Apache Camel
How to go from EIPs to Production

by Claus Ibsen
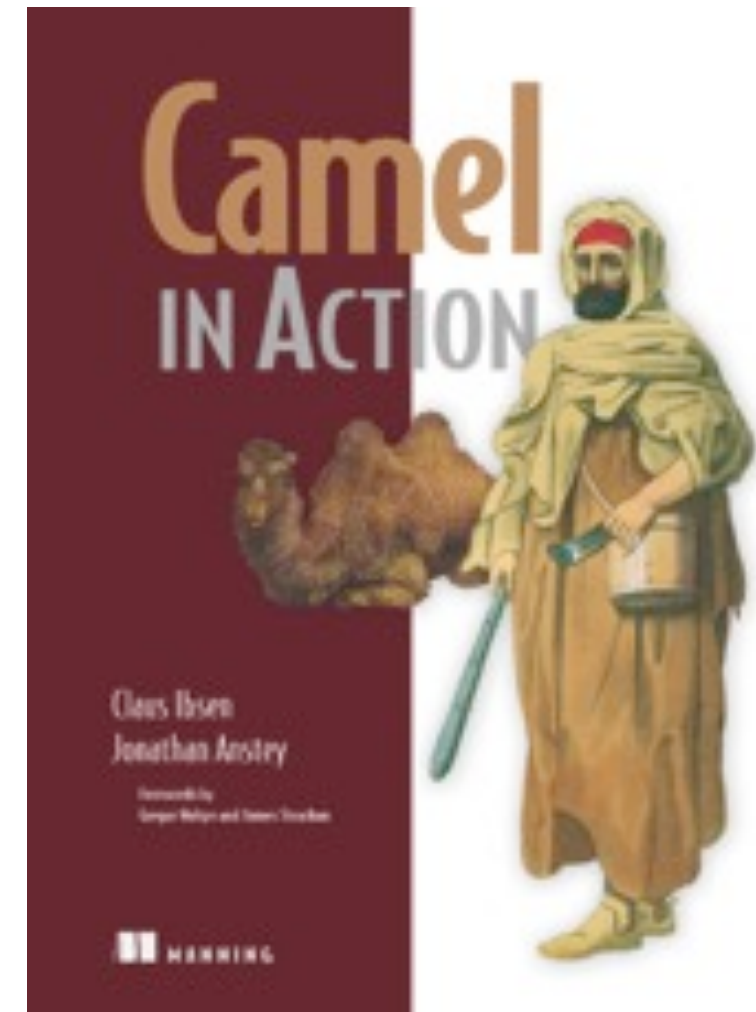
Principal Software Engineer, FuseSource

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Agenda

- Who is Claus Ibsen?
- What is Apache Camel?
- A little example
- Whats included in the box?
- Running Camel
- Live Demos
- Q and A

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Who is Claus Ibsen?

- **Principal Software Engineer at FuseSource**
  - Full time Apache Camel hacker
- **Apache Camel committer for 3 years**
  - Camel Project Lead
  - 3.5 years working with Camel
- **Author of Camel in Action book**
- **Contact**
  - Twitter: @davsclaus
  - Blog: http://davsclaus.blogspot.com
  - Email: cibsen@fusesource.com

http://www.manning.com/ibsen

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My Employer

- FuseSource - http://fusesource.com

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- What does Camel stand for?

Concise
Application
Messaging
Exchange
Language

http://camel.apache.org/why-the-name-camel.html

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- The reason for the Camel name

Camel is easy to remember and type

http://camel.apache.org/why-the-name-camel.html

- Camel's parents

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The birth of Apache Camel

- First commit
r519901 | jstrachan | 2007-03-19 11:54:57 +0100 (Mon, 19 Mar 2007) | 1 line

  Initial checkin of Camel routing library

- Apache Camel 1.0 released June 2007

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The birth of Apache Camel

- My initial commit

  r640963 | davsclaus | 2008-03-25 21:07:10 +0100 (Tue, 25 Mar 2008) | 1 line

  Added unit test for mistyped URI

Top-3 Committers

4074 Claus Ibsen

2073 Willem Ning Jiang

1316 James Strachan

git shortlog -ns

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What is Apache Camel

- Quote from the web site
  - http://camel.apache.org

> Apache Camel is a powerful Open Source Integration Framework based on known Enterprise Integration Patterns

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What is Apache Camel

- Why do we need integration?
  - Your apps are build using different tech stacks
  - Critical for your business to integrate
- Why Integration Framework?
  - Framework do the heavy lifting
  - Focus on business problem
  - Not "reinventing the wheel"

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- **What is Enterprise Integration Patterns?**

System A   System B

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- What is Enterprise Integration Patterns?

Its a book

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- Camel and EIP

Apache
ActiveMQ

WebSphereMQ

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- Camel and EIP

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- Camel and EIP

from
A

filter
message

send to
B

Widget
Quote

Gadget
Quote

Widget
Quote

Message
Filter

Widget
Quote

Widget
Quote

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- Camel and EIP

from(A)   filter(predicate)   to(B)

Widget Quote   Gadget Quote   Widget Quote   Message Filter   Widget Quote   Widget Quote

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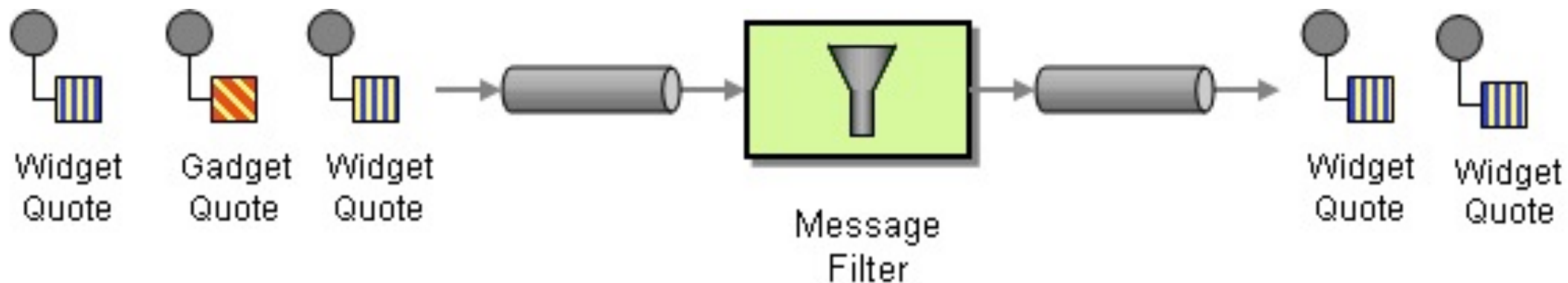
What is Apache Camel

- Camel and EIP

from(A)   .filter(isWidget)   .to(B)

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- Camel and EIP

from(A).filter(isWidget).to(B);

| Widget Quote | Gadget Quote | Widget Quote | | Message Filter | | Widget Quote | Widget Quote |

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- Camel and EIP

isWidget = xpath("/quote/product = 'widget'");

from(A).filter(isWidget).to(B);

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- Camel and EIP

```
Endpoint A = endpoint("activemq:queue:quote");
Endpoint B = endpoint("mq:quote");
Predicate isWidget = xpath("/quote/product = 'widget'");

from(A).filter(isWidget).to(B);
```

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- Filter Route

```java
public void configure() throws Exception {
    Endpoint A = endpoint("activemq:queue:quote");
    Endpoint B = endpoint("mq:quote");
    Predicate isWidget = xpath("/quote/product = 'widget'");

    from(A).filter(isWidget).to(B);
}
```

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What is Apache Camel

- Filter Route - Java DSL

```java
import org.apache.camel.builder.RouteBuilder;

public class FilterRoute extends RouteBuilder {

  public void configure() throws Exception {
    Endpoint A = endpoint("activemq:queue:quote");
    Endpoint B = endpoint("mq:quote");
    Predicate isWidget = xpath("/quote/product = 'widget'");

    from(A).filter(isWidget).to(B);
  }
}
```

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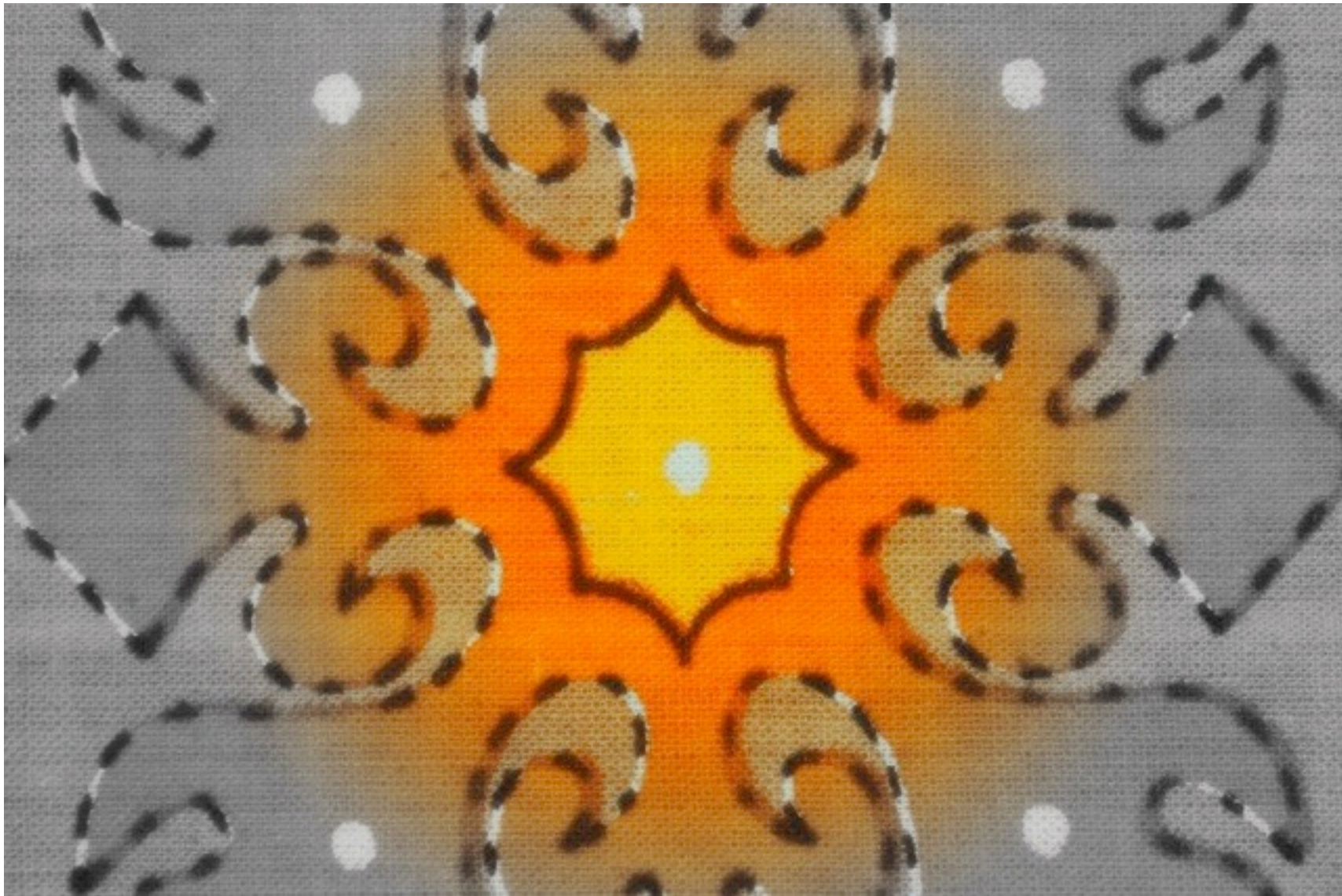# What is Apache Camel

- Filter Route - Java DSL

```java
import org.apache.camel.builder.RouteBuilder;

public class FilterRoute extends RouteBuilder {

    public void configure() throws Exception {
        from("activemq:queue:quote")
            .filter().xpath("/quote/product ='widget'")
                .to("mq:quote");
    }
}
```
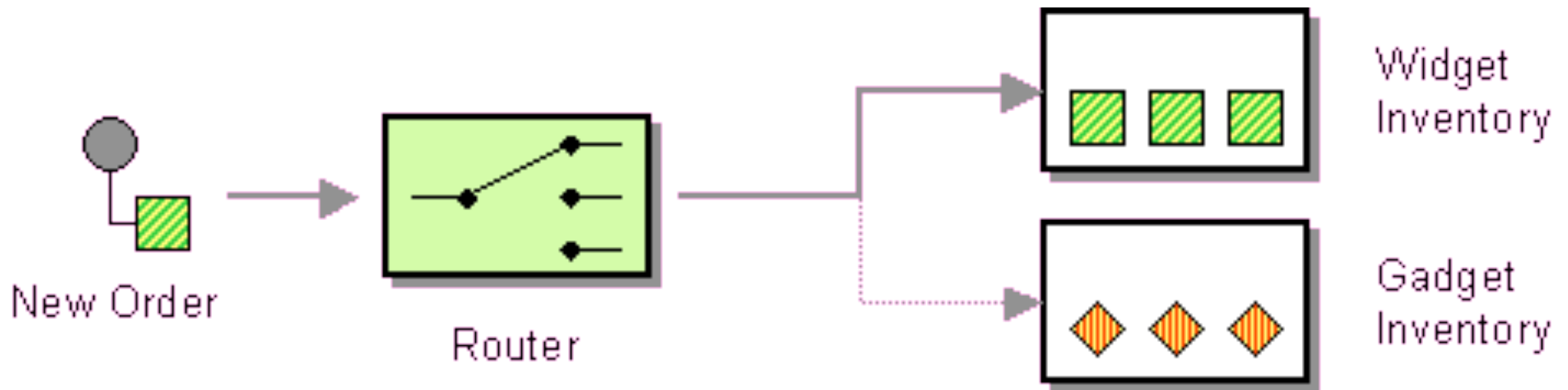
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- Lets look at the most famous pattern

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- Content Based Router

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What is Apache Camel

- Content Based Router - XML DSL

```xml
<camelContext>
  <route>
    <from uri="activemq:NewOrders"/>
    <choice>
      <when>
        <xpath>/order/product = 'widget'</xpath>
        <to uri="activemq:Orders.Widgets"/>
      </when>
      <otherwise>
        <to uri="activemq:Orders.Gadgets"/>
      </otherwise>
    </choice>
  </route>
</camelContext>
```

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What is Apache Camel

- Content Based Router - Java DSL

```
from("activemq:NewOrders")
  .choice()
    .when().xpath("/order/product = 'widget'")
      .to("activemq:Orders.Widget")
    .otherwise()
      .to("activemq:Orders.Gadget");
```

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What is Apache Camel

- Endpoints as URIs

use file instead

```
from("file:inbox/orders")
  .choice()
    .when().xpath("/order/product = 'widget'")
      .to("activemq:Orders.Widget")
    .otherwise()
      .to("activemq:Orders.Gadget");
```

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What is Apache Camel

- Endpoints as URIs

parameters

```
from("file:inbox/orders?delete=true")
  .choice()
    .when().xpath("/order/product = 'widget'")
      .to("activemq:Orders.Widget")
    .otherwise()
      .to("activemq:Orders.Gadget");
```

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- **Summary**
  - Integration framework
  - Enterprise Integration Patterns (EIP)
  - Routing (using DSL)
  - Easy configuration (endpoints as URIs)
  - No heavy specification
  - No container dependency
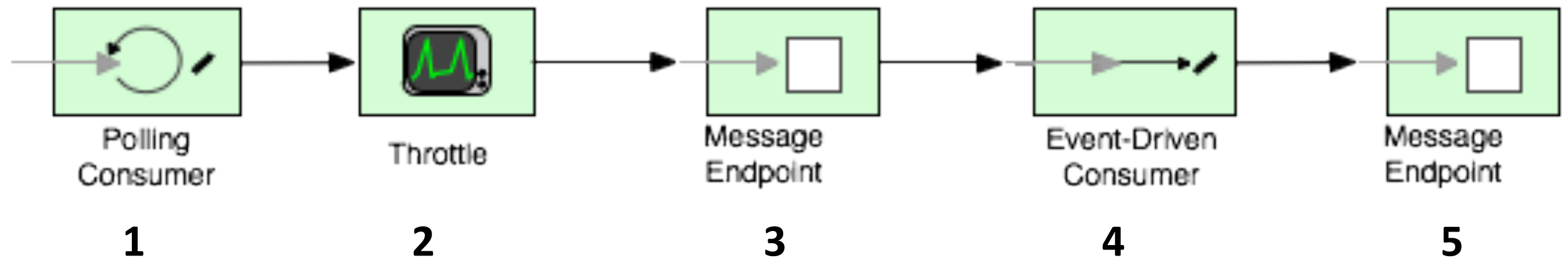 - Payload agnostic
  - A lot of components

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A little example

- Based on community user (Gunnar Hillert)
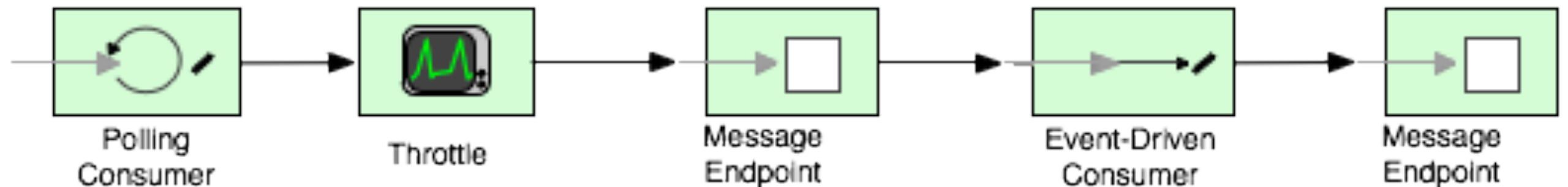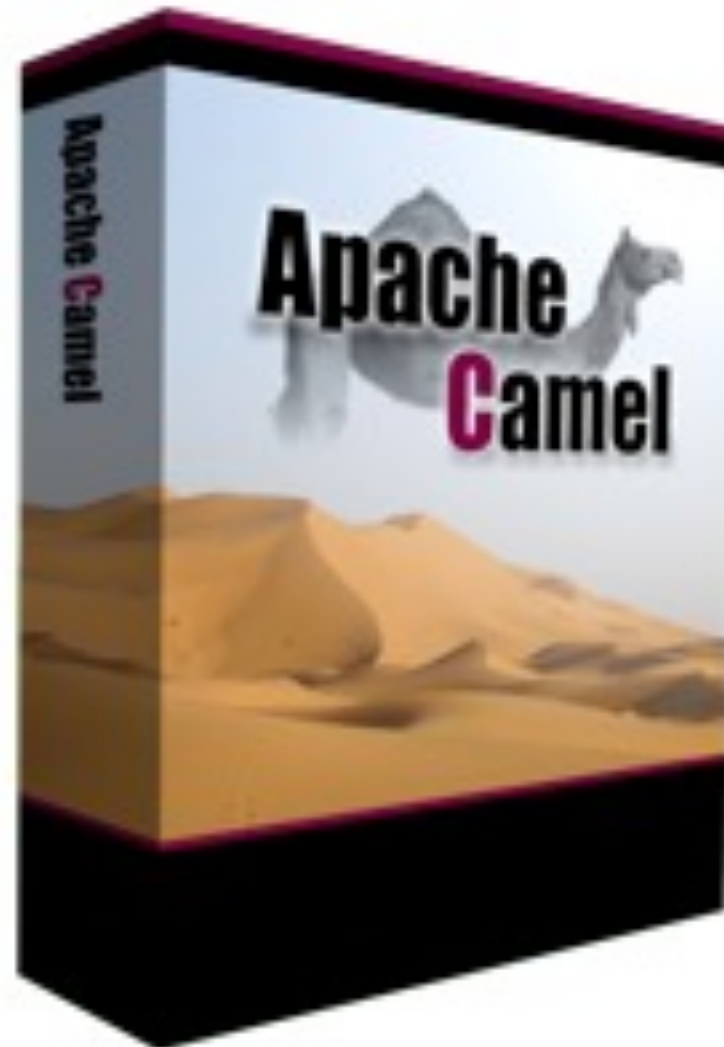 - http://hillert.blogspot.com/2009/09/camellos-discovering-apache-camel-ii.html
- Goals
  - 1) Pickup files from a directory
  - 2) Make sure we only pickup 3 files per 30 seconds
  - 3) Store into JMS queue
  - 4) Listen on JMS queue
  - 5) And upload file to FTP server

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A little example

- Goals using Enterprise Integration Patterns

| 1 | 2 | 3 | 4 | 5 |

- Goals
  - 1) Pickup files from a directory
  - 2) Make sure we only pickup 3 files per 30 seconds
  - 3) Store into JMS queue
  - 4) Listen on JMS queue
  - 5) And upload file to FTP server

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A little example

- Goals using Enterprise Integration Patterns

Polling Consumer	Throttle	Message Endpoint	Event-Driven Consumer	Message Endpoint
from	**throttle**	**to**	**from**	**to**

- Goals
  - 1) Pickup files from a directory
  - 2) Make sure we only pickup 3 files per 30 seconds
  - 3) Store into JMS queue
  - 4) Listen on JMS queue
  - 5) And upload file to FTP server

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A little example

- Camel Route in XML DSL

```xml
<camelContext>
  <route>
    <from uri="file:camellos/inbox?move=.done"/>
    <throttle maximumRequestsPerPeriod="3"
              timePeriodMillis="30000">
      <to uri="activemq:queue:camellos"/>
    </throttle>
  </route>
  <route>
    <from uri="activemq:queue:camellos"/>
    <to uri="ftp://admin:secret@localhost:3333"/>
  </route>
</camelContext>
```

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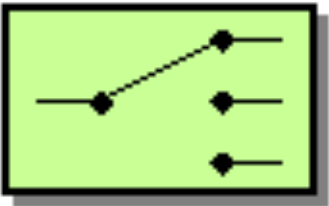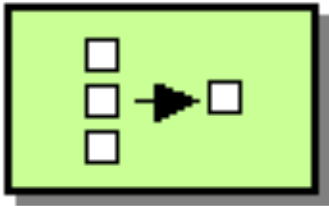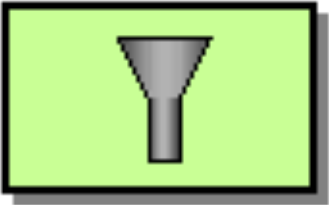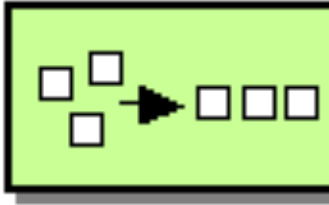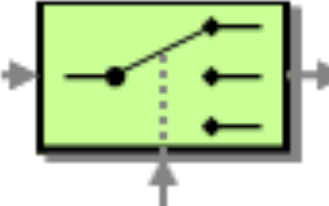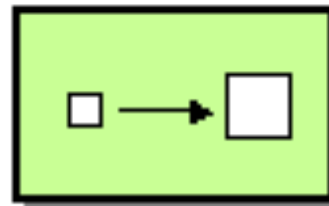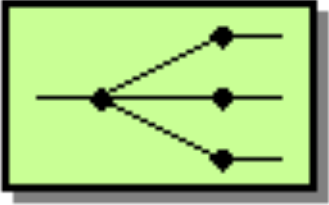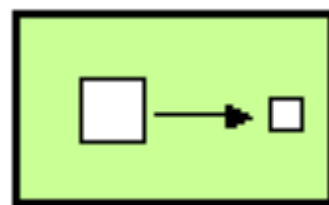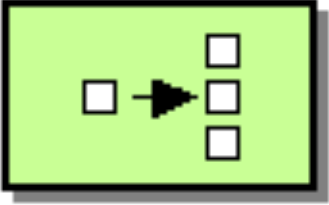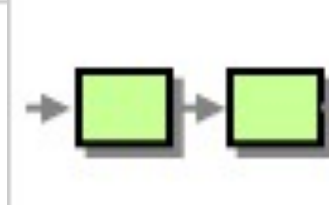
- Highlights of some of the features
    (there is much more)

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- 50 Enterprise Integration Patterns

	Content Based Router		Aggregator
	Message Filter		Resequencer
	Dynamic Router		Content Enricher
	Recipient List		Content Filter
	Splitter		Pipes and Filters

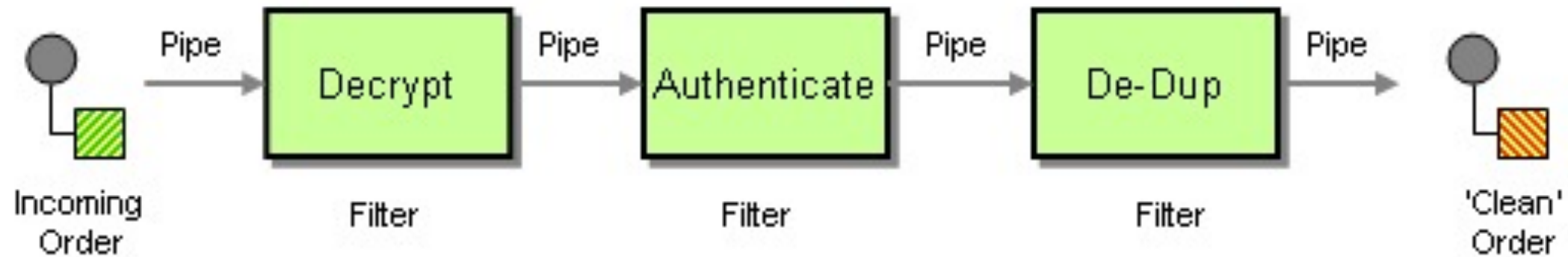http://camel.apache.org/eip

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- Pipes and Filters EIP
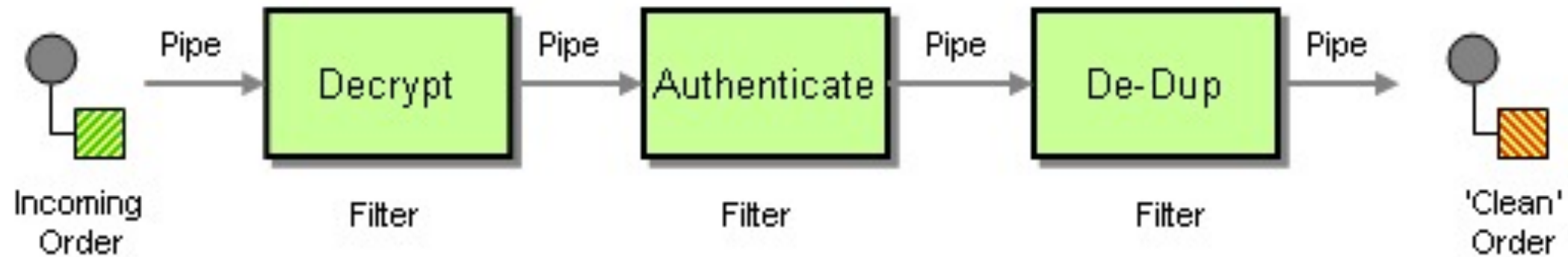

```
from("file:inbox")
    .pipeline()
    .to("bean:decrypt")
    .to("bean:authenticate")
    .to("bean:deDup");
```

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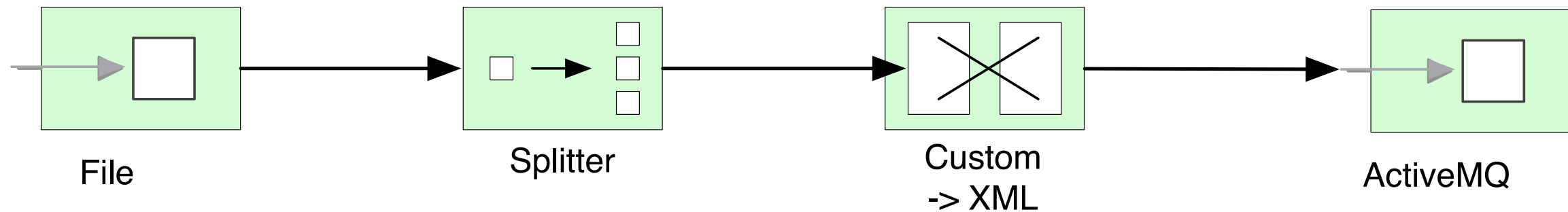
- Pipes and Filters EIP


```
from("file:inbox")
    .to("bean:decrypt")
    .to("bean:authenticate")
    .to("bean:deDup");
```

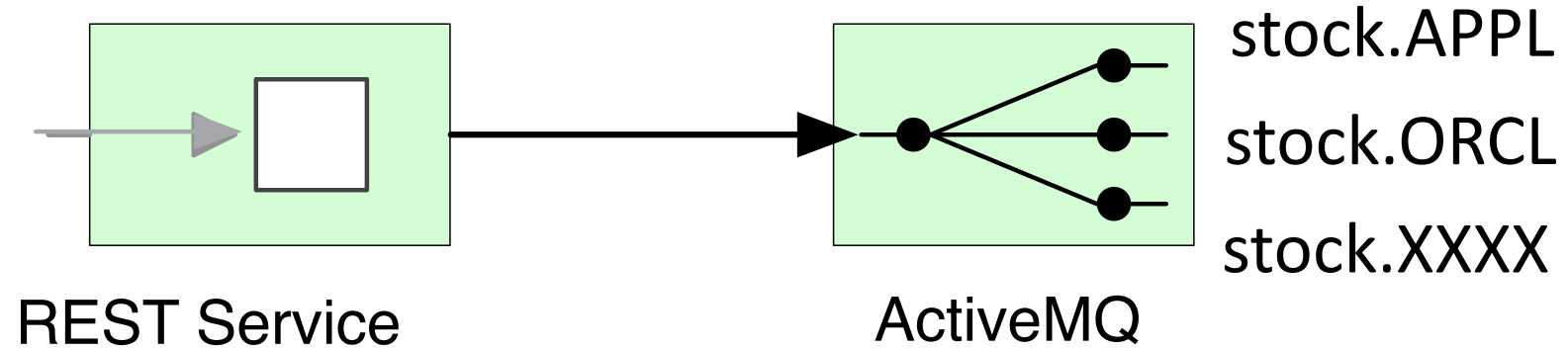*pipeline() is default mode in Camel and can usually be omitted*

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Whats included in the box?

- Splitter EIP

File · Splitter · Custom -> XML · ActiveMQ

```
from("file:inbox")
    .split(body().tokenize("\n")
        .marshal(customToXml)
        .to("activemq:line");
```

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- **Recipient List EIP**
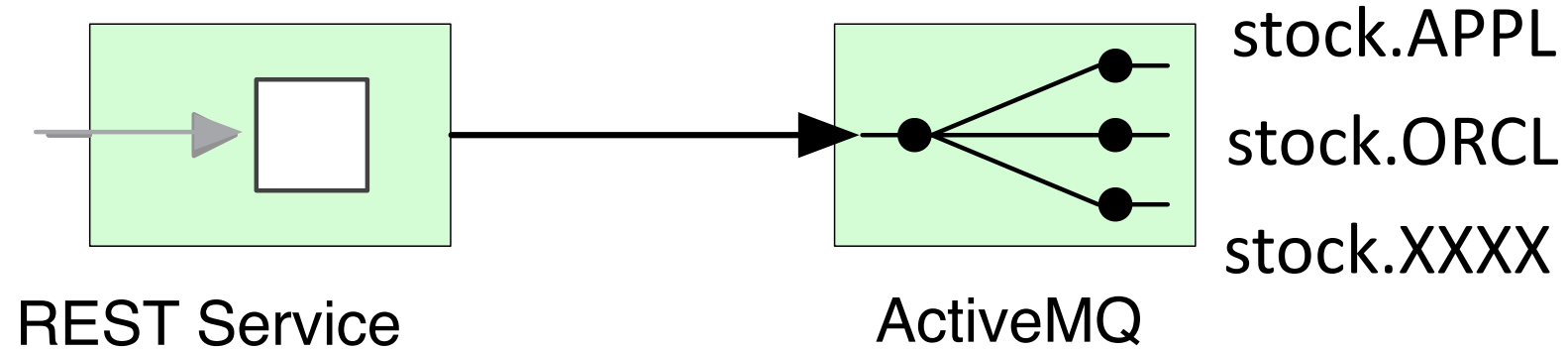

REST Service   ActiveMQ

stock.APPL
stock.ORCL
stock.XXXX

```
from("restlet:http:localhost:9080
     /stock/${symbol}?restletMethods=post")
  .recipientList()
    .simple("activemq:stocks.${header.symbol}");
```

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Whats included in the box?

- Recipient List EIP

REST Service   ActiveMQ

stock.APPL
stock.ORCL
stock.XXXX

```
from("restlet:http:localhost:9080
        /stock/${symbol}?restletMethods=post")
    .recipientList()
    .simple("activemq:stocks.${header.symbol}");
```

curl -X POST -d "120" "http://localhost:9080/stock/ORCL"

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Whats included in the box?

- ## 80 Components

activemq	cxf	flatpack	jasypt
activemq-journal	cxfrs	freemarker	javaspace
amqp	dataset	ftp/ftps/sftp	jbi
atom	db4o	gae	jcr
bean	direct	hdfs	jdbc
bean validation	ejb	hibernate	jetty
browse	esper	hl7	jms
cache	event	http	jmx
cometd	exec	ibatis	jpa
crypto	file	irc	jt/400

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

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Whats included in the box?

- 80 Components

language	properties	seda	stream
ldap	quartz	servlet	string-template
mail/imap/pop3	quickfix	sip	test
mina	ref	smooks	timer
mock	restlet	smpp	validation
msv	rmi	snmp	velocity
nagios	rnc	spring-integration	vm
netty	rng	spring-security	xmpp
nmr	rss	spring-ws	xquery
printer	scalate	sql	xslt

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

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Whats included in the box?

- 19 Data Formats

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

http://camel.apache.org/data-format.html

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Whats included in the box?

- 15 Expression Languages

BeanShell	Python
EL	Ruby
Groovy	Simple
JavaScript	SpEL
JSR 223	SQL
OGNL	XPath
MVEL	XQuery
PHP	

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

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Whats included in the box?

- DSL in multiple flavors

```xml
<route>
  <from ref="A"/>
  <filter>
    <xpath>/quote/product = 'widget'</xpath>
    <to ref="B"/>
  </filter>
</route>
```

Java
```java
from(A).filter(isWidget).to(B);
```

Scala
```scala
from(A) filter(isWidget) --> B
```

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- Bean as Message Translator

Translator

Incoming Message   Translated Message

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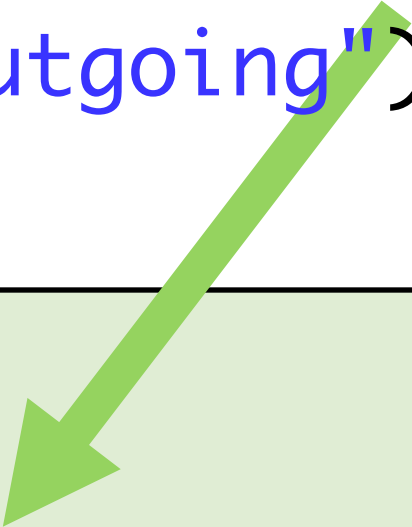
Whats included in the box?

- Bean as Message Translator

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

```
public class Foo {

  public String someMethod(String name) {
    return "Hello " + name;
  }
}
```

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- Test Kit
  - camel-test JAR (JUnit)
  - camel-testng JAR (TestNG)
  - Supports Spring
  - Easy to test
  - Quick prototyping

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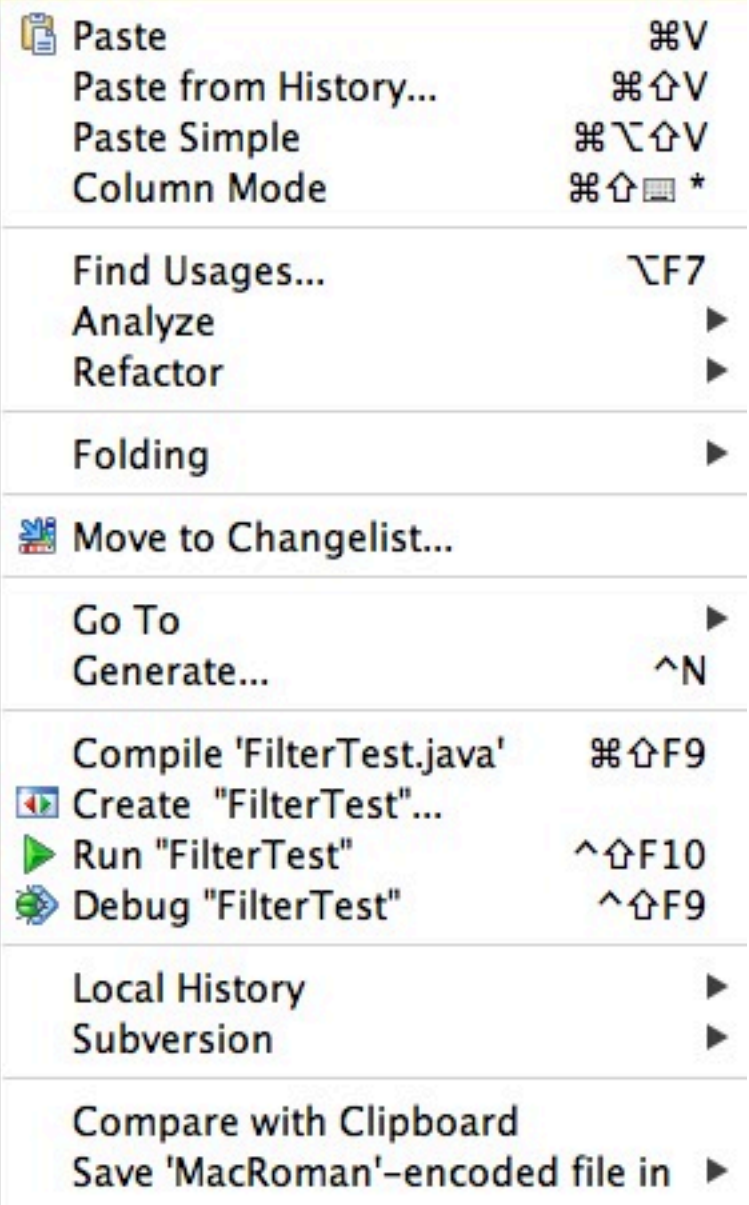
Whats included in the box?

- **Test Kit from IDE**
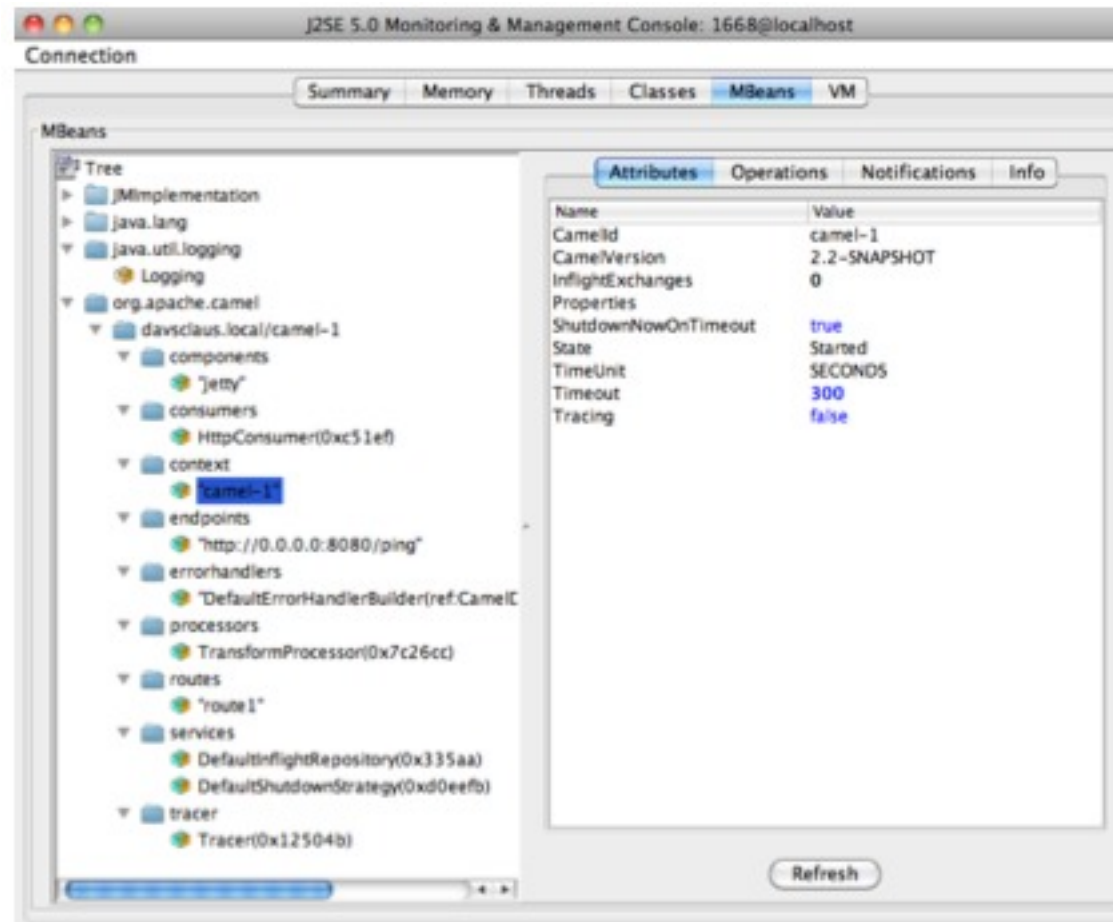
```java
public class FilterTest extends CamelTestSupport {

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

    @Produce(uri = "direct:start")
    protected ProducerTemplate template;

    public void testSendMatchingMessage() throws Exception {
        resultEndpoint.expectedBodiesReceived("<matched/>");

        template.sendBodyAndHeader("<matched/>", "foo", "bar");

        assertMockEndpointsSatisfied();
    }

    @Override
    protected RouteBuilder createRouteBuilder() {
        return new RouteBuilder() {
            public void configure() {
                from("direct:start")
                    .filter(header("foo").isEqualTo("bar"))
                        .to("mock:result");
            }
        };
    }
}
// END SNIPPET: example
```

Paste	⌘V
Paste from History...	⌘⇧V
Paste Simple	⌘⌥⇧V
Column Mode	⌘⇧▦ *
Find Usages...	⌥F7
Analyze	▶
Refactor	▶
Folding	▶
Move to Changelist...	
Go To	▶
Generate...	^N
Compile 'FilterTest.java'	⌘⇧F9
Create "FilterTest"...	
Run "FilterTest"	^⇧F10
Debug "FilterTest"	^⇧F9
Local History	▶
Subversion	▶
Compare with Clipboard	
Save 'MacRoman'-encoded file in	▶

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Whats included in the box?

- ## Managed
  - JMX API
  - REST API

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Whats included in the box?

- Developer Web Console

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Whats included in the box?

- Fuse IDE - http://fusesource.com/products/fuse-ide-camel/

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- **Error Handling**
  - Errors happen

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- Error Handling
  - Try … Catch style

```
from("activemq:incoming")
  .doTry()
    .marshal().jaxb()
    .to("mq:QueueWithXmlMessages")
  .doCatch(Exception.class)
    .to("activemq:error")
  .end();
```

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Whats included in the box?

- Error Handling
  - Dead Letter Channel EIP

```
errorHandler(
    deadLetterChannel("activemq:error")
);

from("activemq:incoming")
    .marshal().jaxb()
    .to("mq:QueueWithXmlMessages");
```

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Whats included in the box?

- Error Handling
  - Dead Letter Channel EIP w/ Redelivery

```
errorHandler(
  deadLetterChannel("activemq:error")
    .maximumRedeliveries(5)
    .redeliveryDelay(5000)
);

from("activemq:incoming")
  .marshal().jaxb()
  .to("mq:QueueWithXmlMessages");
```
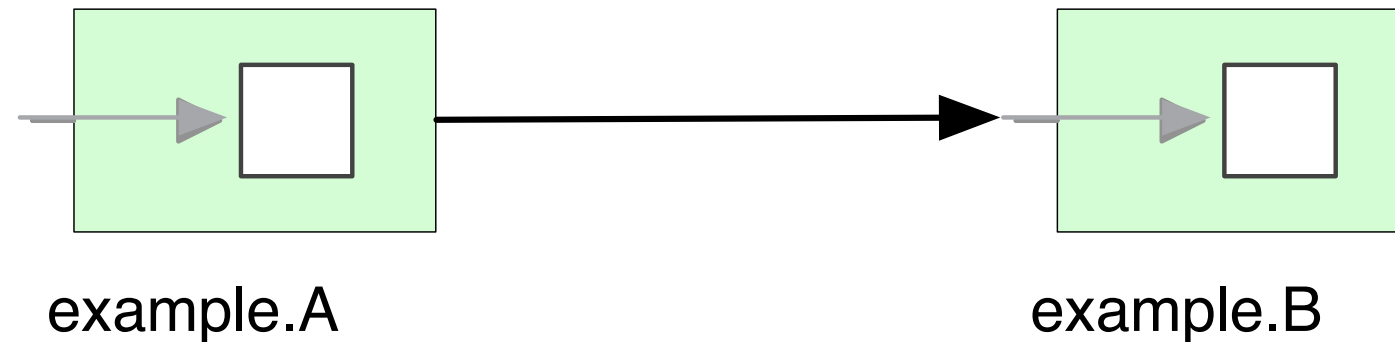
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- Who is Claus Ibsen?
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- A little example
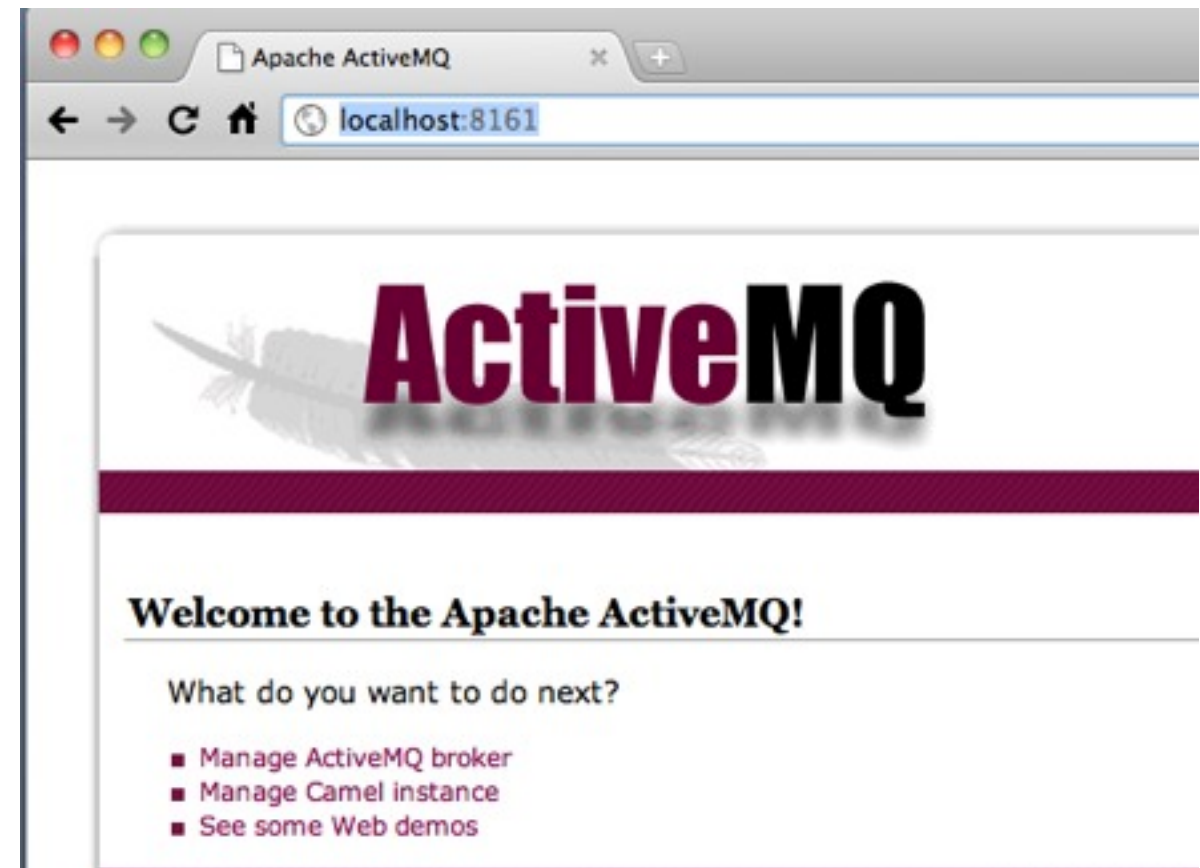- Whats included in the box?
- **Running Camel**
- Live Demos
- Q and A

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- Deployment Strategy
  - No container dependency
  - Lightweight
  - Embedable
- Deployment Options
  - Standalone
  - WAR
  - Spring
  - J2EE
  - JBI
  - OSGi
  - Cloud

Known Containers
Apache ServiceMix
Apache ActiveMQ
Apache Tomcat
Jetty
JBoss
IBM WebSphere
Oracle WebLogic
Oracle OC4j
Glassfish
Google App Engine
Amazon EC2
... others

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Running Camel

- Java Application

```
CamelContext context = new DefaultCamelContext();
context.addRoutes(new MyRouteBuilder());
context.start();
```

- Spring Application

```xml
<beans xmlns="http://www.springframework.org/schema/beans">

    <camelContext xmlns="http://camel.apache.org/schema/spring">
      <route>
        <from uri="file:/orders"/>
        ...
      </route>
    </camelContext>

</beans>
```

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Live Demo 1

- **ActiveMQ and Camel**

example.A   example.B

To start ActiveMQ: bin/activemq start

WebConsole: http://localhost:8161/

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- Groovy Script

HTTP Service   Transform
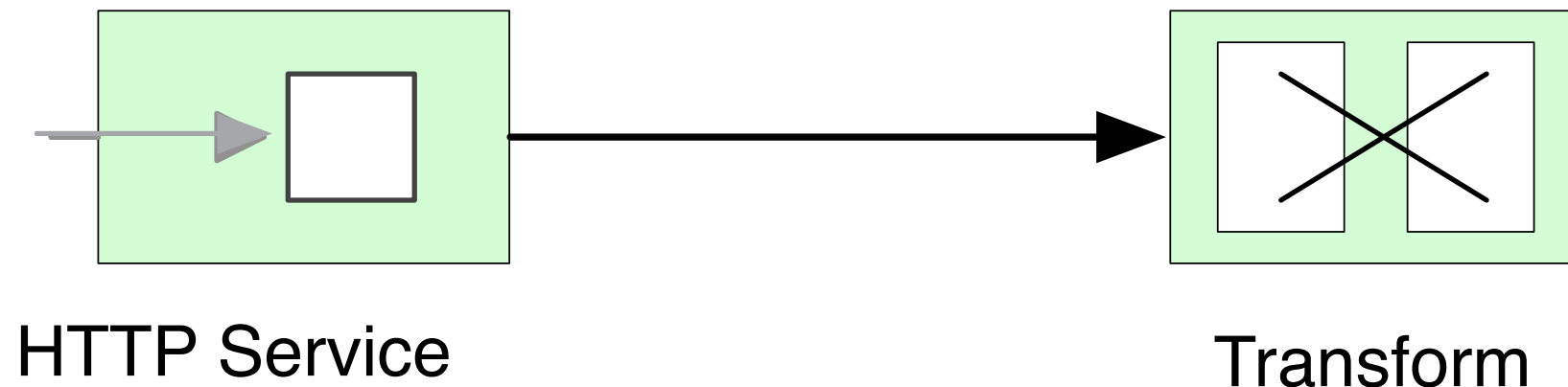
groovy mycamel.groovy
curl http://localhost:8080

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Live Demo 2

- **Groovy Script (mycamel.groovy)**

```groovy
import org.apache.camel.builder.RouteBuilder
import org.apache.camel.impl.DefaultCamelContext

@Grab(group="org.apache.camel",module="camel-core",version="2.7.1")
@Grab(group="org.apache.camel",module="camel-jetty",version="2.7.1")
@Grab(group="org.slf4j",module="slf4j-jdk14",version="1.6.1")
class MyRouteBuilder extends RouteBuilder {
  void configure() {
    from("jetty:http://localhost:8080/")
      .to("log:input")
      .transform(constant("Hello from Groovy\n"))
  }
}
```

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- Groovy Script (mycamel.groovy - cont.)

```
...
def camelContext = new DefaultCamelContext()
camelContext.addRoutes(new MyRouteBuilder())

camelContext.start()
System.console().readLine()
camelContext.stop()
```

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- Create new Project using Maven
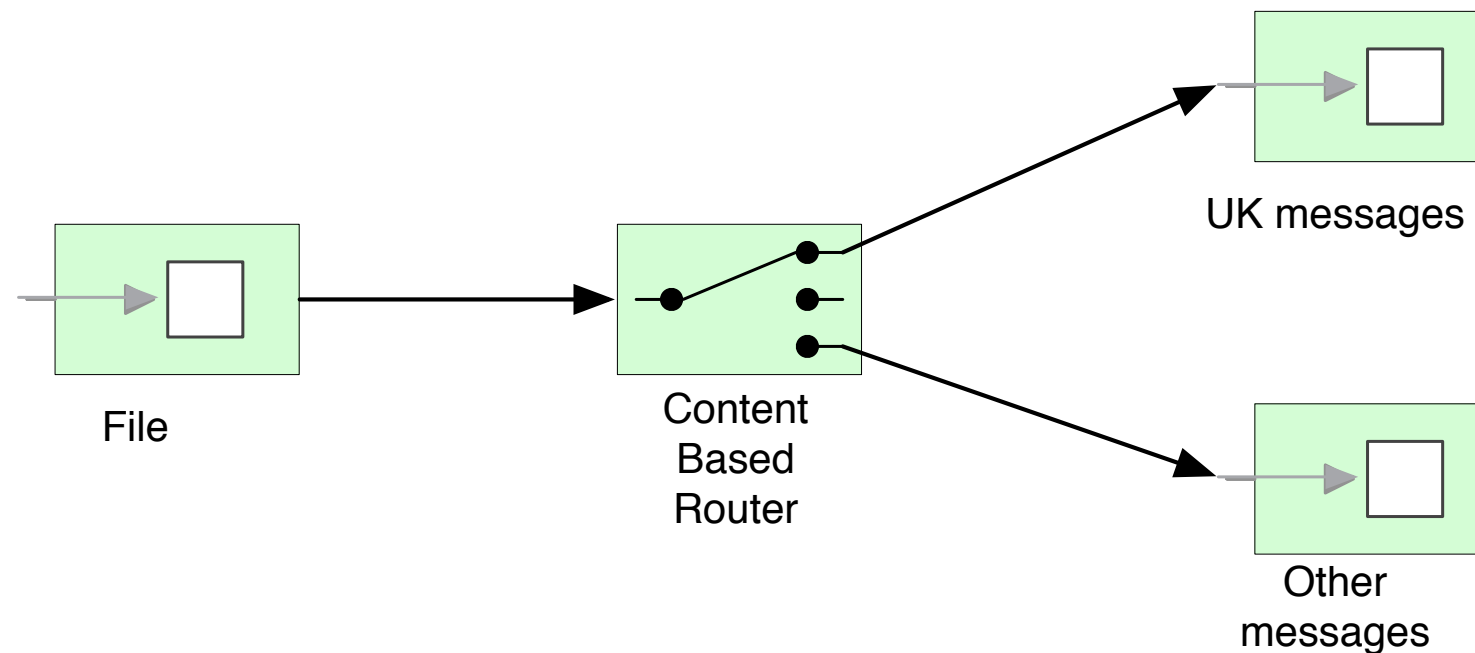

```
mvn archetype:generate
(camel-archetype-spring)
mvn eclipse:eclipse
mvn camel:run
```

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Live Demo 3

- Create new Project using Maven

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Agenda

- Who is Claus Ibsen?
- What is Apache Camel?
- A little example
- Whats included in the box?
- Running Camel
- Live Demos
- **Q and A**

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More Information

- **Where do I get more information?**
  - Apache Camel Website
    - http://camel.apache.org

Overview
- Home
- Download
- Getting Started
- FAQ

Getting Started

First you need to Download the Camel distribution; or you could grab the Source and try Building it yourself.

> ✅ **Great introduction article**
> The best introduction to Camel is in fact an article posted at dzone. We strongly suggest you go read the article:
> Apache Camel: Integration Nirvana great article to learn what Camel is and has a good use case example.

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More Information

- **Where do I get more information?**
  - Join the Mailinglist
    - http://camel.apache.org/mailing-lists.html

  - Try the IRC-room
    - http://camel.apache.org/irc-room.html

  - Use the Search Box

    ■ **Search**

    Google™ Custom Search

    [Search]

  - Checkout the Camel Articles
    - http://camel.apache.org/articles.html

  - Run Camel Examples
    - http://camel.apache.org/examples.html

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More Information

- FuseSource - http://fusesource.com

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More Information

- The definitive Camel guide
  - Camel in Action book: http://manning.com/ibsen
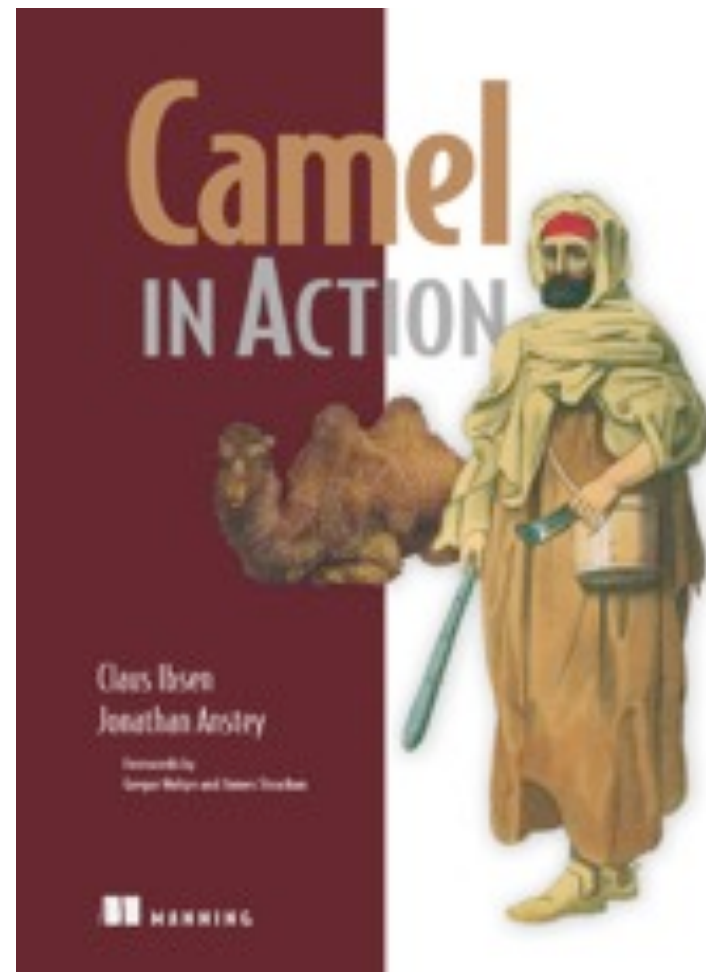
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