redhat.

Develop cloud-native microservices with Apache Camel on Spring Boot and Kubernetes

Claus Ibsen
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About me

- Senior Principal Software Engineer at Red Hat
- 10 years as Apache Camel committer
- Author of Camel in Action books
- Based in Denmark

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Twitter: @davsclaus
Linkedin: davsclaus

System Integration

Figure 1.1 Camel is the glue between disparate systems.

Integration Framework

APACHE Camel

PATTERN BASED INTEGRATION

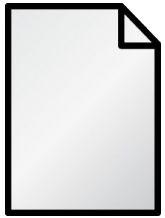
Apache Camel, a powerful pattern-based integration engine with a comprehensive set of connectors and data formats to tackle any integration problem.

ENTERPRISE INTEGRATION PATTERNS

Build integrations using enterprise best practices.

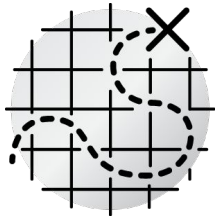
200+ COMPONENTS

Batch, messaging, web services, cloud, APIs, and more ...



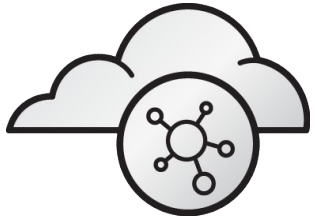
BUILT-IN DATA TRANSFORMATION

JSON, XML, HL7, YAML, SOAP, Java, CSV, and more ...



INTUITIVE ROUTING

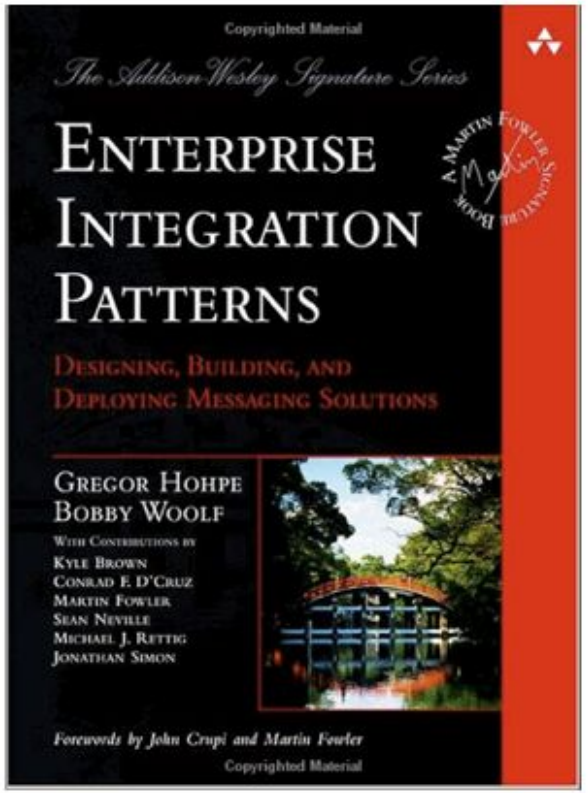
Develop integrations quickly in Java or XML.



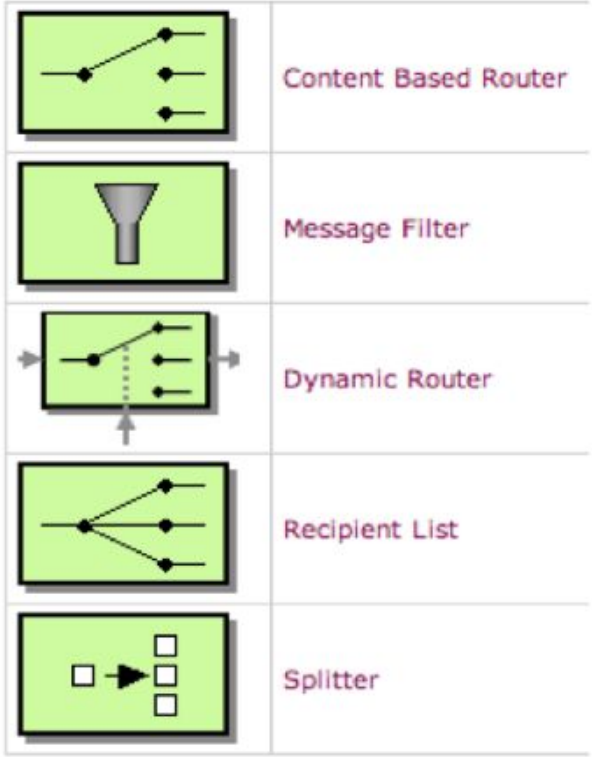
NATIVE REST SUPPORT

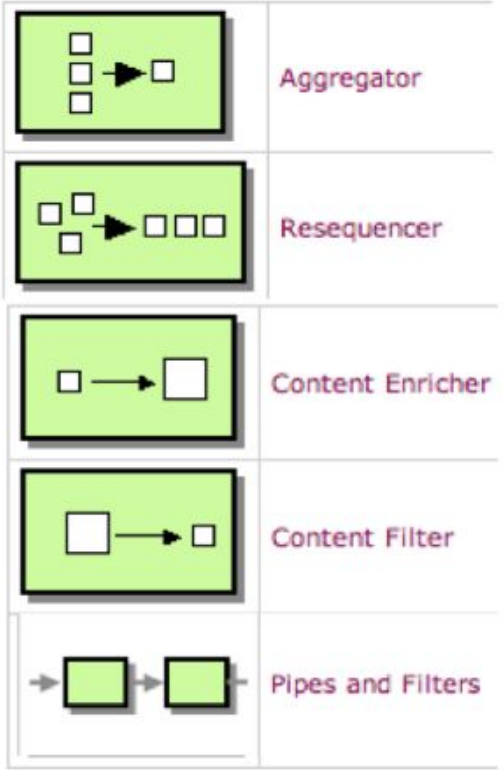
Create, connect, and compose APIs with ease.

Enterprise Integration Patterns

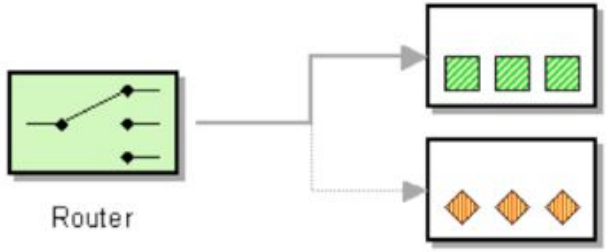


Enterprise Integration Patterns





Camel Routes



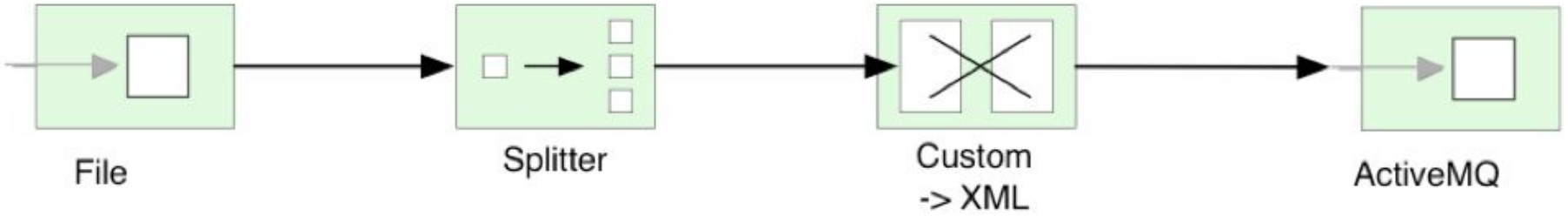

```
from("file:data/inbox")
   .to("jms:queue:order");
```

Java DSL

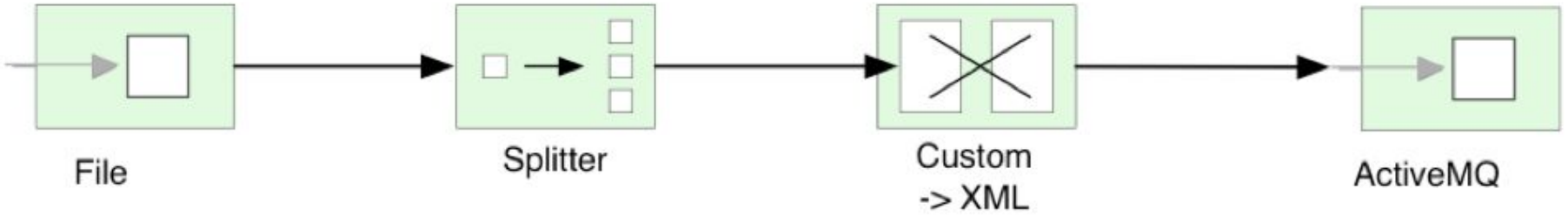
XML DSL

```
<route>
   <from ri="file:data/inbox"/>
   <to uri="jms:queue:order"/>
</route>
```

Camel Routes with Splitter

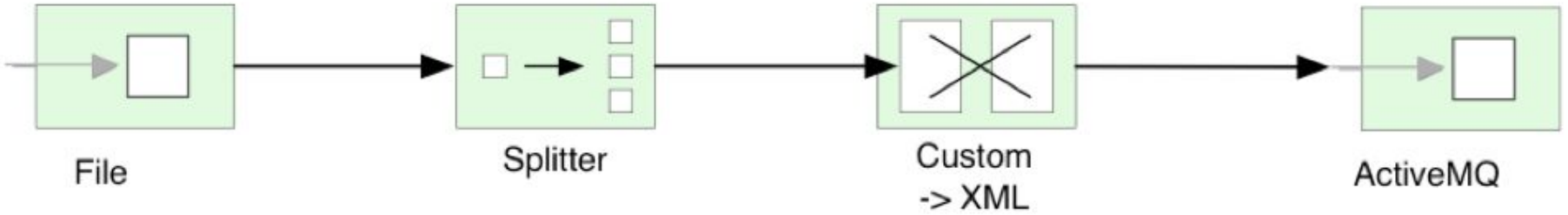


Camel Routes with Splitter



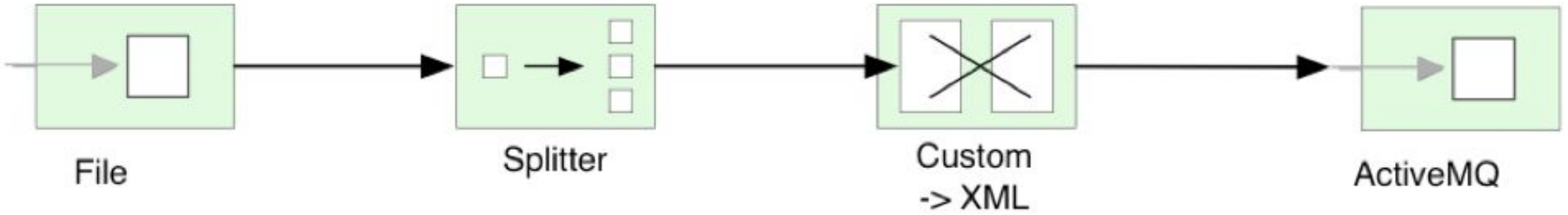

```
from("file:inbox")
```

Camel Routes with Splitter




```
from("file:inbox")
    .split(body().tokenize("\n"))
```

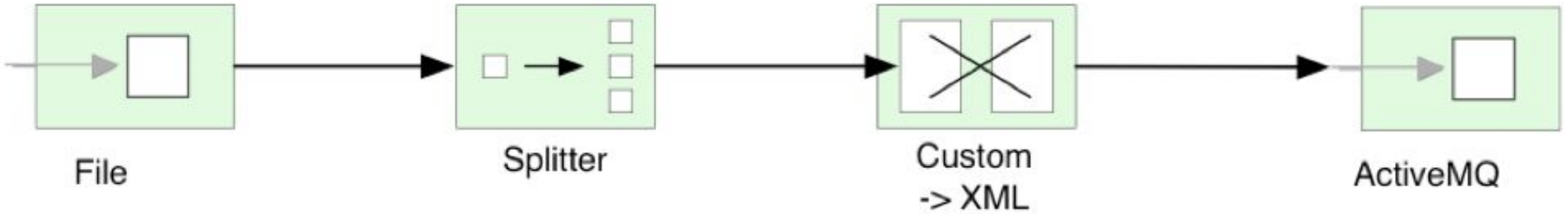
Camel Routes with Splitter




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

Custom data transformation

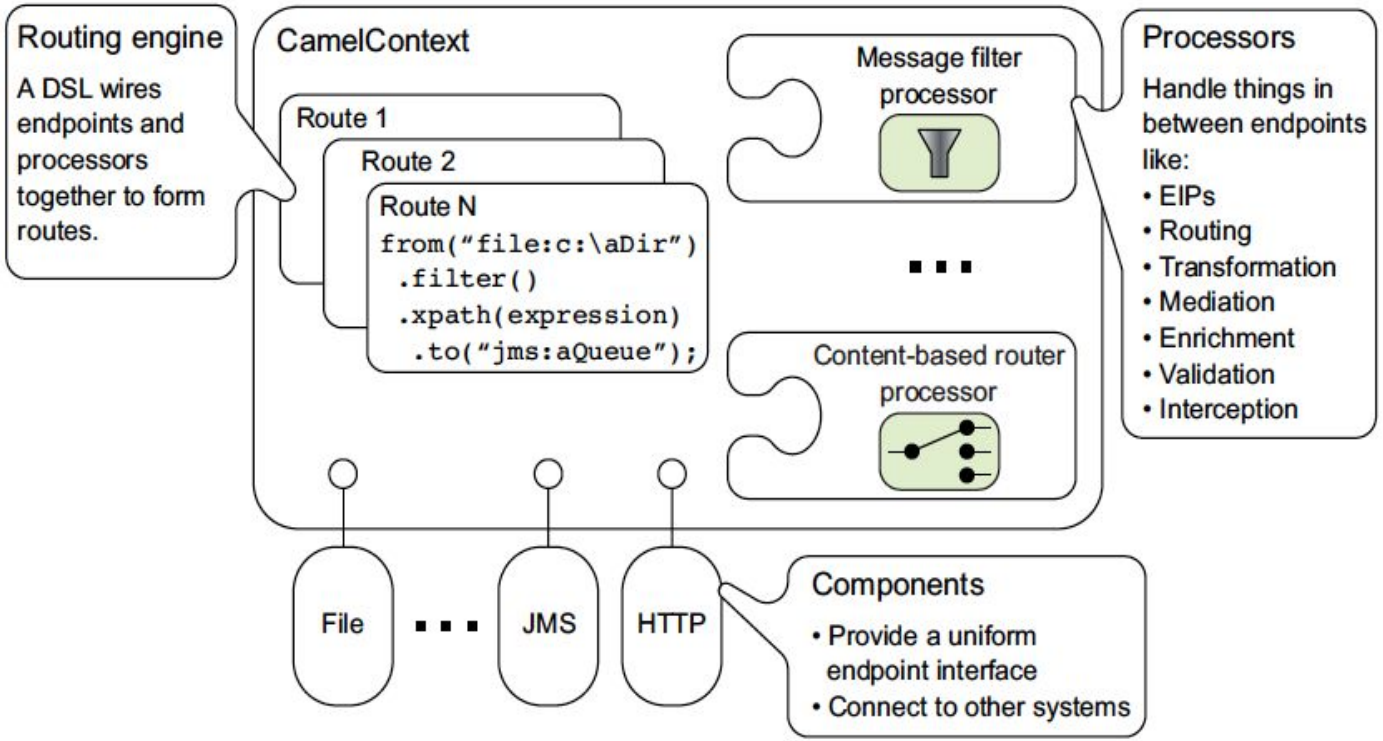
Camel Routes with Splitter



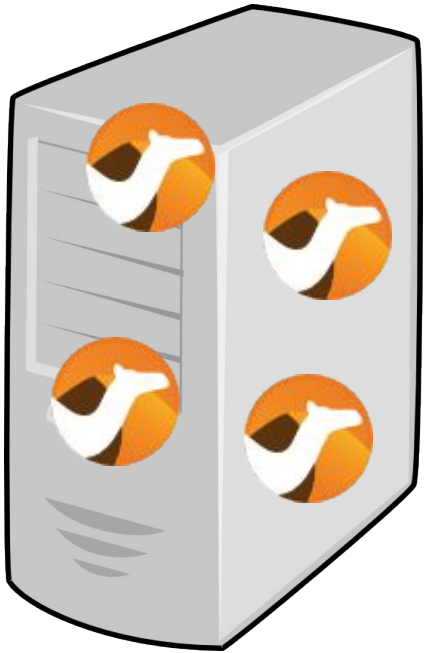

```
from("file:inbox")
    .split(body().tokenize("\n"))
        .marshal(customToXml)
        .to("activemq:line");
```

Custom data transformation

Camel Architecture



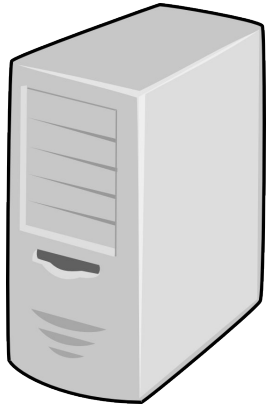
Camel runs everywhere



Application
Servers

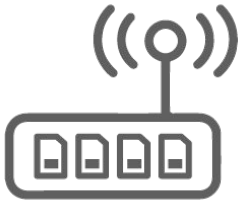
Linux
Containers

Camel connects everything



Enterprise Systems

- File
- FTP
- JMS
- AMQP
- JDBC
- SQL
- TCP/UDP
- Mail
- HDFS
- JPA
- MongoDB
- Kafka
- ...



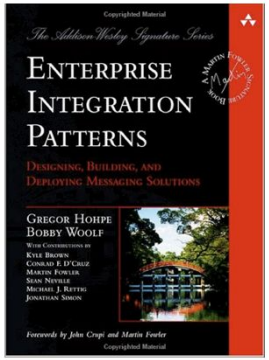
IoT

- CoAP
- MQTT
- PubNub

- AWS
  - S3
  - SQS
  - Kinesis
  - ...
- Google
  - BigQuery
  - PubSub
- Azure
  - Blob
  - Queue

- Box
- Dropbox
- Facebook
- Linkedin
- Salesforce
- SAP
- ServiceNow


TOOL BOX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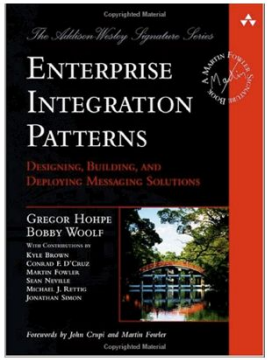
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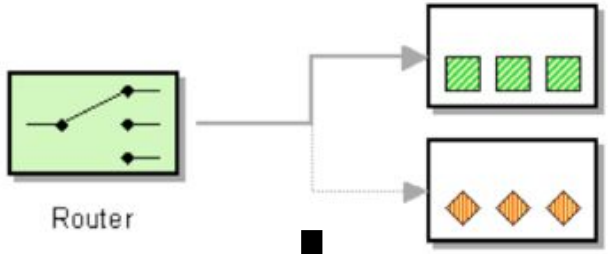
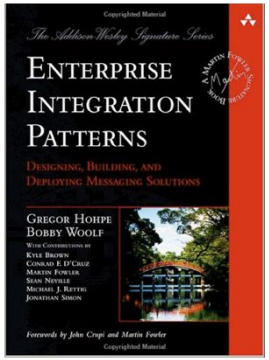

Router


TOOL BOX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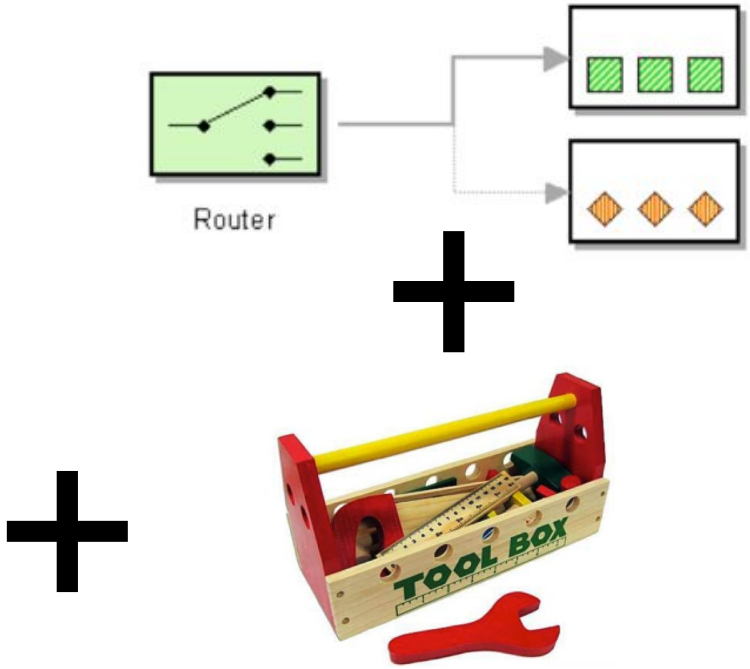
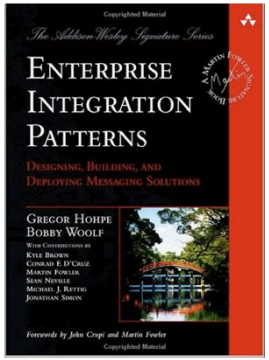

Router
TOOL BOX
File
JMS
HTTP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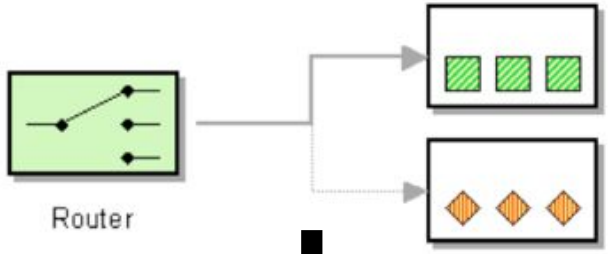
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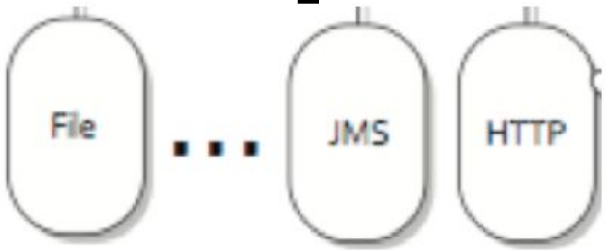
File
JMS
HTTP

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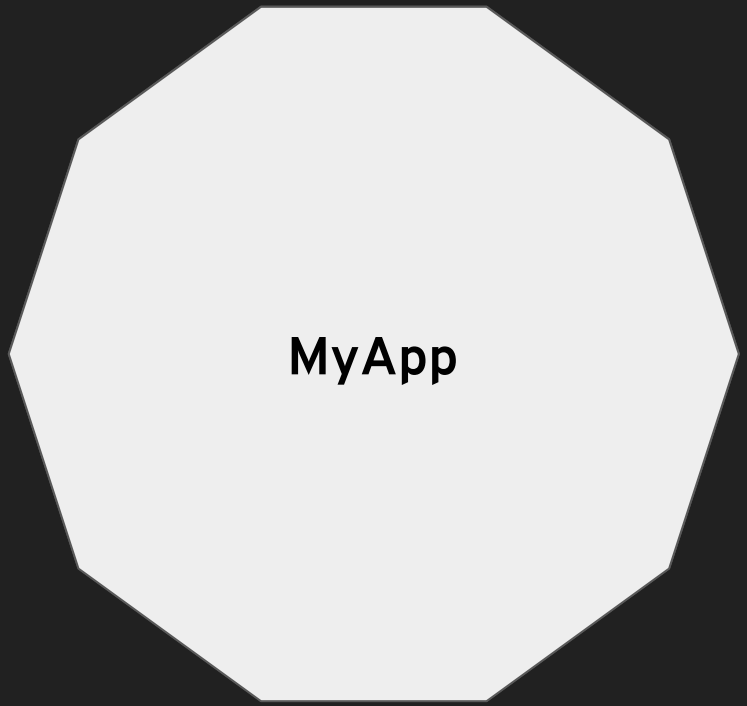
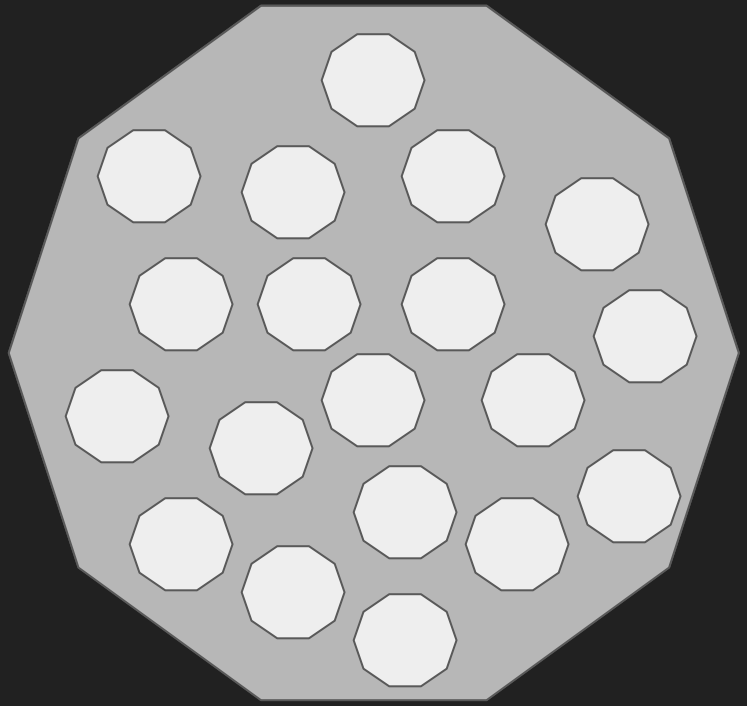
What about Camel
on OpenShift?

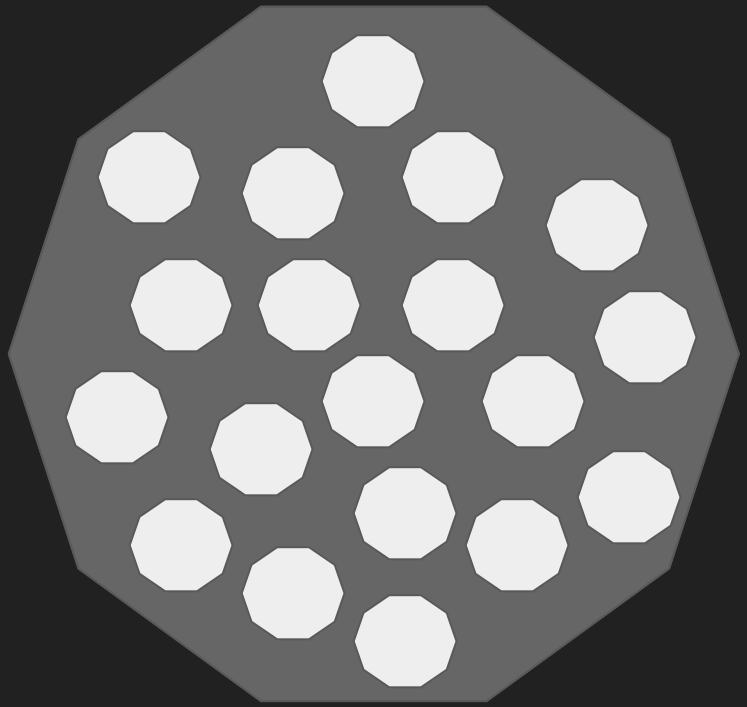
Monolith



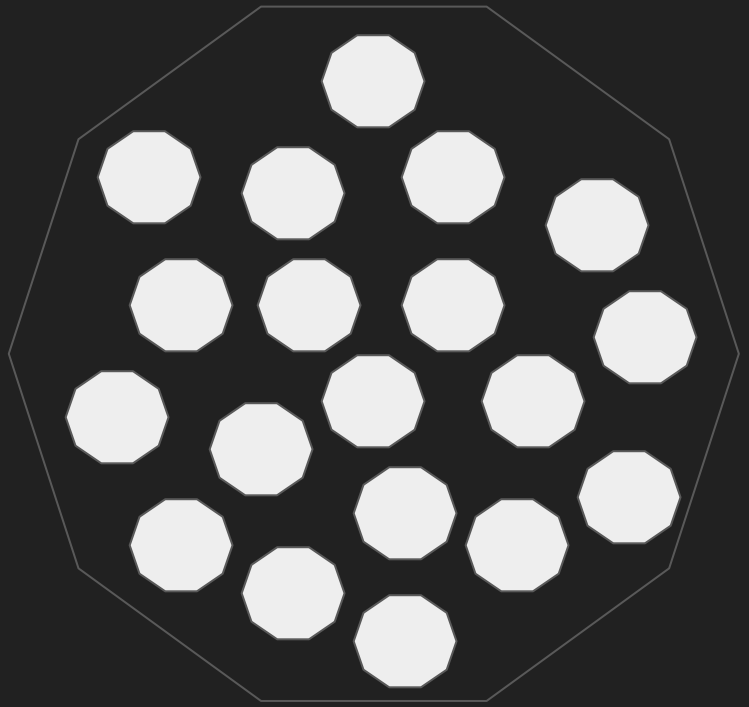
Microservices



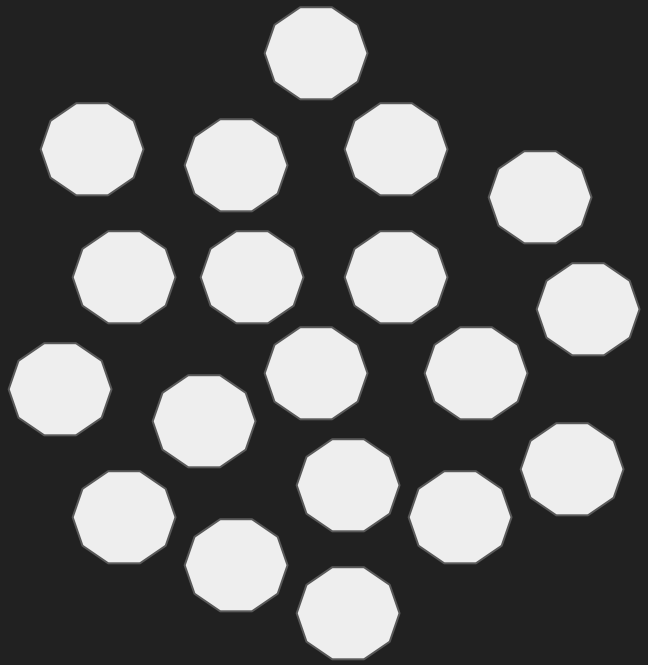
Microservices



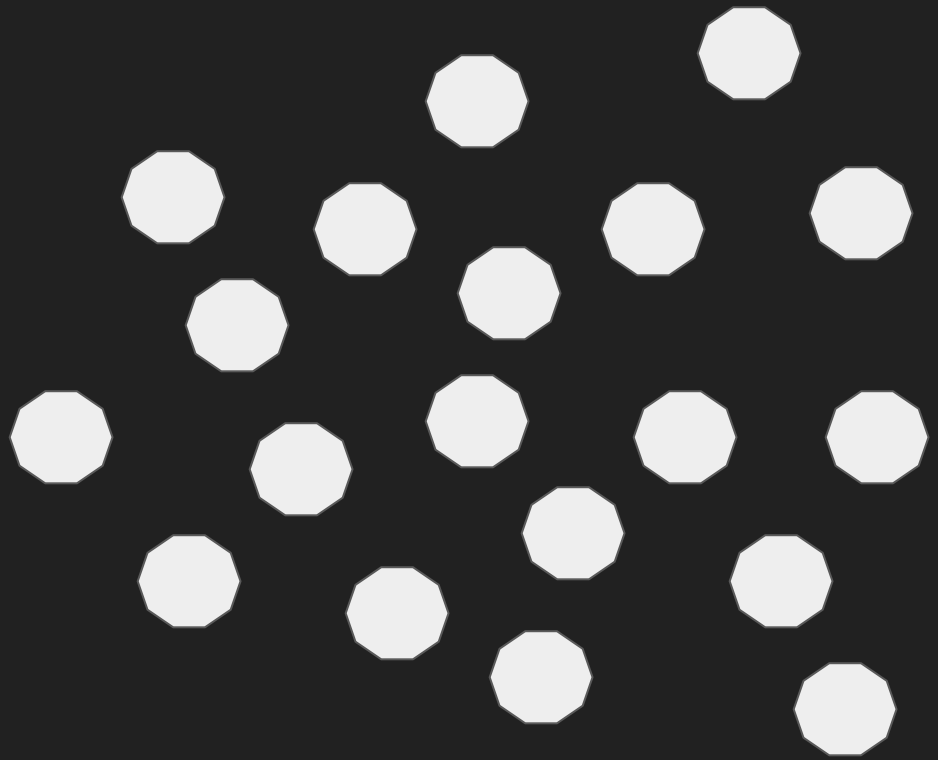
Microservices



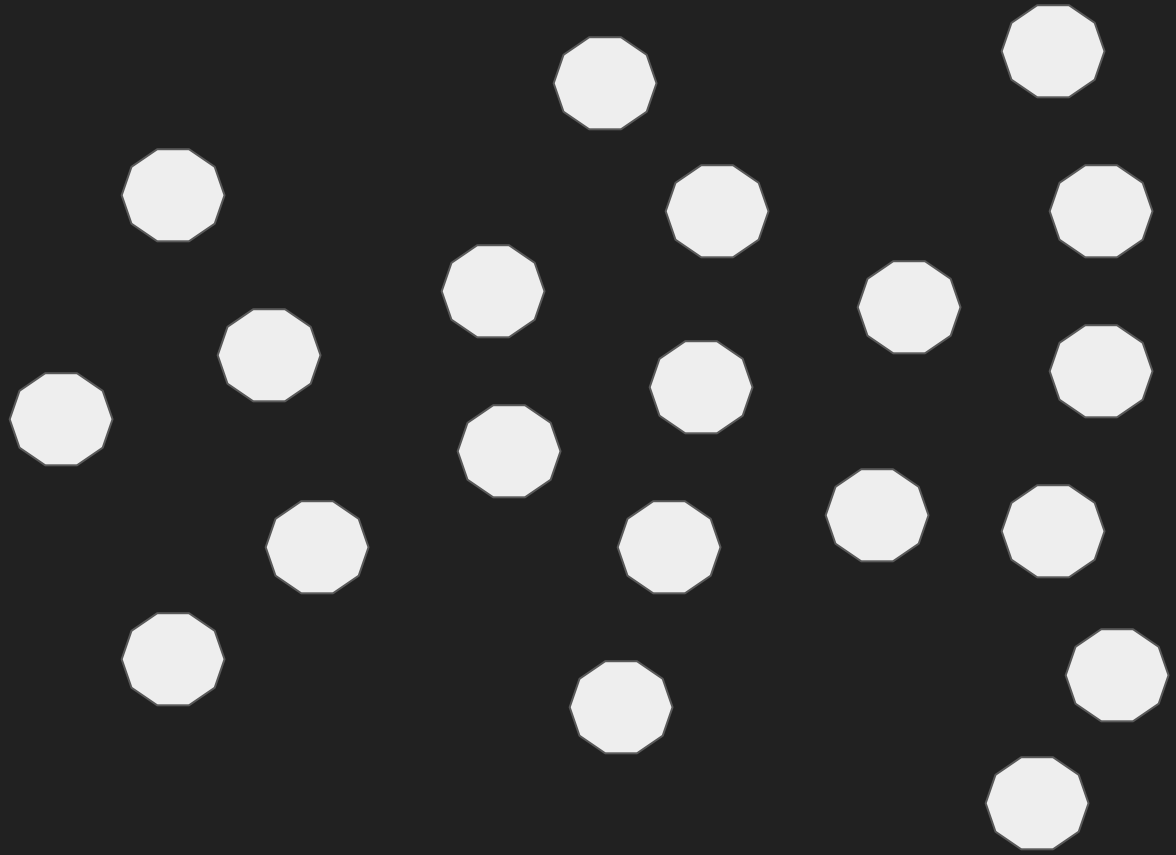
Microservices



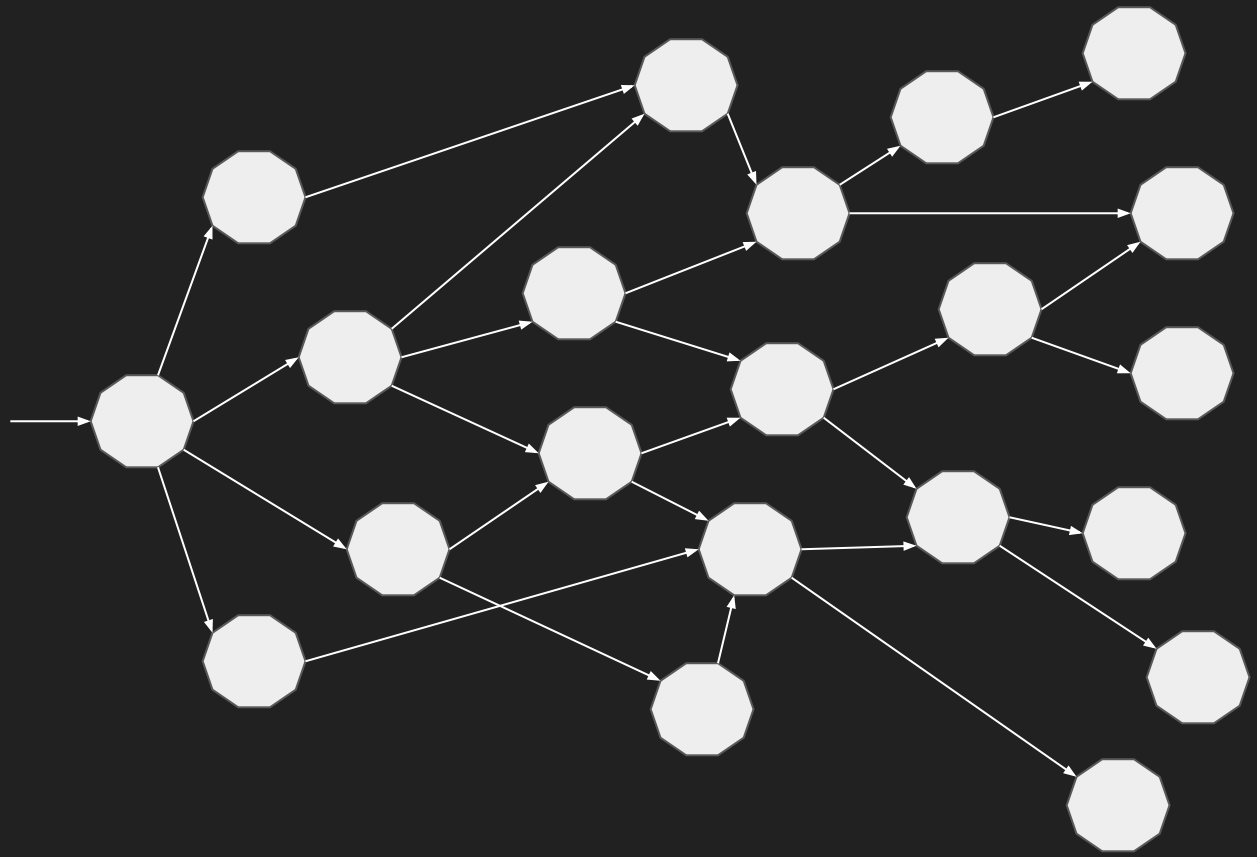
Microservices



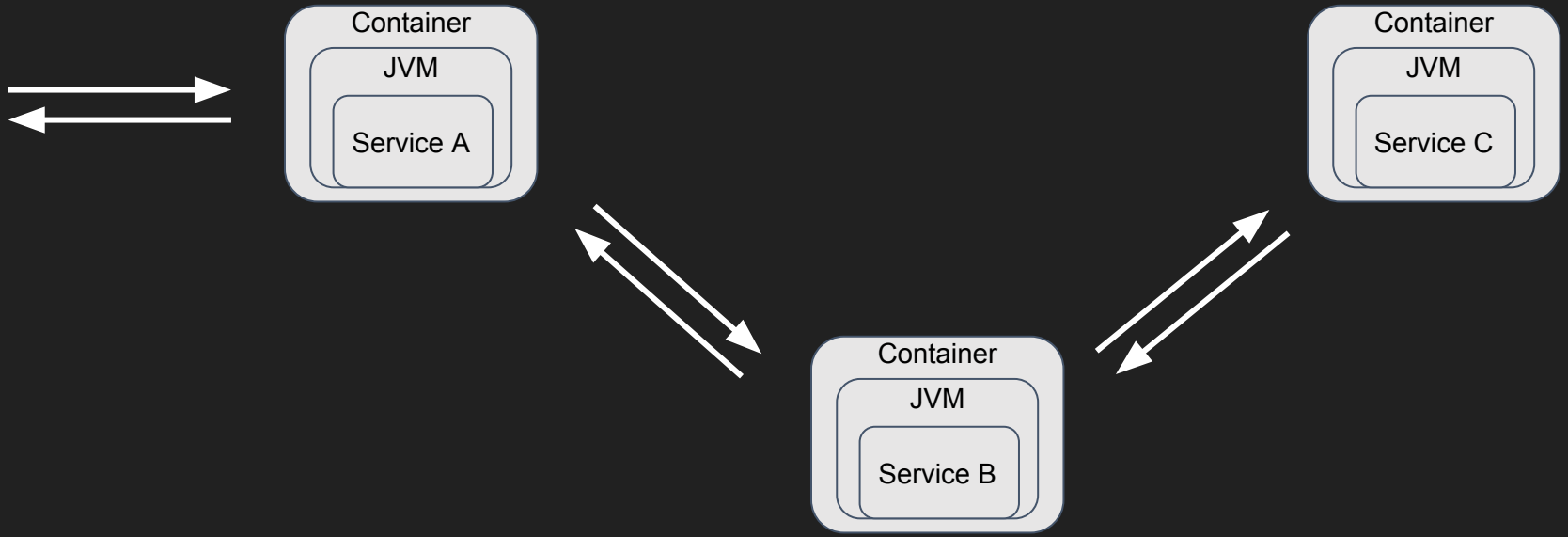
Microservices



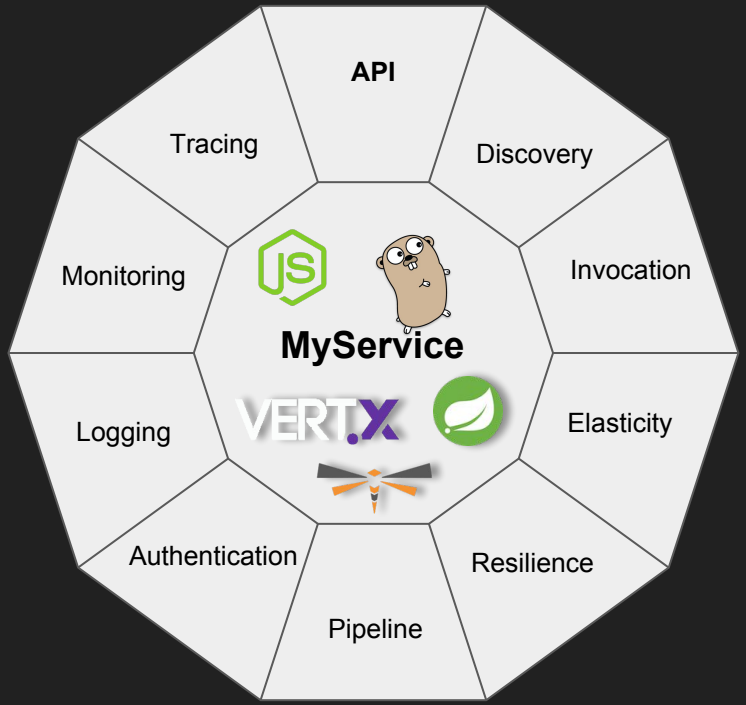
Network of Services



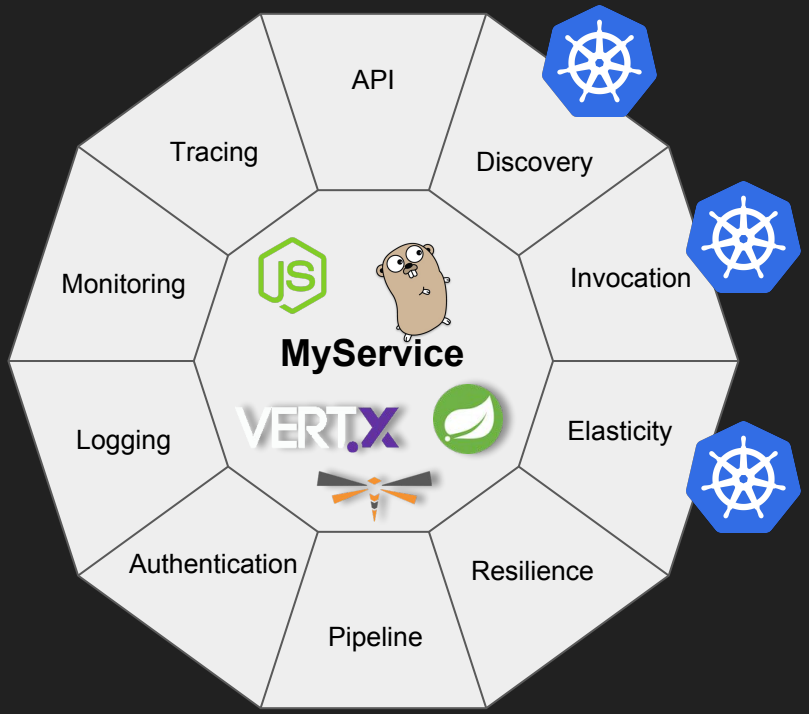
Microservices == Distributed Computing



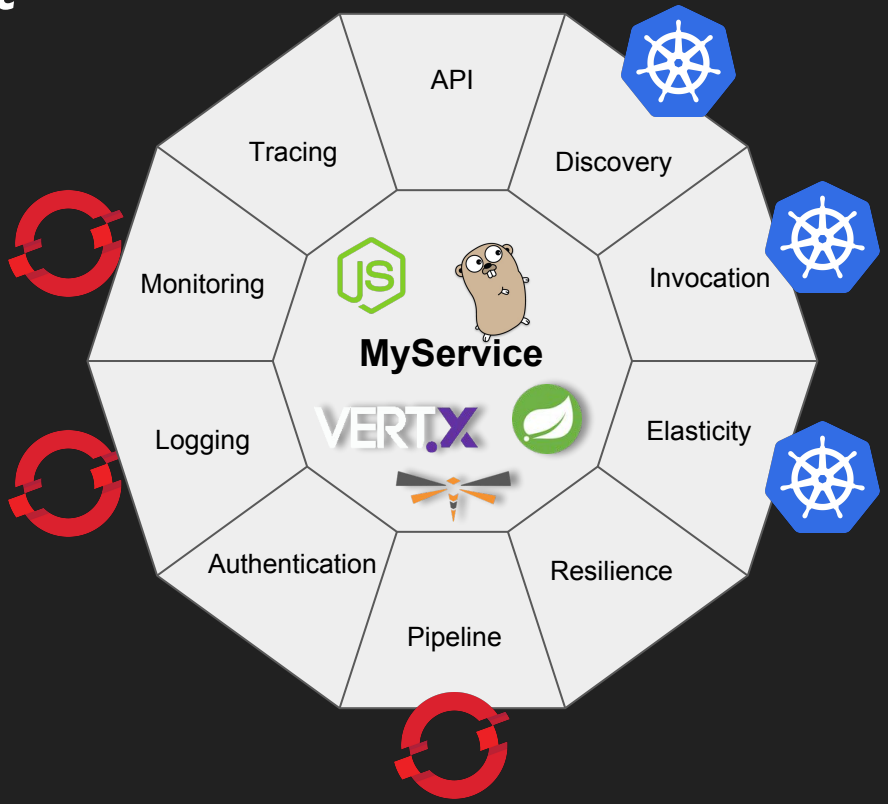
Microservices'ilities



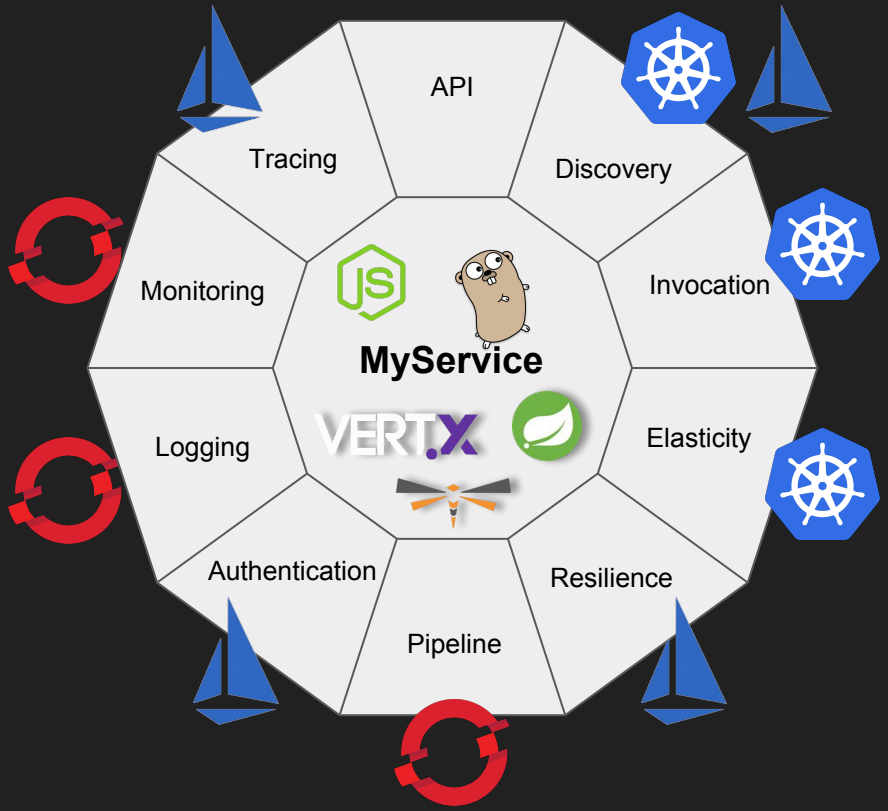
Microservices'ilities + Kubernetes



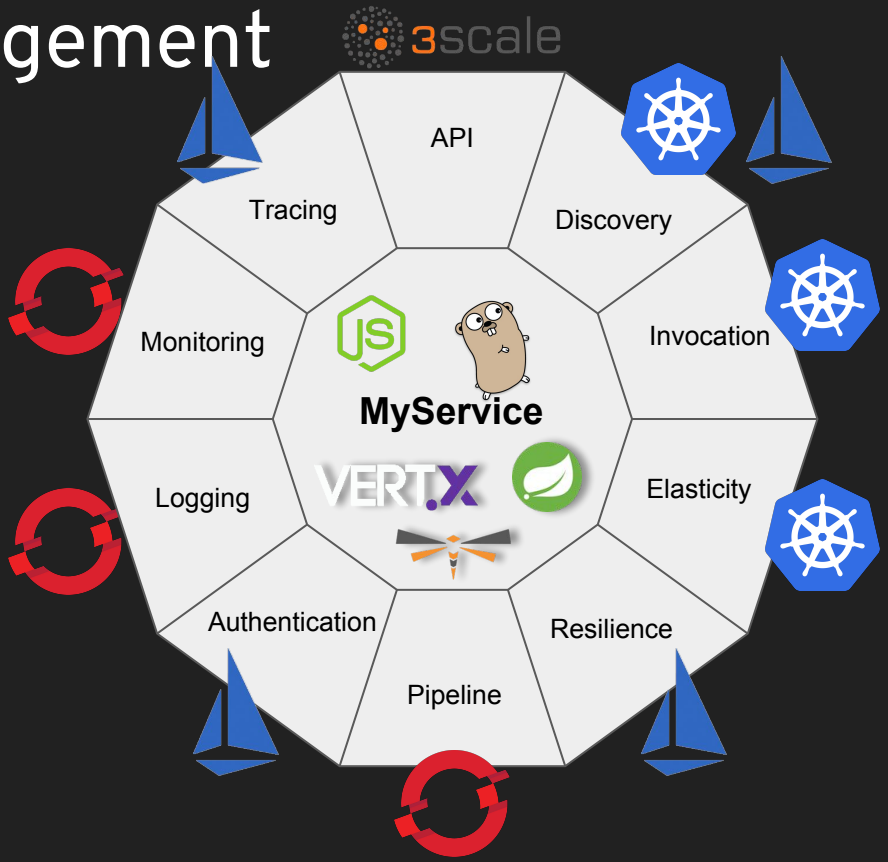
Microservices'ilities + OpenShift



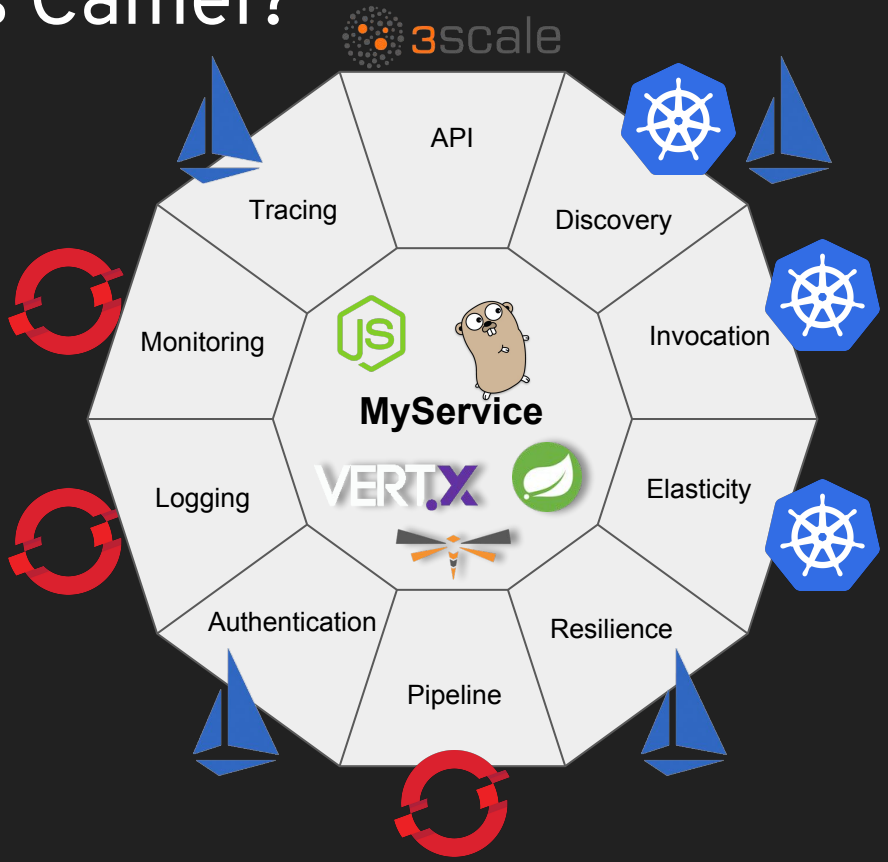
Microservices'ilities + Istio



Microservices'ilities + API management



But where is Camel?



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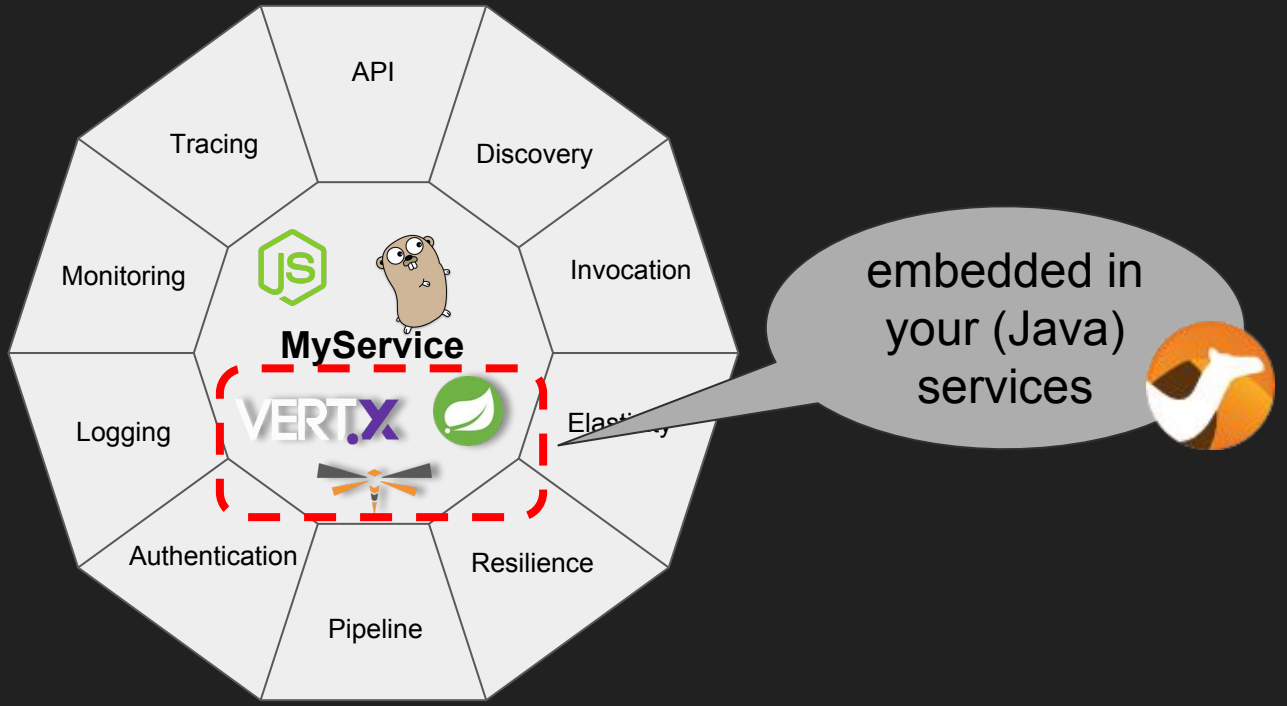
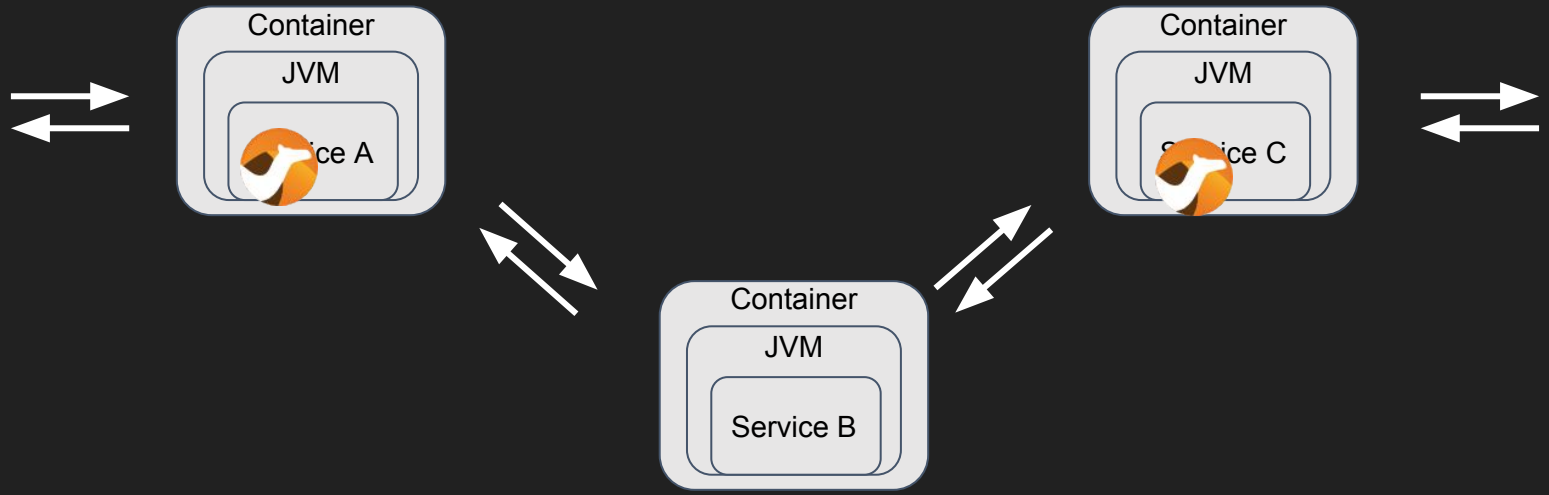
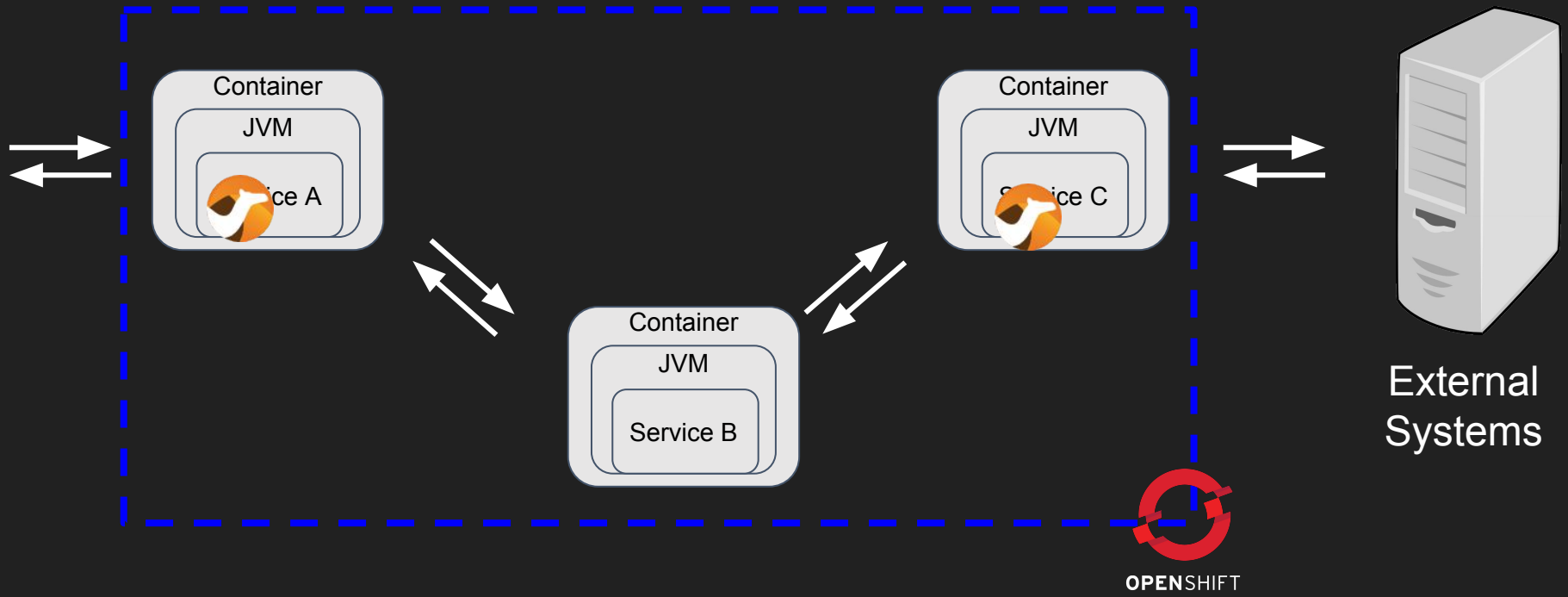


Microservices == Distributed Integration



Microservices == Distributed Integration



THE THREE PILLARS OF AGILE INTEGRATION

Key foundational capabilities needed by today's enterprises

DISTRIBUTED INTEGRATION

-LIGHTWEIGHT
-PATTERN BASED
-EVENT ORIENTED
-COMMUNITY SOURCED

FLEXIBILITY

CONTAINERS

- CLOUD NATIVE SOLUTIONS
-LEARN ARTIFACTS, INDIVIDUALLY DEPLOYABLE
- CONTAINER BASED SCALING AND HIGH AVAILABILITY

SCALABILITY

APIs

-WELL DEFINED, REUSABLE, AND WELL MANAGED END-POINTS
-ECOSYSTEM LEVERAGE

RE-USABILITY

Camel in the Cloud

Best Practice - Small in Size

- Camel is light-weight
  - (camel-core 4mb)
  - + what you need

- Single fat-jar via:

Best Practice - Stateless

- Favour stateless applications

- If state is needed:
  - Data-grid
    - camel-infinispan
    - camel-hazelcast
    - camel-ignite
    - ...
  - Storage
    - camel-sql
    - camel-jpa
    - camel-kafka
    - ...
  - Kubernetes
    - Stateful-set

Best Practice - Configuration Management

- Kubernetes ConfigMap
  - Inject via ENV
  - Inject via files
- Kubernetes Secrets
  - Inject via ENV
  - Inject via files


```
$ kubectl get cm -o yaml my-configmap
apiVersion: v1
data:
  fallback: I still got no response
kind: ConfigMap
```

Best Practice - Fault Tolerant

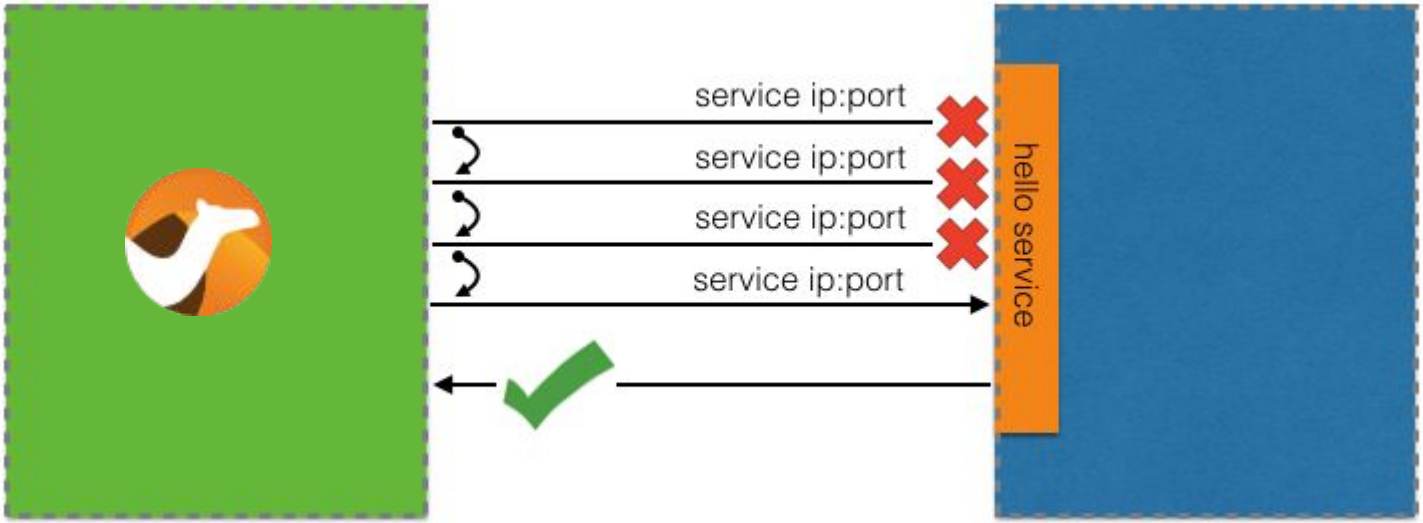
- Camel Retry
  - onException
  - errorHandler

- Camel Hystrix
  - circuit breaker

Best Practice - Fault Tolerant

- Camel Retry
  - onException
  - errorHandler

```
onException(Exception.class)
    .maximumRedeliveries(10)
    .redeliveryDelay(1000);
```



Best Practice - Fault Tolerant

- Camel Retry
  - onException
  - errorHandler

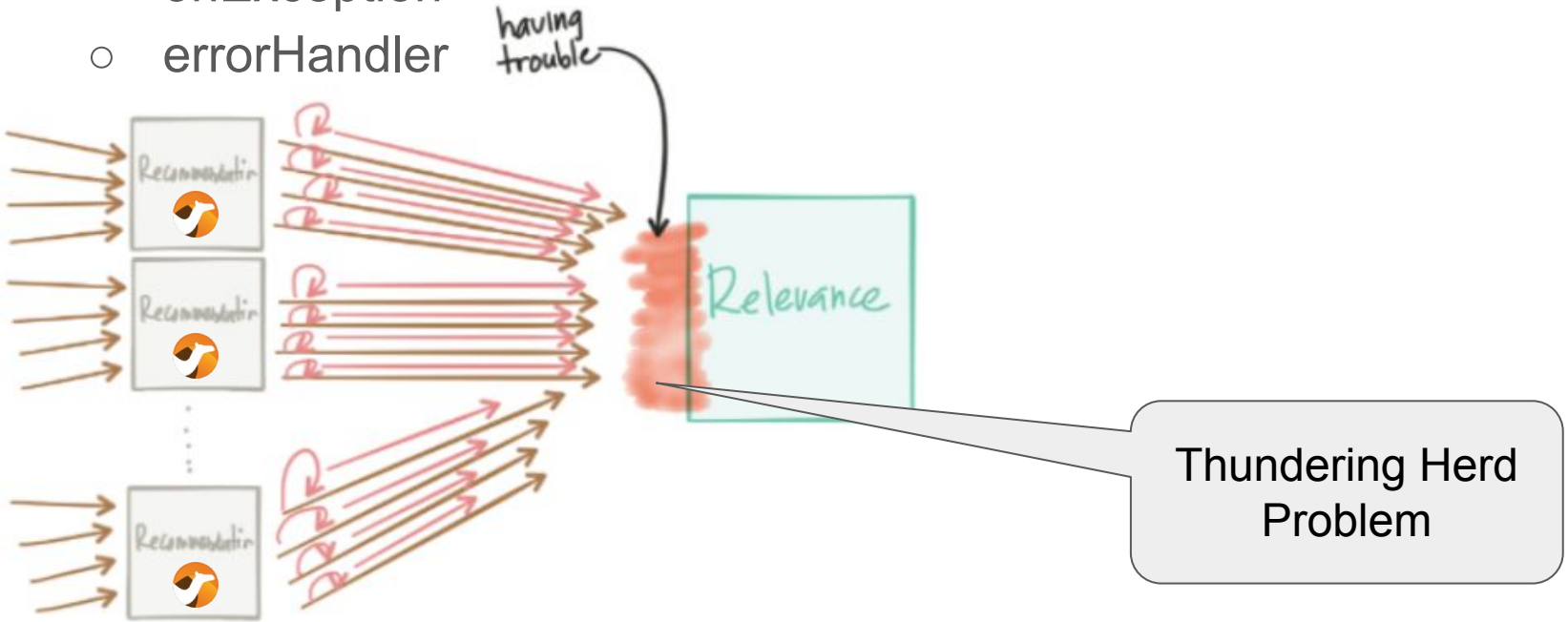
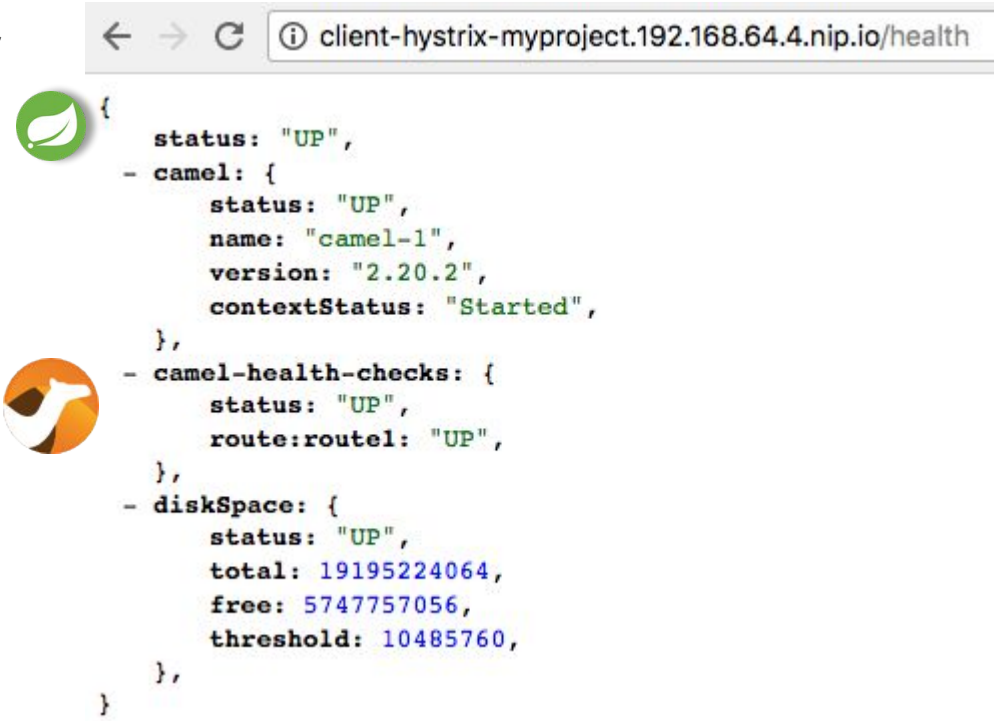


Figure by Christian Posta

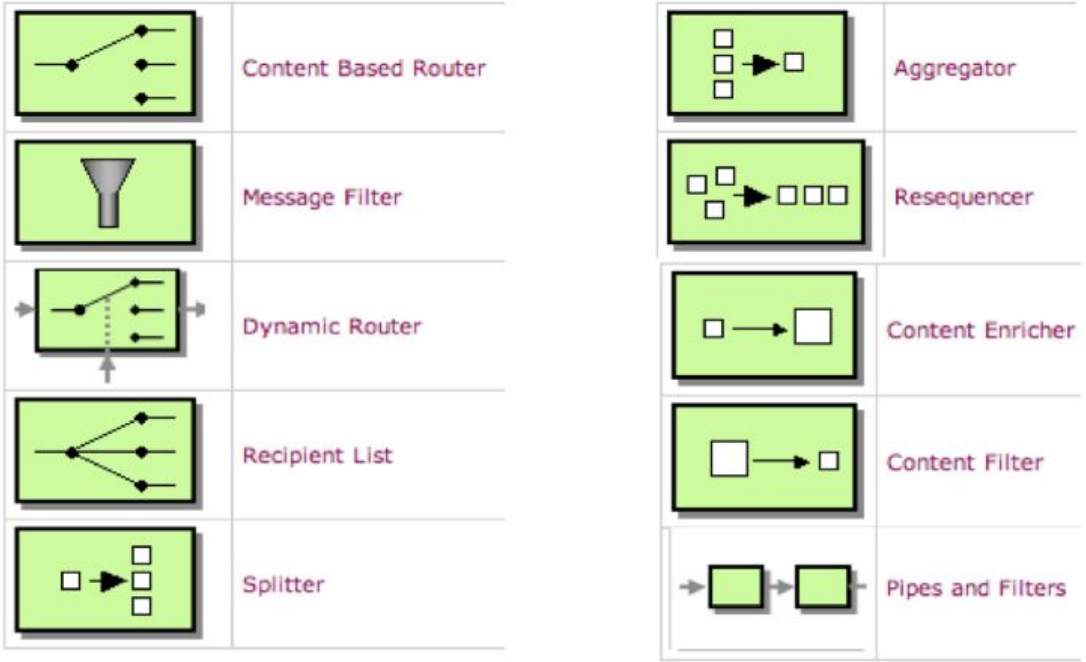
Best Practice - Health Checks

- Health Checks
  - camel-spring-boot actuator
  - wildfly-swarm monitor
- Readiness Probe
  - Kubernetes
- Liveness Probe
  - Kubernetes

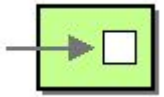


Best Practice - EIP Patterns

- Works anywhere



EIP Cloud Patterns



Service Call

Plugins

- Consul
- Etcd
- Kubernetes
- Ribbon
- Zookeeper

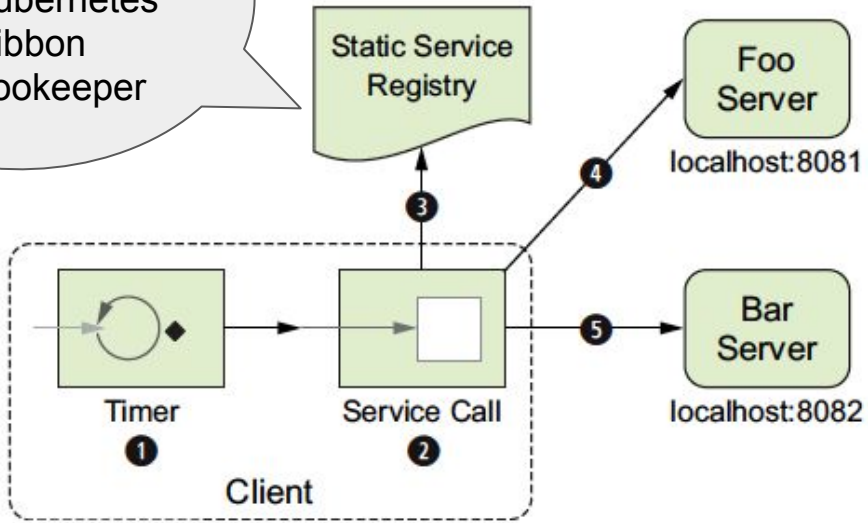
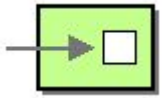


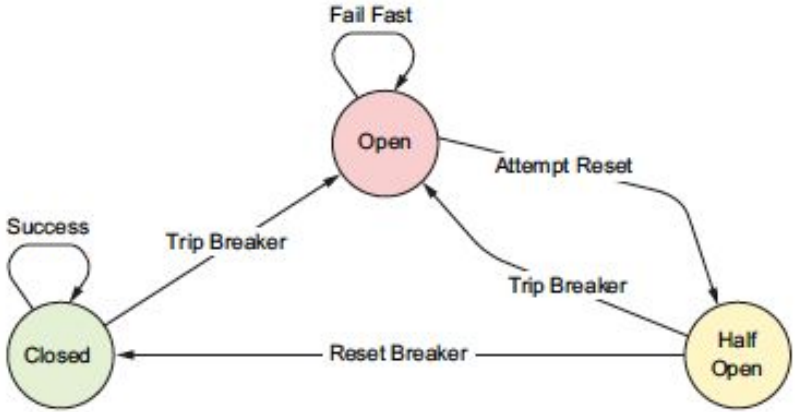
Figure 17.9 A timer (1) triggers the Service Call EIP (2) to call a clustered service. The physical locations of the service are looked up in the service registry (3). The service is then called in a round-robin fashion by calling either Foo server (4) or Bar server (5).

```
from("timer")
  .serviceCall("hello-service");
```

EIP Cloud Patterns

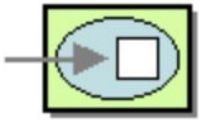


Hystrix EIP

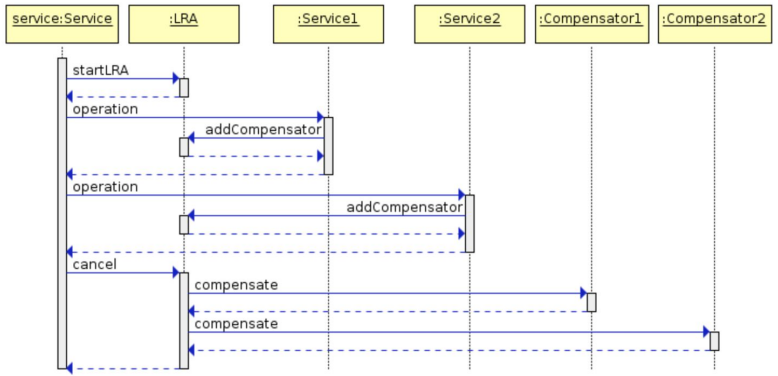



```
from("timer:foo")
   .hystrix()
      .to("http:myservice")
   .onFallback()
      .to("bean:myfallback")
   .end()
```

EIP Cloud Patterns



Saga EIP



Sequence diagram of a failed LRA saga

```
rest().post("train/buy/seat")
   .saga()
      .compensation("direct:cancel")
      ...
      .to("http:trainservice/buy")
```

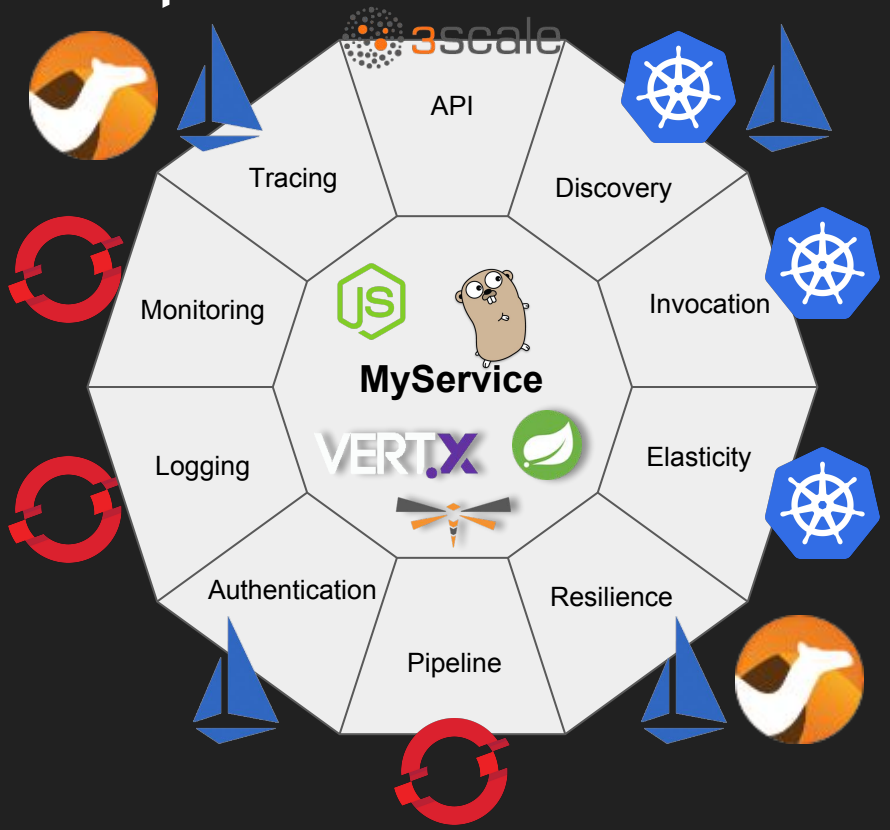
EIP Cloud Patterns

Distributed Tracing

Usable Camel capabilities

Camel Rest

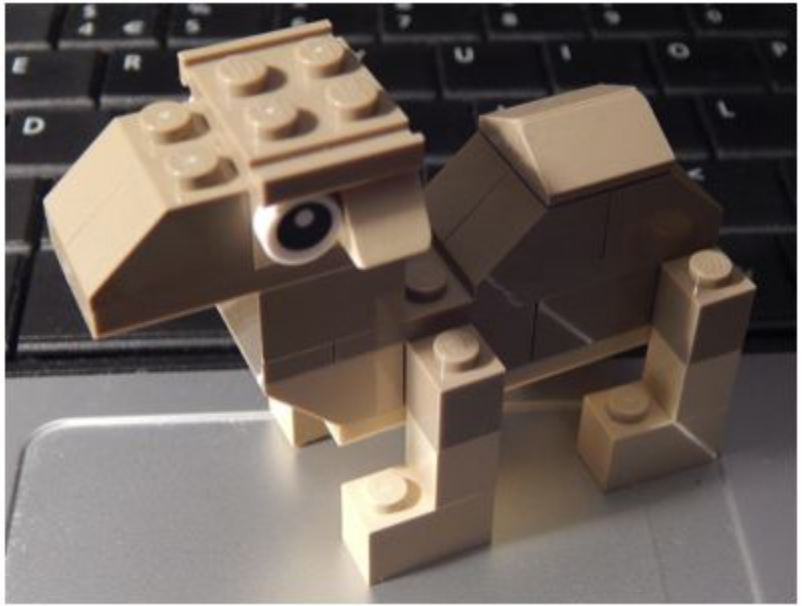
Camel Zipkin
Camel OpenTracing



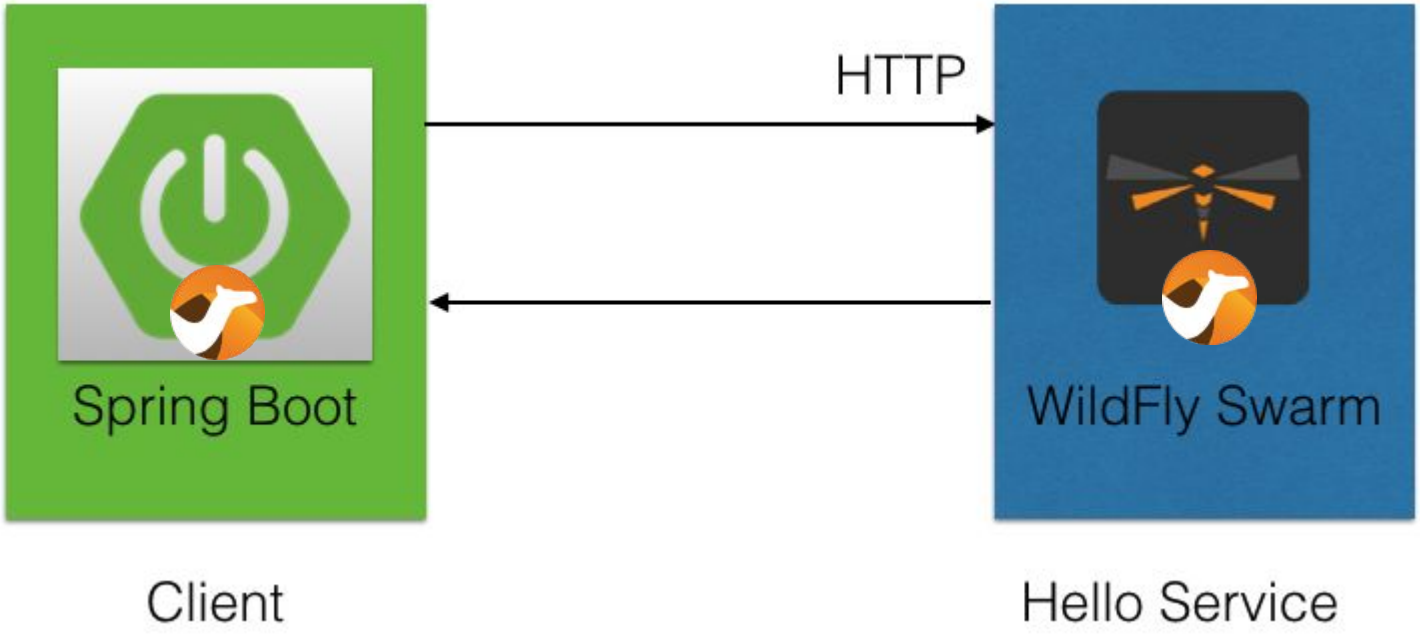
Camel
Components

Camel Retry
Camel Hystrix

Demo Time



Basic Demo



Tip of the iceberg

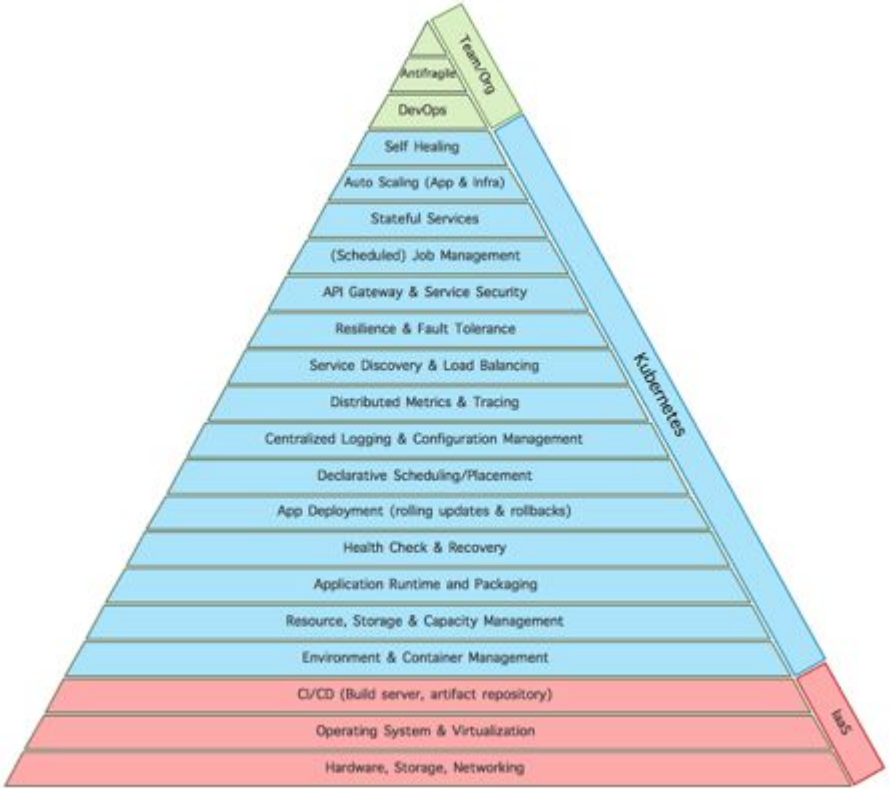
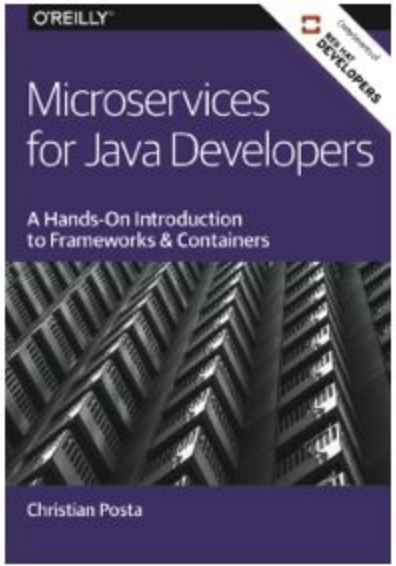


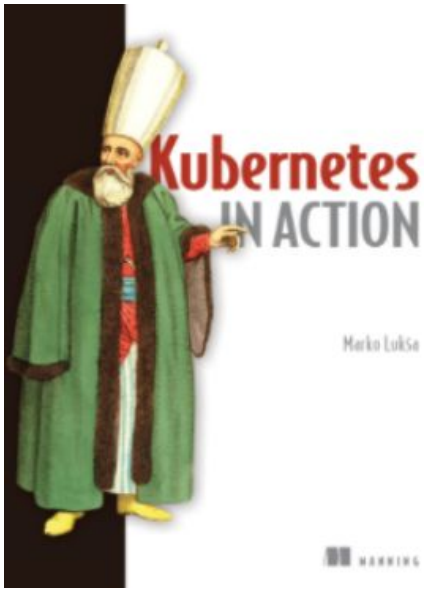
Figure by Bilgin Ibryam

Free book



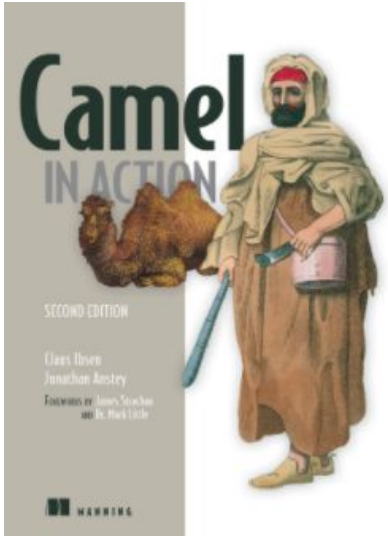
http://developers.redhat.com/promotions/microservices-for-java-developers

Not so free book



https://www.manning.com/books/kubernetes-in-action

Free first 3-chapters



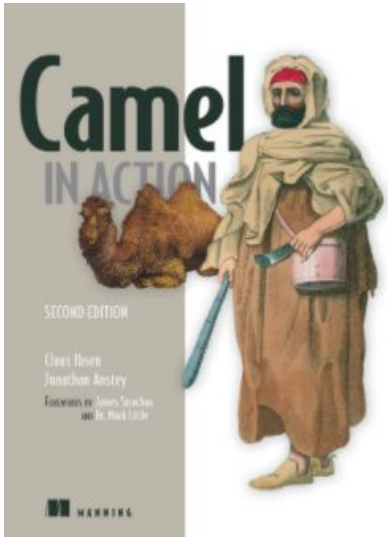
https://developers.redhat.com/books/selections-camel-action/

Not so free book

- Discount code (39%):

  `camel139`

  (ordering from Manning)



https://www.manning.com/books/camel-in-action-second-edition

Free e-book

https://www.redhat.com/en/resources/mi-agile-integration-ebook

More Information

- Slides and Demo source code: https://github.com/davsclaus/camel-riders-in-the-cloud/tree/webinar
- Apache Camel website: http://camel.apache.org
- Best "What is Apache Camel" article: https://dzone.com/articles/open-source-integration-apache
- My blog: http://www.davsclaus.com
- DevNation Webinars: https://developers.redhat.com/devnationlive

Q & A