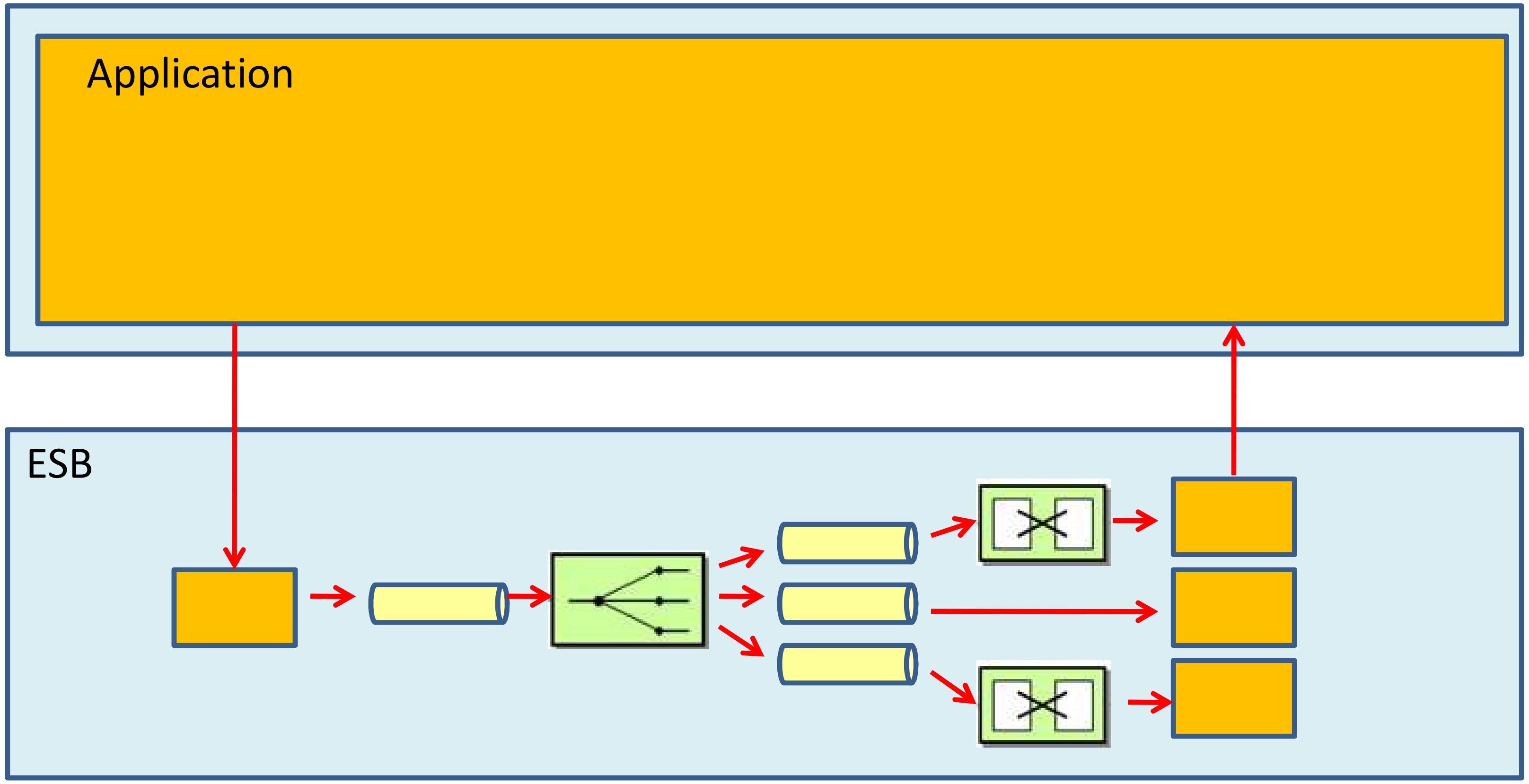
SPRING INTEGRATION

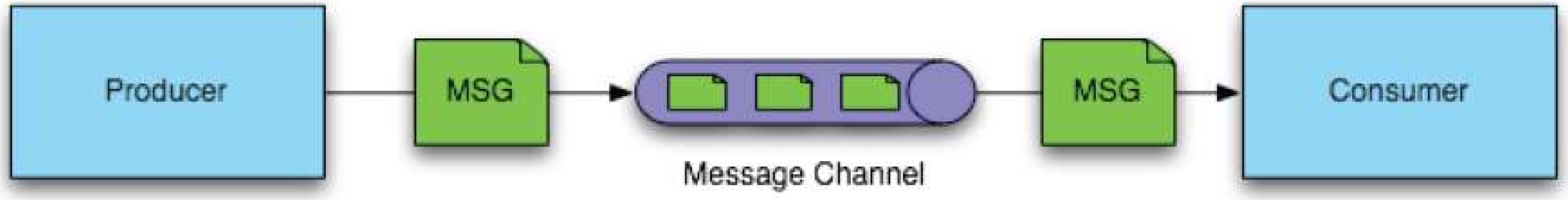
ESB

- Runs outside the application
  - Needs to be installed, started, stopped, monitored.

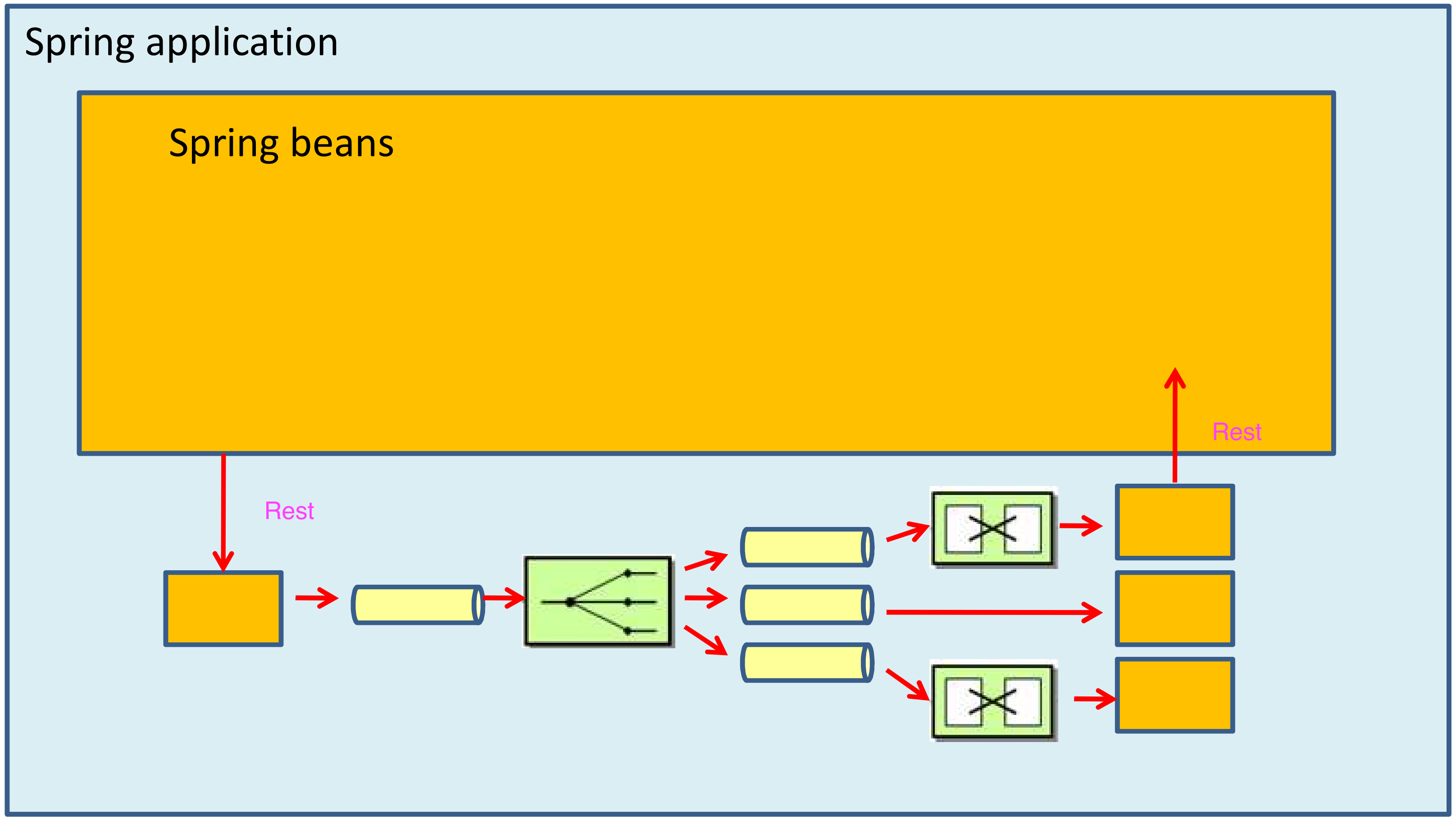


What is Spring Integration?

- Integration framework
- Provides a simple model to implement complex enterprise integration solutions
- Facilitate asynchronous, parallel, message-driven behavior within a Spring-based application

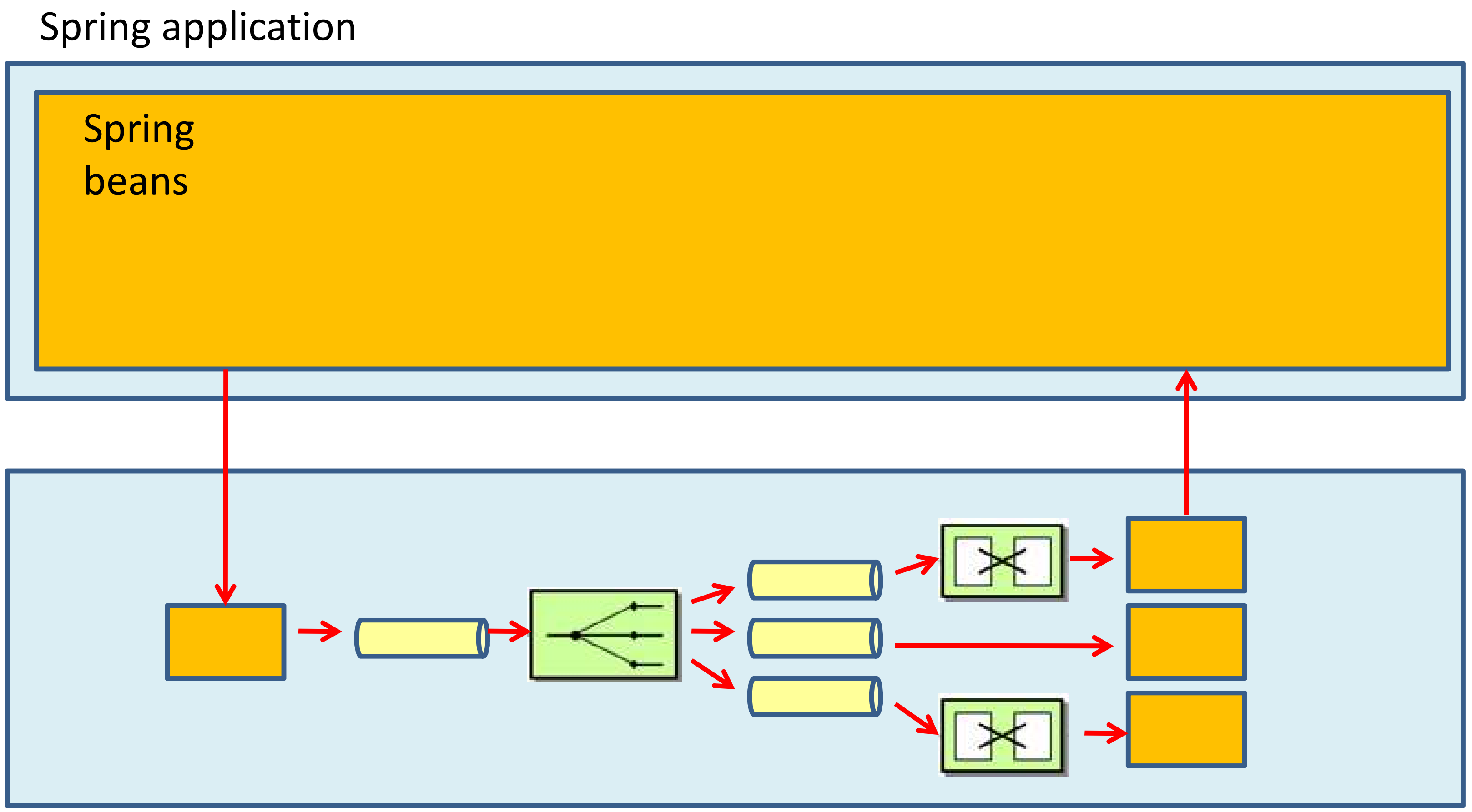


Using Spring Integration



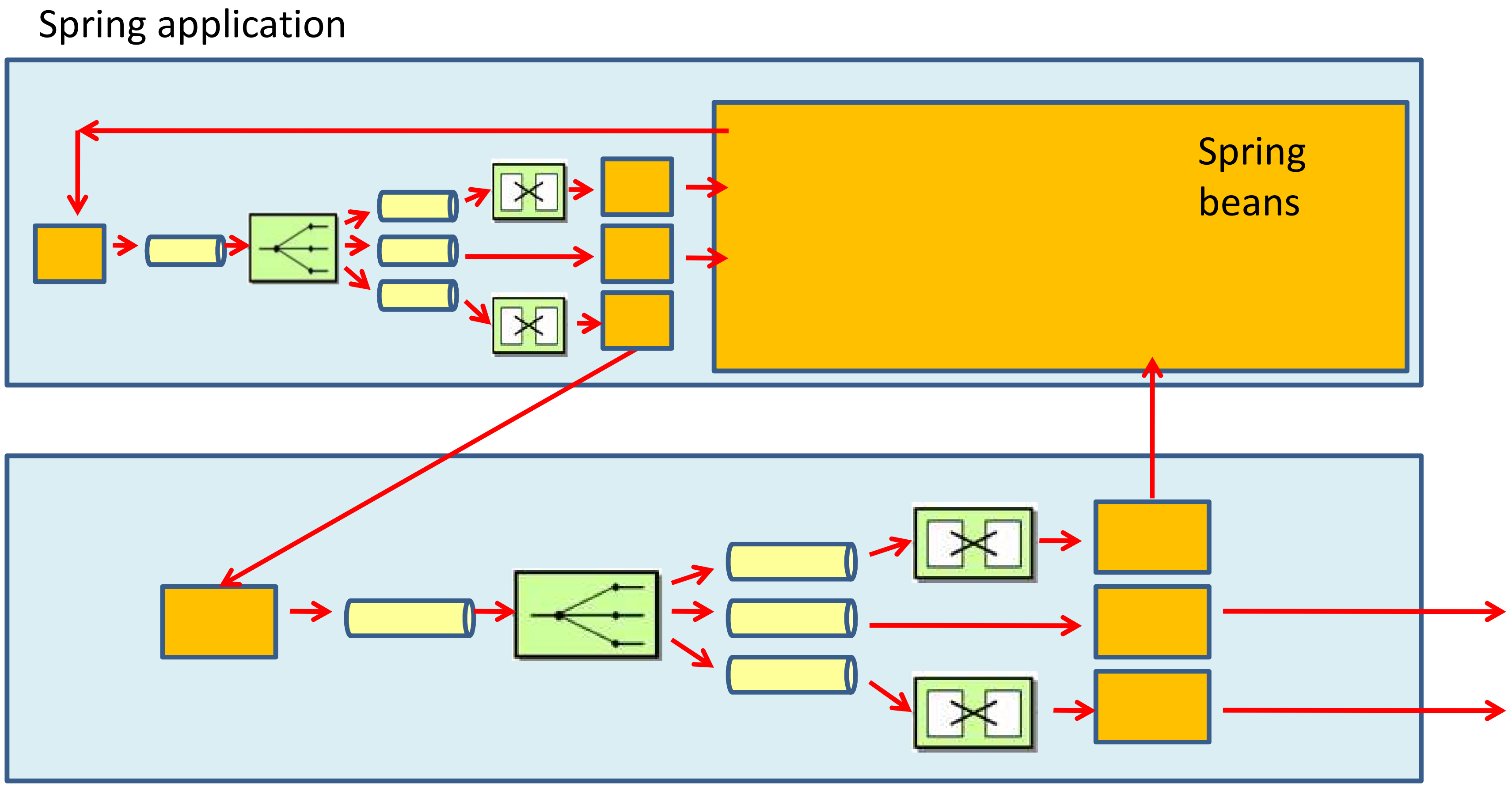
- Use SI inside your application

Using Spring Integration



- Use SI outside your application

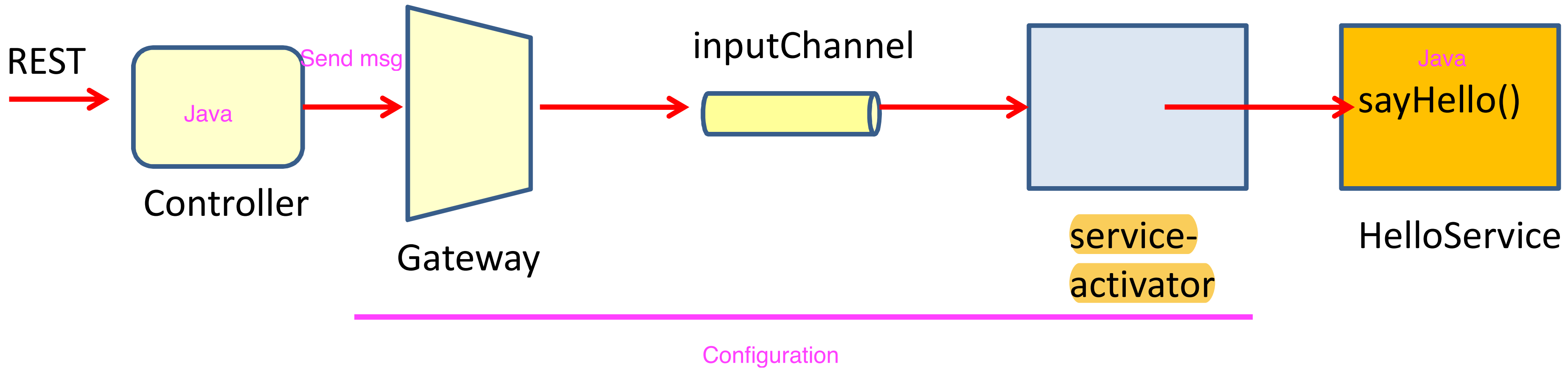
Using Spring Integration



- Use SI inside and outside your application

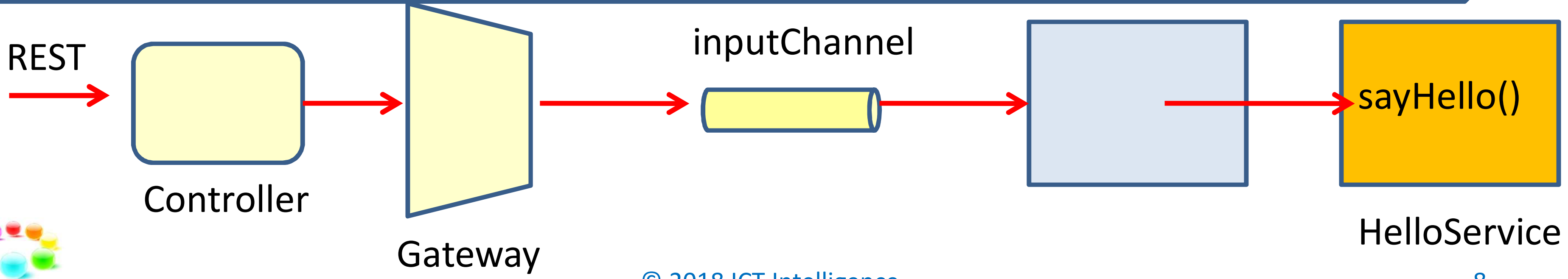
Spring integration Hello World

```java
public class HelloService {

  public void sayHello(String name) {
    System.out.println("Hello "+ name);
  }
}
```



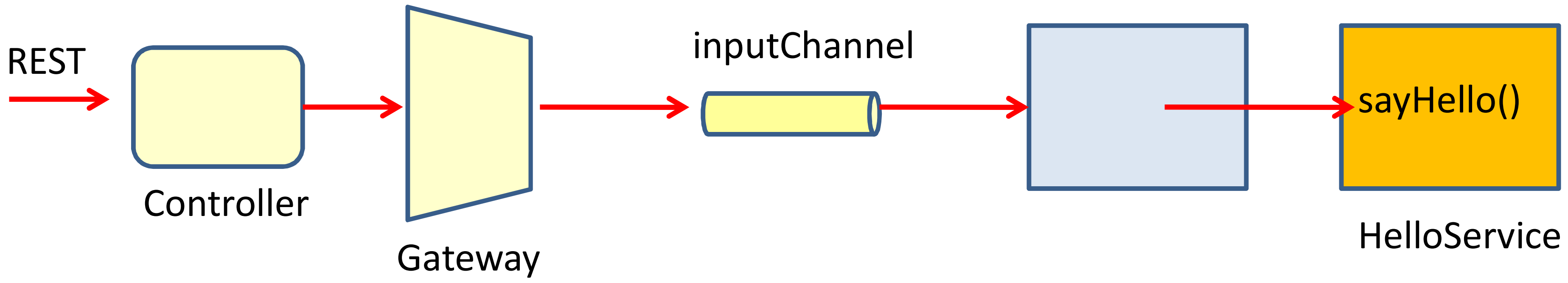
springconfiguration.xml

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

  <channel id="inputChannel"/>

  <service-activator input-channel="inputChannel"
                     ref="helloService"
                     method="sayHello"/>

  <beans:bean id="helloService"  class="integration.HelloService"/>

</beans:beans>
```



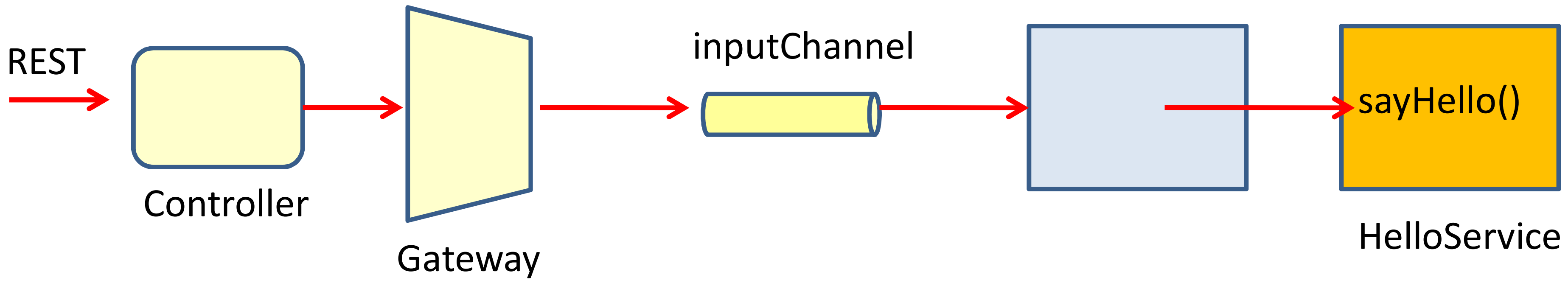
The gateway

```
@MessagingGateway
public interface GreetingGateway {
                                              On which channel should work on
  @Gateway(requestChannel = "inputChannel")
  String handleRequest(String name);
}
```

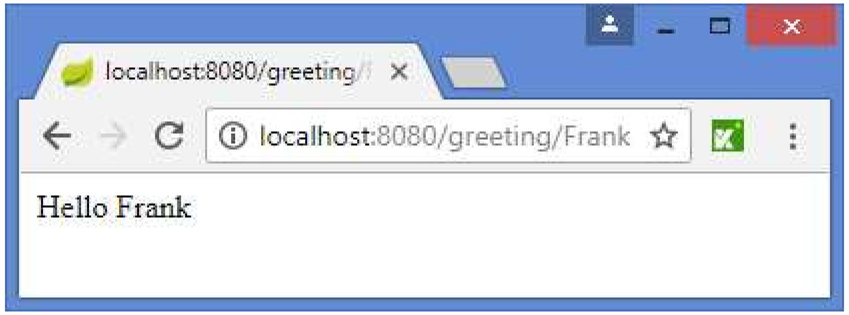


The controller

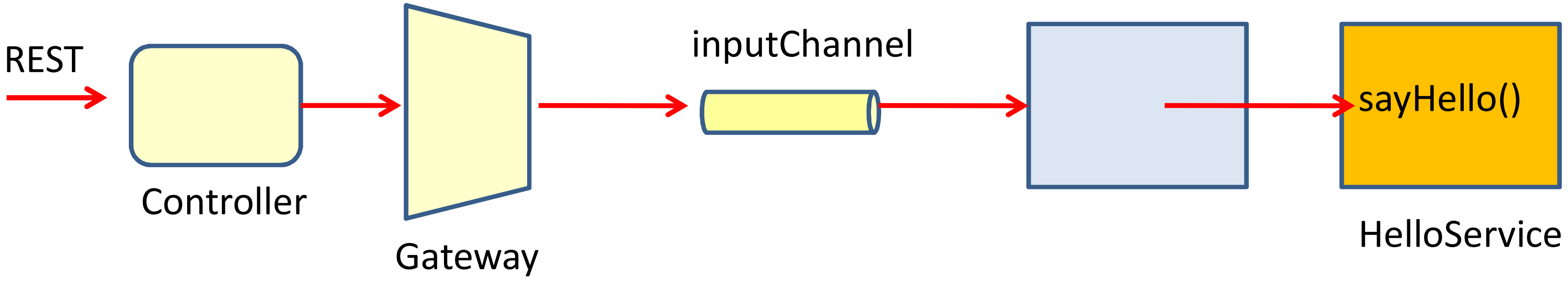
```
@RestController
public class Controller {
  @Autowired
  private GreetingGateway gateway;

  @RequestMapping("/greeting/{name}")
  public String getGreeting(@PathVariable("name") String name) {
    String result = gateway.handleRequest(name);
    return result;
  }
}
```



The output

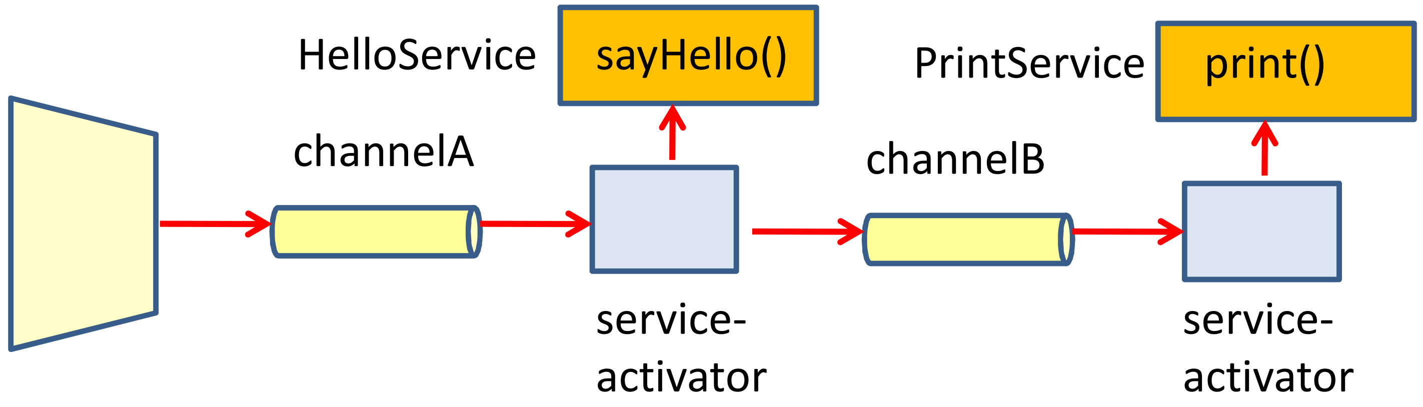

localhost:8080/greeting/Frank

Hello Frank



Extending the application

```xml
<channel id="channelA"/>
<channel id="channelB"/>

<service-activator input-channel="channelA"
                   output-channel="channelB"
                   ref="helloService"
                   method="sayHello"/>

<service-activator input-channel="channelB"
                   ref="printService"
                   method="print"/>

<beans:bean id="helloService" class="integration.HelloService"/>
<beans:bean id="printService" class="integration.PrintService"/>
```



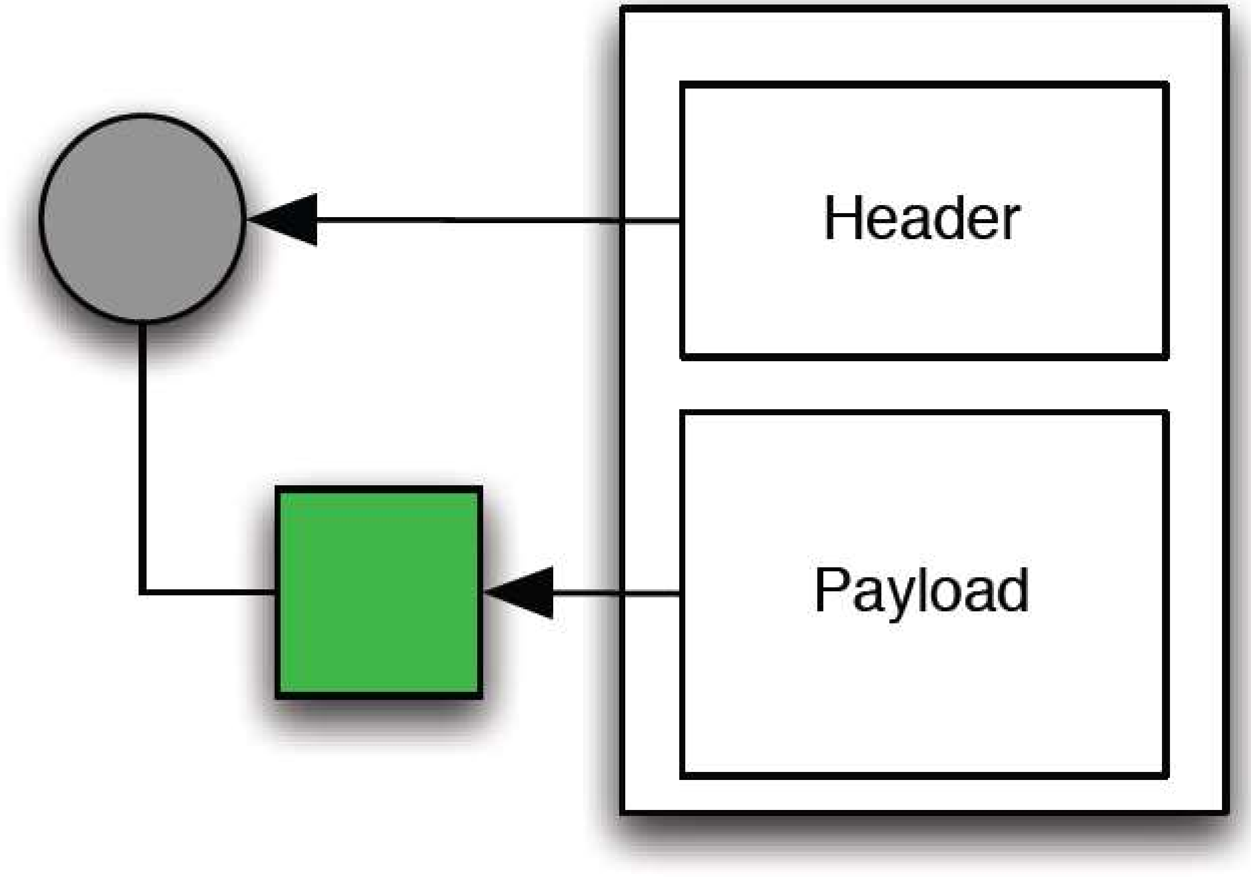
Extending the application

```
public class HelloService {

  public String sayHello(String name) {
    System.out.println("HelloService: receiving name "+name);
    return "Hello "+ name;
  }
}
```

```
public class PrintService {

  public void print(String message) {
   System.out.println("Printing message: "+ message);
  }
}
```

MESSAGES

Message



The Message interface

```
public interface Message<T> {

    T getPayload();

    MessageHeaders getHeaders();

}
```

Messages are immutable
There are no setter methods

```
public final class MessageHeaders implements Map<String, Object>, Serializable
{
  ...
}
```

MessageHeaders is a Map of Java objects

Creating a Message

```
Message<String> helloMessage =
         MessageBuilder.withPayload("Hello, world!").build();
```

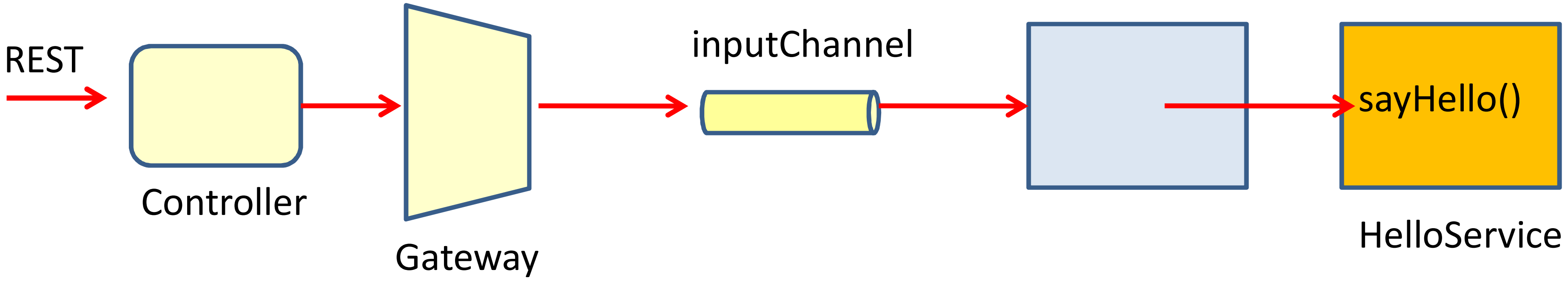
```
Message<String> helloMessage =
         MessageBuilder.withPayload("Hello, world!")
         .setHeader("my.custom.header", "HeaderValue")
         .build();
```

name value

The gateway

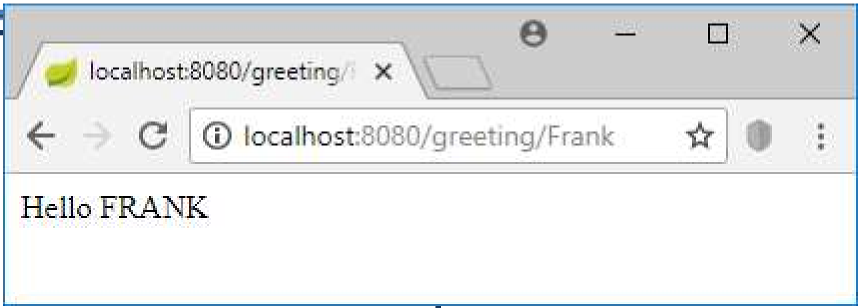
```
@MessagingGateway
public interface GreetingGateway {

  @Gateway(requestChannel = "inputChannel")
  String handleRequest(Message<String> message);
}
```

Message instead of a String



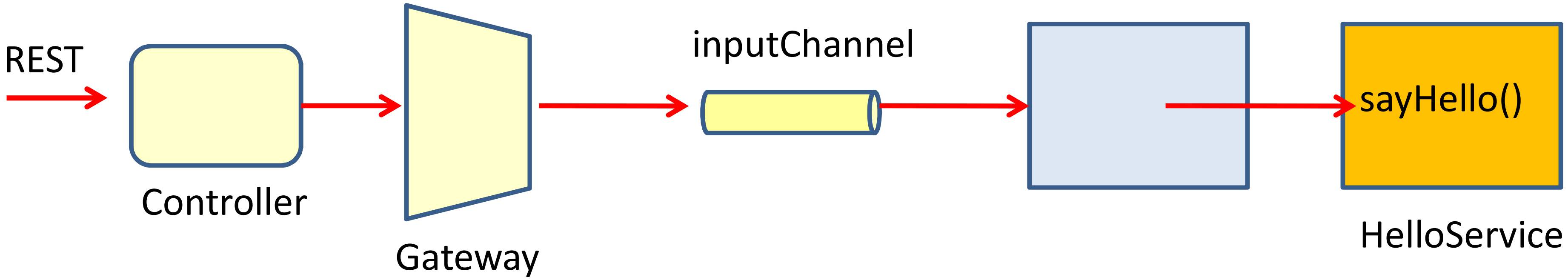
The controller

```
@RestController
public class Controller {
  @Autowired
  private GreetingGateway gateway;

  @RequestMapping("/greeting/{name}")
  public String getGreeting(@PathVariable("name") String name) {
    Message<String> helloMessage =
        MessageBuilder.withPayload(name.toUpperCase()).build();

    String result = gateway.handleRequest(helloMessage);
    return result;
  }
}
```


localhost:8080/greeting/Frank

Hello FRANK

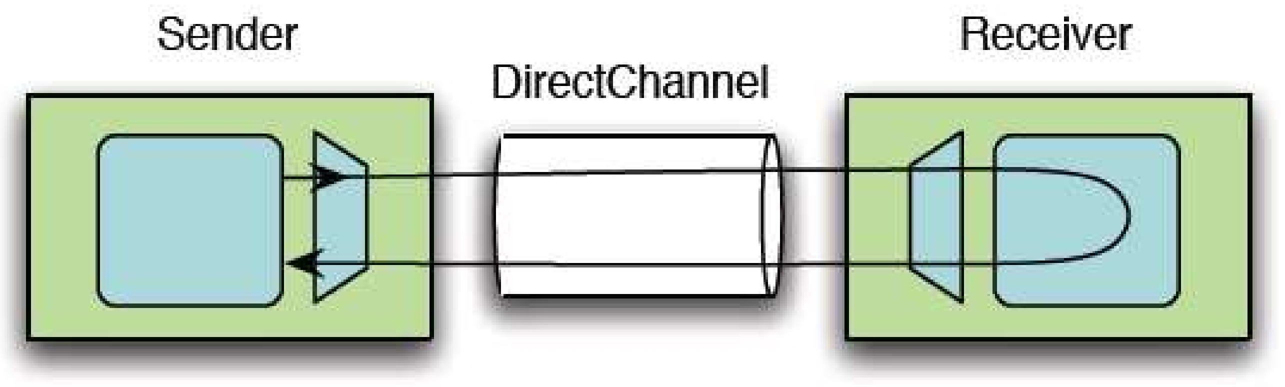
Message instead of a String



MESSAGE CHANNELS

Synchronous

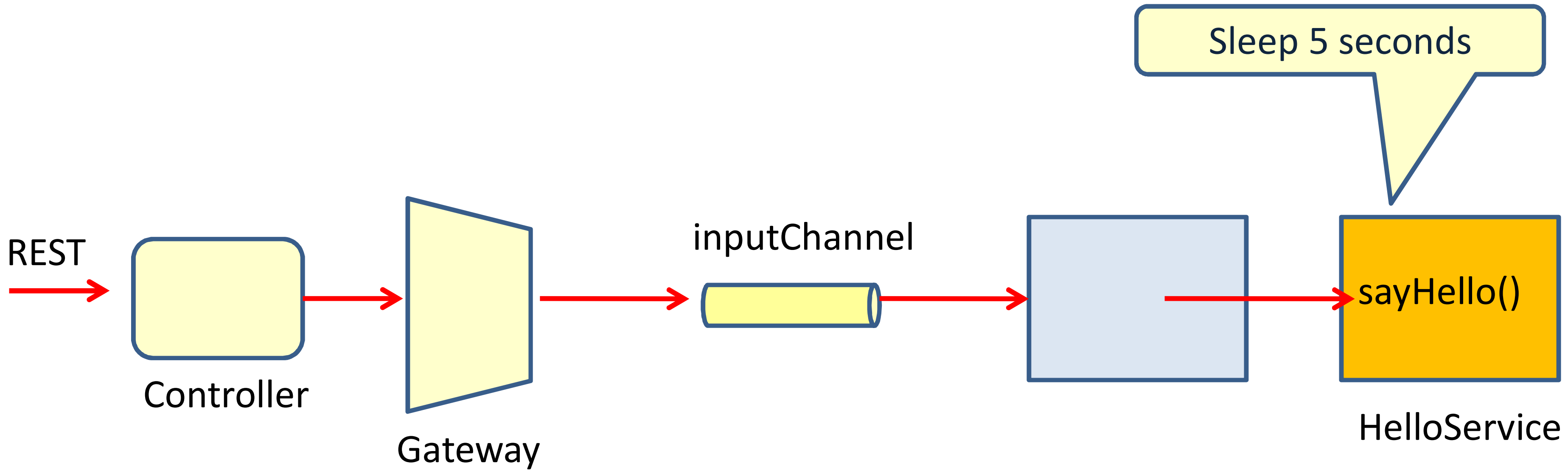
- A direct default channel is synchronous



Synchronous

```
public class HelloService {
  public String sayHello(String name) throws Exception {
    System.out.println("Hello " + name);
    Thread.sleep(5000);
    return "Hello " + name;
  }
}
```

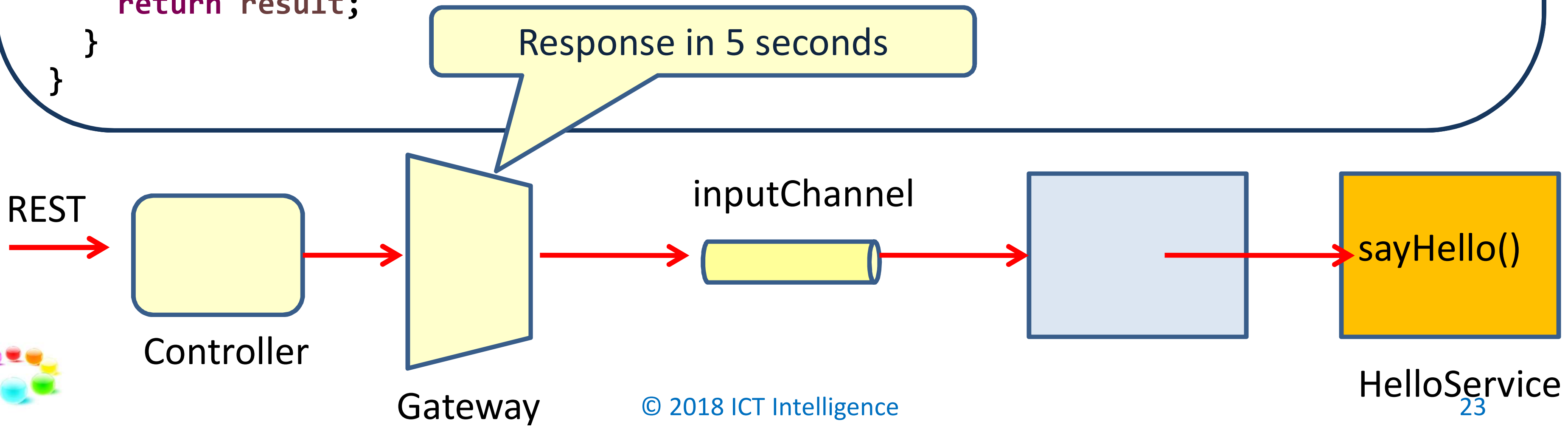
Sleep 5 seconds



Synchronous

```
@RestController
public class Controller {
  @Autowired
  private GreetingGateway gateway;

  @RequestMapping("/greeting/{name}")
  public String getGreeting(@PathVariable("name") String name) {
    LocalTime localTime = LocalTime.now();

    System.out.println("time before sending message ="+ localTime);

    String result = gateway.handleRequest(name);
    localTime = LocalTime.now();
    System.out.println("time after sending message ="+ localTime);
    return result;
  }
}
```

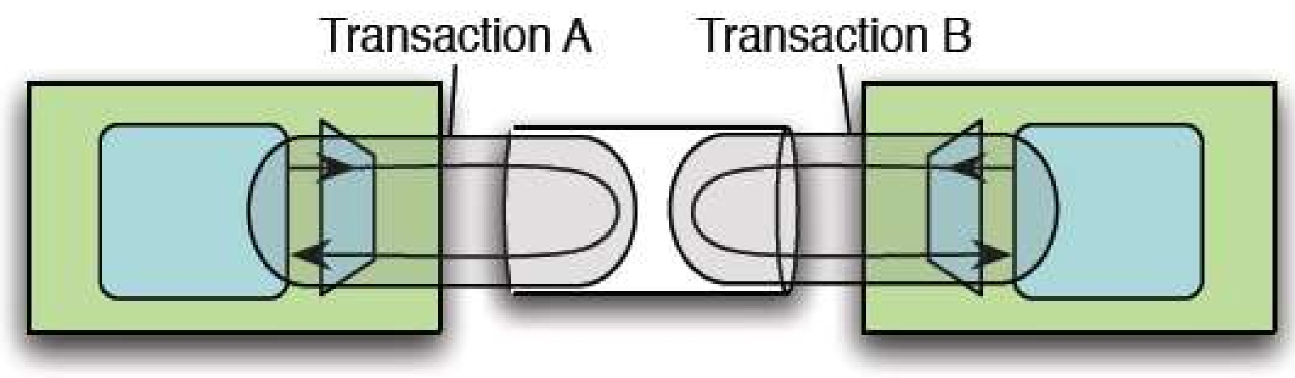
```
time before sending message =12:03:33.027
Hello Frank
time after sending message =12:03:38.062
```



QueueChannel: Asynchronous

- A queue channel is asynchronous

point to point



QueueChannel

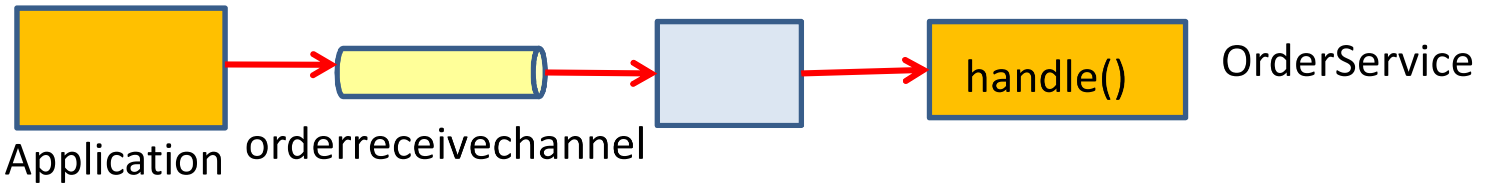
```
<channel id="orderreceivechannel" >
  <queue capacity="25"/>
</channel>

<service-activator input-channel="orderreceivechannel" ref="orderservice"
                   method="handle" >
  <poller>
    <interval-trigger interval="200"/>
  </poller>
</service-activator>

<beans:bean id="orderservice" class="integration.OrderService" />
```

Add a queue

every 200 ms will check to see if there is some thing in the queue of channel. and if there is, will call Handel method of order service

Now we need a poller

```
time before sending message =9:22:30
time after sending message =9:22:30
OrderService receiving order: order: nr=H-234-X56 amount=1245.75
```



Poller

- We need a poller whenever the component needs to be active
  - Getting a message from a QueueChannel
  - Reading files
  - Getting JMS messages

```
<poller>
  <interval-trigger interval="200"/>
</poller>
```

```
<poller>
  <cron-trigger expression="30 * 9-17 * * MON-FRI"/>
</poller>
```

Spring Integration enables lightweight messaging within Spring-based applications and supports integration with external systems via declarative adapters.

Datatype channel

```
<channel id="numberChannel" datatype="java.lang.Number"/>
```

Datatype Channel that only accepts messages containing a certain payload type

```
<channel id="stringOrNumberChannel"
        datatype="java.lang.String,java.lang.Number"/>
```

Accept multiple types

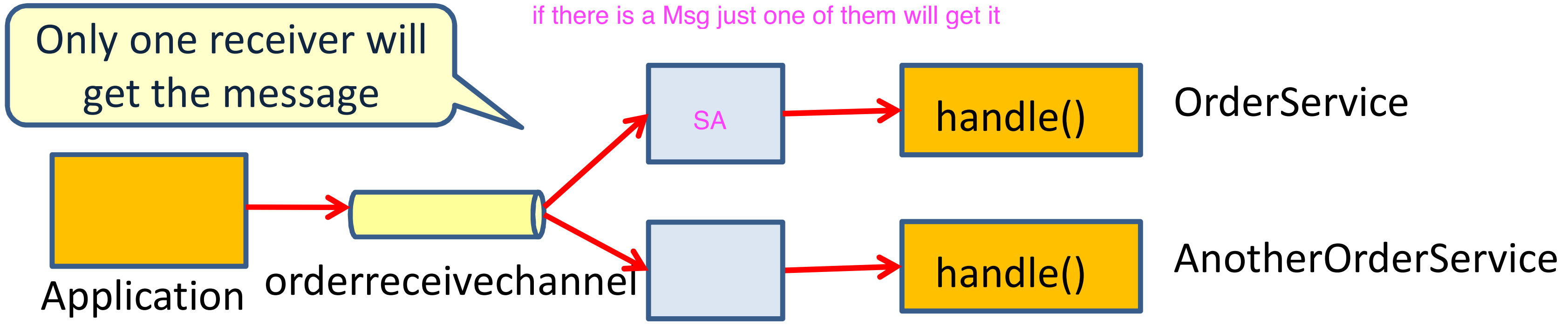
Point-to-point channel

Two SA on the same channel

```
<channel id="orderreceivechannel" />

<service-activator input-channel="orderreceivechannel"
ref="orderservice" method="handle" />

<service-activator input-channel="orderreceivechannel"
ref="anotherorderservice" method="handle" />

<beans:bean id="orderservice" class="integration.OrderService" />
<beans:bean id="anotherorderservice" class="integration.AnotherOrderService" />
```

```
OrderService receiving order: order: nr=H-234-X56 amount=1245.75
```

if there is a Msg just one of them will get it

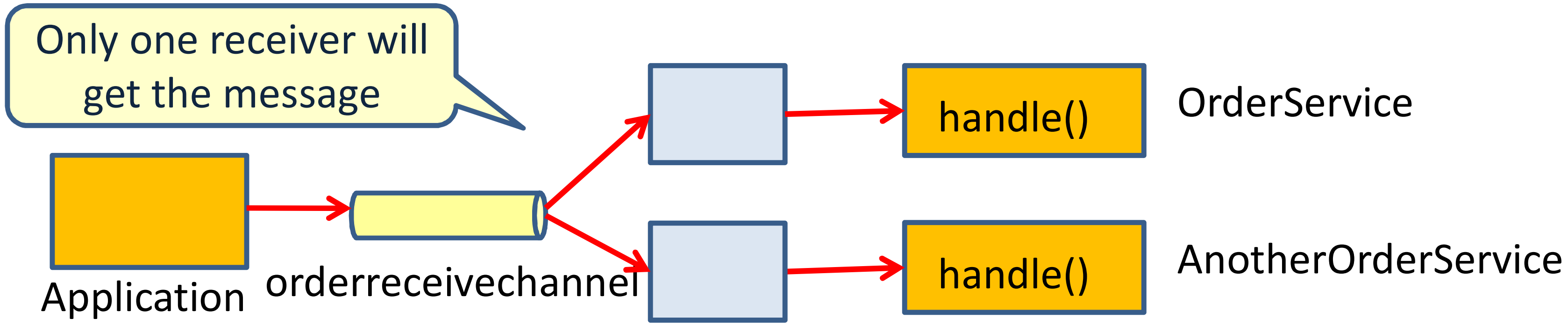


Point-to-point channel

```
public class OrderService {
  public void handle(Order order) {
    System.out.println("OrderService receiving order: "+ order.toString());
  }
}
```

```
public class AnotherOrderService {
  public void handle(Order order) {
    System.out.println("AnotherOrderService receiving order: "+ order.toString());
  }
}
```

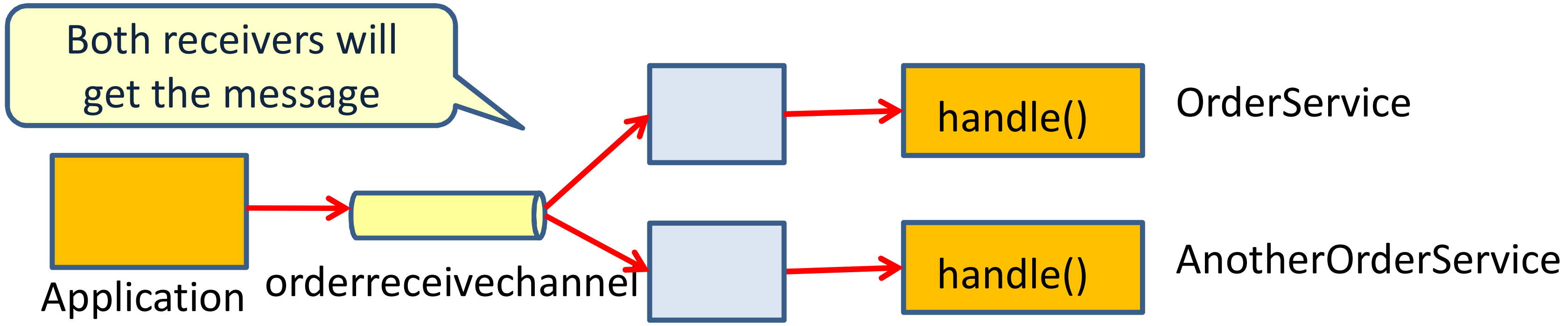
```
OrderService receiving order: order: nr=H-234-X56 amount=1245.75
```



Publish-Subscribe channel

```
<publish-subscribe-channel id="orderreceivechannel" />

<service-activator input-channel="orderreceivechannel"
ref="orderservice" method="handle" />

<service-activator input-channel="orderreceivechannel"
ref="anotherorderservice" method="handle" />

<beans:bean id="orderservice" class="integration.OrderService" />
<beans:bean id="anotherorderservice" class="integration.AnotherOrderService" />
```

```
OrderService receiving order: order: nr=H-234-X56 amount=1245.75
AnotherOrderService receiving order: order: nr=H-234-X56 amount=1245.75
```



default

Synchronous pub-sub

```
public class OrderService {
  public void handle(Order order) throws Exception {
    System.out.println("OrderService receiving order: "+ order.toString());
    Thread.sleep(5000);
  }
}
```

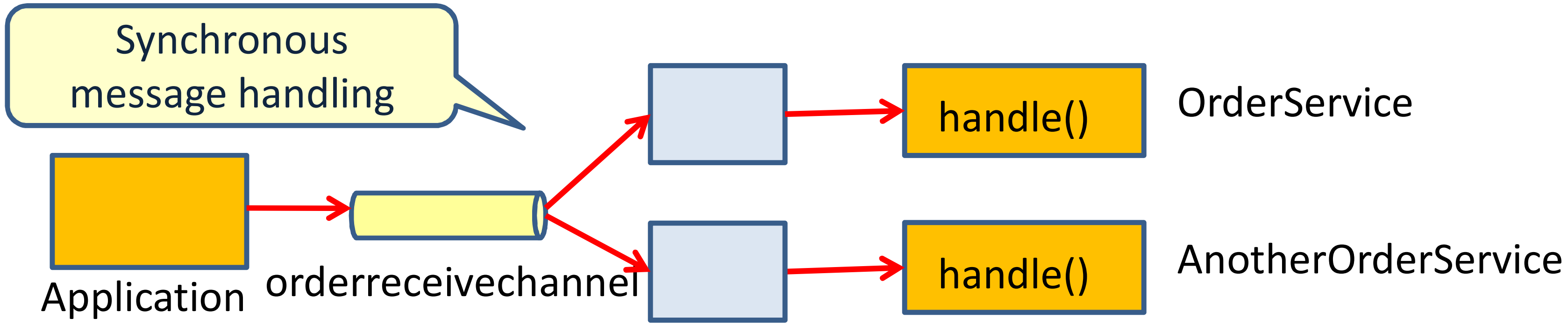
```
public class AnotherOrderService {
  public void handle(Order order) throws Exception {
    System.out.println("AnotherOrderService receiving order: "+ order.toString());
    Thread.sleep(5000);
  }
}
```

```
public class Application {

   public static void main(String[] args) {
     ...
     System.out.println("time before sending message ="
+DateFormat.getTimeInstance(DateFormat.DEFAULT).format(Calendar.getInstance().ge
tTime()));
     inputChannel.send(orderMessage);
     System.out.println("time after sending message ="
+DateFormat.getTimeInstance(DateFormat.DEFAULT).format(Calendar.getInstance().ge
tTime()));
   }
}
```

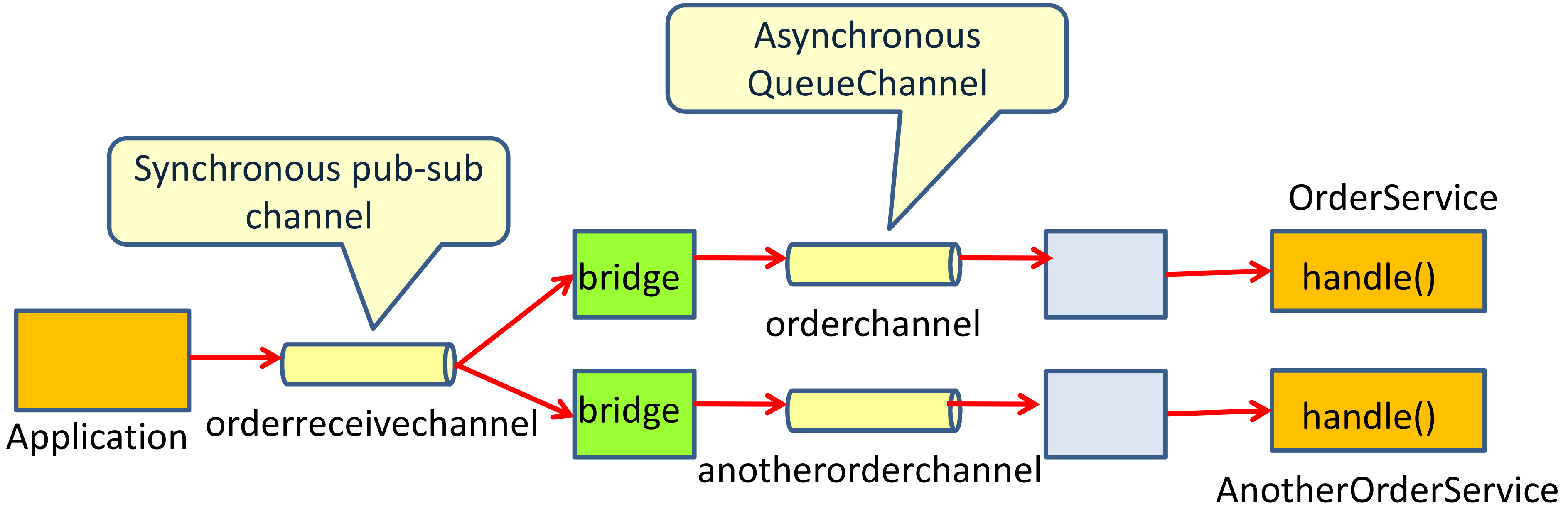
Synchronous pub-sub

```xml
<publish-subscribe-channel id="orderreceivechannel" />

<service-activator input-channel="orderreceivechannel"
ref="orderservice" method="handle" />

<service-activator input-channel="orderreceivechannel"
ref="anotherorderservice" method="handle" />

<beans:bean id="orderservice" class="integration.OrderService" />
<beans:bean id="anotherorderservice" class="integration.AnotherOrderService" />
```

```
time before sending message =9:40:31
OrderService receiving order: order: nr=H-234-X56 amount=1245.75
AnotherOrderService receiving order: order: nr=H-234-X56 amount=1245.75
time after sending message =9:40:41
```



Asynchronous pub-sub



Using Bridge to make async pub-sub channel

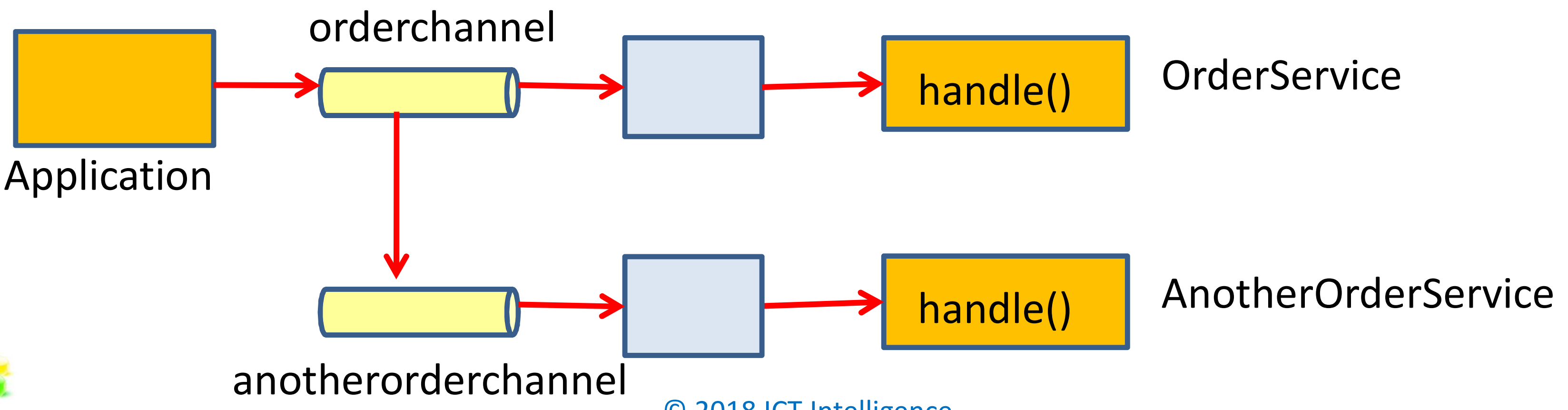
```
time before sending message =9:54:32
time after sending message =9:54:32
OrderService receiving order: order: nr=H-234-X56 amount=1245.75
AnotherOrderService receiving order: order: nr=H-234-X56 amount=1245.75
```

Asynchronous pub-sub

```
<channel id="orderchannel">
  <queue capacity="25" />
</channel>
<channel id="anotherorderchannel">
  <queue capacity="25" />
</channel>
<publish-subscribe-channel id="orderreceivechannel" />

                pub-sub                                 q channel
<bridge input-channel="orderreceivechannel" output-channel="orderchannel" />
<bridge input-channel="orderreceivechannel" output-channel="anotherorderchannel" />

<service-activator input-channel="orderchannel" ref="orderservice"
                   method="handle">
  <poller>
    <interval-trigger interval="200" />
  </poller>
</service-activator>
<service-activator input-channel="anotherorderchannel"
                    ref="anotherorderservice" method="handle">
  <poller>
    <interval-trigger interval="200" />
  </poller>
</service-activator>
<beans:bean id="orderservice" class="integration.OrderService" />
<beans:bean id="anotherorderservice" class="integration.AnotherOrderService" />
```

Wiretap

```
<channel id="orderchannel"> p2p
  <interceptors>
    <wire-tap channel="anotherorderchannel" />
  </interceptors>
</channel>
<channel id="anotherorderchannel" />

<service-activator input-channel="orderchannel"
                   ref="orderservice" method="handle" />
<service-activator input-channel="anotherorderchannel"
                   ref="anotherorderservice" method="handle" />

<beans:bean id="orderservice" class="integration.OrderService" />
<beans:bean id="anotherorderservice" class="integration.AnotherOrderService" />
```



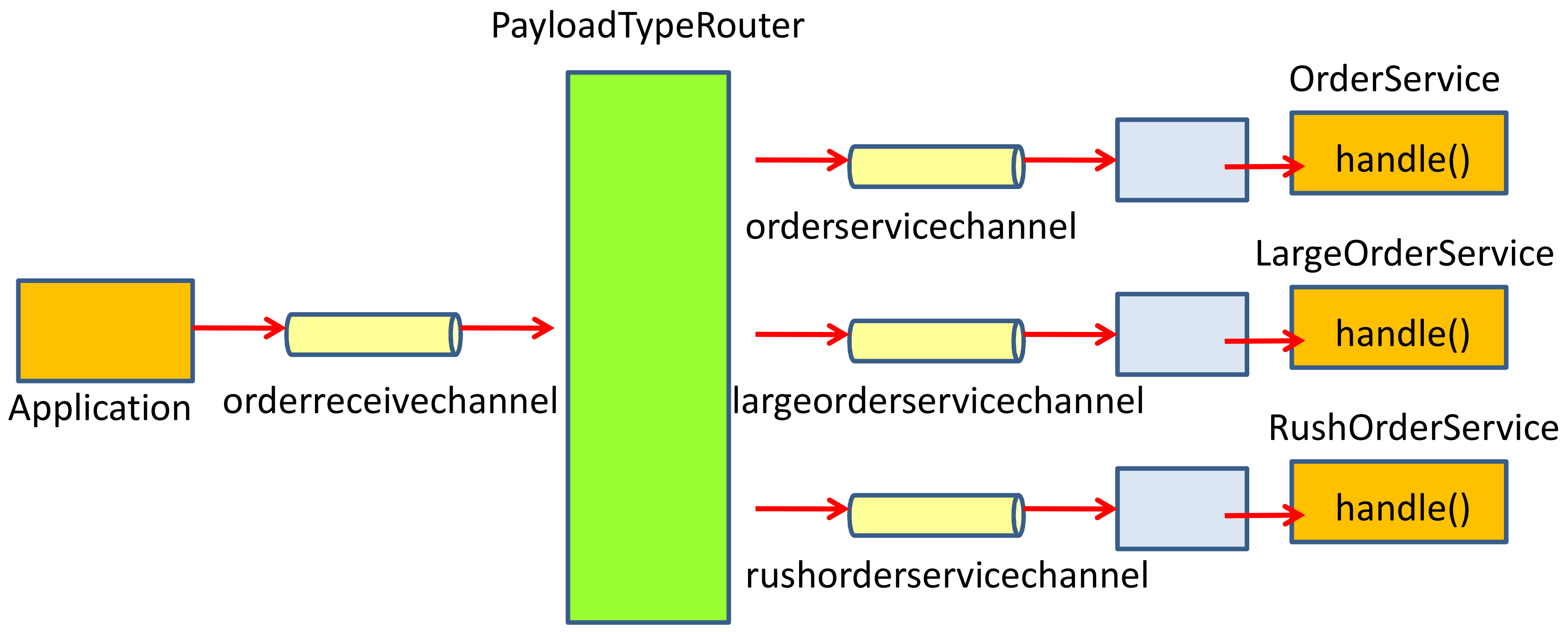
ROUTER

Routers

- Build-in routers
  - PayloadTypeRouter
  - HeaderValueRouter
  - RecipientListRouter
- Custom router

PayloadTypeRouter

based on the logic will send the Msg to one of the channels



PayloadTypeRouter

```
<channel id="orderreceivechannel" />
<channel id="orderservicechannel" />
<channel id="rushorderservicechannel" />
<channel id="largeorderservicechannel" />
```

based on the type of payload/ type of class

```
<payload-type-router input-channel="orderreceivechannel">
  <mapping type="integration.Order" channel="orderservicechannel" />
  <mapping type="integration.RushOrder" channel="rushorderservicechannel" />
  <mapping type="integration.LargeOrder" channel="largeorderservicechannel" />
</payload-type-router>

<service-activator input-channel="orderservicechannel"
                   ref="orderservice" method="handle" />

<service-activator input-channel="rushorderservicechannel"
                   ref="rushorderservice" method="handle" />

<service-activator input-channel="largeorderservicechannel"
                   ref="largeorderservice" method="handle" />

<beans:bean id="orderservice" class="integration.OrderService" />
<beans:bean id="rushorderservice" class="integration.RushOrderService" />
<beans:bean id="largeorderservice" class="integration.LargeOrderService" />
```

The Payload types

```
public class Order {
  private String orderNumber;
  private double amount;

  public String toString(){
    return "order: nr="+orderNumber+" amount="+amount;
   }
   ...
}
```

```
public class RushOrder extends Order{
  public RushOrder(String orderNumber, double amount) {
    super(orderNumber, amount);
  }
}
```

```
public class LargeOrder extends Order{
  public LargeOrder(String orderNumber, double amount) {
    super(orderNumber, amount);
  }
}
```

The services

```
public class OrderService {
  public void handle(Order order) {
    System.out.println("OrderService receiving order: "+ order.toString());
  }
}
```

```
public class LargeOrderService {
  public void handle(Order order) {
    System.out.println("LargeOrderService receiving order: "+ order.toString());
  }
}
```

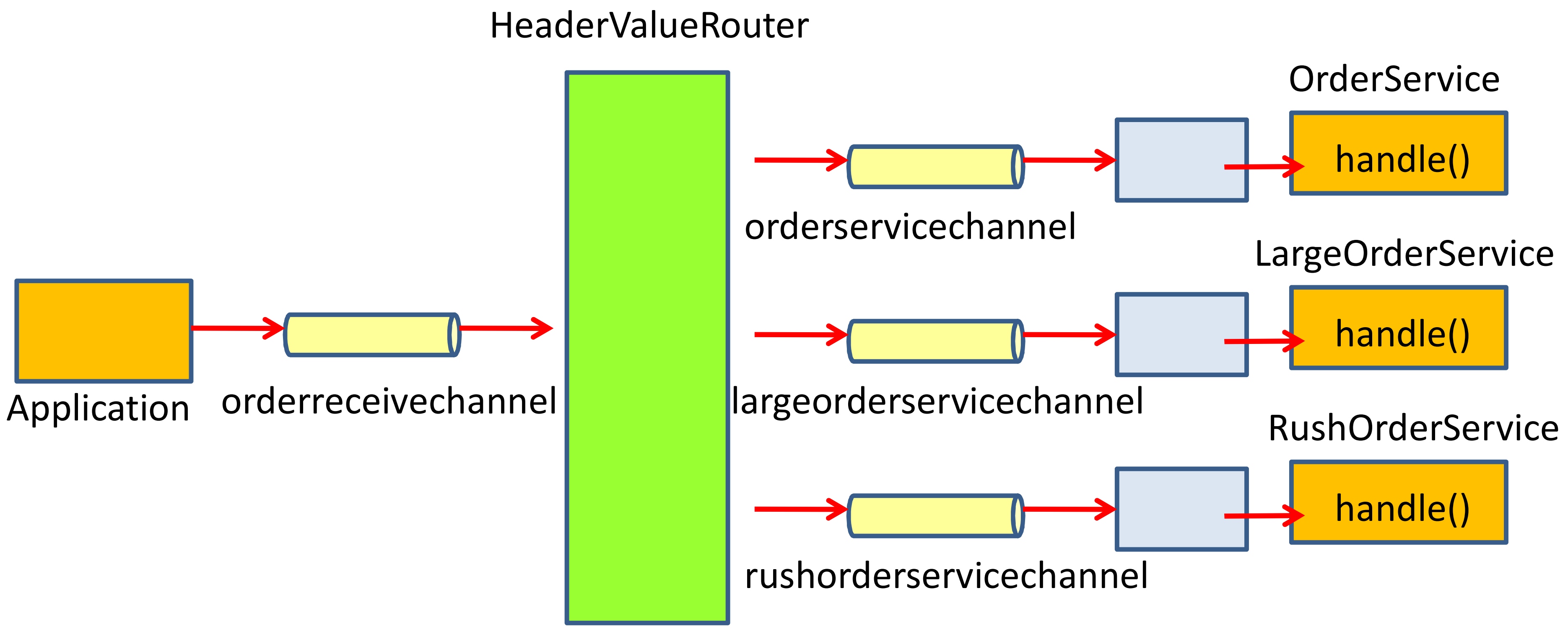
```
public class RushOrderService {
  public void handle(Order order) {
    System.out.println("RushOrderService receiving order: "+ order.toString());
  }
}
```

The application

```
    Order rushOrder = new RushOrder("H-234-X56",600.65);
    Order largeOrder = new LargeOrder("H-234-X56",30045.35);

    Message<Order> orderMessage = MessageBuilder.withPayload(order).build();
    Message<Order> rushOrderMessage =
                   MessageBuilder.withPayload(rushOrder).build();
    Message<Order> largeOrderMessage =
                   MessageBuilder.withPayload(largeOrder).build();

    gateway.handleRequest(orderMessage);
    gateway.handleRequest(rushOrderMessage);
    gateway.handleRequest(largeOrderMessage);
  }
}
```

```
OrderService receiving order: order: nr=H-234-X56 amount=1245.75
RushOrderService receiving order: order: nr=H-234-X56 amount=600.65
LargeOrderService receiving order: order: nr=H-234-X56 amount=30045.35
```

HeaderValueRouter



HeaderValueRouter

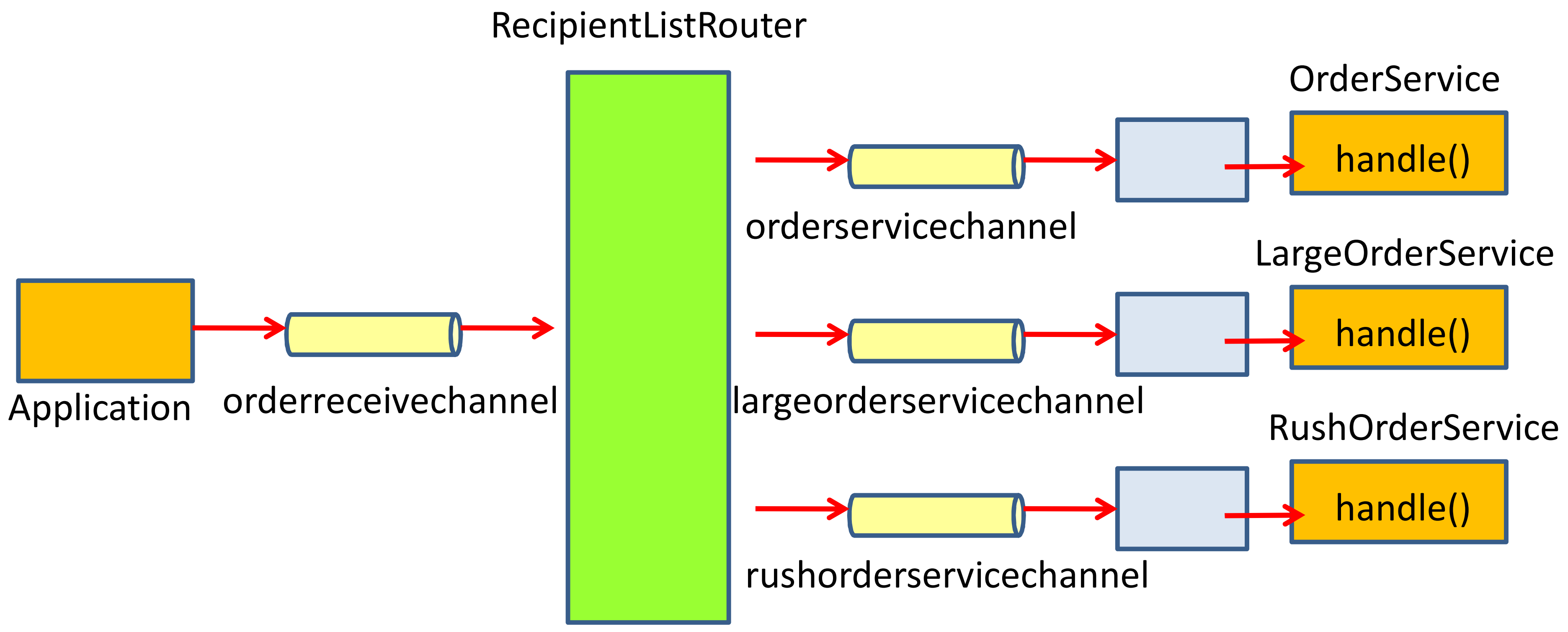
```
<channel id="orderreceivechannel" />
<channel id="orderservicechannel" />
<channel id="rushorderservicechannel" />
<channel id="largeorderservicechannel" />

<header-value-router input-channel="orderreceivechannel"
                     header-name="orderType">
  <mapping value="normal" channel="orderservicechannel" />
  <mapping value="rush" channel="rushorderservicechannel" />
  <mapping value="large" channel="largeorderservicechannel" />
</header-value-router>

<service-activator input-channel="orderservicechannel"
                   ref="orderservice" method="handle" />

<service-activator input-channel="rushorderservicechannel"
                   ref="rushorderservice" method="handle" />

<service-activator input-channel="largeorderservicechannel"
                   ref="largeorderservice" method="handle" />

<beans:bean id="orderservice" class="integration.OrderService" />
<beans:bean id="rushorderservice" class="integration.RushOrderService" />
<beans:bean id="largeorderservice" class="integration.LargeOrderService" />
```

The application

```
Order order = new Order("H-234-X56",1245.75);
Order rushOrder = new RushOrder("H-234-X57",600.65);
Order largeOrder = new LargeOrder("H-234-X58",30045.35);

Message<Order> orderMessage = MessageBuilder.withPayload(order)
                .setHeader("orderType", "normal").build();
Message<Order> rushOrderMessage = MessageBuilder.withPayload(rushOrder)
                .setHeader("orderType", "rush").build();
Message<Order> largeOrderMessage = MessageBuilder.withPayload(largeOrder)
                .setHeader("orderType", "large").build();

gateway.handleRequest(orderMessage);
gateway.handleRequest(rushOrderMessage);
gateway.handleRequest(largeOrderMessage);
```

```
OrderService receiving order: order: nr=H-234-X56 amount=1245.75
RushOrderService receiving order: order: nr=H-234-X57 amount=600.65
LargeOrderService receiving order: order: nr=H-234-X58 amount=30045.35
```

RecipientListRouter



RecipientListRouter

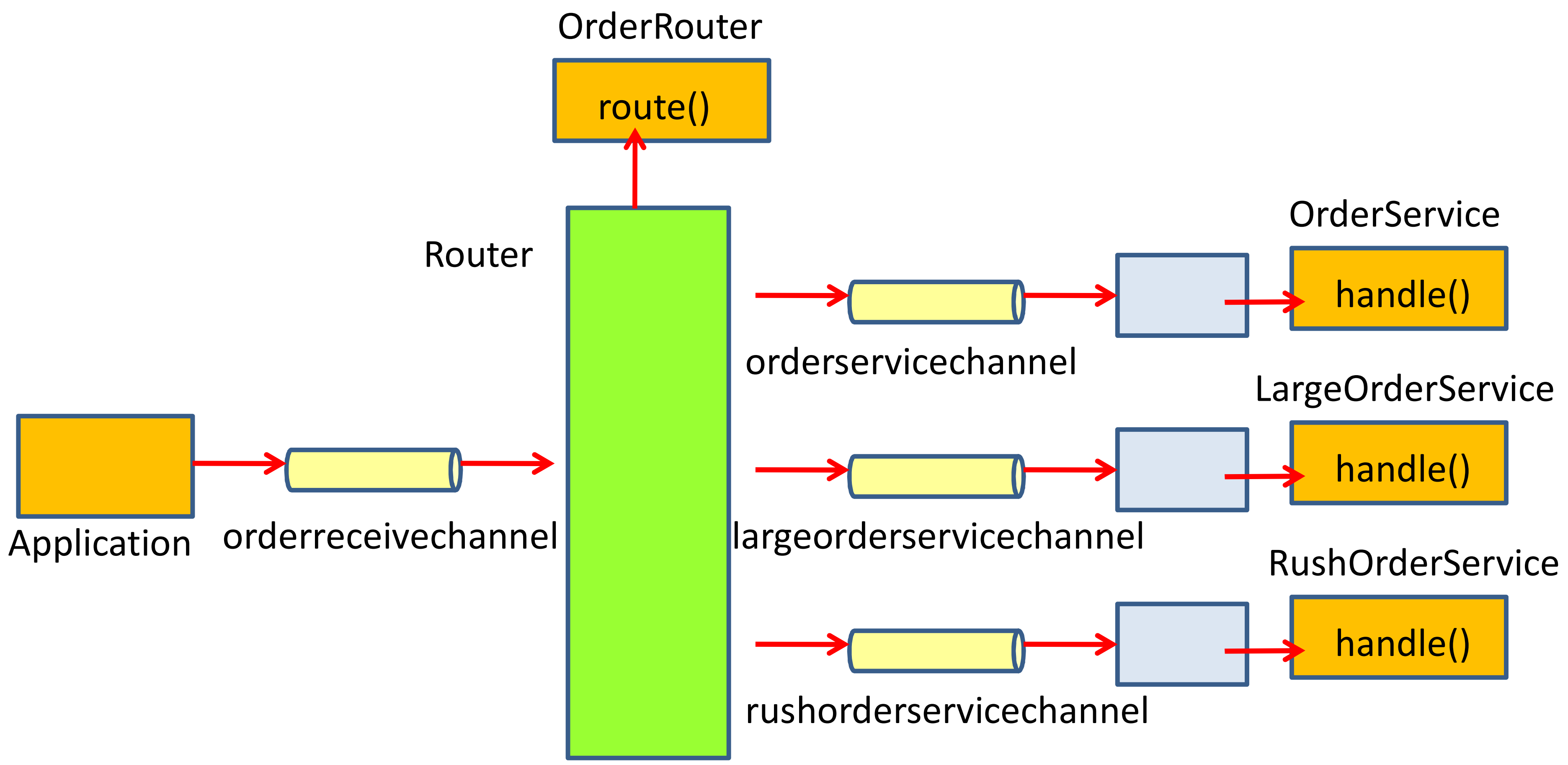
```
<channel id="orderreceivechannel" />
<channel id="orderservicechannel" />
<channel id="rushorderservicechannel" />
<channel id="largeorderservicechannel" />

<recipient-list-router id="customRouter" input-channel="orderreceivechannel"
                  apply-sequence="true">
  <recipient channel="orderservicechannel" />
  <recipient channel="rushorderservicechannel" />
  <recipient channel="largeorderservicechannel" />
</recipient-list-router>

<service-activator input-channel="orderservicechannel"
ref="orderservice" method="handle" />

<service-activator input-channel="rushorderservicechannel"
ref="rushorderservice" method="handle" />

<service-activator input-channel="largeorderservicechannel"
ref="largeorderservice" method="handle" />

<beans:bean id="orderservice" class="integration.OrderService" />
<beans:bean id="rushorderservice" class="integration.RushOrderService" />
<beans:bean id="largeorderservice" class="integration.LargeOrderService" />
```

The application

```
Order order = new Order("H-234-X56",1245.75);
Order order2 = new Order("H-234-X57",600.65);

Message<Order> orderMessage = MessageBuilder.withPayload(order).build();
Message<Order> orderMessage2 = MessageBuilder.withPayload(order2).build();

gateway.handleRequest(orderMessage);
gateway.handleRequest (orderMessage2);
```

```
OrderService receiving order: order: nr=H-234-X56 amount=1245.75
RushOrderService receiving order: order: nr=H-234-X56 amount=1245.75
LargeOrderService receiving order: order: nr=H-234-X56 amount=1245.75
OrderService receiving order: order: nr=H-234-X57 amount=600.65
RushOrderService receiving order: order: nr=H-234-X57 amount=600.65
LargeOrderService receiving order: order: nr=H-234-X57 amount=600.65
```

Custom Router bean



Custom Router bean

```
<channel id="orderreceivechannel" />
<channel id="orderservicechannel" />
<channel id="rushorderservicechannel" />
<channel id="largeorderservicechannel" />
  for every message It calls route method of orderRouter
<router method="route" input-channel="orderreceivechannel">
  <beans:bean class="integration.OrderRouter" />
</router>

<service-activator input-channel="orderservicechannel"
ref="orderservice" method="handle" />

<service-activator input-channel="rushorderservicechannel"
ref="rushorderservice" method="handle" />

<service-activator input-channel="largeorderservicechannel"
ref="largeorderservice" method="handle" />

<beans:bean id="orderservice" class="integration.OrderService" />
<beans:bean id="rushorderservice" class="integration.RushOrderService" />
<beans:bean id="largeorderservice" class="integration.LargeOrderService" />
```

The router bean

```java
public class OrderRouter {
  public String route(Order order) {
    String destinationChannel = null;
    if (order.isRush())
      destinationChannel = "rushorderservicechannel";
    else if (order.getAmount() > 20000)
      destinationChannel = "largeorderservicechannel";
    else
      destinationChannel = "orderservicechannel";
    return destinationChannel;
  }
}
```

The application

```java
Order order = new Order("H-234-X56",1245.75, true);
Order order2 = new Order("H-234-X57",600.65, false);
Order order3 = new Order("H-234-X58",50600.65, false);

Message<Order> orderMessage = MessageBuilder.withPayload(order).build();
Message<Order> orderMessage2 = MessageBuilder.withPayload(order2).build();
Message<Order> orderMessage3 = MessageBuilder.withPayload(order3).build();

gateway.handleRequest(orderMessage);
gateway.handleRequest(orderMessage2);
gateway.handleRequest(orderMessage3);
```

```
RushOrderService receiving order: order: nr=H-234-X56 amount=1245.75
OrderService receiving order: order: nr=H-234-X57 amount=600.65
LargeOrderService receiving order: order: nr=H-234-X58 amount=50600.65
```

The router bean: multiple return values

```
public class OrderRouter {
  public List<String> route(Order order) {
    List<String> destinationChannels = new ArrayList<String>();
    if (order.isRush())
      destinationChannels.add("rushorderservicechannel");
    if (order.getAmount() > 20000)
      destinationChannels.add("largeorderservicechannel");
    destinationChannels.add("orderservicechannel");
    return destinationChannels;
  }
}
```

The application

```java
public class Application {
  public static void main(String[] args) {
    ApplicationContext context = new
      ClassPathXmlApplicationContext("/integration/springconfiguration.xml");
    Order order = new Order("H-234-X56",1245.75, true);
    Order order2 = new Order("H-234-X57",600.65, false);
    Order order3 = new Order("H-234-X58",50600.65, true);
    Message<Order> orderMessage = MessageBuilder.withPayload(order).build();
    Message<Order> orderMessage2 = MessageBuilder.withPayload(order2).build();
    Message<Order> orderMessage3 = MessageBuilder.withPayload(order3).build();
    MessageChannel inputChannel = context.getBean("orderreceivechannel",
                                  MessageChannel.class);
    inputChannel.send(orderMessage);
    inputChannel.send(orderMessage2);
    inputChannel.send(orderMessage3);
  }
}
```

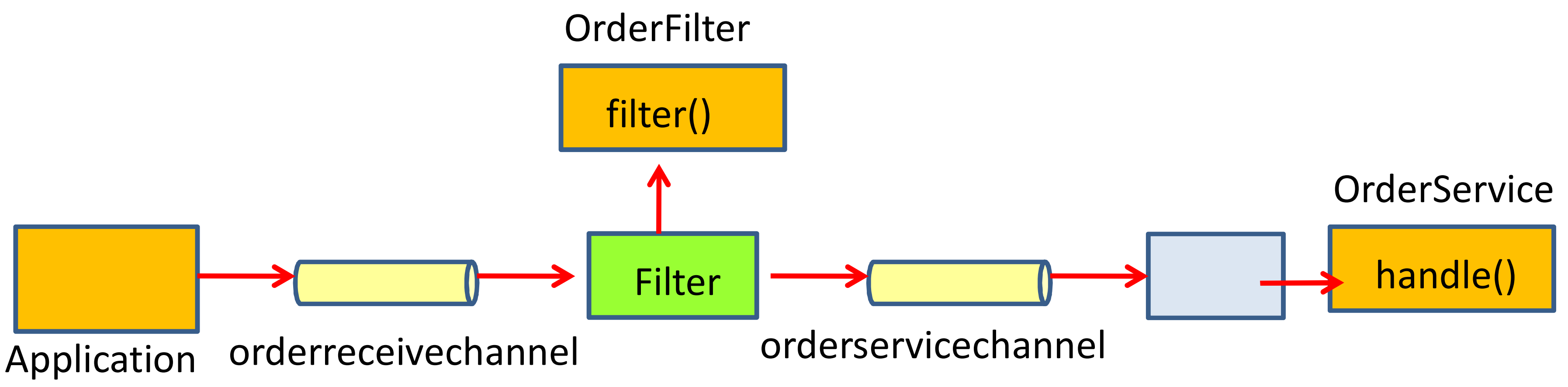
```
RushOrderService receiving order: order: nr=H-234-X56 amount=1245.75
OrderService receiving order: order: nr=H-234-X56 amount=1245.75
OrderService receiving order: order: nr=H-234-X57 amount=600.65
RushOrderService receiving order: order: nr=H-234-X58 amount=50600.65
LargeOrderService receiving order: order: nr=H-234-X58 amount=50600.65
OrderService receiving order: order: nr=H-234-X58 amount=50600.65
```

FILTER

Filter

```
<channel id="orderreceivechannel" />
<channel id="orderservicechannel" />

<filter input-channel="orderreceivechannel" output-channel="orderservicechannel"
        ref="orderfilter" method="filter"/>

<service-activator input-channel="orderservicechannel"
                   ref="orderservice" method="handle" />

<beans:bean id="orderservice" class="integration.OrderService" />
<beans:bean id="orderfilter" class="integration.OrderFilter" />
```

Calls the method filter of orderFilter. if returns True, it send Mgs to output-channel



The Filter class

```
public class OrderFilter {
  public boolean filter(Order order) {
    if (order.getAmount() > 800)
      return true;
    else
      return false;
  }
}
```

The Order and the OrderService

```java
public class Order {
  private String orderNumber;
  private double amount;

  public String toString(){
    return "order: nr="+orderNumber+" amount="+amount;
  }
  ...
}
```

```java
public class OrderService {
  public void handle(Order order) {
    System.out.println("OrderService receiving order: "+ order.toString());
  }
}
```

The application

```
    Order order = new Order("H-234-X56",1245.75);
    Order order2 = new Order("H-234-X57",600.65);
    Order order3 = new Order("H-234-X58",50600.65);

    Message<Order> orderMessage = MessageBuilder.withPayload(order).build();
    Message<Order> orderMessage2 = MessageBuilder.withPayload(order2).build();
    Message<Order> orderMessage3 = MessageBuilder.withPayload(order3).build();

    gateway.handleRequest(orderMessage);
    gateway.handleRequest(orderMessage2);
    gateway.handleRequest(orderMessage3);
  }
}
```

```
OrderService receiving order: order: nr=H-234-X56 amount=1245.75
OrderService receiving order: order: nr=H-234-X58 amount=50600.65
```

What to do with rejected messages?

```
<filter input-channel="orderreceivechannel" output-channel="orderservicechannel"
        ref="orderfilter" method="filter" throw-exception-on-rejection="true"/>
```

Throw an exception if a message is rejected

```
<filter input-channel="orderreceivechannel" output-channel="orderservicechannel"
        ref="orderfilter" method="filter" discard-channel="rejectedMessages"/>
```

Send rejected messages to another channel

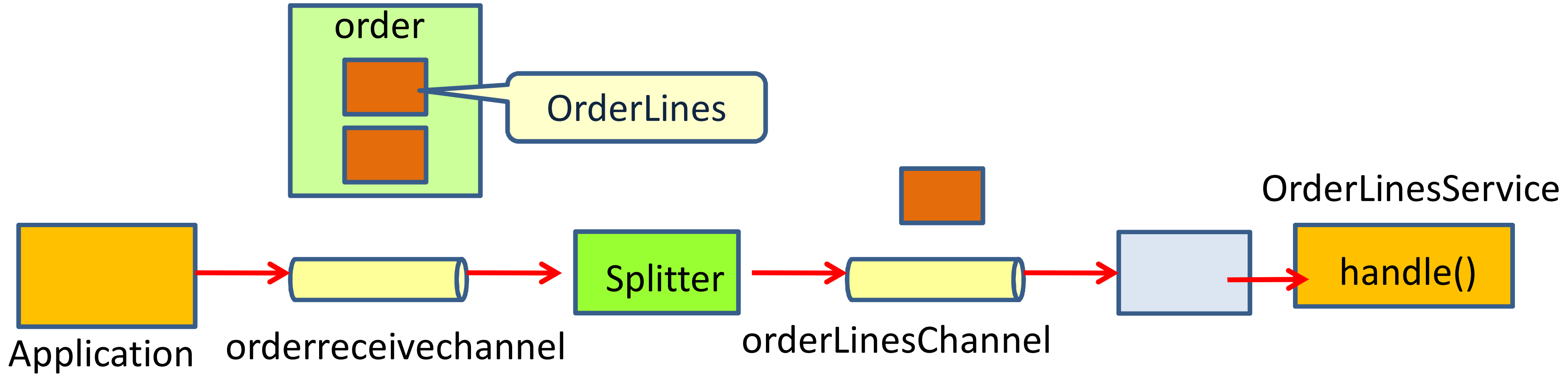
SPLITTER AND AGGREGATOR

Splitter

```
<channel id="orderreceivechannel" />
<channel id="orderLinesChannel" />

<splitter input-channel="orderreceivechannel" output-channel="orderLineschannel"
          ref="splitterBean" method="split" />
```

get the order from input-channel, call split method of class splitterBean and send it to output-channel

```
<service-activator input-channel="orderLinesChannel"
                   ref="orderLinesService" method="handle" />

<beans:bean id="splitterBean" class="integration.OrderSplitter" />
<beans:bean id="orderLinesService" class="integration.OrderLinesService" />
```



The Splitter class

```java
public class OrderSplitter {
  public Collection<OrderLine> split(Order order) {
    return order.getOrderLines();
  }
}
```

```java
public class Order {
  private String orderNumber;
  private Collection<OrderLine> orderLines = new ArrayList<OrderLine>();
...
}
```

```java
public class OrderLine {
  private int quantity;
  private Product product;
...
}
```

```java
public class Product {
  private String nr;
  private String name;
  private double price;
...
}
```

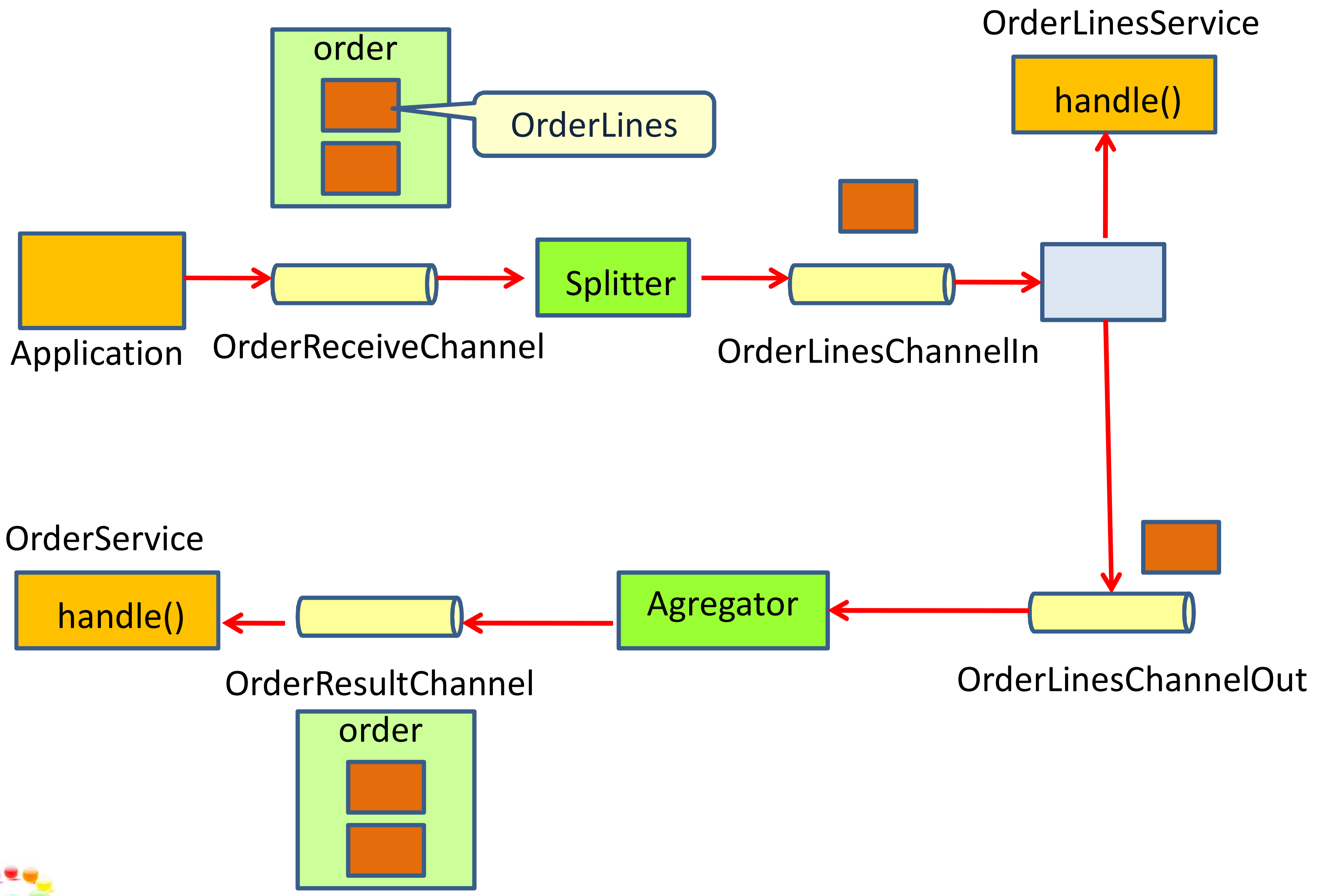
The application

```
Order order = new Order("H-234-X56");
order.addOrderLine(new OrderLine(4, new Product("XH-456","MP3
                   player",125.75)));
order.addOrderLine(new OrderLine(2, new Product("GH-428","LED 3D
                   TV",675.85)));
Message<Order> orderMessage = MessageBuilder.withPayload(order).build();

gateway.handleRequest(orderMessage);
```

```
OrderLinesService receiving orderline: quantity=4 product=MP3 player
sequenceNumber: 1
sequenceSize: 2
-----------------------------------
OrderLinesService receiving orderline: quantity=2 product=LED 3D TV
sequenceNumber: 2
sequenceSize: 2
-----------------------------------
```

Spring Integration adds sequenceNumber and sequenceSize

Aggregator


order
OrderLines
OrderLinesService
handle()
Splitter
Application
OrderReceiveChannel
OrderLinesChannelIn
OrderService
handle()
Agregator
OrderResultChannel
OrderLinesChannelOut
order

Aggregator

```
<channel id="orderReceiveChannel" />
<channel id="OrderLinesChannelIn" />
<channel id="OrderLinesChannelOut" />
<channel id="OrderResultChannel" />

<splitter input-channel="orderReceiveChannel"
          output-channel="OrderLinesChannelIn"
          ref="splitterBean" method="split" />

<service-activator input-channel="OrderLinesChannelIn"
                   output-channel="OrderLinesChannelOut"
                   ref="orderLinesService" method="handle" />

<aggregator input-channel="OrderLinesChannelOut"
            output-channel="OrderResultChannel"
            ref="aggegatorBean" method="aggregate"/>

<service-activator input-channel="OrderResultChannel"
                   ref="orderService" method="handle" />

<beans:bean id="splitterBean" class="integration.OrderSplitter" />
<beans:bean id="aggegatorBean" class="integration.OrderAggregator" />
<beans:bean id="orderLinesService" class="integration.OrderLinesService" />
<beans:bean id="orderService" class="integration.OrderService" />
```

The Splitter and Aggregator

```
public class OrderSplitter {
  public Collection<OrderLine> split(Order order) {
    return order.getOrderLines();
  }
}
```

```
public class OrderAggregator {
  public Order aggregate(Collection<OrderLine> orderlines) {
    Order order = new Order();   gets collection of orderLine and returns Order
    for (OrderLine ol: orderlines){
      order.addOrderLine(ol);
    }
    return order;
  }
}
```

The Payload and Services

```java
public class OrderLinesService {
  public OrderLine handle(OrderLine orderline) throws Exception {
    System.out.println("OrderLinesService receiving orderline: "+
           orderline.toString());
    return orderline;
  }
}
```

```java
public class OrderService {
  public void handle(Order order)  {
    System.out.println("OrderService receiving order:");
    for (OrderLine ol : order.getOrderLines()){
      System.out.println(ol.getProduct().getName());
    }
  }
}
```

```java
public class Order {
private Collection<OrderLine> orderLines = new ArrayList<OrderLine>();
...
}
```

```java
public class OrderLine {
  private int quantity;
  private Product product;
...
}
```

```java
public class Product {
  private String nr;
  private String name;
  private double price;
...
}
```

The application

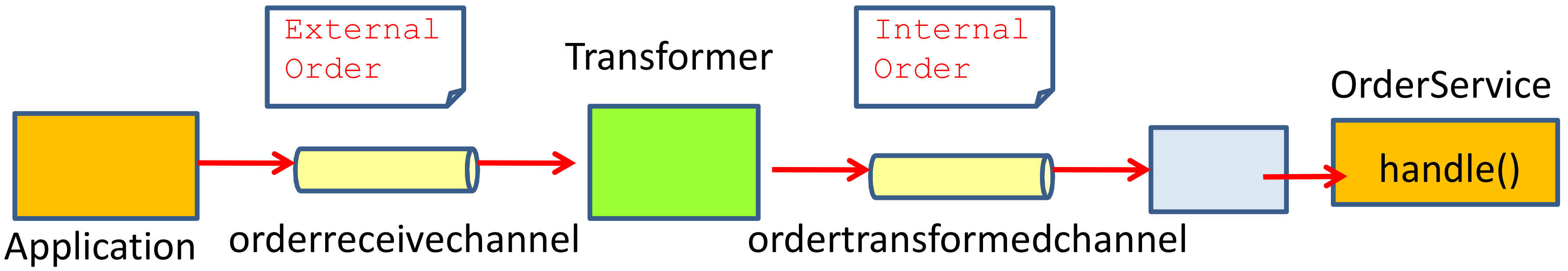
```
Order order = new Order();
order.addOrderLine(new OrderLine(4, new Product("XH-456","MP3
                   player",125.75)));
order.addOrderLine(new OrderLine(2, new Product("GH-428","LED 3D
                   TV",675.85)));
Message<Order> orderMessage = MessageBuilder.withPayload(order).build();

gateway.handleRequest(orderMessage);
```

```
OrderLinesService receiving orderline: quantity = 4 , product = MP3 player
OrderLinesService receiving orderline: quantity = 2 , product = LED 3D TV
OrderService receiving order:
MP3 player
LED 3D TV
```

TRANSFORMATION

Transformer

```
<channel id="orderreceivechannel" />
<channel id="ordertransformedchannel" />

<transformer  ref="orderTransformerBean" input-channel="orderreceivechannel"
              method="transform" output-channel="ordertransformedchannel"/>
<beans:bean id="orderTransformerBean" class="integration.OrderTransformer" />

<service-activator input-channel="ordertransformedchannel" ref="orderservice"
                   method="handleOrder" />

<beans:bean id="orderservice" class="integration.OrderService" />
```



The OrderTransformer

```java
public class OrderTransformer {

  public InternalOrder transform (ExternalOrder order){
    if (order.getType().equals("large")){
      return new LargeOrder(order.getOrderNumber(), order.getAmount());
    }
    else if (order.getType().equals("rush")){
      return new RushOrder(order.getOrderNumber(), order.getAmount());
    }
    return null;
  }
}
```

```java
public class InternalOrder {
  private String orderNumber;
  private double amount;
  private String type;

...
}
```

```java
public class InternalOrder {
  private String orderNumber;
  private double amount;
...
}
```

The OrderService

```
public class OrderService {
  public void handleOrder(LargeOrder largeorder) throws Exception {
    System.out.println("OrderService receiving large order: "+
                        largeorder.toString());
  }
  public void handleOrder(RushOrder rushOrder) throws Exception {
    System.out.println("OrderService receiving rush order: "+
                        rushOrder.toString());
  }
}
```

The application

```
ExternalOrder order = new ExternalOrder("H-234-X56",1245.75,"large");
ExternalOrder order2 = new ExternalOrder("H-234-X57",600.65,"rush");

Message<ExternalOrder> message1 = MessageBuilder.withPayload(order).build();
Message<ExternalOrder> message2 =
    MessageBuilder.withPayload(order2).build();

gateway.handleRequest(message1);
gateway.handleRequest(message2);
```

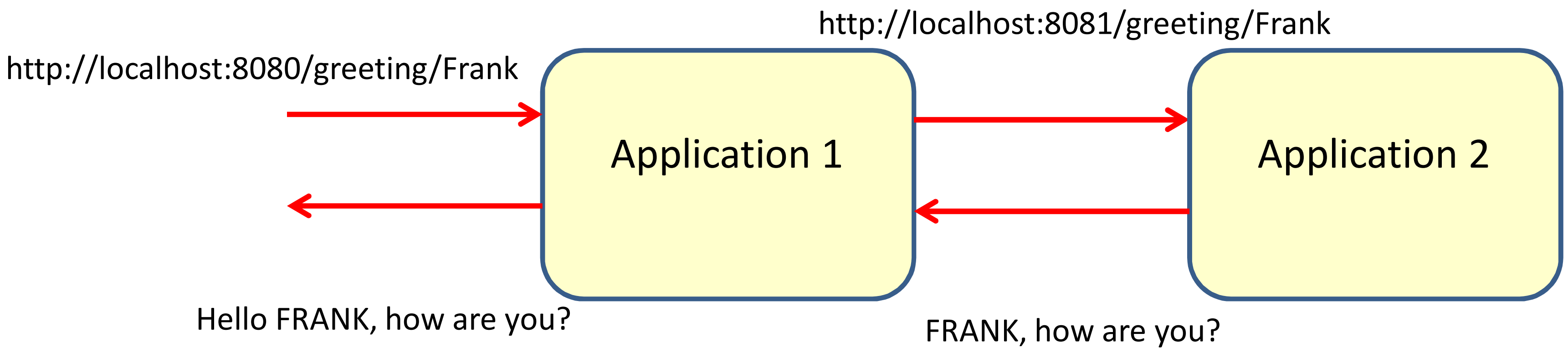
```
OrderService receiving large order: order: nr=H-234-X56 amount=1245.75
OrderService receiving rush order: order: nr=H-234-X57 amount=600.65
```

Adapters

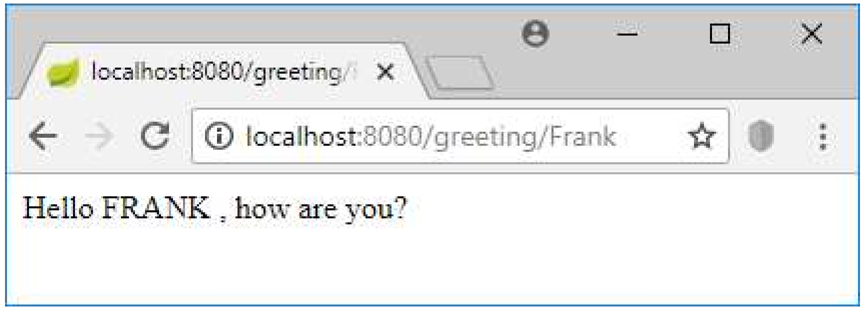
Spring integration adapters

- File
- FTP
- HTTP
- Mail
- TCP and UDP
- JDBC
- JMS
- RMI
- Web services
- …

Http sender adapter

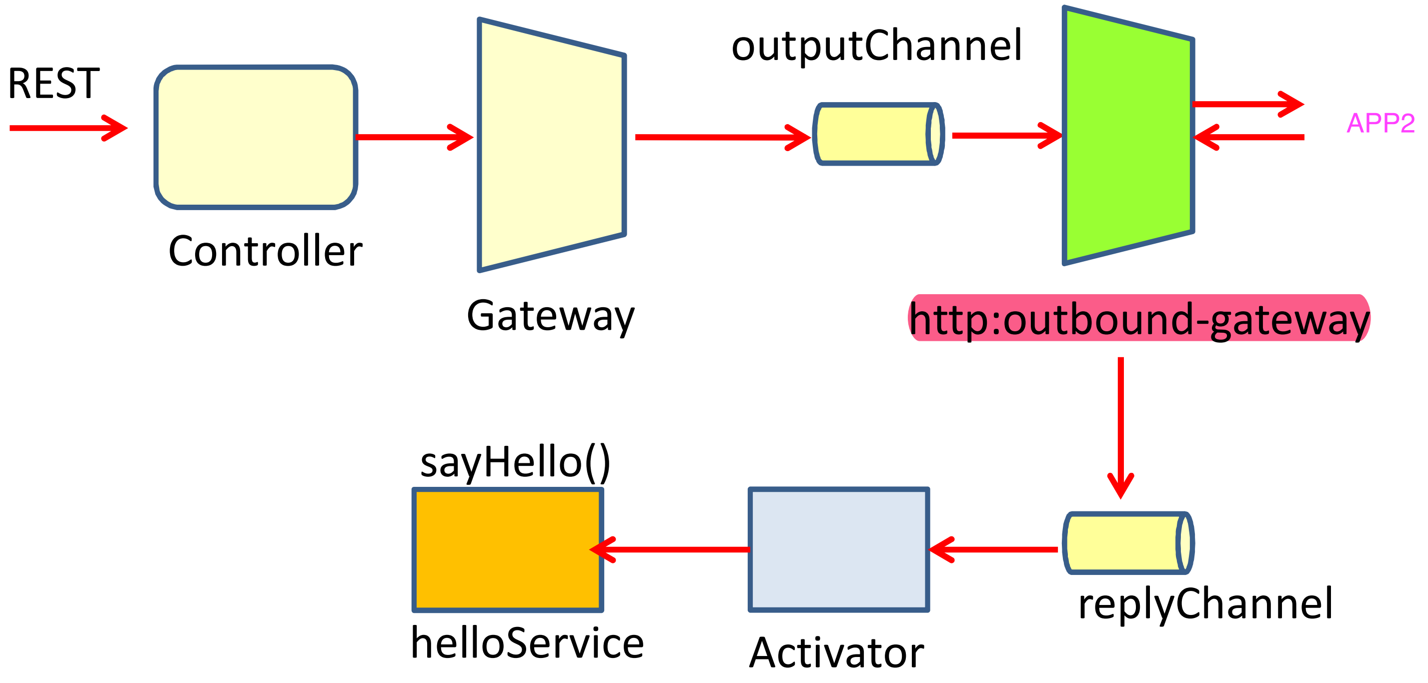


http://localhost:8081/greeting/Frank
http://localhost:8080/greeting/Frank
Application 1
Application 2
Hello FRANK, how are you?
FRANK, how are you?



Hello FRANK , how are you?

Application 1



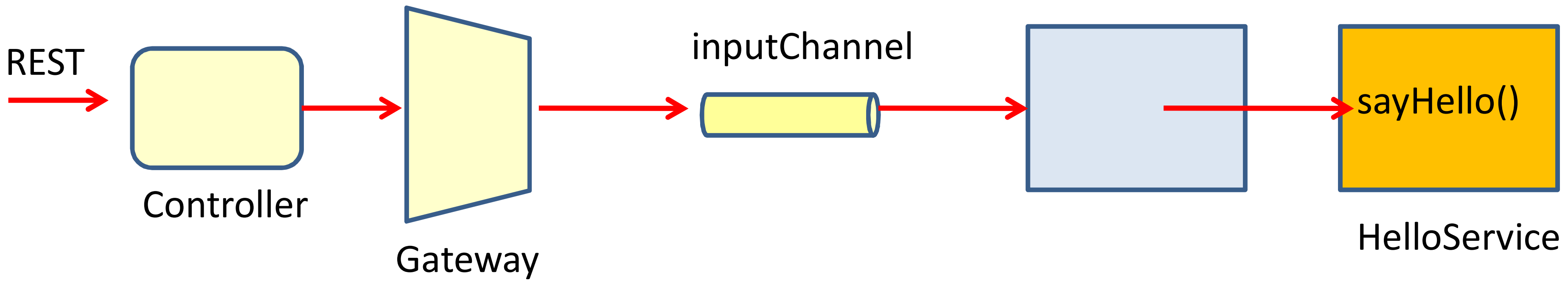
```
public class HelloService {
  public String sayHello(String name) throws Exception {
    System.out.println("Hello " + name);
    return "Hello " + name;
  }
}
```

Application 2

application.properties

```
server.port=8081
```

```
public class HelloService {
  public String sayHello(String name) throws Exception {
    System.out.println("Hi  " + name);
    return name+" , how are you?";
  }
}
```



Application 1

```
<channel id="replyChannel"/>
<channel id="outputChannel"/>

<service-activator input-channel="replyChannel"
                   ref="helloService"
                   method="sayHello"/>

<beans:bean id="helloService" class="integration.HelloService"/>

<int-http:outbound-gateway
      request-channel="outputChannel"
      reply-channel="replyChannel"
      url="http://localhost:8081/greeting/{name}"
      http-method="GET"
      expected-response-type="java.lang.String">
   <int-http:uri-variable name="name" expression="payload"/>
</int-http:outbound-gateway>
```

when some thing comes to request-channel, it calls this Url with Get method.
the response that comeback from Url will be in reply-channel

And the query string will be the Payload of message

Application 1

```
@RestController
public class Controller {
  @Autowired
  private GreetingGateway gateway;

  @RequestMapping("/greeting/{name}")
  public String getGreeting(@PathVariable("name") String name) {
    Message<String> helloMessage =
                    MessageBuilder.withPayload(name.toUpperCase()).build();

    String result = gateway.handleRequest(helloMessage);
    return result;
  }
}
```

Application 1

```java
@MessagingGateway
public interface GreetingGateway {

@Gateway(requestChannel = "outputChannel")
  String handleRequest(Message<String> message);
}
```

```java
public class HelloService {
  public String sayHello(String name) throws Exception {
    System.out.println("Hello " + name);
    return "Hello " + name;
  }
}
```

Application 2

```xml
<channel id="inputChannel"/>

<service-activator input-channel="inputChannel"
                   ref="helloService"
                   method="sayHello"/>

<beans:bean id="helloService" class="integration.HelloService"/>
```

application.properties

```
server.port=8081
```

```java
public class HelloService {
  public String sayHello(String name) throws Exception {
    System.out.println("Hi " + name);
    return name+" , how are you?";
  }
}
```

Application 2

```java
@RestController
public class Controller {
  @Autowired
  private GreetingGateway gateway;

  @RequestMapping("/greeting/{name}")
  public String getGreeting(@PathVariable("name") String name) {
    Message<String> helloMessage =
                    MessageBuilder.withPayload(name.toUpperCase()).build();

    String result = gateway.handleRequest(helloMessage);
    return result;
  }
}
```

```java
@MessagingGateway
public interface GreetingGateway {

@Gateway(requestChannel = "inputChannel")
  String handleRequest(Message<String> message);
}
```

Main point

- Spring integration supports all different integration patterns:
  - Message channels
  - Routers
  - Filters
  - Splitters
  - Transformers
  - …

- Pure Consciousness is the home of all the laws of nature, field of all possibilities.

Connecting the parts of knowledge with the wholeness of knowledge

1. Spring integration is a framework that can run both inside and outside your application.
2. Spring integration separates the standard integration structure (in XML) from the specific integration logic (in POJO's).

3. **Transcendental consciousness** is the field of all possibilities.

- **Wholeness moving within itself:** In unity consciousness one realizes that the perfect underling structure of the entire creation is just the same structure of one's own pure consciousness.