Getting Started with Apache Camel

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Principal Software Engineer, Red Hat
Javagruppen Århus, may 2013

Agenda

- History of Camel

- What is Apache Camel?

- A little Example

- Riding Camel

- What's in the Camel box?

- Deploying Camel

- Creating new Camel Projects

- Q and A

redhat.

Your Speaker

- Principal Software Engineer at Red Hat

- Apache Camel

  - 5 years working with Camel

- Author of Camel in Action book

- Contact

  - EMail: cibsen@redhat.com

  - Twitter: @davsclaus

  - Blog: http://davsclaus.com

  - Linkedin: http://www.linkedin.com/in/davsclaus
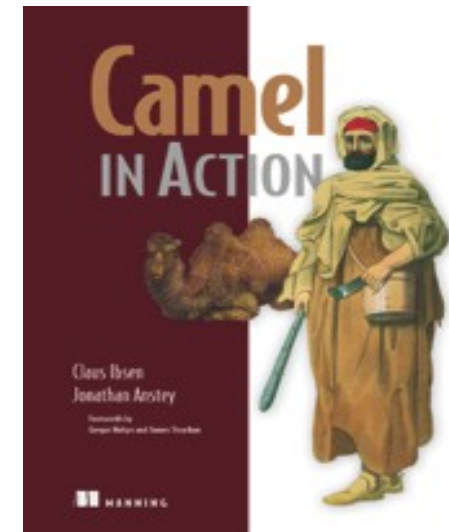
Why the name Camel?

Concise
Application
Messaging
Exchange
Language

redhat.

Why the name Camel?

**Because Camel is
easy to remember and type ...**

redhat.

Why the name Camel?

James Strachan

Programmer

James Strachan is a software engineer who created the Groovy programming language in 2003. He is a member of the Apache Software Foundation and a co-founder of a number of other open source projects … Wikipedia

… or the creator used to smoke cigarets!

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

redhat.

Camel's parents

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redhat.

Camel's parents

James Strachan (creator of Camel)
Gregor Hohpe (author of EIP book)

redhat.

The birth of Camel

- First Commit

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

Initial checkin of Camel routing library

redhat.

The birth of Camel

- My first Commit

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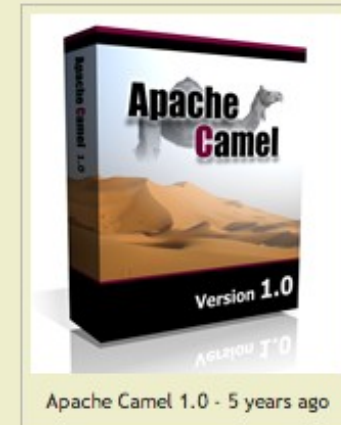 (Tue, 25 Mar 2008) | 1 line

  Added unit test for mistyped URI

redhat.

The birth of Camel

- First Release

  - Apache Camel 1.0
    June 2007

http://www.davsclaus.com/2012/05/looking-at-impressive-first-apache.html

redhat.

Agenda

- History of Camel
- **What is Apache Camel?**
- A little Example
- Riding Camel
- What's in the Camel box?
- Deploying Camel
- Creating new Camel Projects
- Q and A

redhat.

What is Apache Camel?

- Quote from the website

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

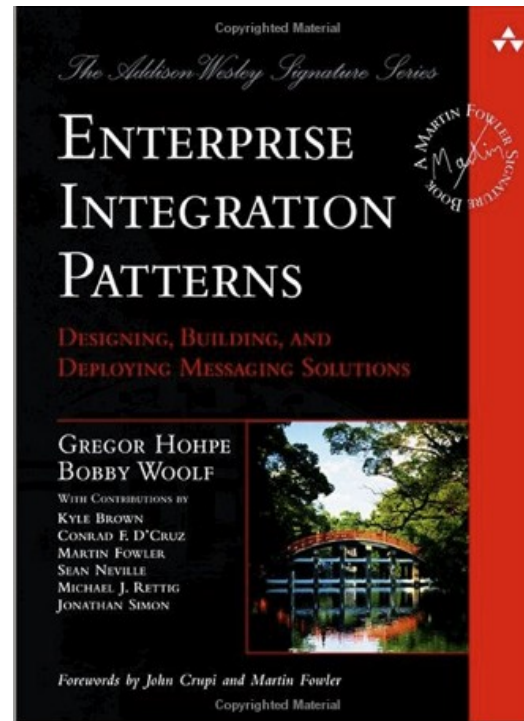**PUBLIC PRESENTATION | CLAUS IBSEN**

redhat.

What is Apache Camel?

- Why do we need integration?
    - Critical for your business to integrate
- Why Integration Framework?
    - Framework do the heavy lifting
    - You can focus on business problem
    - Not "reinventing the wheel"
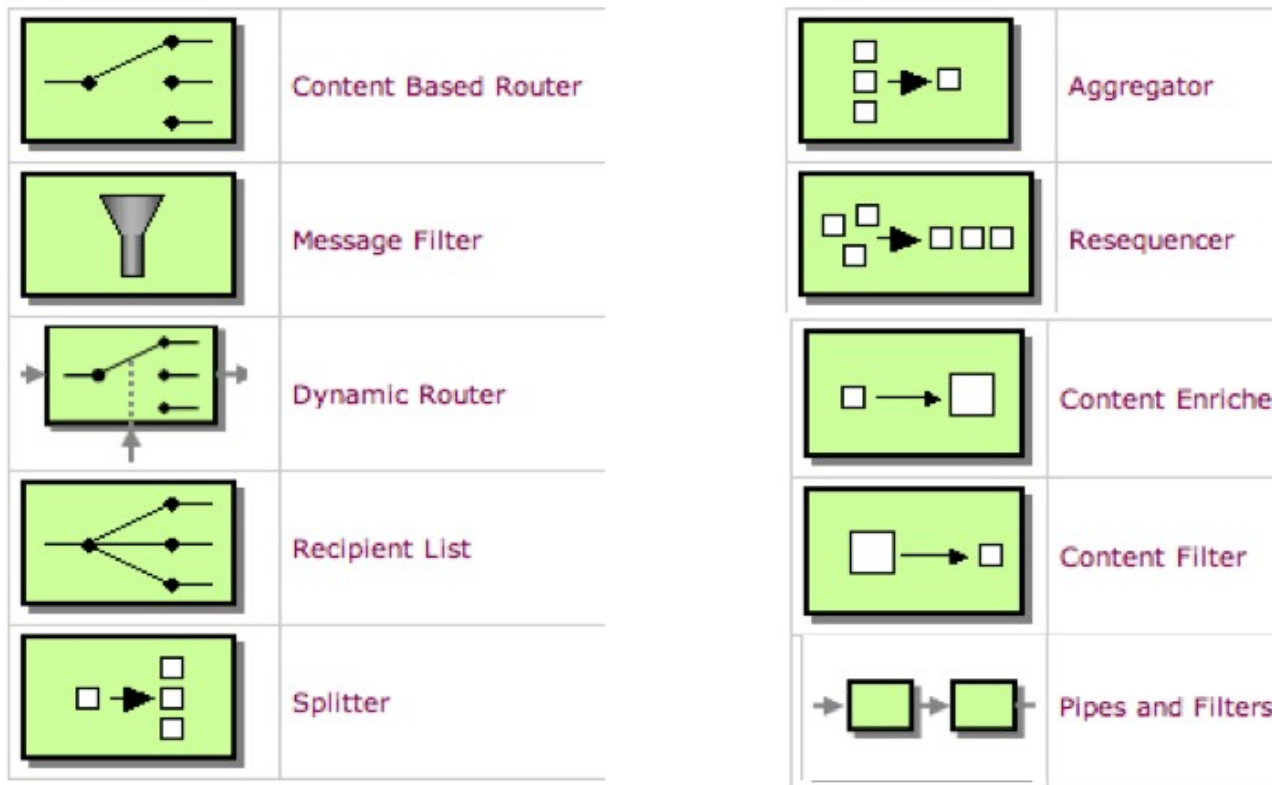
What is Apache Camel?

- What is Enterprise Integration Patterns?
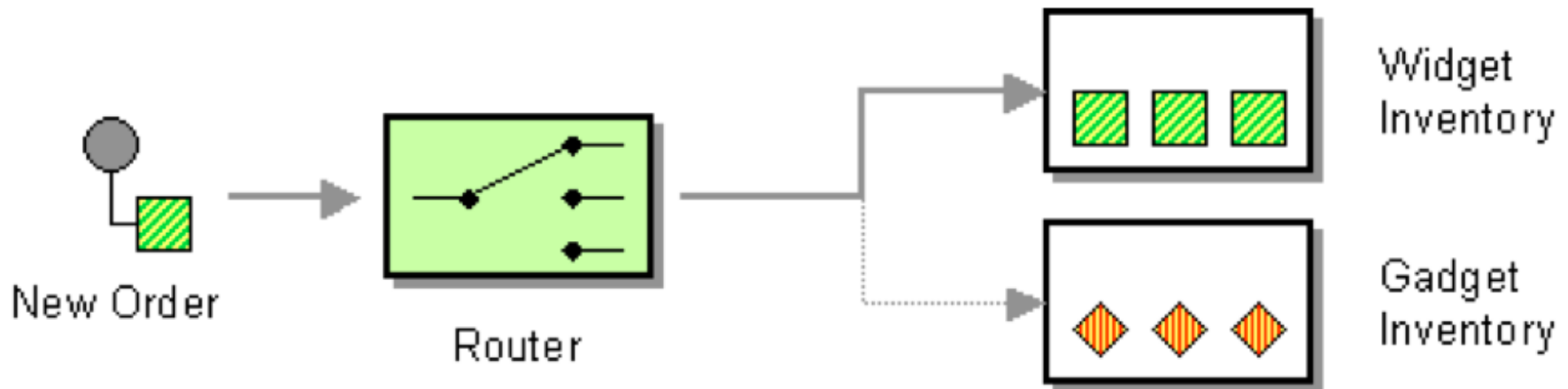

It's a book

What is Apache Camel?
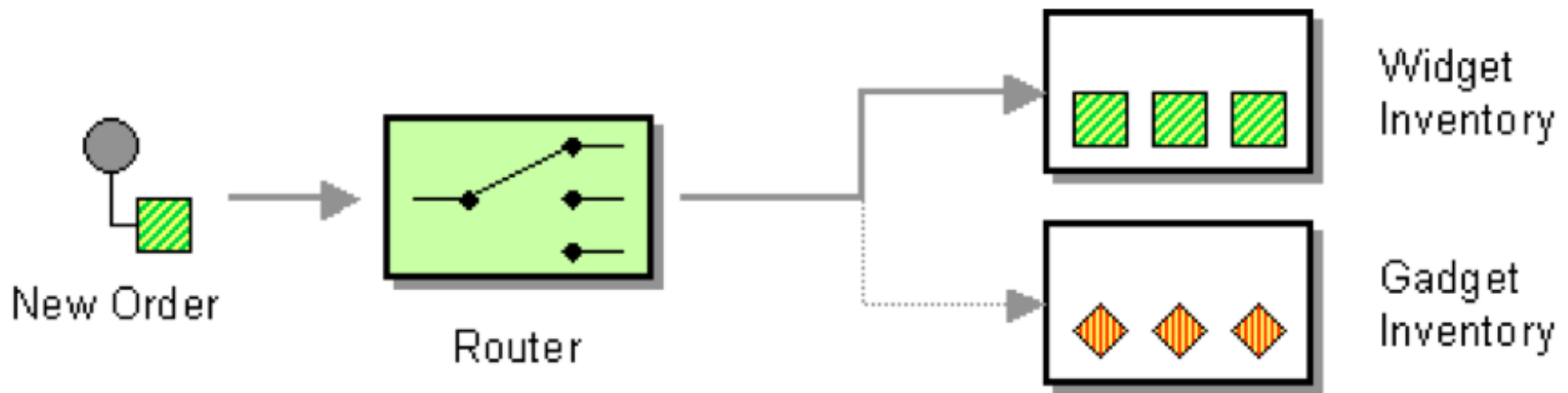
- Enterprise Integration Patterns

	Content Based Router
	Message Filter
	Dynamic Router
	Recipient List
	Splitter

	Aggregator
	Resequencer
	Content Enricher
	Content Filter
	Pipes and Filters

http://camel.apache.org/eip

redhat.

What is Apache Camel?

- EIP - Content Based Router

What is Apache Camel?


```
from newOrder
```

redhat.

What is Apache Camel?


```
from newOrder
    choice
```

redhat.
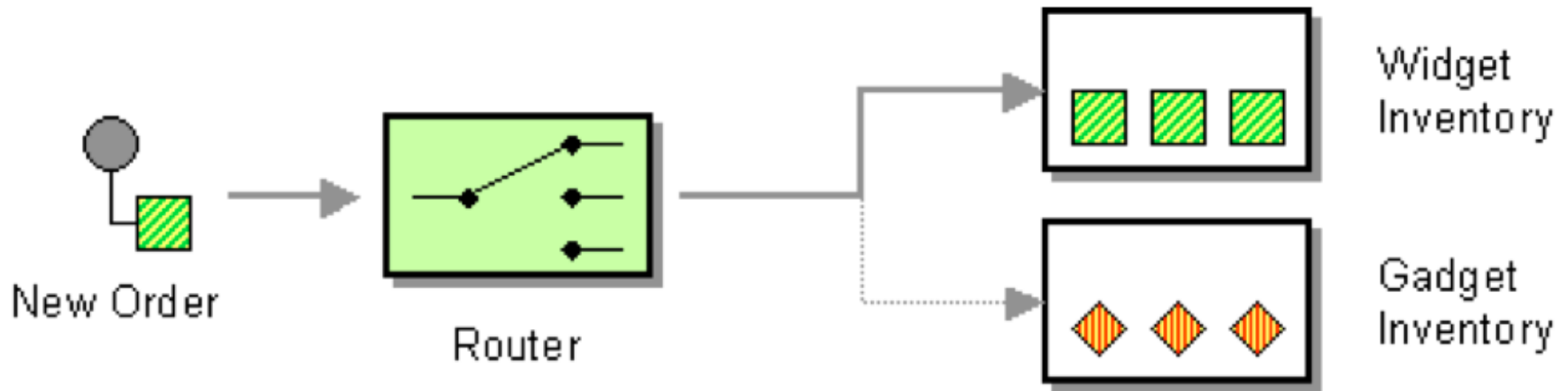
What is Apache Camel?
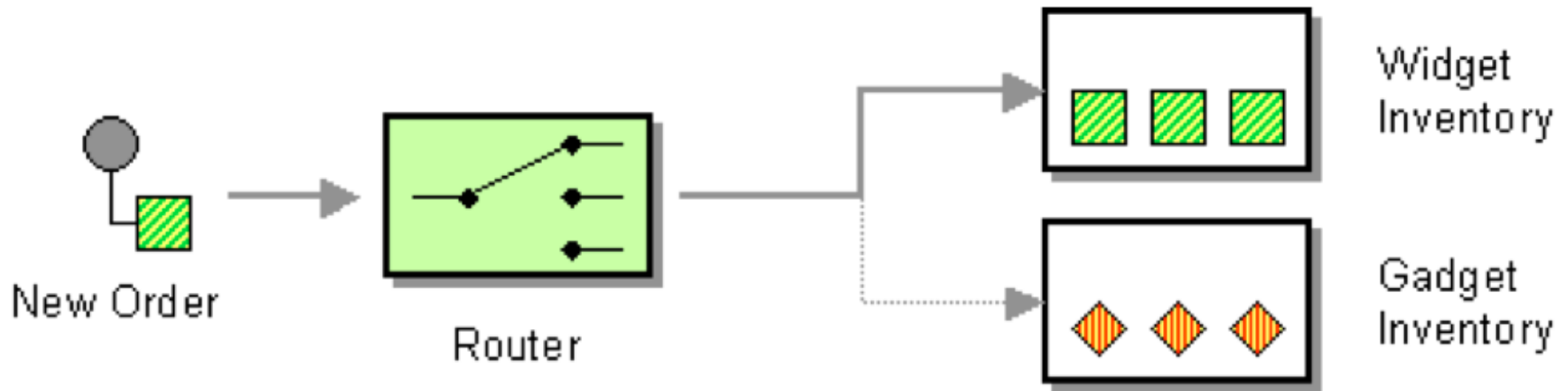

```
from newOrder
  choice
    when isWidget to widget
```
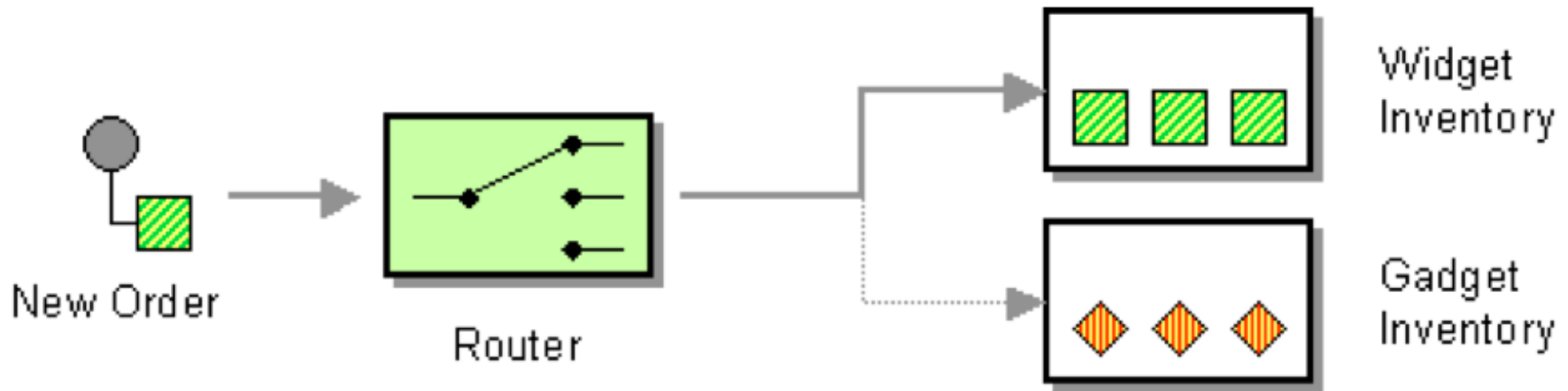
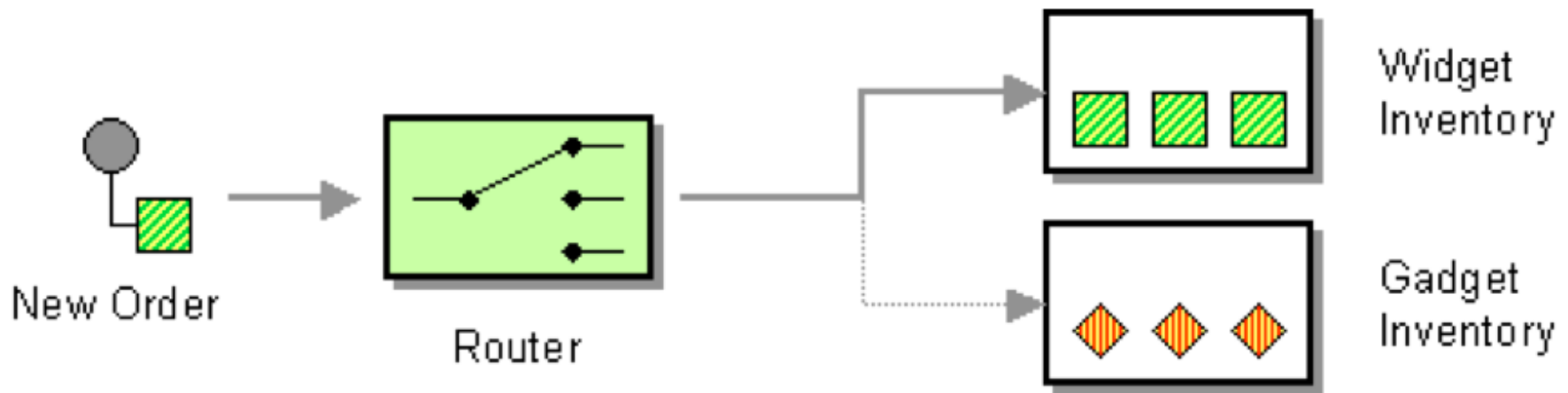# What is Apache Camel?
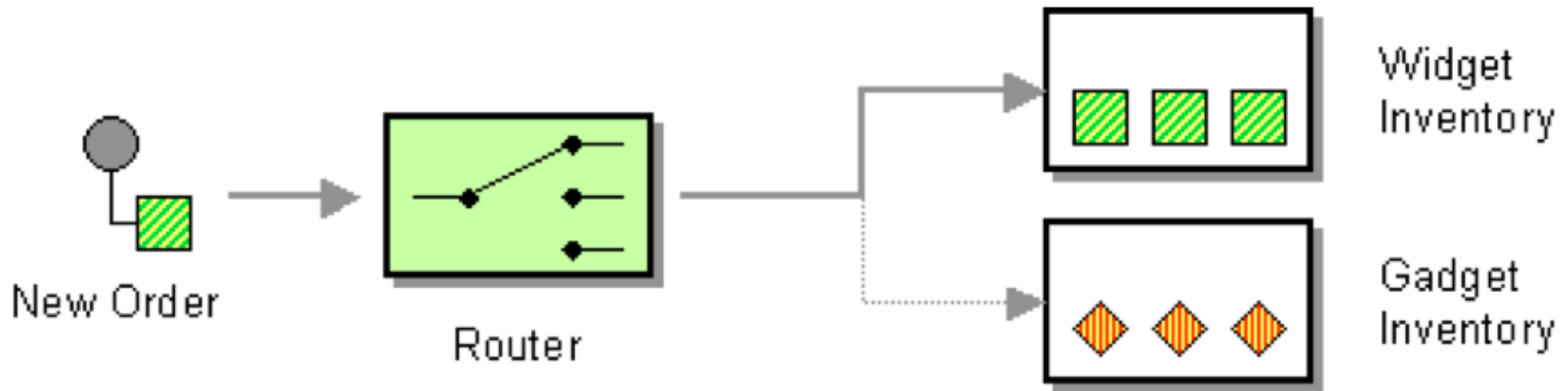

```
from newOrder
  choice
    when isWidget to widget
    otherwise to gadget
```

redhat.

What is Apache Camel?


```
from(newOrder)
  choice
    when(isWidget) to(widget)
    otherwise to(gadget)
```

redhat.

What is Apache Camel?


```
from(newOrder)
  .choice()
    .when(isWidget).to(widget)
    .otherwise().to(gadget);
```

redhat.

What is Apache Camel?
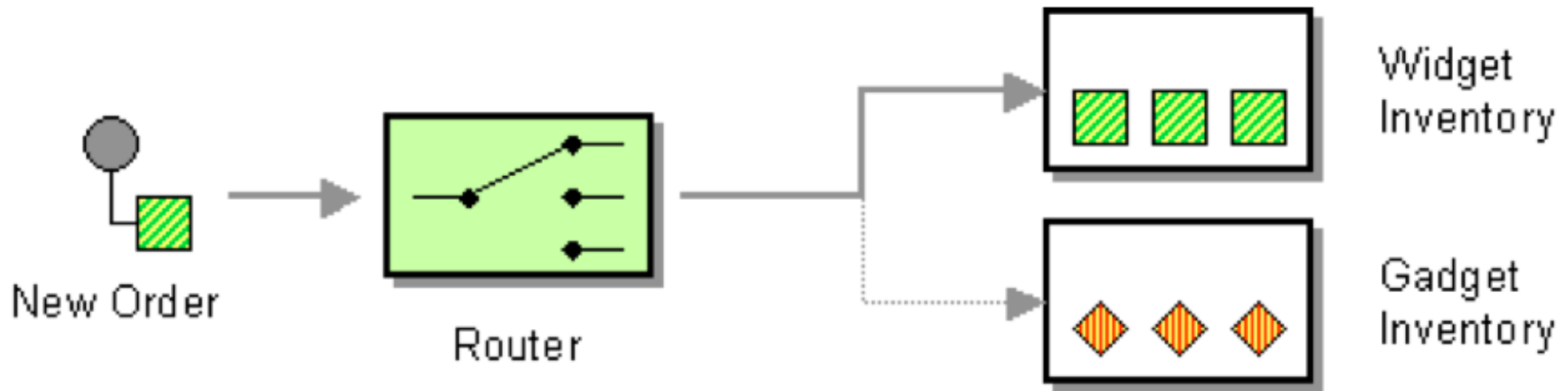

```
Endpoint newOrder = endpoint("activemq:queue:newOrder");


from(newOrder)
  .choice()
    .when(isWidget).to(widget)
    .otherwise().to(gadget);
```
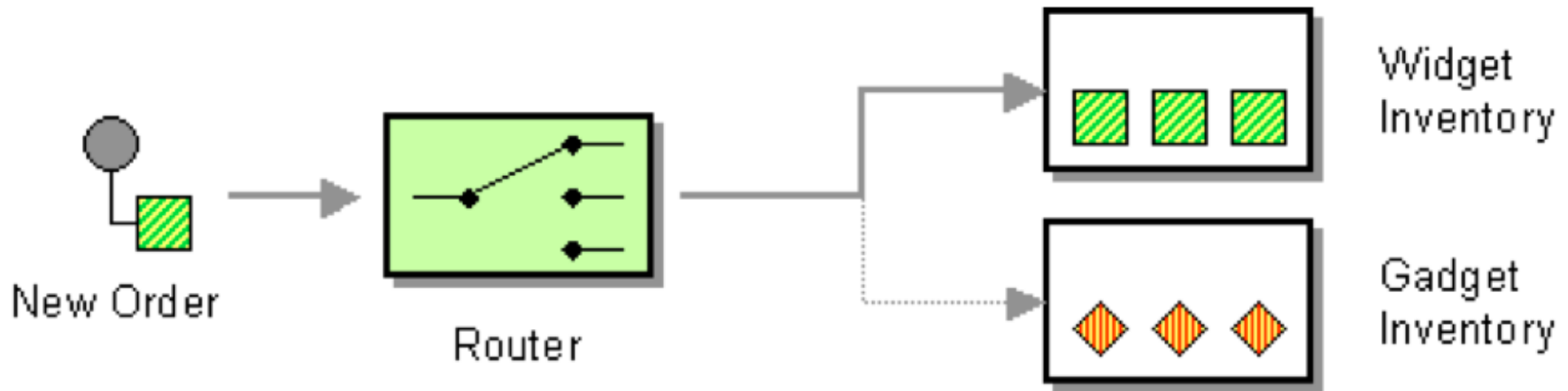
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redhat.

What is Apache Camel?


```
Endpoint newOrder = endpoint("activemq:queue:newOrder");
Predicate isWidget = xpath("/order/product = 'widget'");


from(newOrder)
  .choice()
    .when(isWidget).to(widget)
    .otherwise().to(gadget);
```

redhat.

What is Apache Camel?


```
Endpoint newOrder = endpoint("activemq:queue:newOrder");
Predicate isWidget = xpath("/order/product = 'widget'");
Endpoint widget = endpoint("activemq:queue:widget");
Endpoint gadget = endpoint("activemq:queue:gadget");

from(newOrder)
  .choice()
    .when(isWidget).to(widget)
    .otherwise().to(gadget);
```
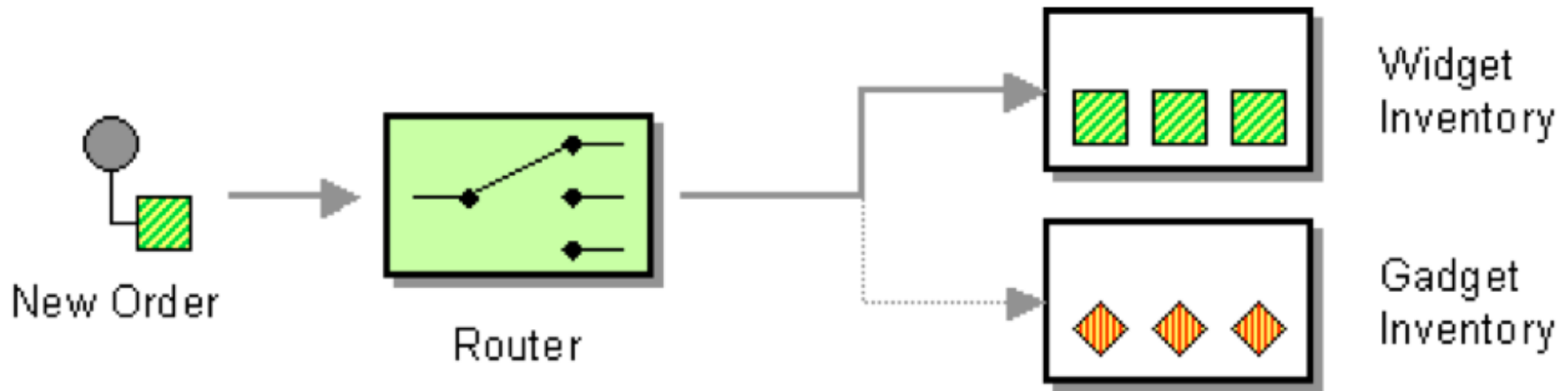
PUBLIC PRESENTATION | CLAUS IBSEN redhat.

What is Apache Camel?

- Java Code

```java
public void configure() throws Exception {
    Endpoint newOrder = endpoint("activemq:queue:newOrder");
    Predicate isWidget = xpath("/order/product = 'widget'");
    Endpoint widget = endpoint("activemq:queue:widget");
    Endpoint gadget = endpoint("activemq:queue:gadget");

    from(newOrder)
        .choice()
            .when(isWidget).to(widget)
            .otherwise().to(gadget)
        .end();
}
```

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redhat.

What is Apache Camel?

- Java Code

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

public class MyRoute extends RouteBuilder {

  public void configure() throws Exception {
    Endpoint newOrder = endpoint("activemq:queue:newOrder");
    Predicate isWidget = xpath("/order/product = 'widget'");
    Endpoint widget = endpoint("activemq:queue:widget");
    Endpoint gadget = endpoint("activemq:queue:gadget");

    from(newOrder)
      .choice()
        .when(isWidget).to(widget)
        .otherwise().to(gadget)
      .end();
  }
}
```

What is Apache Camel?

- Camel Java DSL

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

public class MyRoute extends RouteBuilder {

  public void configure() throws Exception {
    from("activemq:queue:newOrder")
      .choice()
        .when(xpath("/order/product = 'widget'"))
          .to("activemq:queue:widget")
        .otherwise()
          .to("activemq:queue:gadget")
      .end();
  }
}
```

redhat.

What is Apache Camel?

- Camel XML DSL

```xml
<route>
  <from uri="activemq:queue:newOrder"/>
  <choice>
    <when>
      <xpath>/order/product = 'widget'</xpath>
      <to uri="activemq:queue:widget"/>
    </when>
    <otherwise>
      <to uri="activemq:queue:gadget"/>
    </otherwise>
  </choice>
</route>
```
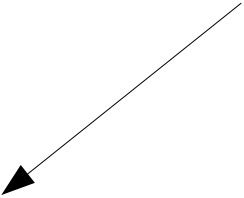
What is Apache Camel?

- Endpoint as URIs

use file instead

```
<route>
  <from uri="file:inbox/orders"/>
  <choice>
    <when>
      <xpath>/order/product = 'widget'</xpath>
      <to uri="activemq:queue:widget"/>
    </when>
    <otherwise>
      <to uri="activemq:queue:gadget"/>
    </otherwise>
  </choice>
</route>
```

redhat.

What is Apache Camel?

parameters

- Endpoint as URIs

```xml
<route>
  <from uri="file:inbox/orders?delete=true"/>
  <choice>
    <when>
      <xpath>/order/product = 'widget'</xpath>
      <to uri="activemq:queue:widget"/>
    </when>
    <otherwise>
      <to uri="activemq:queue:gadget"/>
    </otherwise>
  </choice>
</route>
```
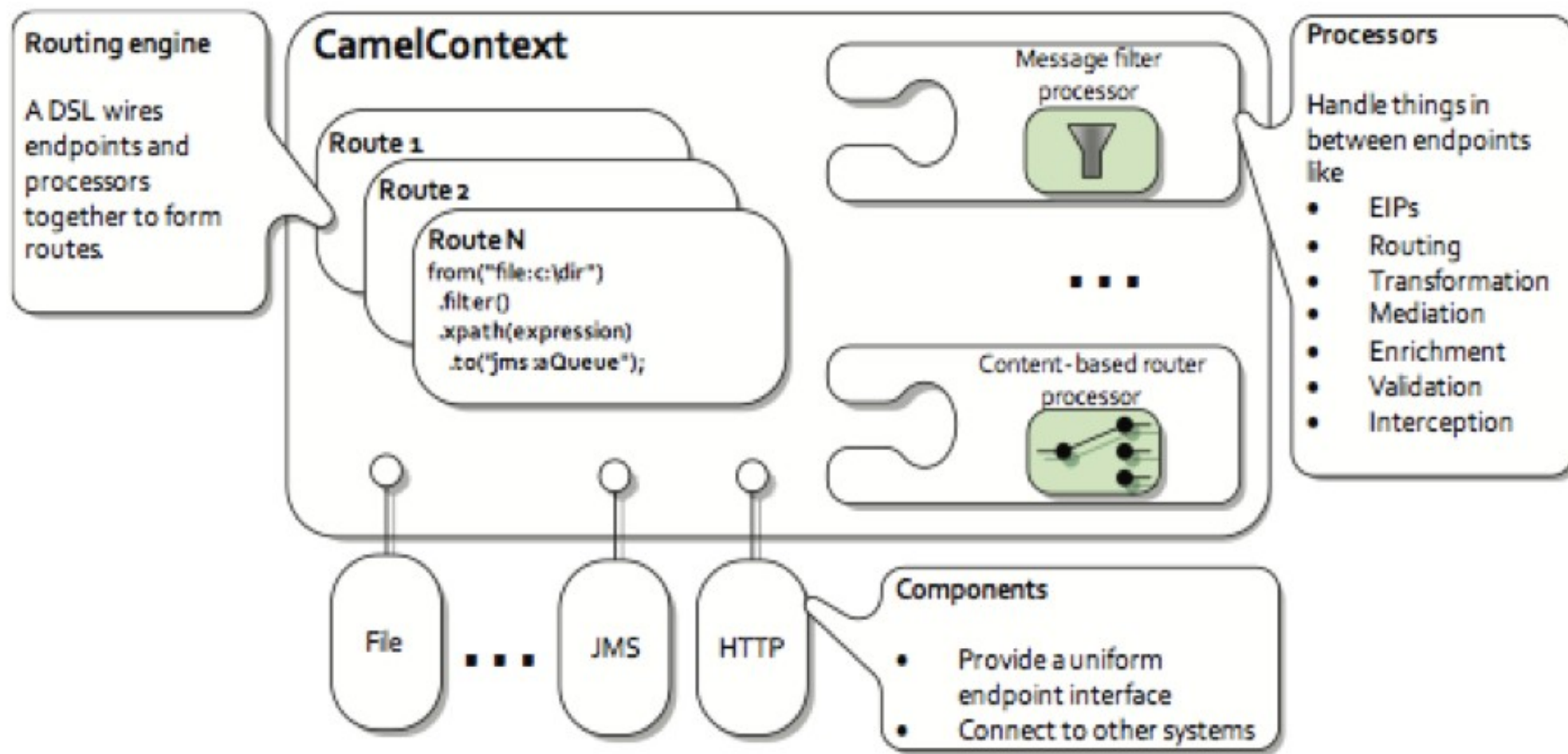
redhat.

What is Apache Camel?

- Camel's Architecture

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What is Apache Camel?

120+ 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

redhat.

What is Apache Camel?

120+ 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

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What is Apache Camel?

- Summary
  - Integration Framework
  - Enterprise Integration Patterns (EIP)
  - Routing (using DSL)
  - Easy Configuration (endpoint as uri's)
  - Payload Agnostic
  - No Container Dependency
  - A lot of components

Agenda

- History of Camel

- What is Apache Camel?

- **A little Example**

- Riding Camel

- What's in the Camel box?

- Deploying Camel

- Creating new Camel Projects
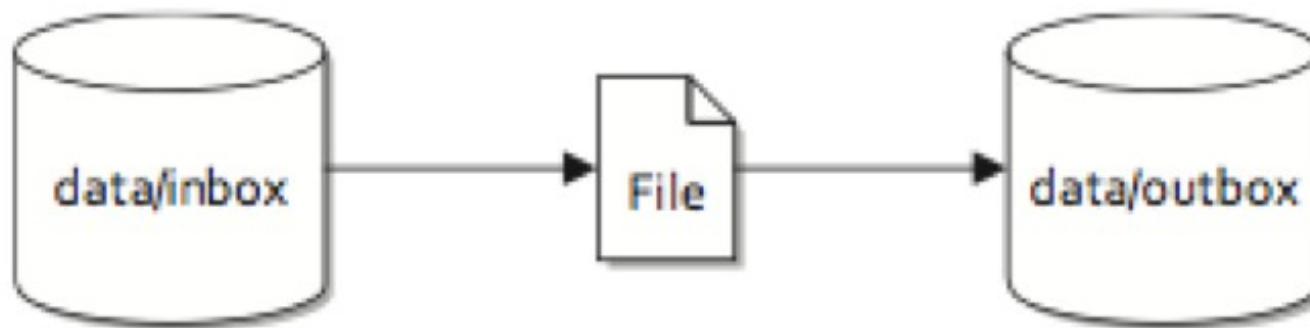
- Extending Camel

- Q and A

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A Little Example

- File Copier Example

Figure 1.2 **Files are routed from the data/inbox directory to the data/outbox directory.**

redhat.

A Little Example

- File Copier Example

Listing 1.2   Routing files from one folder to another with Apache Camel

```
public class FileCopierWithCamel {
    public static void main(String args[]) throws Exception {
        CamelContext context = new DefaultCamelContext();
        context.addRoutes(new RouteBuilder() {
            public void configure() {
                from("file:data/inbox?noop=true")          ① Routes files from
                    .to("file:data/outbox");                  inbox to outbox
            }
        });
        context.start();
        Thread.sleep(10000);
        context.stop();
    }
}
```

redhat.

A Little Example

- File Copier Example

Listing 1.2   Routing files from one folder to another with Apache Camel

```java
public class FileCopierWithCamel {
    public static void main(String args[]) throws Exception {
        CamelContext context = new DefaultCamelContext();
        context.addRoutes(new RouteBuilder() {
            public void configure() {
                from("file:data/inbox?noop=true")
                    .to("file:data/outbox");
            }
        });
        context.start();
        Thread.sleep(10000);
        context.stop();
    }
}
```
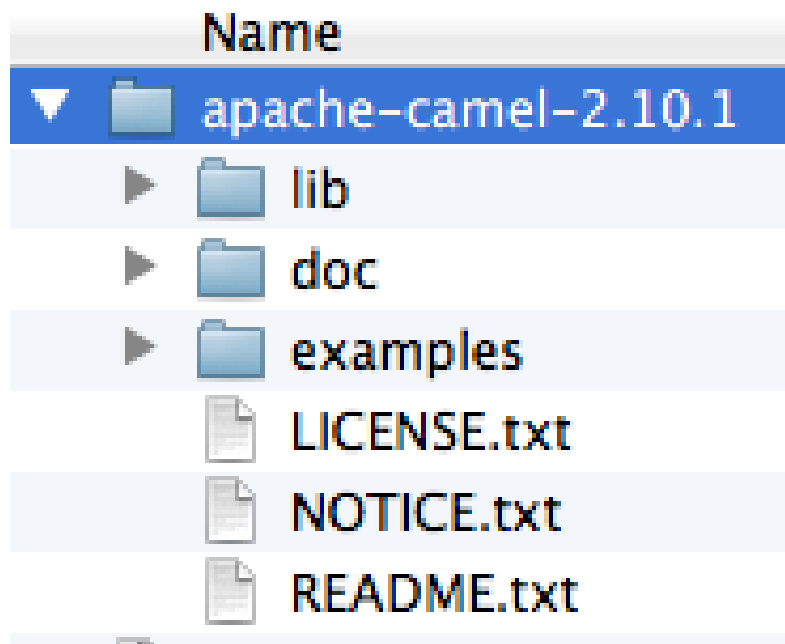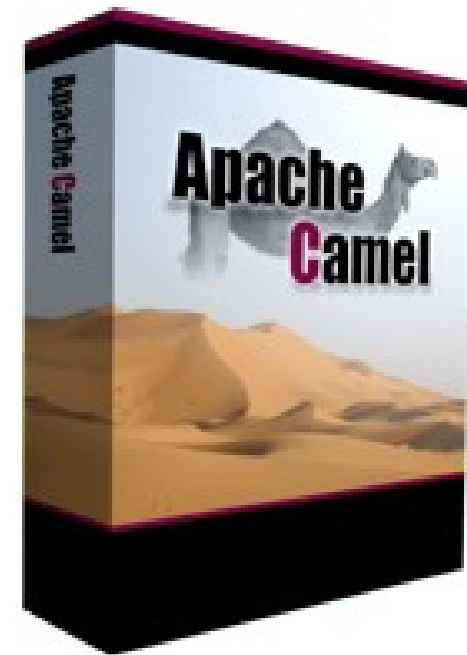
1 **Routes files from inbox to outbox**

redhat.

A Little Example

- File Copier Example

Listing 1.2   Routing files from one folder to another with Apache Camel

```
public class FileCopierWithCamel {
    public static void main(String args[]) throws Exception {
        CamelContext context = new DefaultCamelContext();
        context.addRoutes(new RouteBuilder() {
            public void configure() {
                from("file:data/inbox?noop=true")
                    .to("file:data/outbox");
            }
        });
        context.start();
        Thread.sleep(10000);
        context.stop();
    }
}
```

① **Routes files from inbox to outbox**

redhat.

A Little Example

- File Copier Example

Listing 1.2   Routing files from one folder to another with Apache Camel

```java
public class FileCopierWithCamel {
    public static void main(String args[]) throws Exception {
        CamelContext context = new DefaultCamelContext();
        context.addRoutes(new RouteBuilder() {
            public void configure() {
                from("file:data/inbox?noop=true")
                    .to("file:data/outbox");
            }
        });
        context.start();
        Thread.sleep(10000);
        context.stop();
    }
}
```

1 Routes files from inbox to outbox

redhat.

Agenda

- History of Camel

- What is Apache Camel?

- A little Example

- **Riding Camel**

- What's in the Camel box?

- Deploying Camel

- Creating new Camel Projects

- Q and A

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Riding Camel

- Downloading Apache Camel
    - zip/tarball (approx 14mb)

Download it Today!

http://camel.apache.org

redhat.
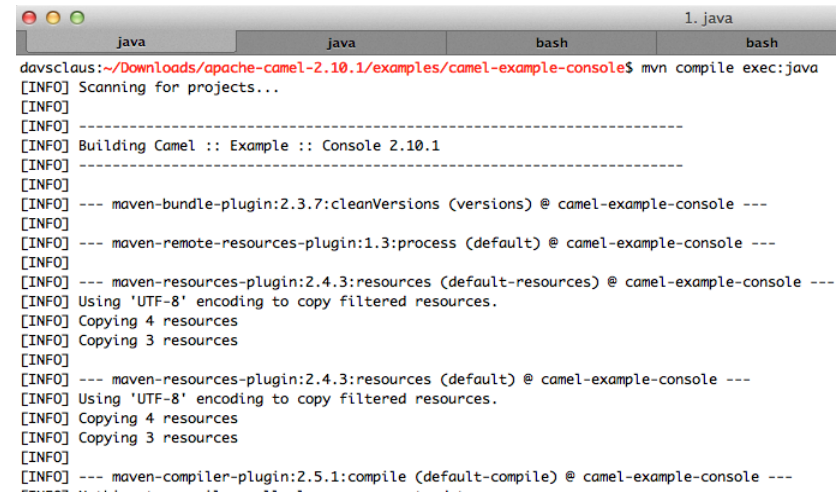
Riding Camel

- Using Command Shell
  - Requires: Apache Maven

- From Eclipse

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Riding Camel

- Console Example


```xml
<camelContext xmlns="http://camel.apache.org/schema/spring">
    <route>
        <from uri="stream:in?promptMessage=Enter something: "/>
        <transform>
            <simple>${body.toUpperCase()}</simple>
        </transform>
        <to uri="stream:out"/>
    </route>
</camelContext>
```
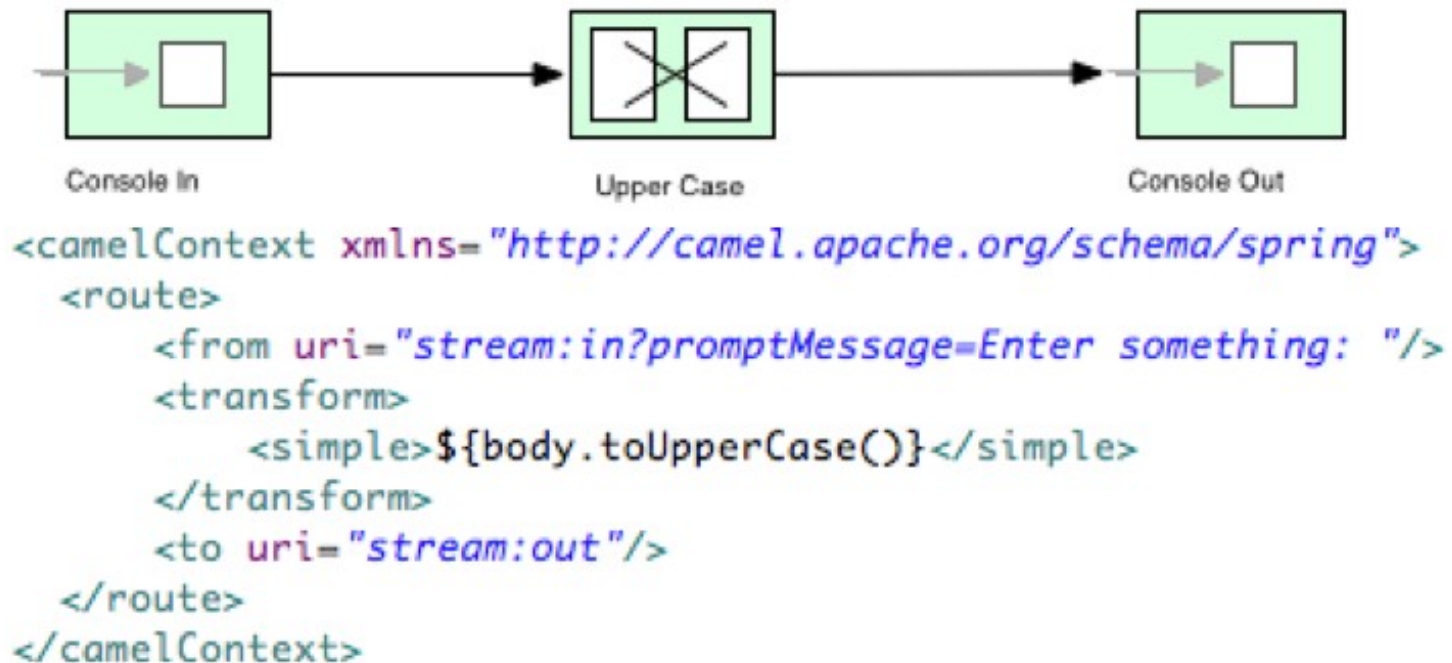
- cd examples/camel-example-console
- mvn compile exec:java

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Riding Camel

- Twitter Example
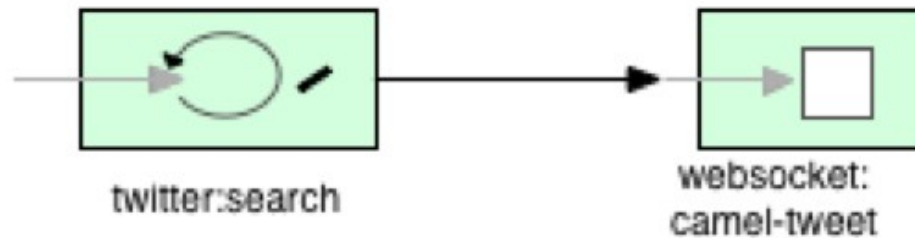
- cd examples/camel-example-twitter-websocket
- mvn compile exec:java

http://localhost:9090/index.html

redhat.

Riding Camel

- More examples ...

```
davsclaus:~/Downloads/apache-camel-2.10.1$ ls examples/
README.txt                    camel-example-docs            camel-example-osgi            camel-example-spring-jms
camel-example-aggregate       camel-example-etl             camel-example-osgi-rmi        camel-example-spring-security
camel-example-bam             camel-example-gae             camel-example-pojo-messaging  camel-example-spring-ws
camel-example-cafe            camel-example-gauth           camel-example-reportincident  camel-example-spring-xquery
camel-example-console         camel-example-guice-jms       camel-example-reportincident-wssecurity  camel-example-ssh
camel-example-cxf             camel-example-jms-file        camel-example-route-throttling  camel-example-tracer
camel-example-cxf-blueprint   camel-example-jmx             camel-example-servlet-tomcat  camel-example-twitter-websocket
camel-example-cxf-osgi        camel-example-loadbalancing   camel-example-simplejirabot   pom.xml
camel-example-cxf-proxy       camel-example-loan-broker     camel-example-spring
camel-example-cxf-tomcat      camel-example-management      camel-example-spring-javaconfig
```
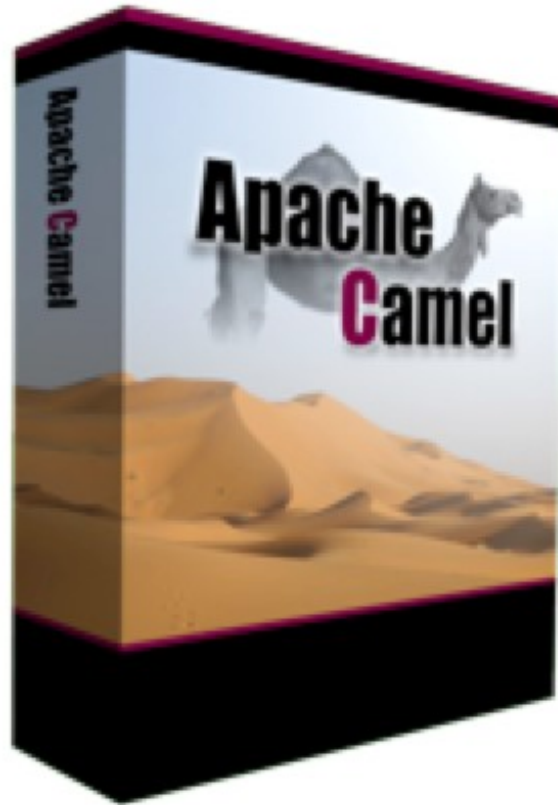
... and further details at website.

http://camel.apache.org/examples
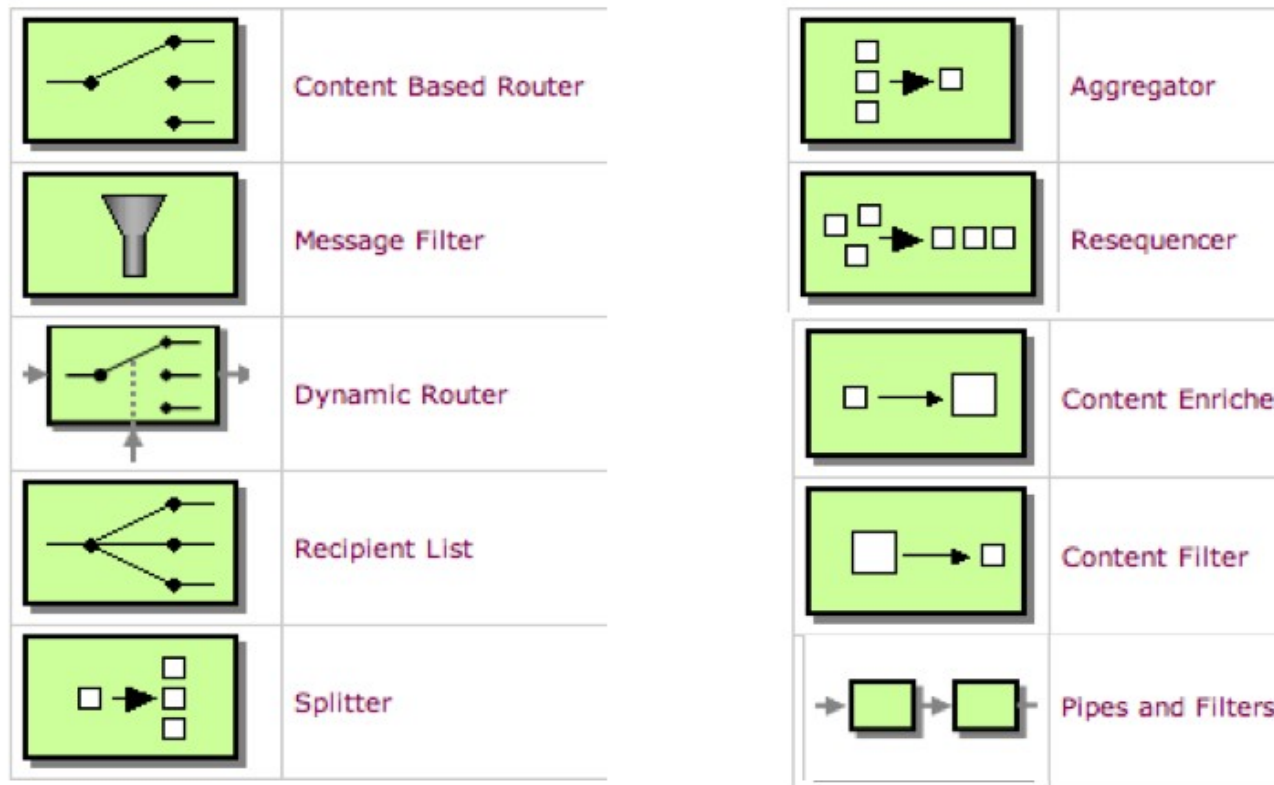
redhat.

Agenda

- History of Camel

- What is Apache Camel?

- A little Example

- Riding Camel

- **What's in the box?**

- Deploying Camel

- Creating new Camel Projects

- Q and A

redhat.

What's in the box?

redhat.

What's in the box?

- Enterprise Integration Patterns

http://camel.apache.org/eip

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redhat.

What's in the box?

- Pipes and Filters EIP

  ▪ Pipes and Filters EIP
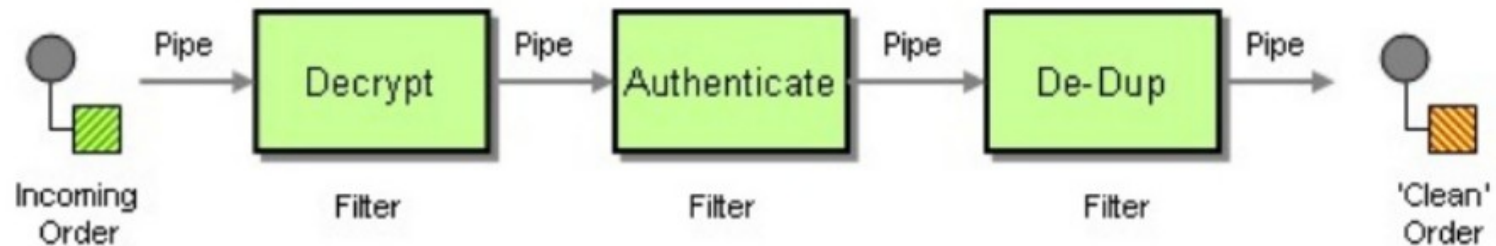

```
from("file:inbox")
    .pipeline()
    .to("bean:decrypt")
    .to("bean:authenticate")
    .to("bean:deDup");
```

redhat.

What's in the box?

- Pipes and Filters EIP

  ▪ Pipes and Filters EIP
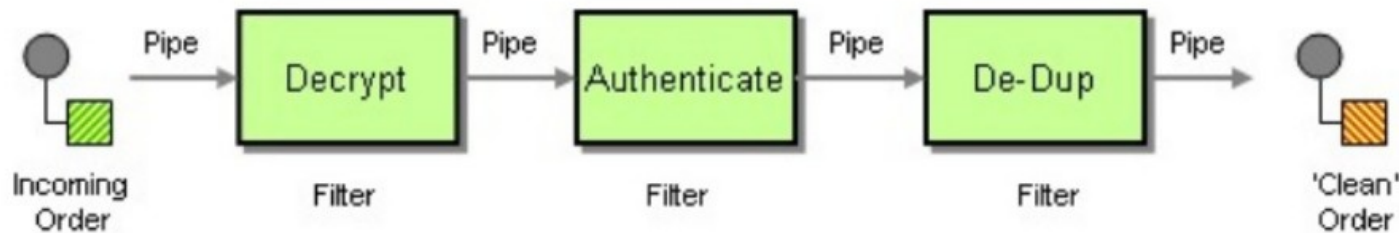

```
from("file:inbox")
    .to("bean:decrypt")
    .to("bean:authenticate")
    .to("bean:deDup");
```

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

redhat.

What's in the box?

- Recipient List EIP

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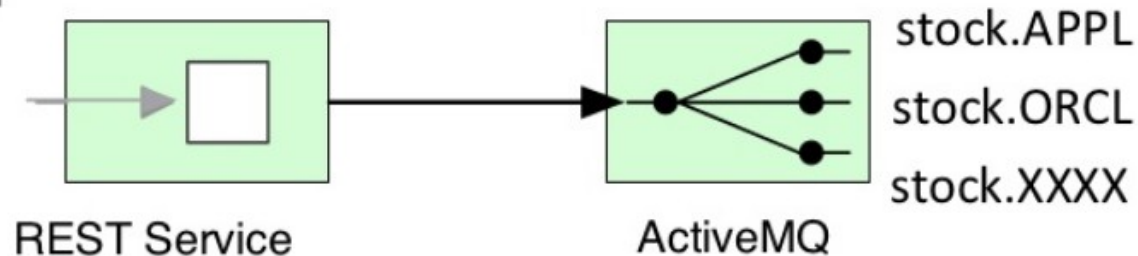
```
from("restlet:http:localhost:9080
      /stock/${symbol}?restletMethods=post")
  .recipientList()
    .simple("activemq:stocks.${header.symbol}");
```

What's in the box?

- Recipient List EIP
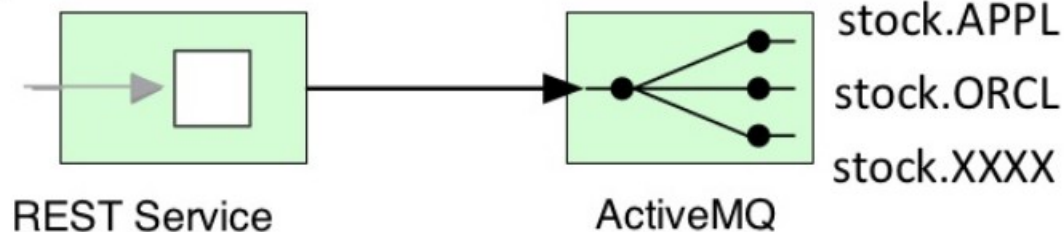

```
from("restlet:http:localhost:9080
     /stock/${symbol}?restletMethods=post")
   .recipientList()
     .simple("activemq:stocks.${header.symbol}");
```

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

redhat.

What's in the box?

- Splitter EIP

| File | Splitter | Custom -> XML | ActiveMQ |
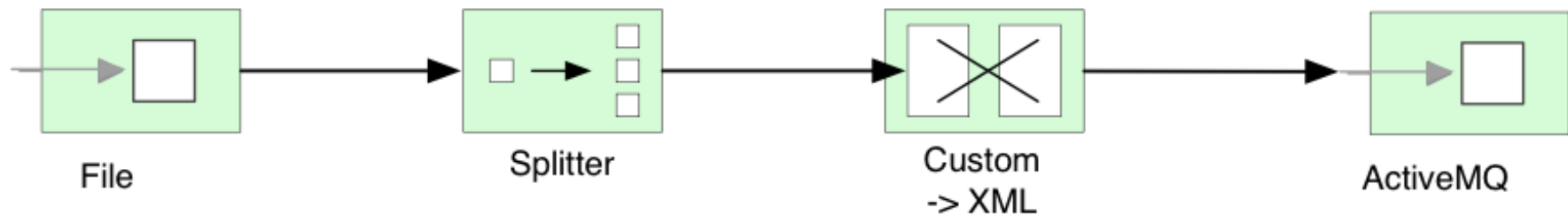
```
from("file:inbox")
  .split(body().tokenize("\n")
    .marshal(customToXml)
    .to("activemq:line");
```

redhat.

What's in the box?

120+ 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

redhat.

What's 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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What's 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

redhat.

What's in the box?

5+ DSL in multiple languages

- Java DSL
- XML DSL (Spring and OSGi Blueprint)
- Groovy DSL
- Scala DSL
- Kotlin DSL (work in progress)

redhat.

What's in the box?

- Type Converters
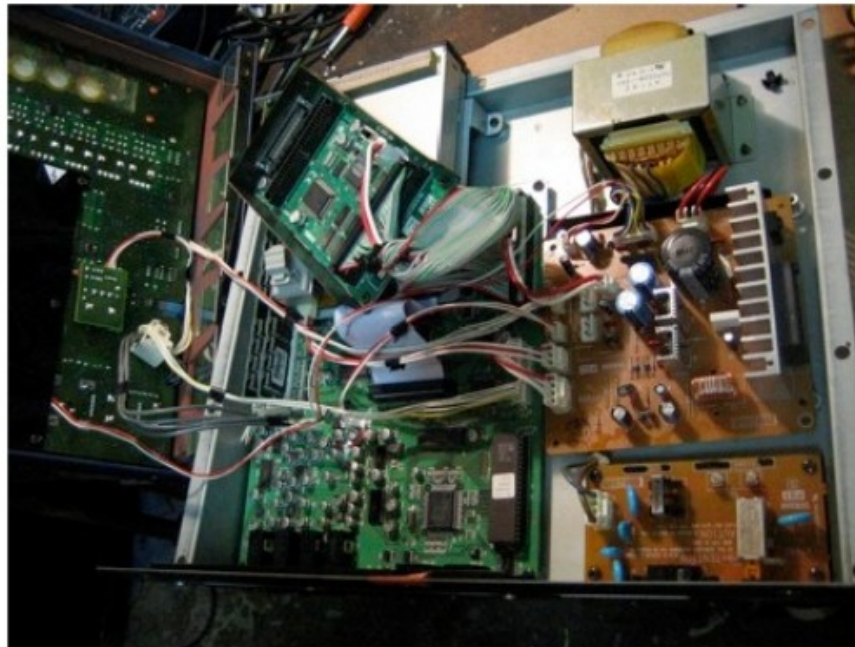
INFO DefaultTypeConverter
- Loaded 148 type converters

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What's in the box?

- Writing Custom Type Converter

```java
@Converter
public class MyTypeConverter {
    @Converter
    public String toString(MyOrder order) {
        StringBuilder sb = new StringBuilder();

        ...

        return sb.toString();
    }
}
```

```
# META-INF/services/org/apache/camel/TypeConverter
com.acme.converters
```

META-INF file in the JAR

redhat.

What's in the box?

- Bean as Message Translator

What's in the box?
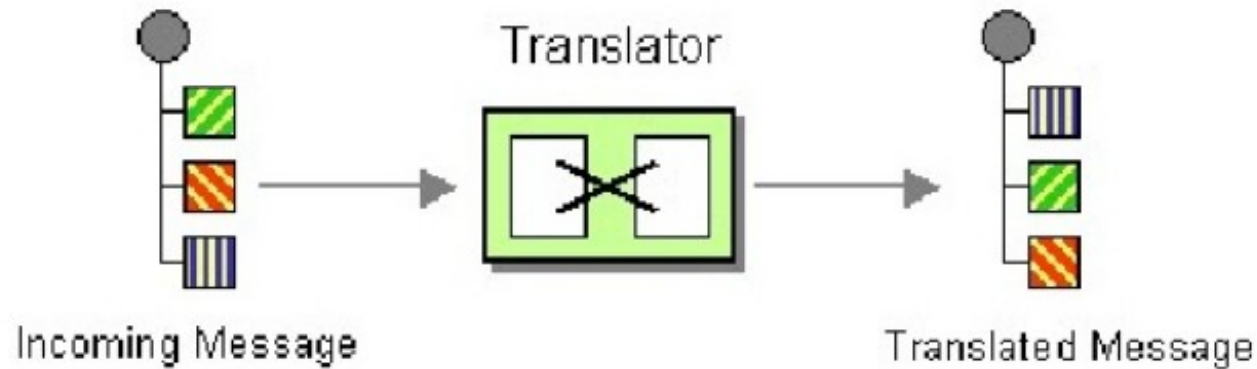
- Bean as Message Translator

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

public class Foo {

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

redhat.

What's in the box?

- Working with beans
  - Powerful bean integration
    - Adapt to your beans
    - EIP as @annotations
      - @Produce
      - @Consume
      - @RecipientList
      - @RoutingSlip
      - @DynamicRouter

What's in the box?

- Working with beans

    - Bean Parameter Binding

```java
public class Foo {

  public String processOrder(
    String orderAsXml,
    @XPath("/order/@id") String oid,
    @Header("JMSCorrelationID") String cid) {
    ...
  }
}
```

redhat.

What's in the box?

- Working with beans
  - Receiving message

```java
public class Foo {

    @Consume(uri="activemq:cheese")
    public void onCheese(String name) {
        ...
    }
}
```

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What's in the box?

- Working with beans
  - Sending message

```java
public class Foo {
    @Produce(uri="activemq:foo.bar")
    ProducerTemplate producer;

    public void doSomething() {
        if (whatever) {
            producer.sendBody("<hello>world!</hello>");
        }
    }
}
```

redhat.

What's in the box?

Test Kit

- camel-test   camel-test-spring

- camel-test-blueprint   camel-testng

What's in the box?

Management

- JMX

- REST
  (@deprecated)
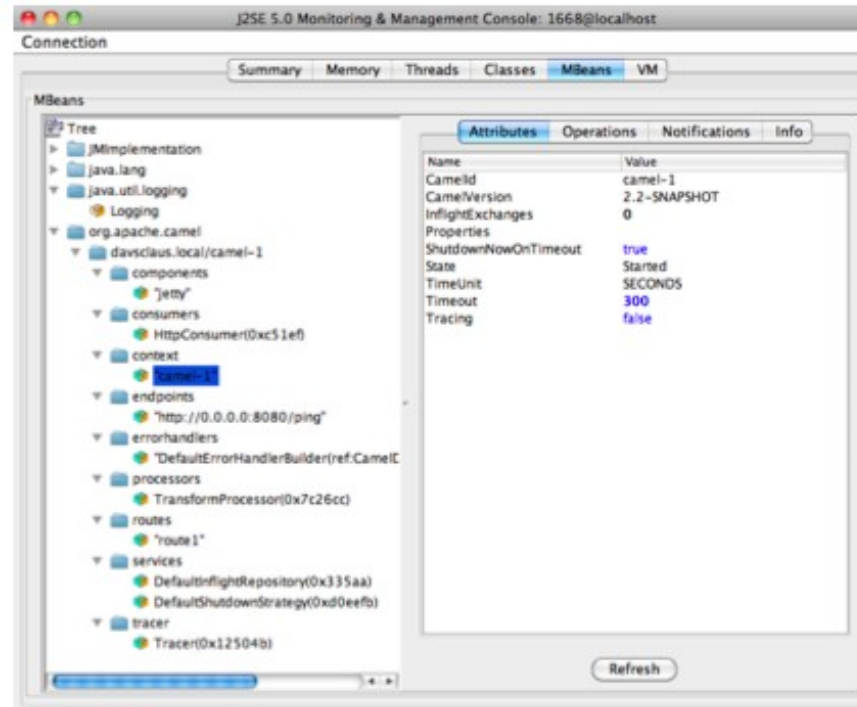
What's in the box?

Tooling – Web console - HawtIO

http://hawt.io
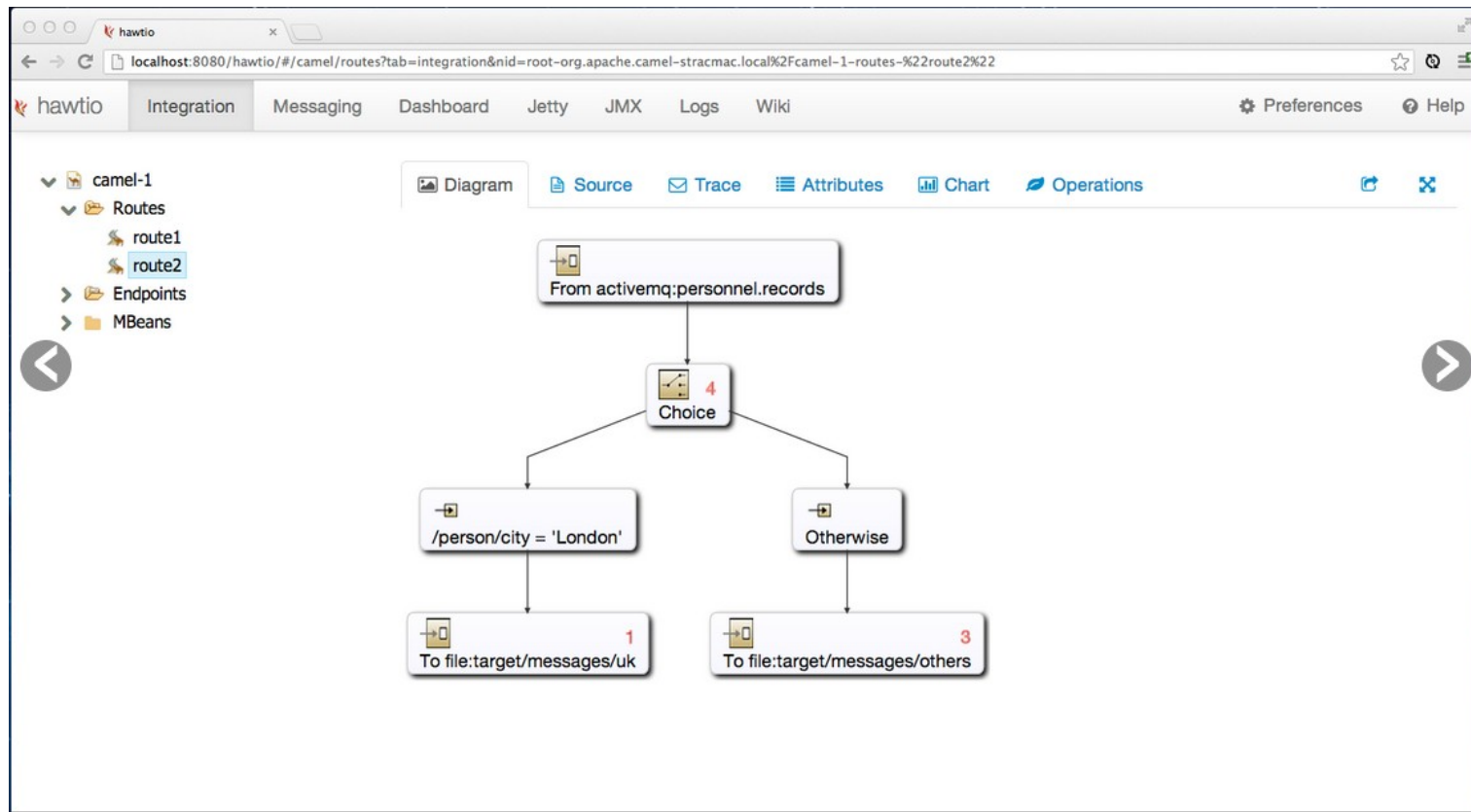
What's in the box?

Tooling – Eclipse Plugin – Fuse IDE

http://github.com/fusesource/fuseide

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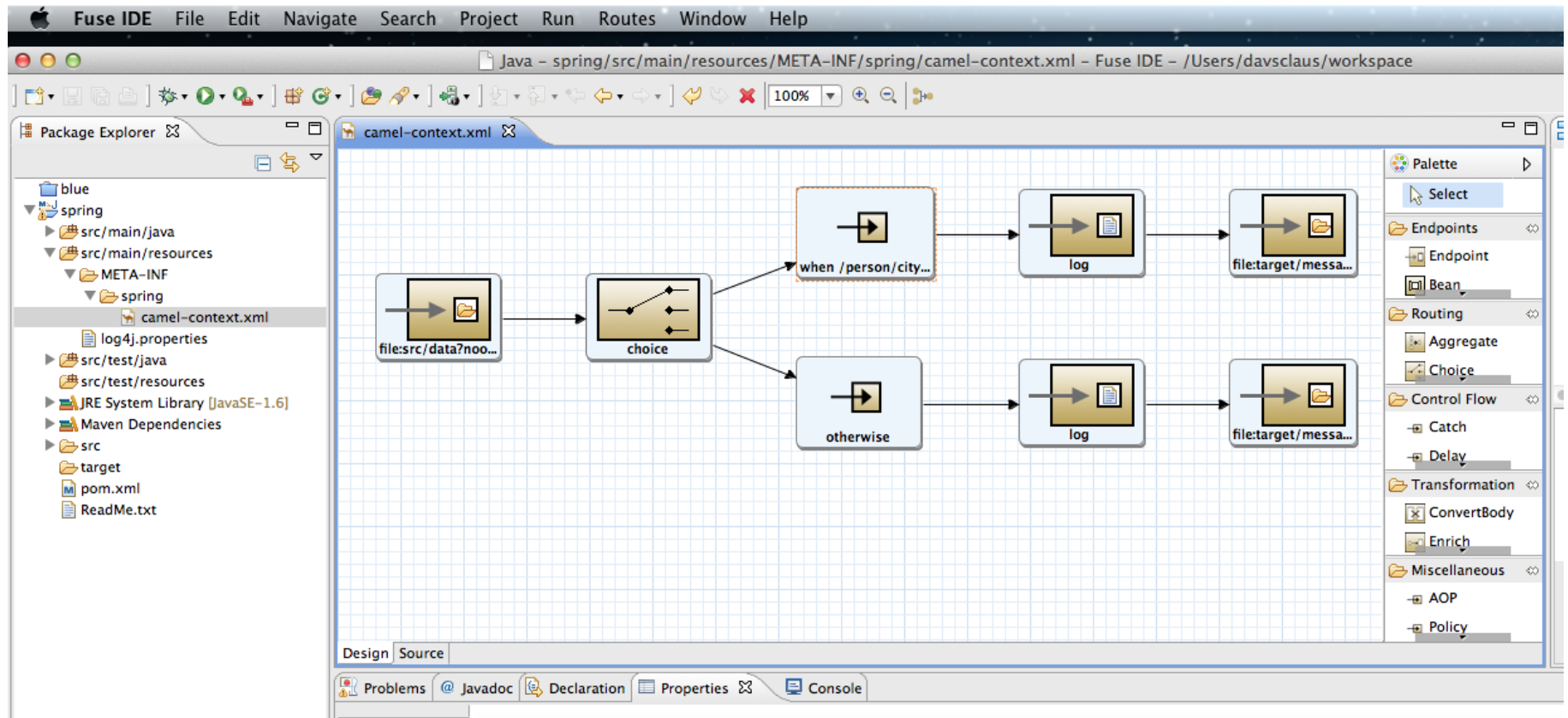
What's in the box?

Error Handling

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What's in the box?

try .. catch style

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

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What's in the box?

Dead Letter Channel (EIP style)

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

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

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What's in the box?

Dead Letter Channel (EIP style)

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

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

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What's in the box?

The Rest

- Interceptors
- Security
- Route Policy
- Type Converters
- Transaction
  - Compensation as rollback
- Asynchronous non-blocking routing engine
- Thread management
- Maven Tooling
- … and much more

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Agenda

- History of Camel

- What is Apache Camel?

- A little Example

- Riding Camel

- What's in the Camel box?

- **Deploying Camel**

- Creating new Camel Projects

- Extending Camel

- Q and A

redhat.

Deploying Camel

- Deployment Strategy
  - No Container Dependency
  - Lightweight & Embeddable
- Deployment Options
  - Standalone
  - WAR
  - Spring
  - JEE
  - OSGi
  - Cloud

Known Containers
Apache ActiveMQ
Apache ServiceMix
Apache Tomcat
Fuse ESB / Fuse MQ
Glassfish
IBM WebSphere
JBoss AS
Jetty
Oracle OC4j
Oracle WebLogic
Amazon EC2
Google App Engine
Rack space
... others

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Camel as a Client

- Java Client Application (no routes)
- Example
  - Upload a file to a FTP server

```java
CamelContext context = new DefaultCamelContext();
ProducerTemplate template = context.createProducerTemplate();

String data = ...
String fileName = ...

String uri = "ftp://myserver?username=foo&password=secret";
template.sendBodyAndHeader(uri, data, Exchange.FILE_NAME, fileName);
```
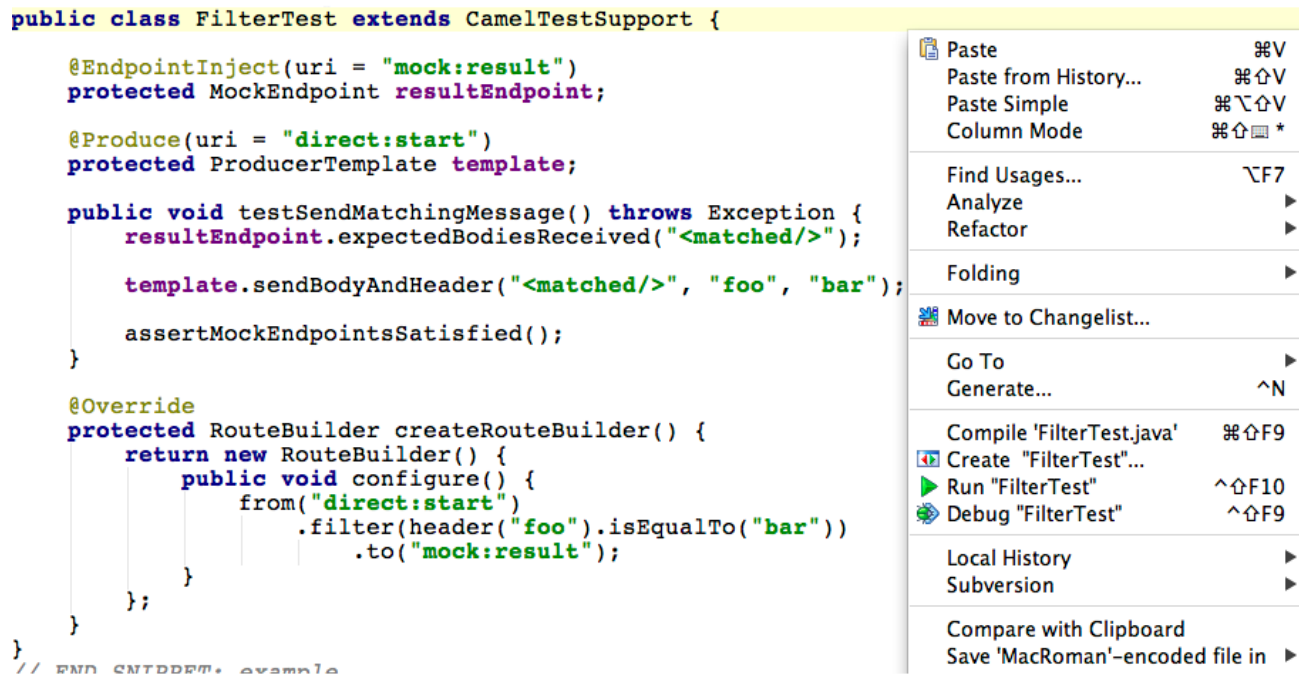
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Agenda

- History of Camel

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- **Creating new Camel Projects**

- Q and A

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Creating new Camel Projects

- Using Command Shell

mvn archetype:generate

- From Eclipse

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Creating new Camel Projects

- Maven Archetypes

camel-archetype-activemq
camel-archetype-blueprint
camel-archetype-component
camel-archetype-dataformat
camel-archetype-java
camel-archetype-scala
camel-archetype-spring
camel-archetype-spring-dm
camel-archetype-web
camel-archetype-webconsole

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Creating new Camel Projects

- camel-archetype-blueprint

```xml
<blueprint xmlns="http://www.osgi.org/xmlns/blueprint/v1.0.0"
        xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xmlns:camel="http://camel.apache.org/schema/blueprint"
        xsi:schemaLocation="
        http://www.osgi.org/xmlns/blueprint/v1.0.0 http://www.osgi.org/xmlns/blueprint/v1.0.0/blueprint.xsd
        http://camel.apache.org/schema/blueprint http://camel.apache.org/schema/blueprint/camel-blueprint.xsd">

    <bean id="helloBean" class="com.foo.HelloBean">
        <property name="say" value="Hi from Camel"/>
    </bean>

    <camelContext trace="false" id="blueprintContext" xmlns="http://camel.apache.org/schema/blueprint">
        <route id="timerToLog">
            <from uri="timer:foo?period=5000"/>
            <setBody>
                <method method="hello" ref="helloBean"></method>
            </setBody>
            <log message="The message contains ${body}"/>
            <to uri="mock:result"/>
        </route>
    </camelContext>

</blueprint>
```

```
mvn install
mvn camel:run
```

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Creating new Camel Projects

- Importing into Eclipse

Existing Maven Project

redhat.
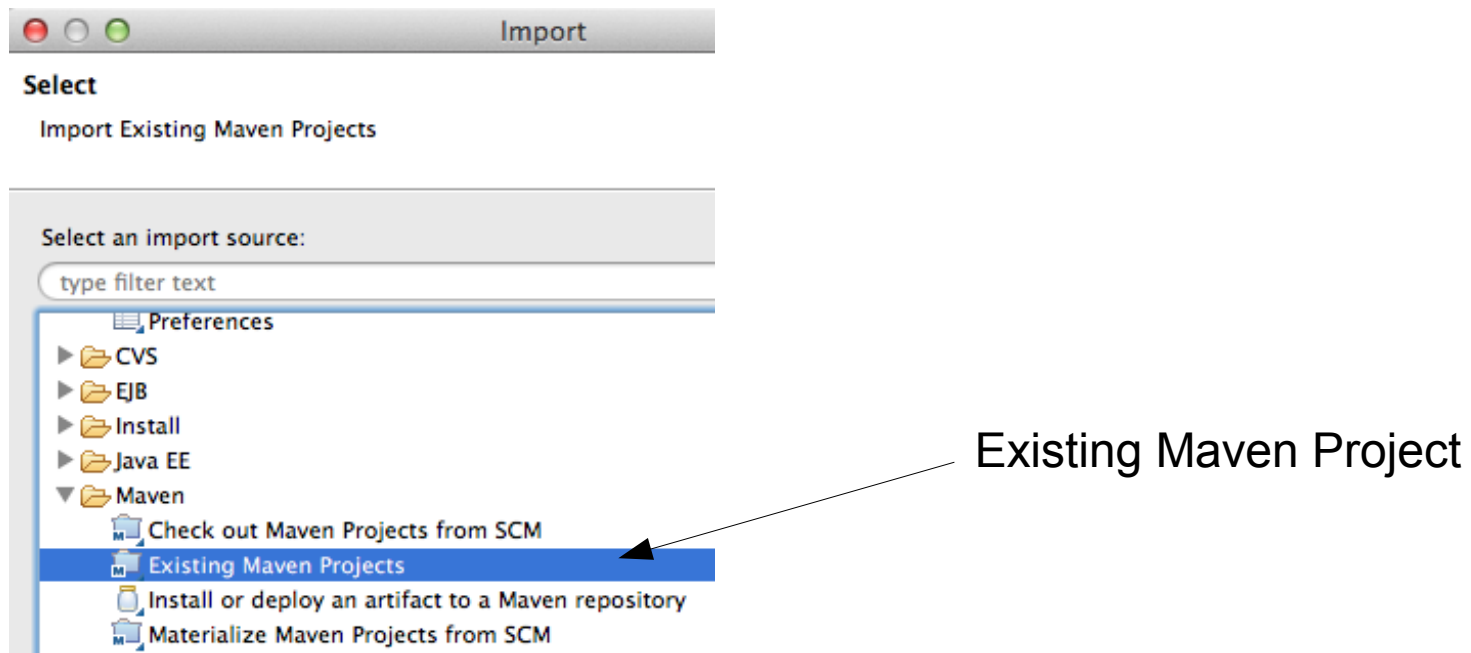
Creating new Camel Projects

- Testing Camel Projects

```java
public class RouteTest extends CamelBlueprintTestSupport {

    @Override
    protected String getBlueprintDescriptor() {
        return "/OSGI-INF/blueprint/blueprint.xml";
    }

    @Test
    public void testRoute() throws Exception {
        // the route is timer based, so every 5th second a message is send
        // we should then expect at least one message
        getMockEndpoint("mock:result").expectedMinimumMessageCount(1);

        // assert expectations
        assertMockEndpointsSatisfied();
    }

}
```

- ... from inside Eclipse
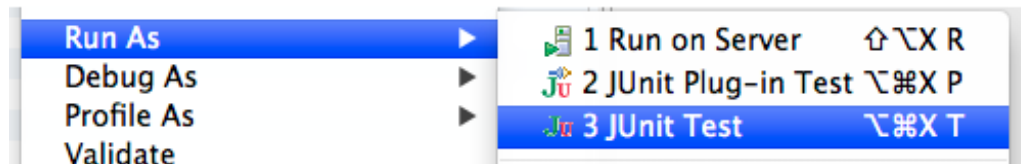
Run As	▶	📇 1 Run on Server	⇧⌥X R
Debug As	▶	Ju 2 JUnit Plug-in Test	⌥⌘X P
Profile As	▶	Ju **3 JUnit Test**	⌥⌘X T
Validate			

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Agenda

- History of Camel

- What is Apache Camel?

- A little Example

- Riding Camel

- What's in the Camel box?

- Deploying Camel

- Creating new Camel Projects

- **Q and A**

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Where do I get more information?

- Best Article covering what Apache Camel is
    - http://java.dzone.com/articles/open-source-integration-apache

Link to article from "Getting Started"

Where do I get more information?

- Try Camel Examples

    - http://camel.apache.org/examples.html

- Read other blogs and articles

    - http://camel.apache.org/articles.html

- Use the "search box" on the Camel front page
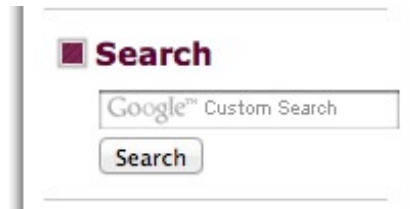
Where do I get more information?

- Use the mailing list / forum
  - http://camel.apache.org/mailing-lists.html

- Use stackoverflow
  - http://stackoverflow.com/questions/tagged/apache-camel

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Where do I get more information?

- Buy the Camel in Action book

http://manning.com/ibsen/
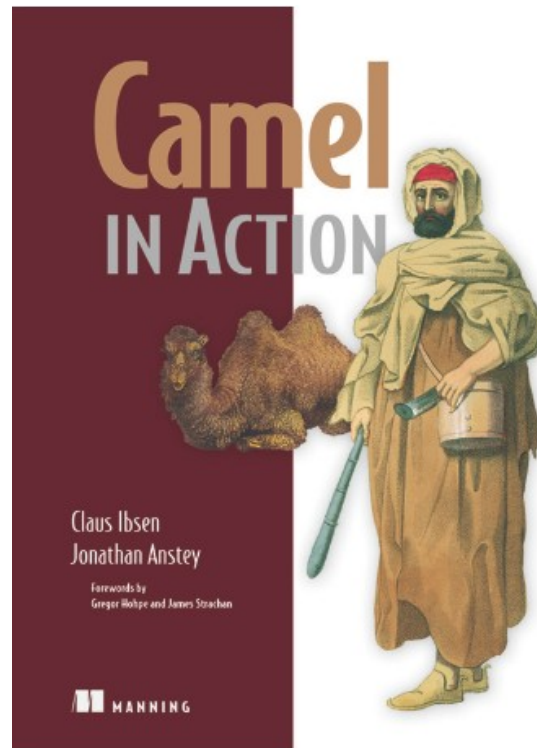
Use code ...
camel40
… for 40% discount

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Any Questions ?

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    - Linkedin: http://www.linkedin.com/in/davsclaus

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