple

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Message Filter : Spring XML

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```
<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xmlns:schemaLocation="http://www.springframework.org/schema/beans
       http://www.springframework.org/schema/beans/spring-beans-2.5.xsd
       http://camel.apache.org/schema/spring
       http://camel.apache.org/schema/spring/camel-spring.xsd">

 <camelContext xmlns="http://camel.apache.org/schema/spring">
    <route>
      <from uri="activemq:topic:Quotes"/>
      <filter>
        <xpath>/quote/product = 'widget'</xpath>
        <to uri="mqseries:WidgetQuotes"/>
      </filter>
    </route>
  </camelContext>

</beans>
```


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Message Filter : Java Complete

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```
package com.acme.quotes;

import org.apache.camel.builder.RouteBuilder;

public class MyRouteBuilder extends RouteBuilder {

    public void configure() {

        // forward widget quotes to MQSeries
        from("activemq:topic:Quotes).
                filter().xpath("/quote/product = ‘widget’").
                to("mqseries:WidgetQuotes");
 }
}
```


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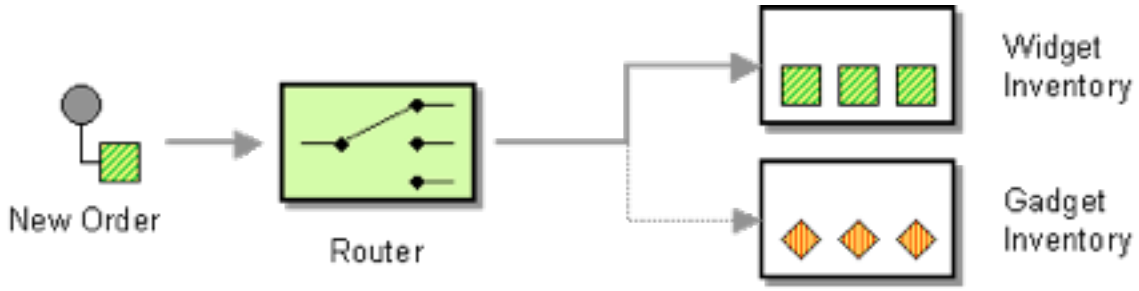
Content Base Router




```
from("activemq:NewOrders”).
  choice().when("/quote/product = ‘widget’").
    to("activemq:Orders.Widgets").
  choice().when("/quote/product = ‘gadget’").
    to("activemq:Orders.Gadgets").
  otherwise().to("activemq:Orders.Bad");
```

Content Based Router

```
<camelContext xmlns="http://camel.apache.org/schema/spring">
  <route>
    <from uri="activemq:NewOrders"/>
    <choice>
      <when>
        <xpath>/order/product = 'widget'</xpath>
        <to uri="activemq:Orders.Widgets"/>
      </when>
      <when>
        <xpath>/order/product = 'gadget'</xpath>
        <to uri="activemq:Orders.Gadgets"/>
      </when>
      <otherwise>
        <to uri="activemq:Orders.Bad"/>
      </otherwise>
    </choice>
  </route>
</camelContext>
```

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Some Cool features of Camel

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- Routing and mediation engine
- Domain-specific language
- Extensive component library
- Beans
- Type Conversion
- Data Format
- Test tools
- Maven tools
- ...

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Beans

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- Powerful bean integration
  - Adapt to you beans
  - EIP as @annotations
    - @Produce
    - @Consumer
    - @RecipientList
    - @RoutingSlip

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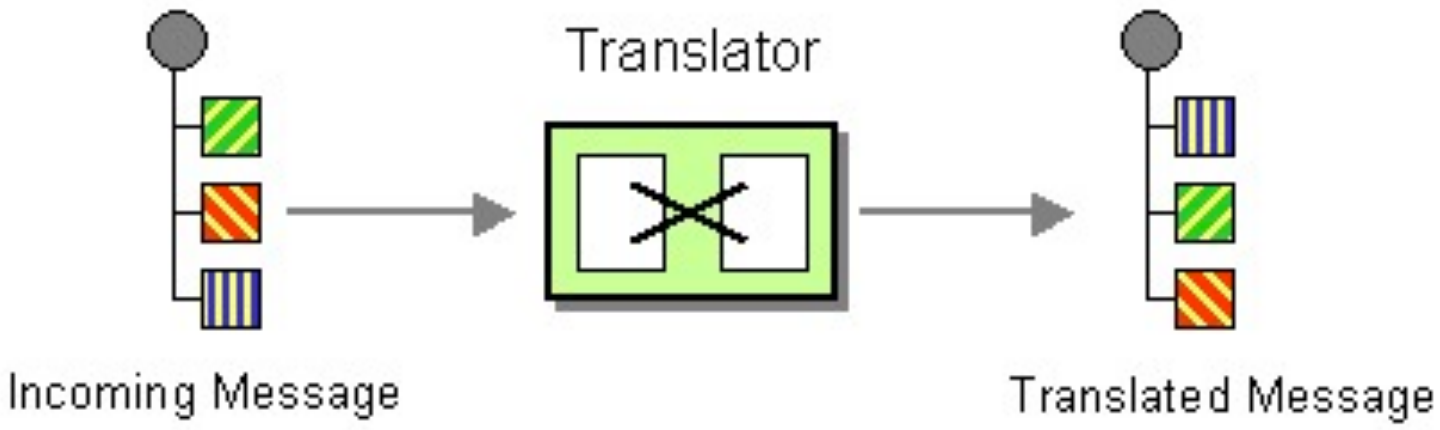
Bean as a Message Translator



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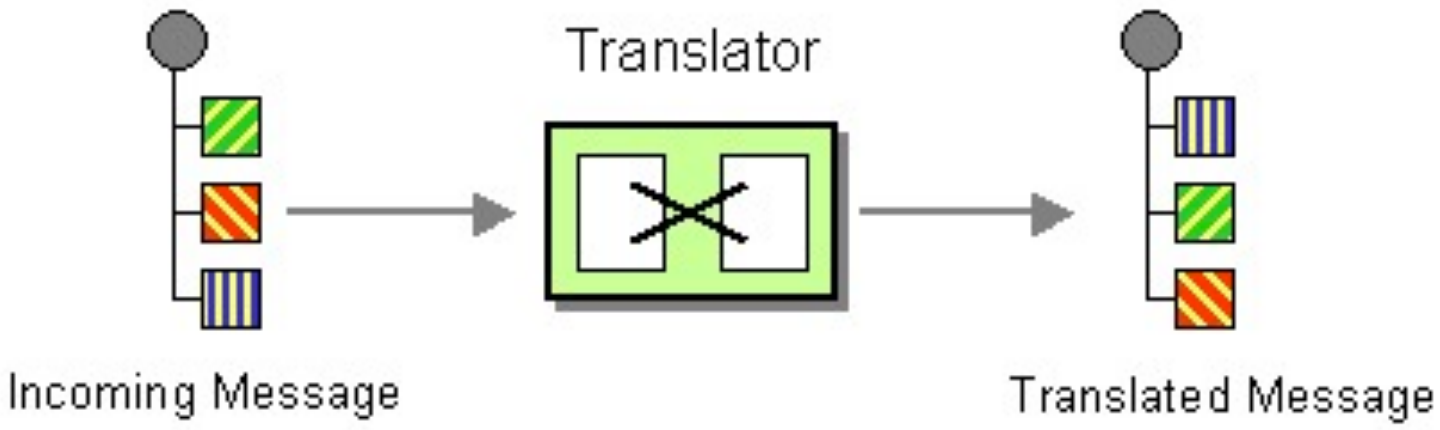
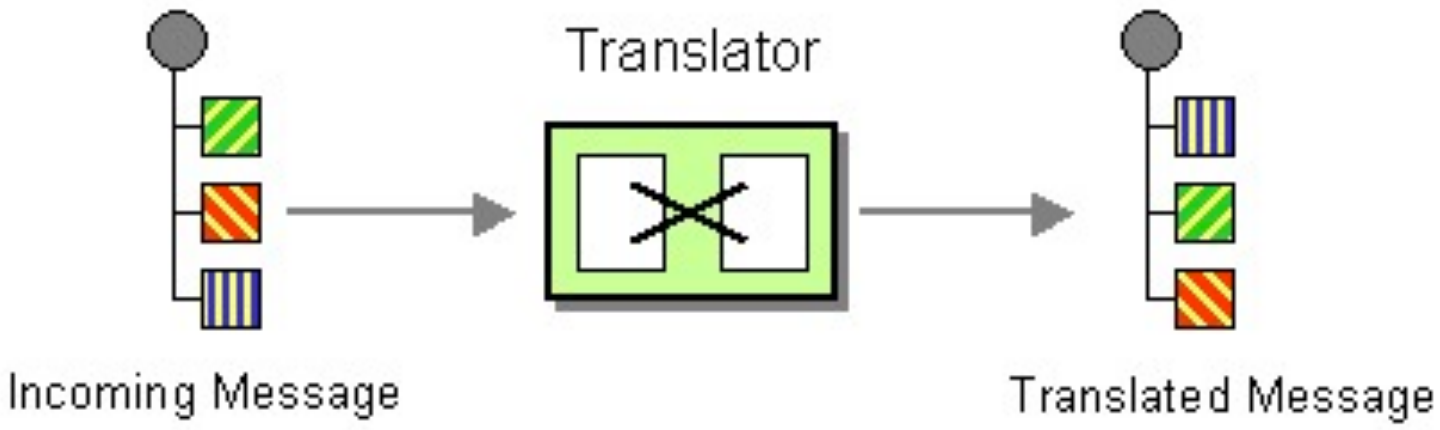



```
from("activemq:Incoming”).
  beanRef("myBeanName").
    to("activemq:Outgoing");
```

Bean as a Message Translator

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from("activemq:Incoming”).
  beanRef("myBeanName").
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public class Foo {

  public void someMethod(String name) {
    ...
  }
}
```

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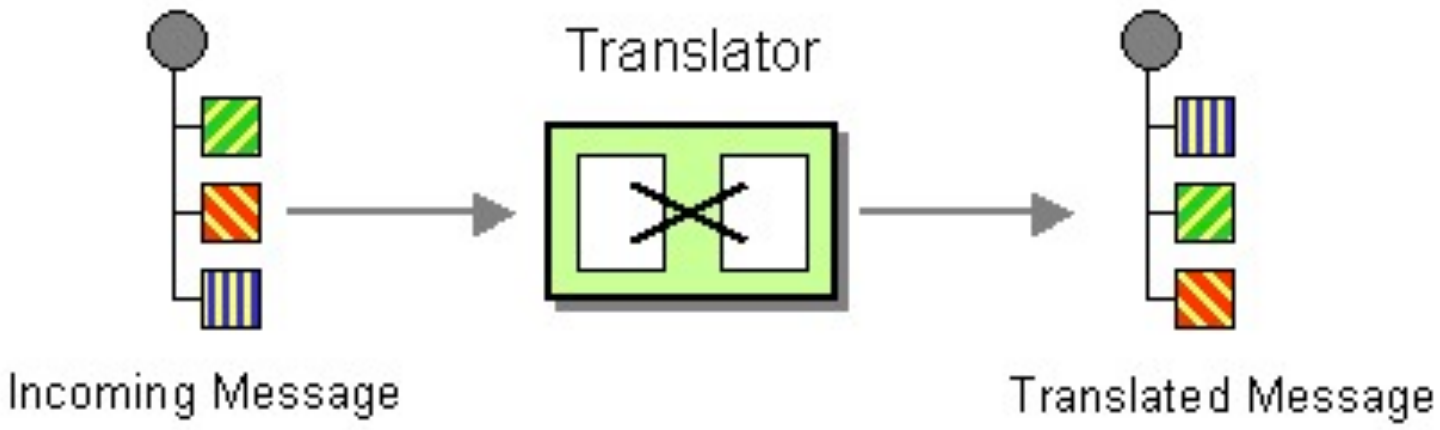


```
from("activemq:Incoming”).
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    to("activemq:Outgoing");

public class Foo {

  public void someMethod(String name) {
    ...
  }
}
```

Binding Method Arguments

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```
public class Foo {

  public void onCheese(
    @XPath("/foo/bar") String name,
    @Header("JMSCorrelationID") String id) {
    ...
  }
}
```


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Sending the message

```
public class MyCoolBean {

    @Produce(uri = "log:foo")
    protected ProducerTemplate producer;

    public void sendMsg() {
        producer.sendBody("Hello World");
    }

}
```

Consume the message and EIP annotation

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```
public class RouterBean {

    @Consume(uri = "direct:start")
    @RecipientList
    public String[] route(String body) {
        return new String[]{"mock:a",
"mock:b"};
    }
}
```


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Type Conversion

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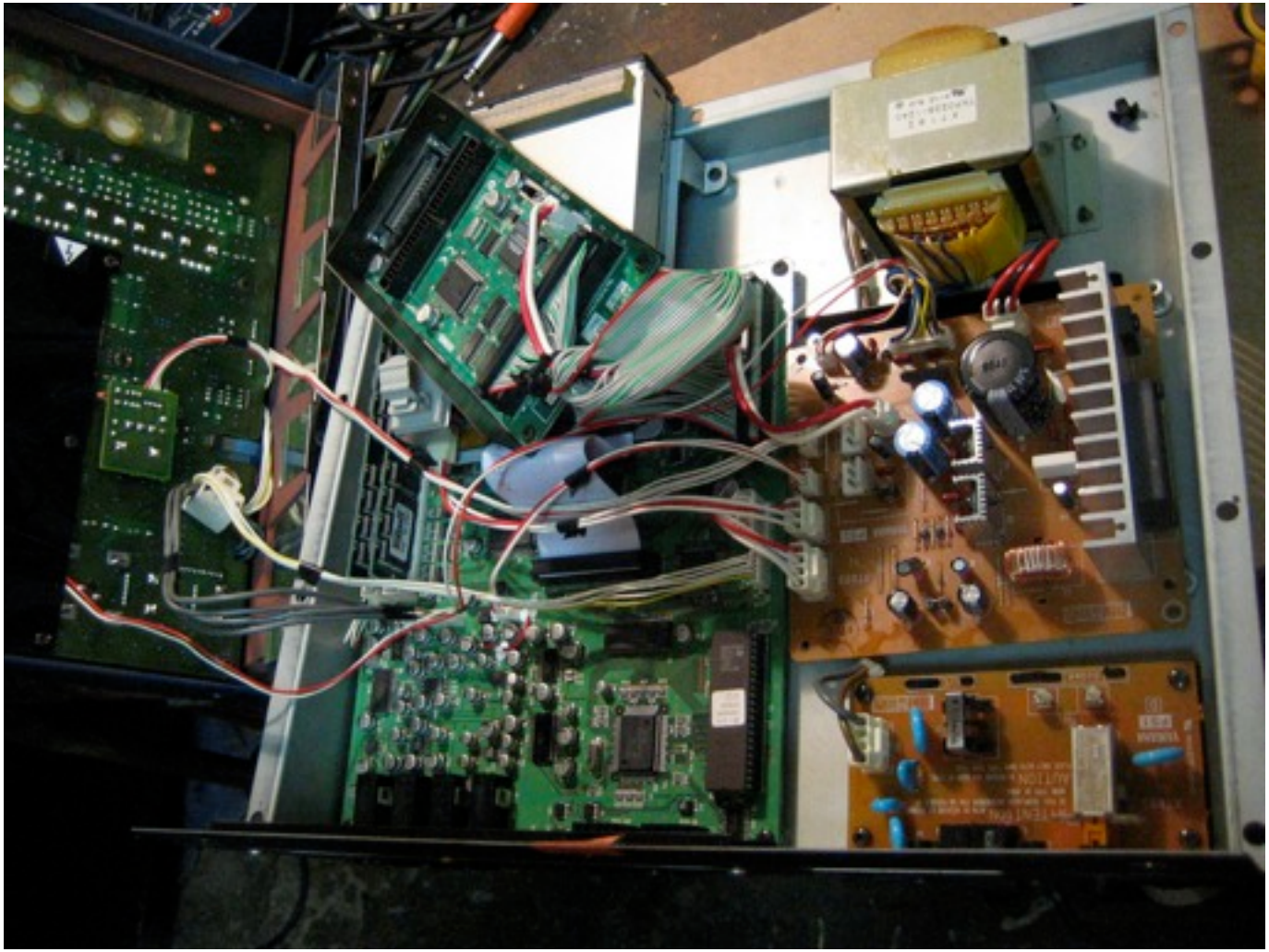

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Type Conversion

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```
package com.acme.foo.converters;

import org.apache.camel.Converter;
import java.io.*;

@Converter
public class IOConverter {

    @Converter
    public static InputStream toInputStream(File file)
throws FileNotFoundException {
        return new BufferedInputStream(new FileInputStream
(file));
    }
}
```

```
# META-INF/services/org/apache/camel/TypeConverter

com.acme.foo.converters
```


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Type Conversion

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```
from("direct:start").convertBodyTo
(InputStream.class).to("mock:result");
```

```
from("direct:start").process(new Processor(){
 public void process(Exchange exchange) {
  Message in = exchange.getIn();
  in.setBody(in.getBody(InputStream.class));
 }
}).to("mock:result");
```


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DataFormat

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- Camel has 18 Data Formats

bindy	protobuf
castor	serialization
csv	soap
crypto	tidy markup
flatpack	xml beans
gzip	xml security
hl7	xstream
jaxb	zip
json	dozer

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Data Format

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```
from("activemq:QueueWithJavaObjects).
  marshal().jaxb().
    to("mqseries:QueueWithXmlMessages");

from("activemq:QueueWithXmlMessages).
  unmarshal().jaxb().
    to("mqseries:QueueWithJavaObjects");
```


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Test kit

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- Mock Endpoint
  - You can use it check if the message is processed rightly
  - jMock like API, declarative expectations
  - The expectations can be asserted in a test case

- Test
  - JUnit based (3.x, 4.x)
  - Supports Spring
  - Easy to test
  - Quick prototyping

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Test support

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```
@ContextConfiguration
public class ProduceTemplateTest extends AbstractJUnit38SpringContextTests {
    @Autowired
    protected ProducerTemplate producer;

    @EndpointInject(uri = "mock:result")
    protected MockEndpoint result;

    public void testProducerTemplate() throws Exception {
        result.expectedBodiesReceived("hello");
        // lets send a message
        producer.sendBody("direct:start", "hello");
        result.assertIsSatisfied();
    }
}
```


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Test support

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```
@ContextConfiguration
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        producer.sendBody("direct:start", "hello");
        result.assertIsSatisfied();
    }
}
```

```
<camelContext id="camelContext" xmlns="http://camel.apache.org/schema/spring">
    <template id="camelTemplate" />
    <route>
       <from uri="direct:start"/>
       <to uri="mock:result"/>
    </route>
 </camelContext>
```


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Maven tooling

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- Maven Archetypes to create new projects

```
mvn archetype:generate \
  -DarchetypeGroupId=org.apache.camel.archetypes \
  -DarchetypeArtifactId=camel-archetype-java \
  -DarchetypeVersion=2.4.0
```

- Maven goals to run the project
  - mvn camel:run

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Riding tips of camel

Running Camel

BUSINESS MAKING PROGRESS

```
CamelContext context = new DefaultCamelContext();
context.addRoutes(new MyRouteBuilder());
context.start();
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```
<camelContext id="camel" xmlns="http://camel.apache.org/
schema/spring">
    <route>
      <from uri="direct:start"/>
      <from to="mock:result"/>
    </route>
  </camelContext>
```


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```

```
<camelContext id="camel" xmlns="http://camel.apache.org/
schema/spring">
    <package>com.exaple.your.package</package>
  </camelContext>
```


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Camel Riding from Java

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- /META-INF/spring/camelContext.xml
- set the CLASSPATH
- java org.apache.camel.spring.Main

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Maven Tooling

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```
<project>
...
   <build>
   <plugins>
      <plugin>
        <groupId>org.apache.camel</groupId>
        <artifactId>camel-maven-plugin</artifactId>
      </plugin>
    </plugins>
  </build>
  </project>
```

mvn camel:run

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Running Camel

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- Lightweight
  - You can use it as Java library
- Embeddable
  - You can deploy it in most of containers
- Know Deployment Option
  - Standalone Java Application
  - Web Application
  - J2EE Application
  - JBI Container
  - OSGi
  - Google App Engine
  - Java Web Start
  - Spring Application

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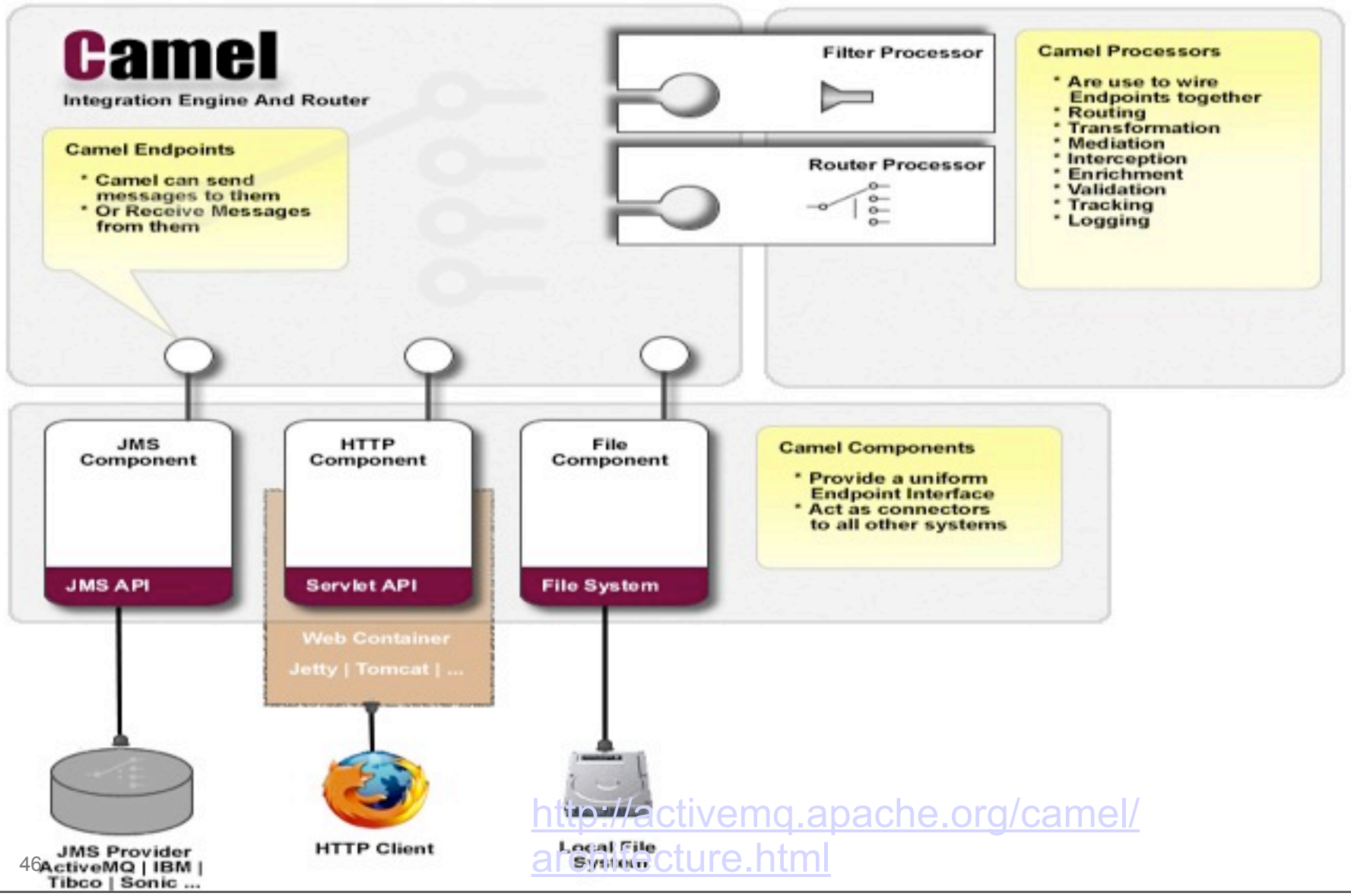
How camel do this routing work ?



http://activemq.apache.org/camel/architecture.html

How to write your own component?

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- Using the Maven Archetypes to create the project
  - camel-archetype-component
- Component
  - The Endpoint Factory
- Endpoint
  - ScheduledPollEndpoint
  - DefaultEndpoint
  - ResourceEndpoint
- Consumer
- Producer

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How to write your own routing rule in Camel

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- What's the magic of from, to, choice .....
  - /camel-core/src/main/java/org/apache/camel/model
- Implementing it in DSL way
  - Defining the type class that you want
- Implementing it in a Spring configuration way
  - Adding the annotation for JAXB consuming

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Q and A

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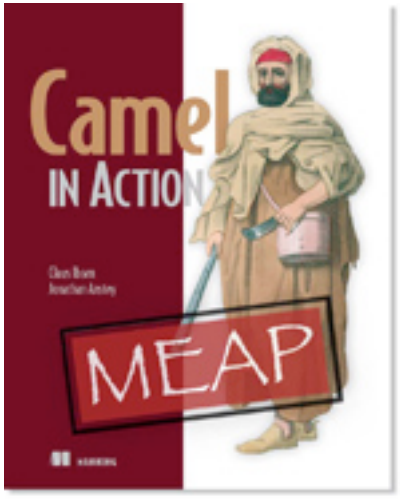
- Where do I get more information?
  - Camel website: http://camel.apache.org
  - Fuse website: http://fusesource.com
  - Camel in Action book: http://manning.com/ibsen



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Thank You

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