

A group of riders on camels racing across a sandy desert under a clear sky. The camels are in full gallop, kicking up dust. The riders are wearing traditional white thobes and ghutras, with some wearing helmets. The scene is dynamic and captures the intensity of the race.

Camel microservices with Spring Boot and Kubernetes

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JavaZone
September 2018

I was last here at JavaZone in 2011



About me

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



Blog: <http://www.davsclaus.com>
Twitter: @davsclaus
Linkedin: davsclaus

System Integration



Figure 1.1 Camel is the glue between disparate systems.

Apache Camel

is an

Integration Framework

based on

Enterprise Integration Patterns

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.



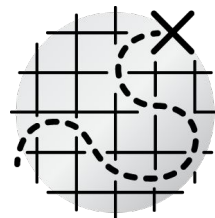
200+ COMPONENTS

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



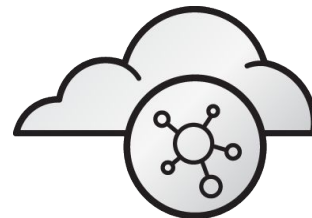
BUILT-IN DATA TRANSFORMATION

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



INTUITIVE ROUTING

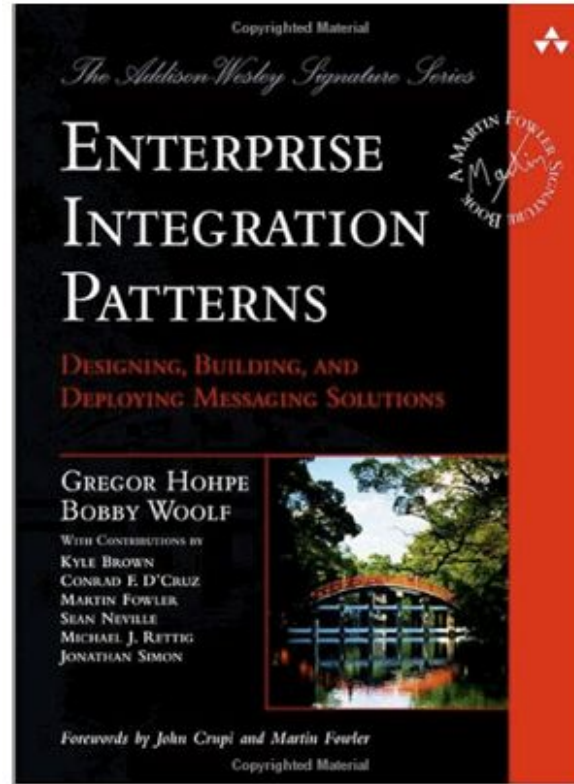
Develop integrations quickly in Java or XML.



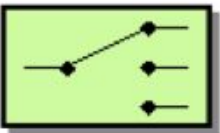
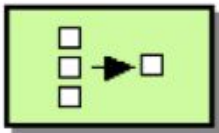

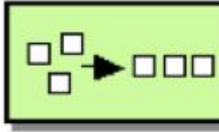
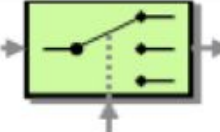
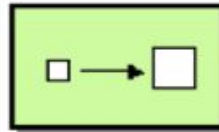
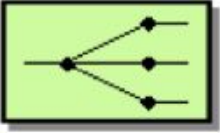
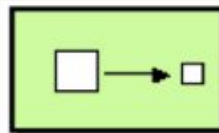
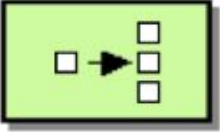
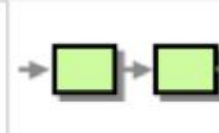
NATIVE REST SUPPORT

Create, connect, and compose APIs with ease.

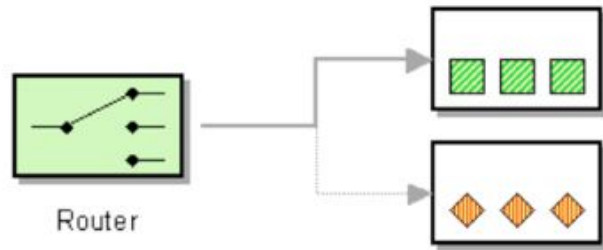
Enterprise Integration Patterns



Enterprise Integration Patterns

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

Camel Routes



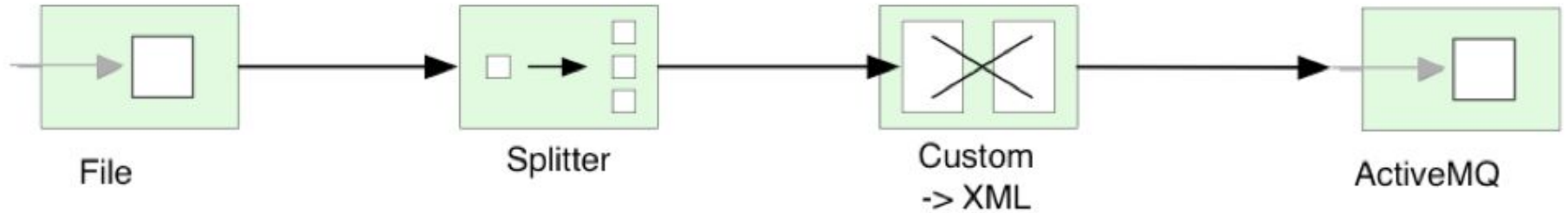
```
from("file:data/inbox")  
    .to("jms:queue:order");
```

Java DSL

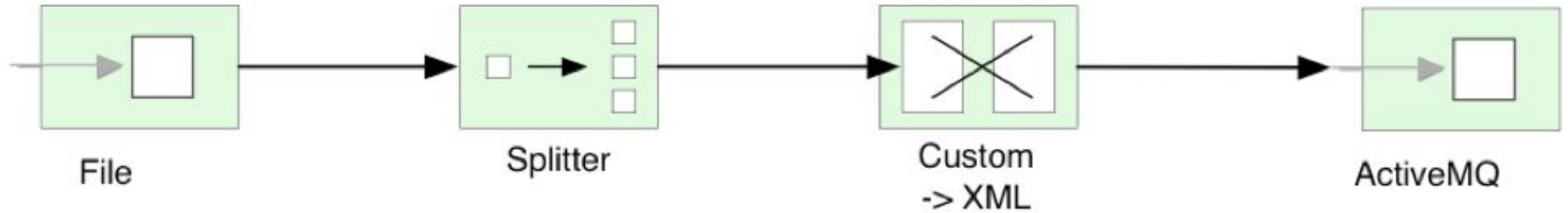
XML DSL

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

Camel Routes with Splitter

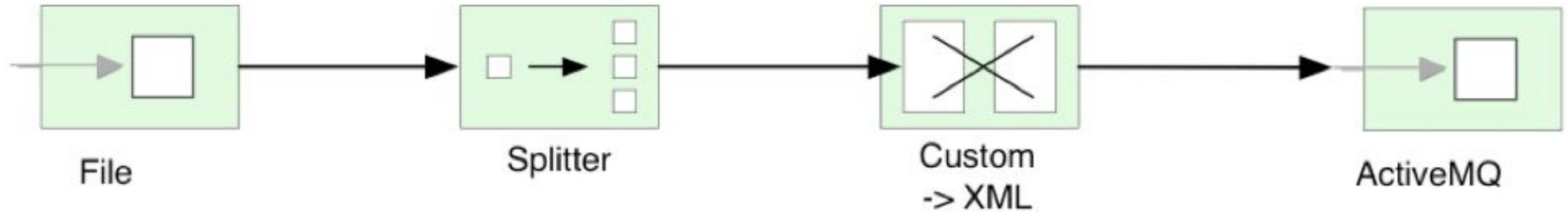


Camel Routes with Splitter



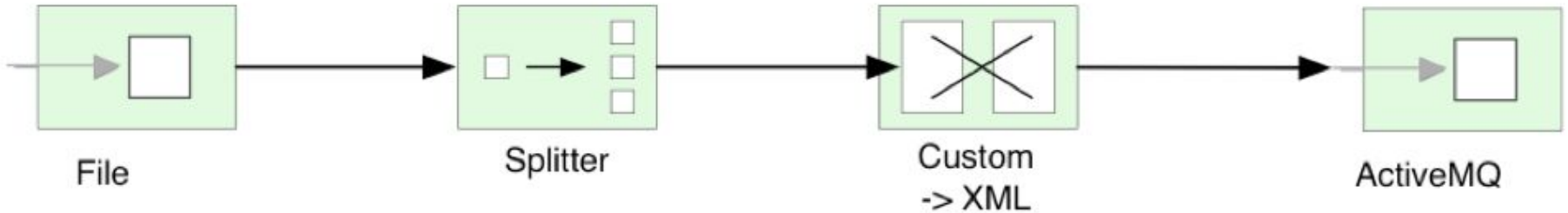
```
from("file:inbox")
```

Camel Routes with Splitter



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

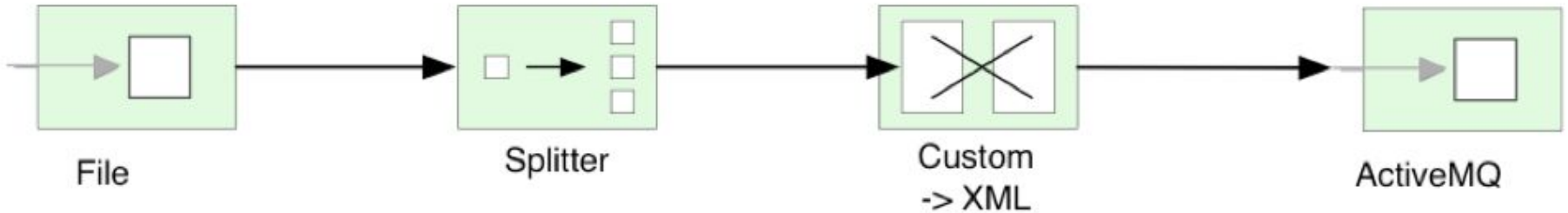
Camel Routes with Splitter



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

Custom data
transformation

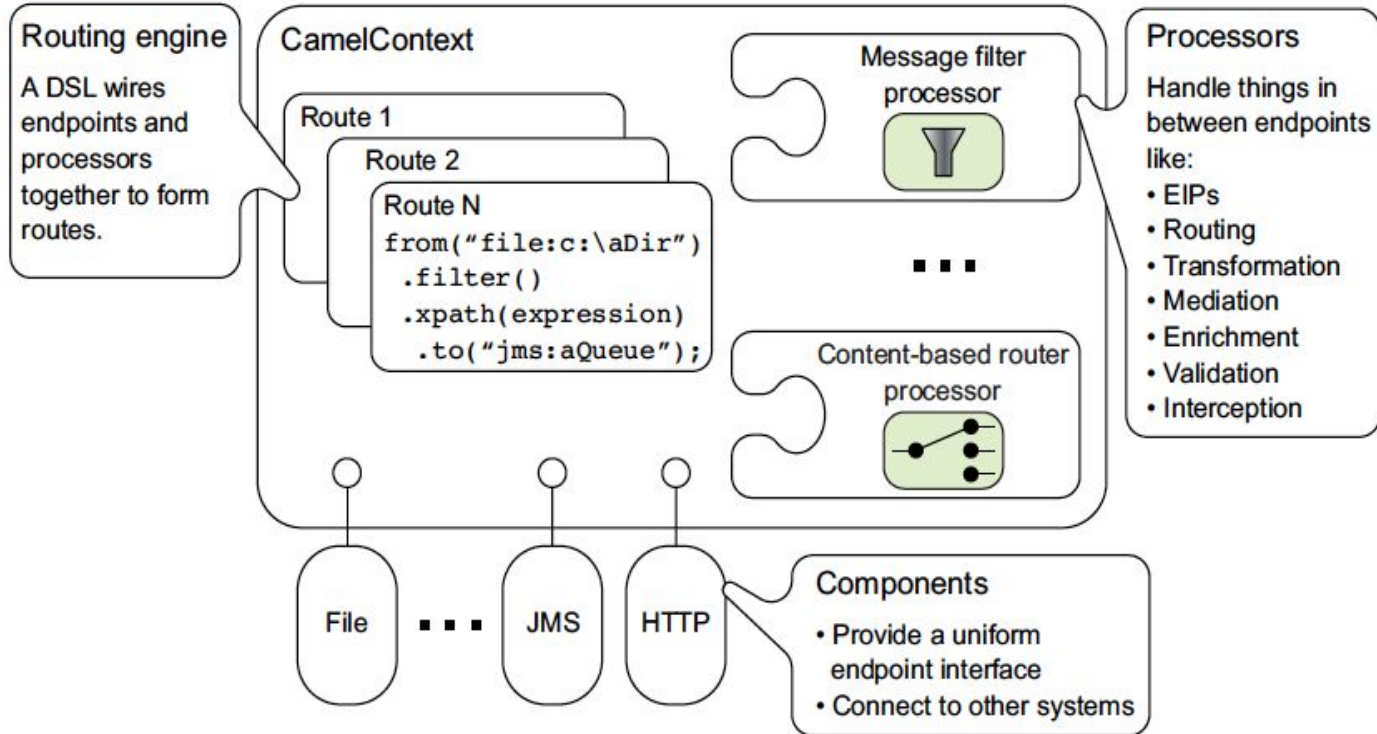
Camel Routes with Splitter



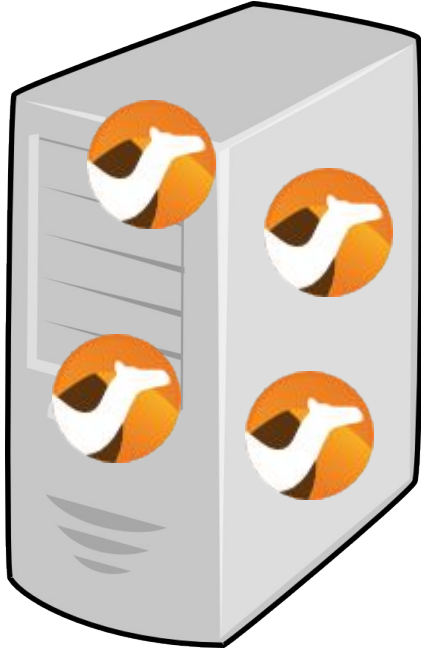
```
from("file:inbox")
    .split(body().tokenize("\n"))
    .marshal(customToXml)
    .to("activemq:line");
```

Custom data
transformation

Camel Architecture



Camel runs everywhere

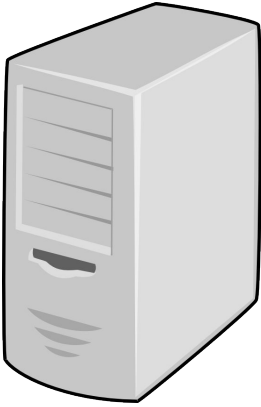


Application
Servers

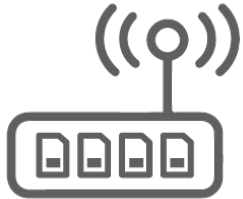


Linux
Containers

Camel connects everything



**Enterprise
Systems**



IoT

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

- CoAP
- MQTT
- PubNub

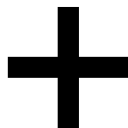
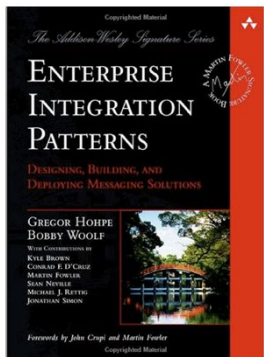


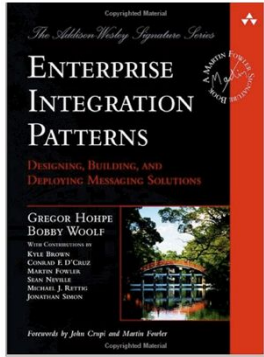
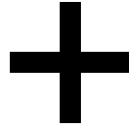
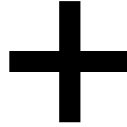
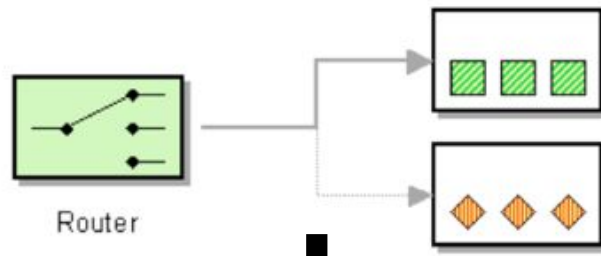
- AWS
 - S3
 - SQS
 - Kinesis
 - ...
- Google
 - BigQuery
 - PubSub
- Azure
 - Blob
 - Queue

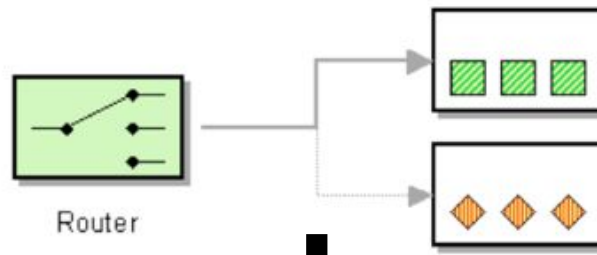


- Box
- Dropbox
- Facebook
- LinkedIn
- Salesforce
- SAP
- ServiceNow







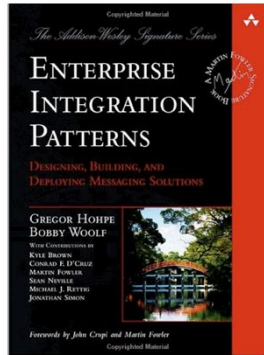
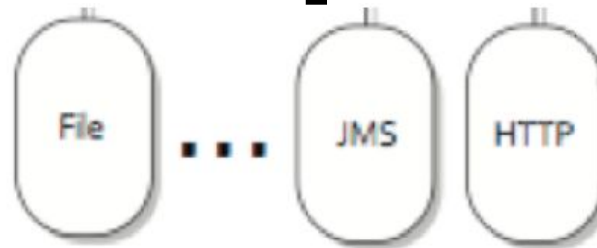


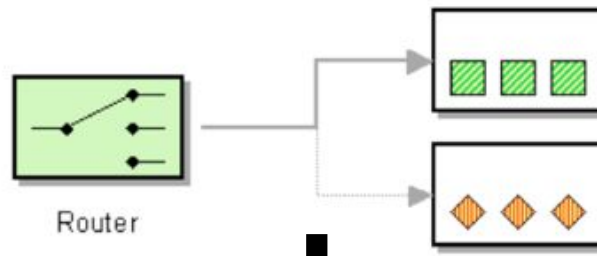
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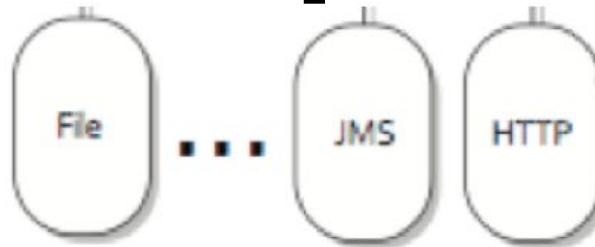


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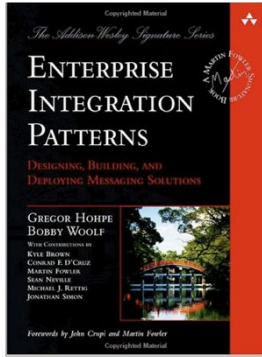
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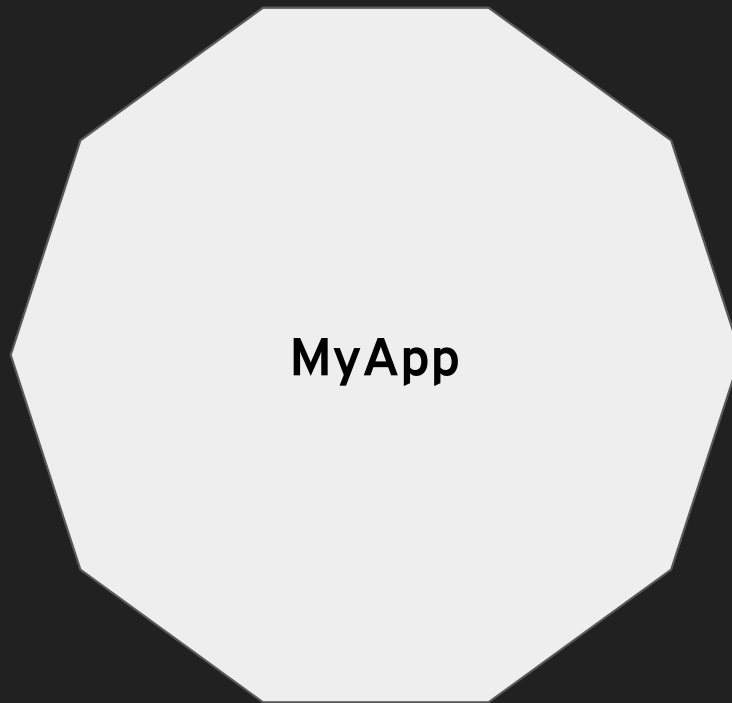
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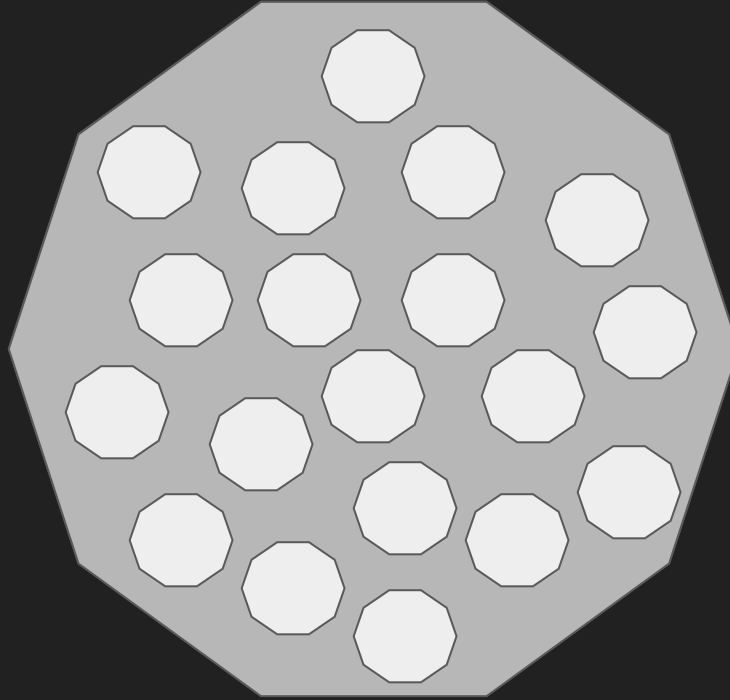


**What about Camel
in the Cloud?**

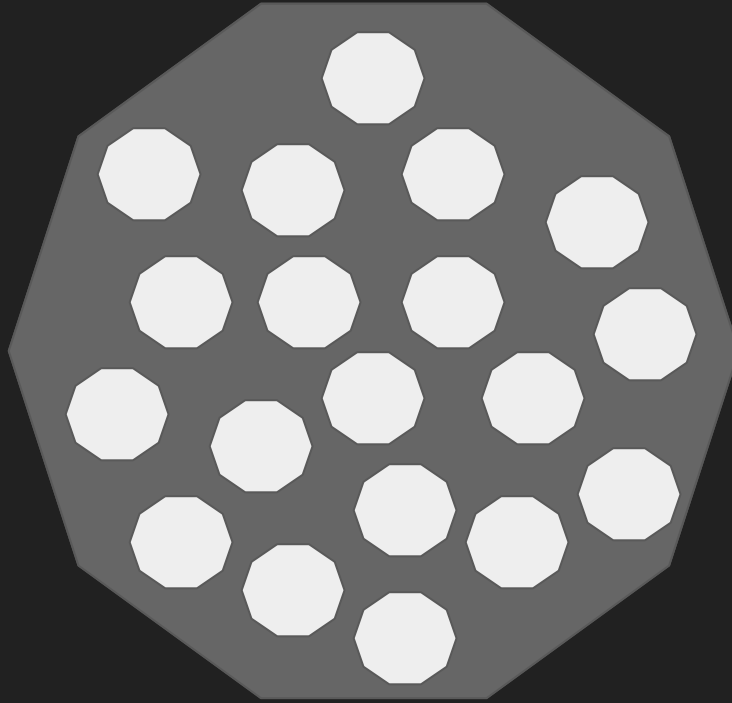
Monolith



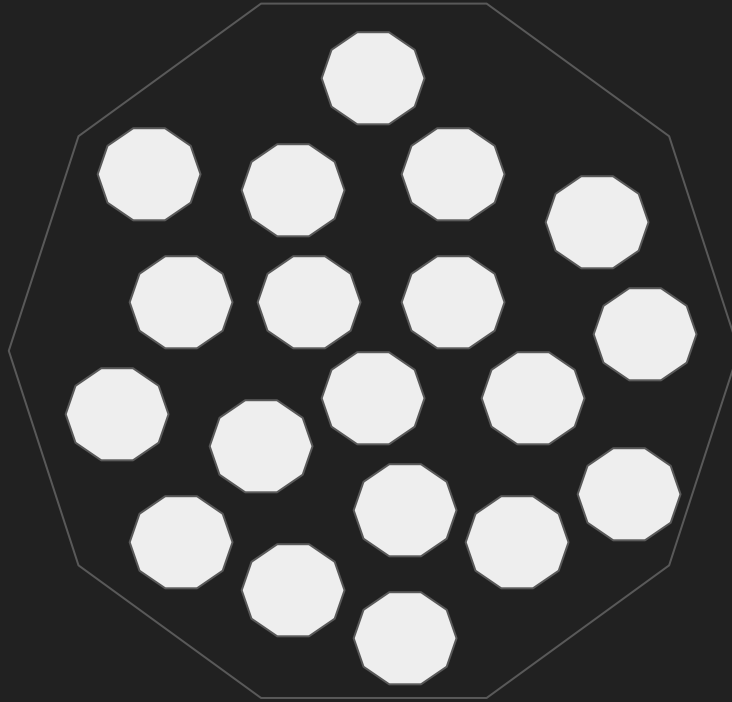
Microservices



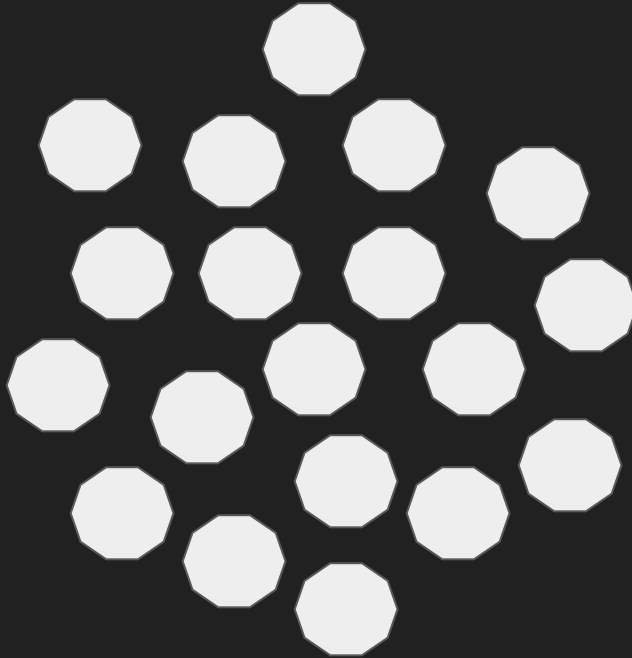
Microservices



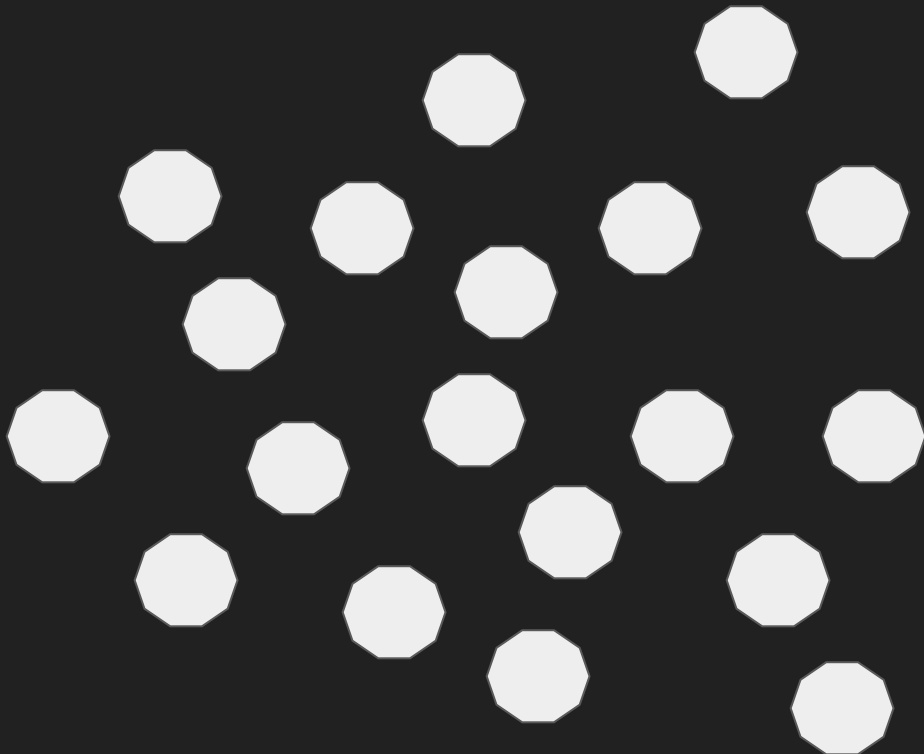
Microservices



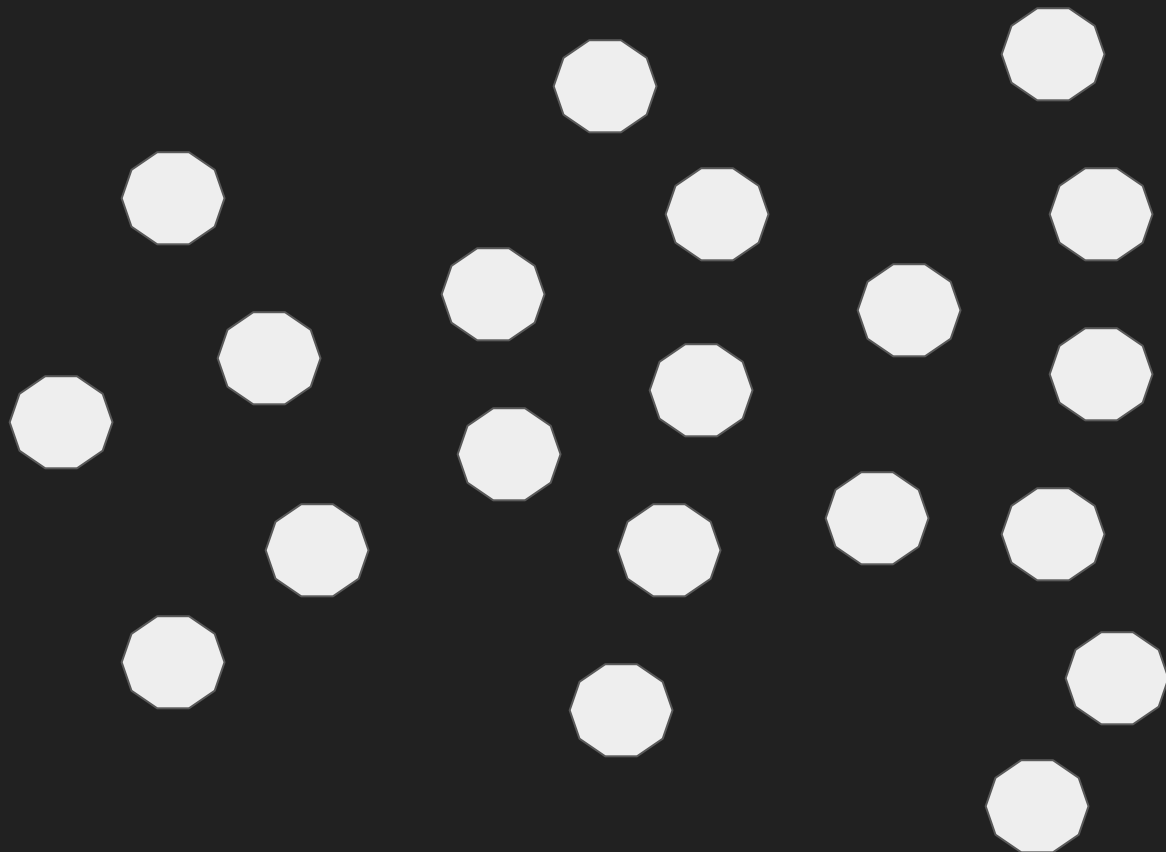
Microservices



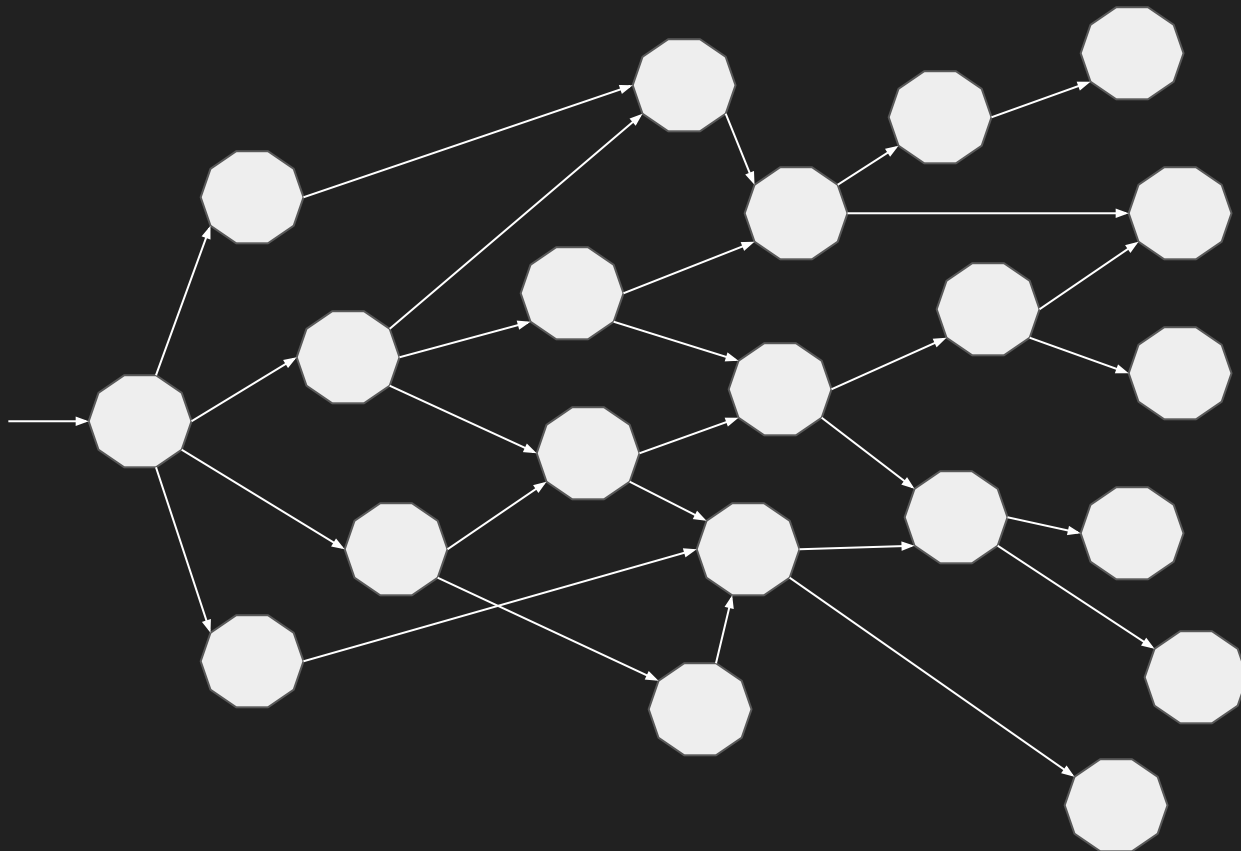
Microservices



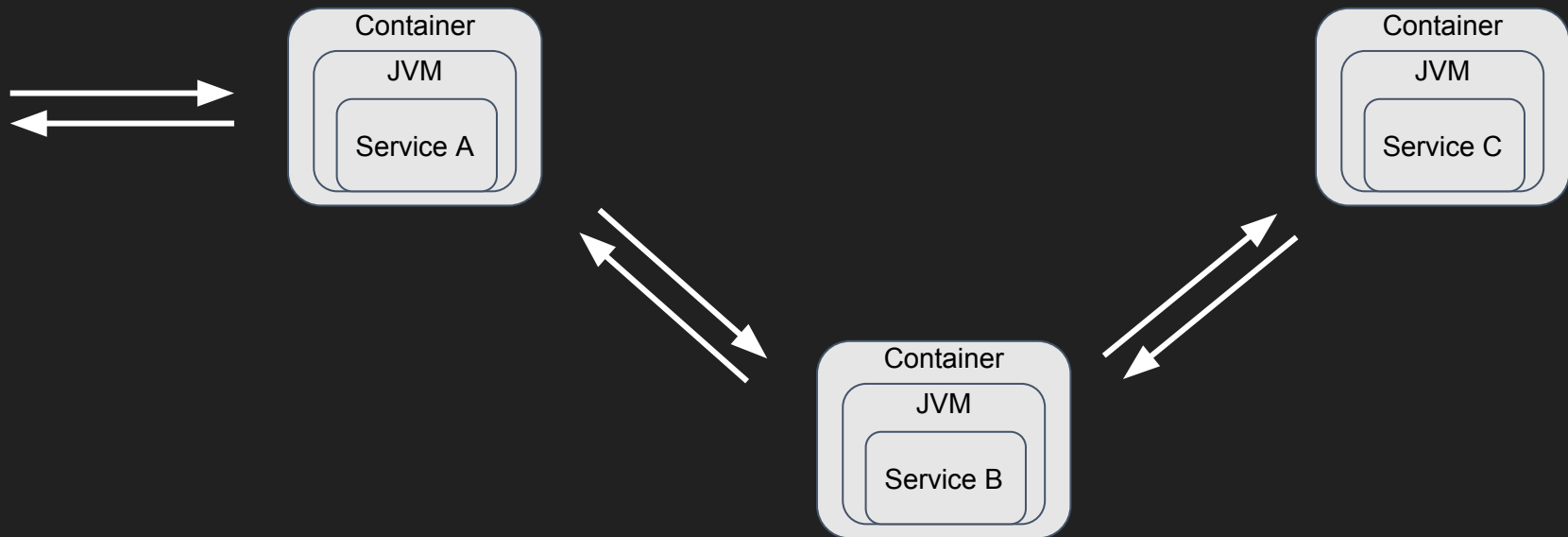
Microservices



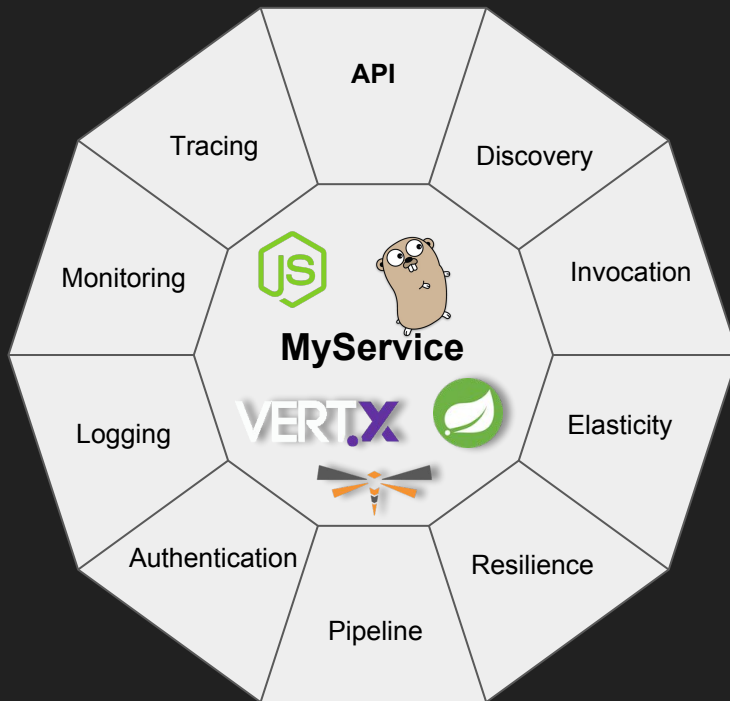
Network of Services



Microservices == Distributed Computing

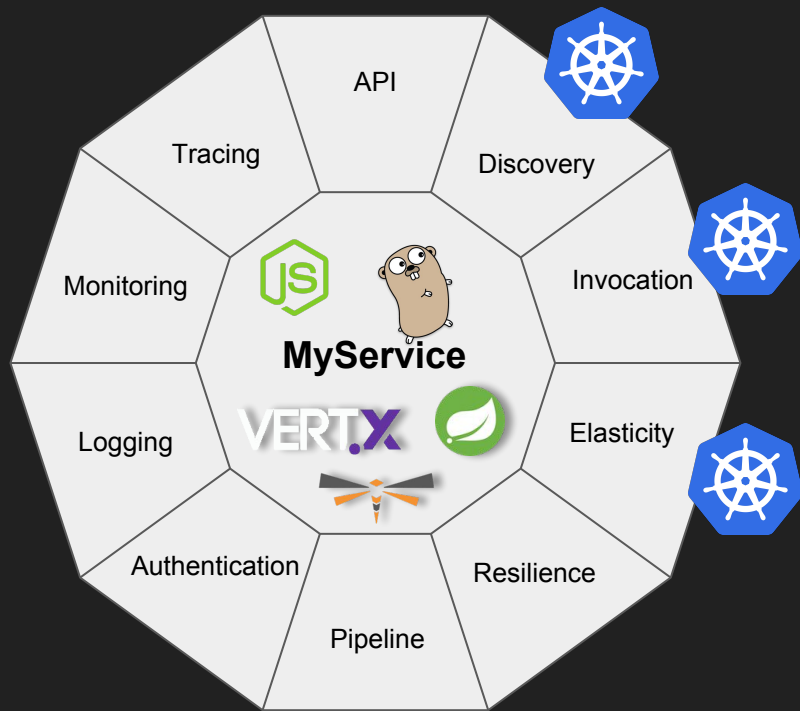


Microservices'ilities

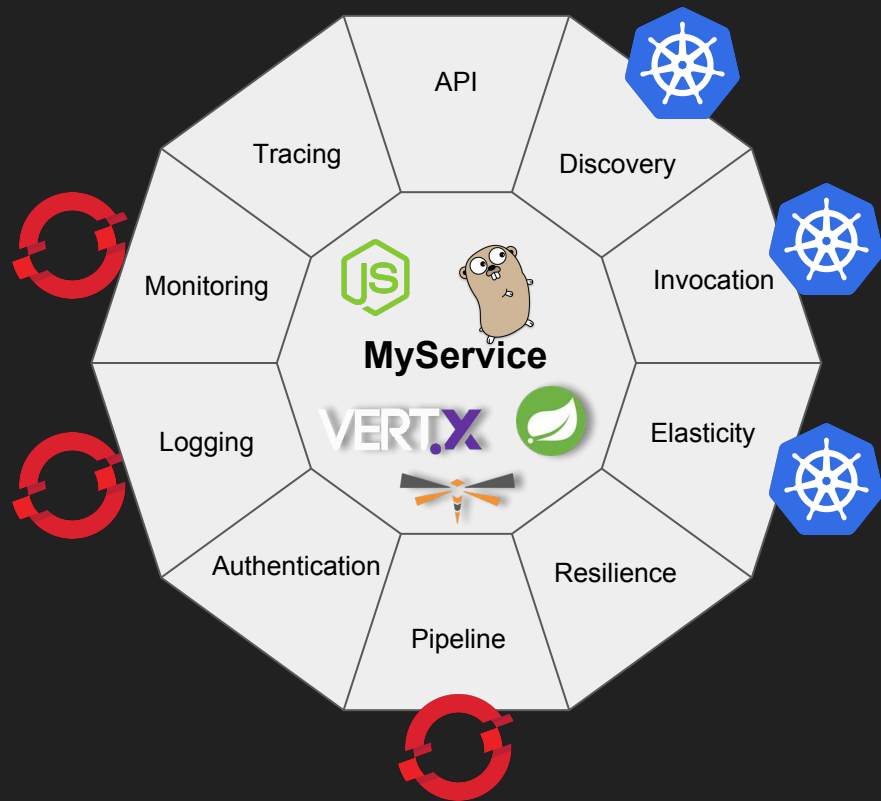




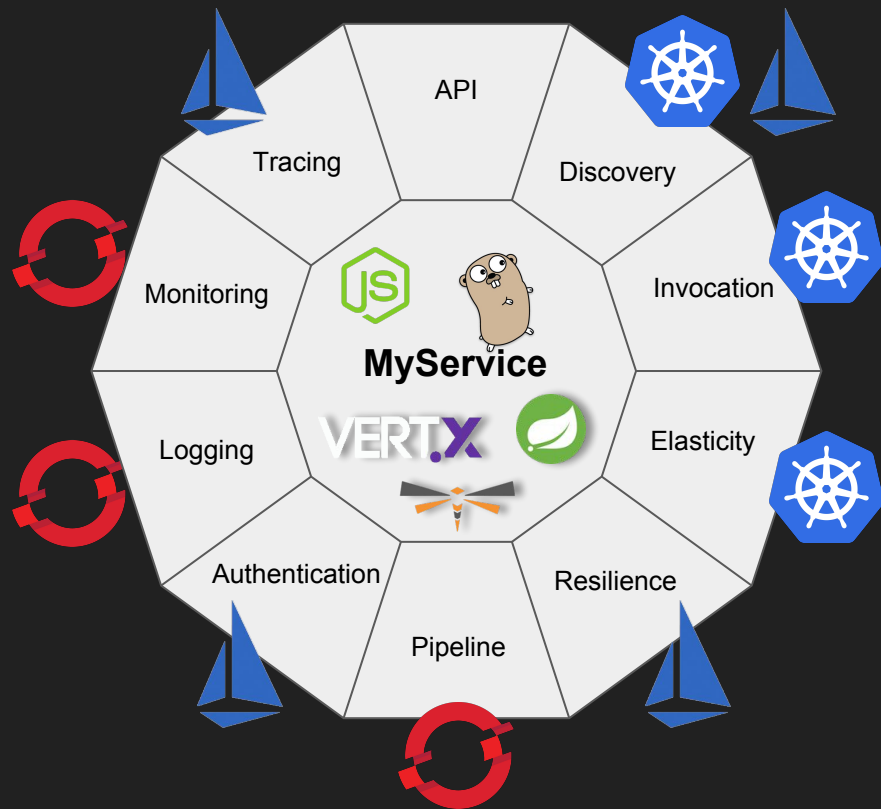
Microservices'ilities + Kubernetes



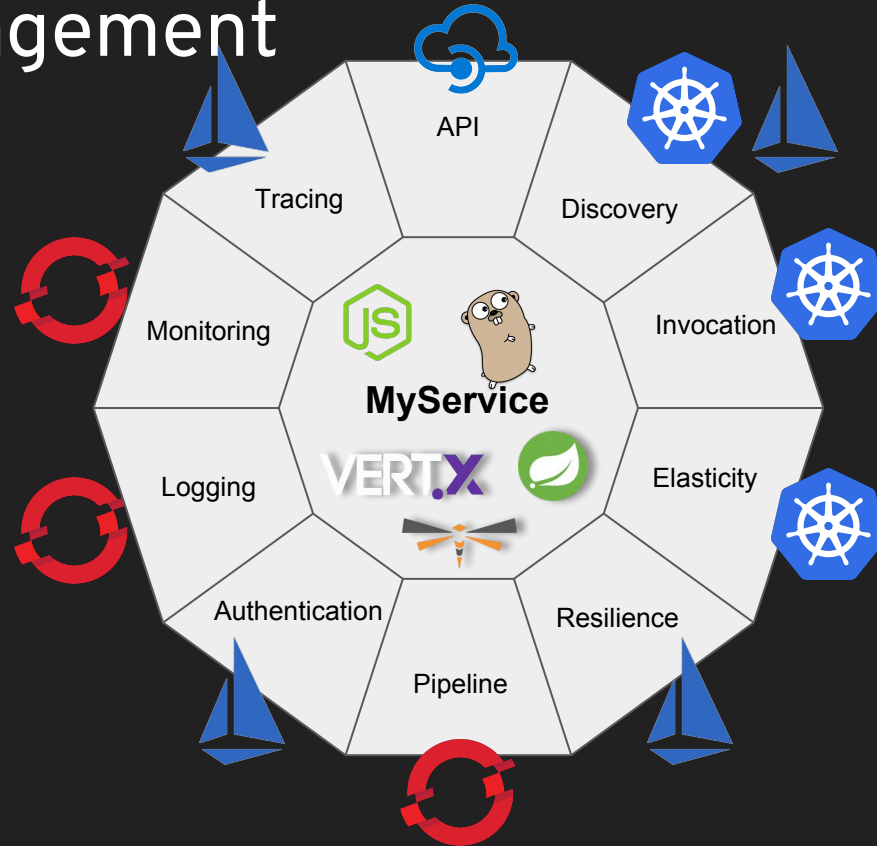
Microservices'ilities + PaaS



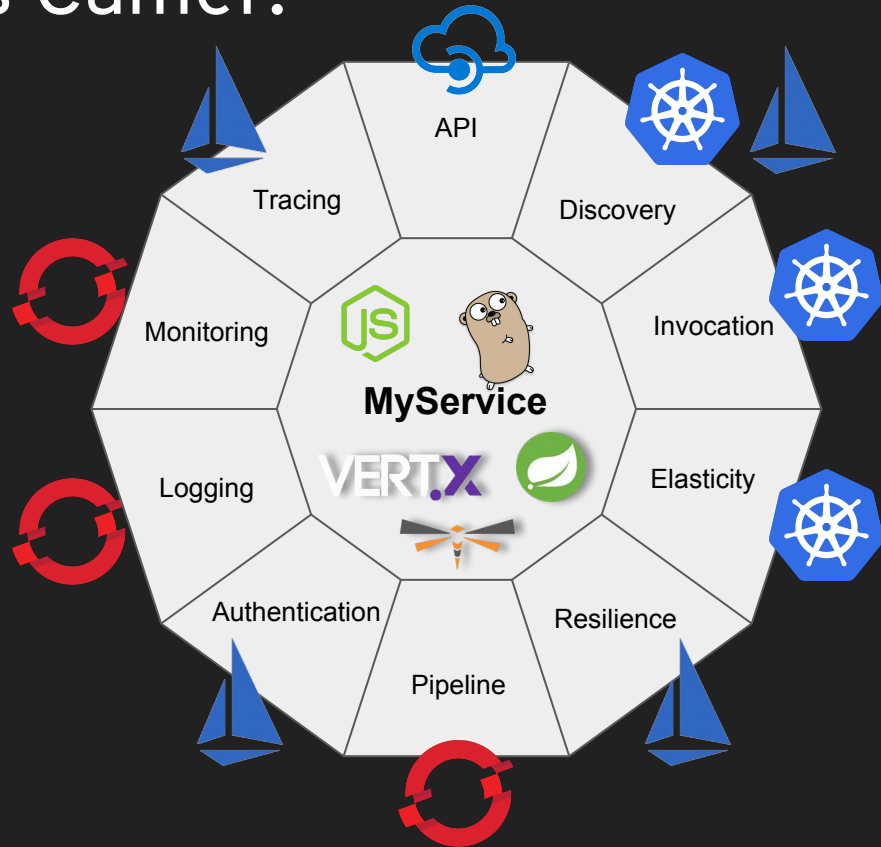
Microservices'ilities + Istio



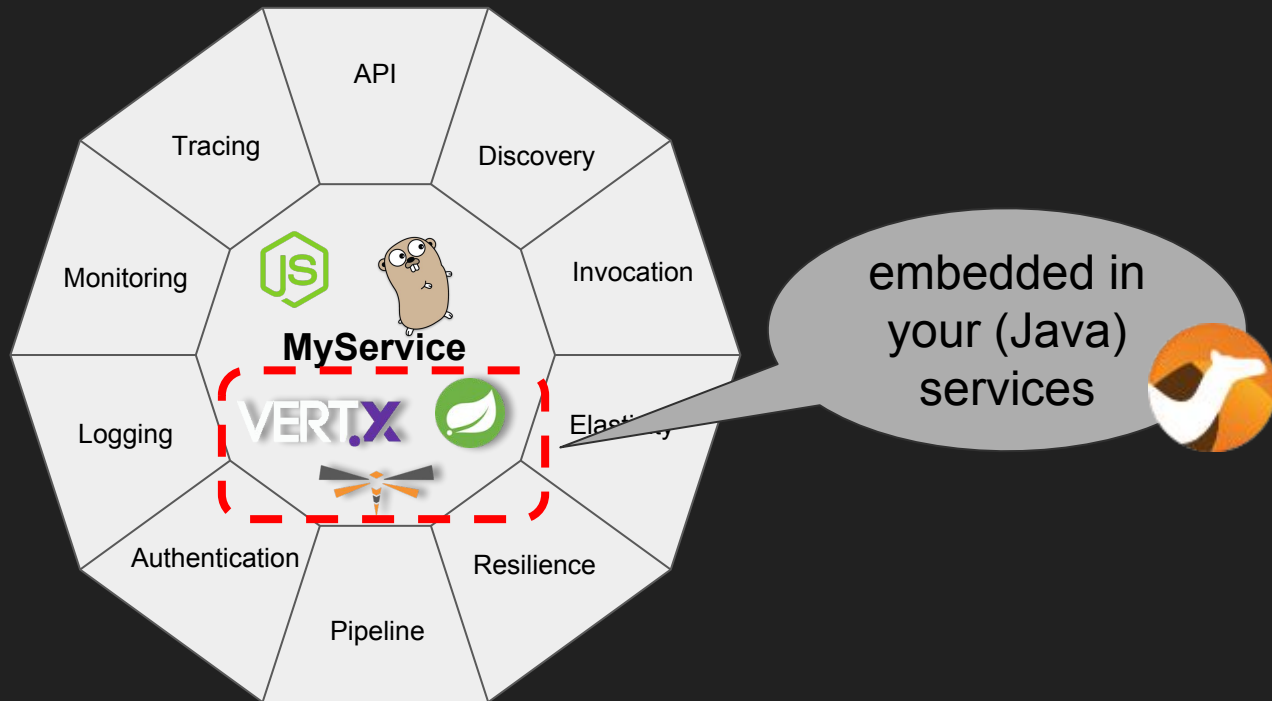
Microservices'ilities + API management



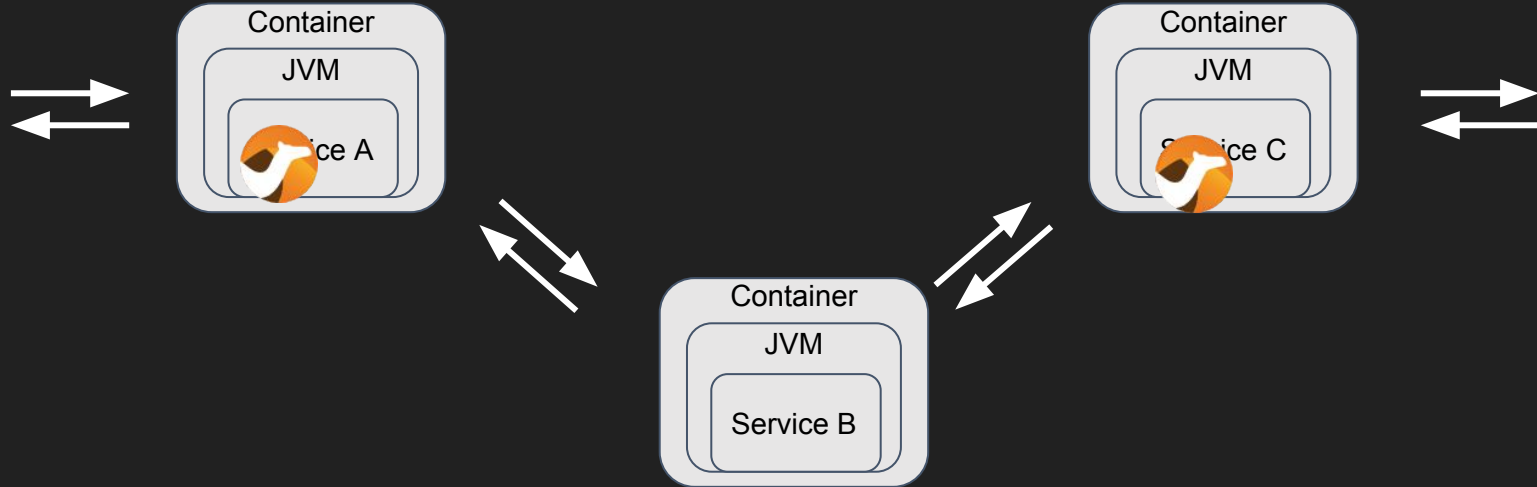
But where is Camel?



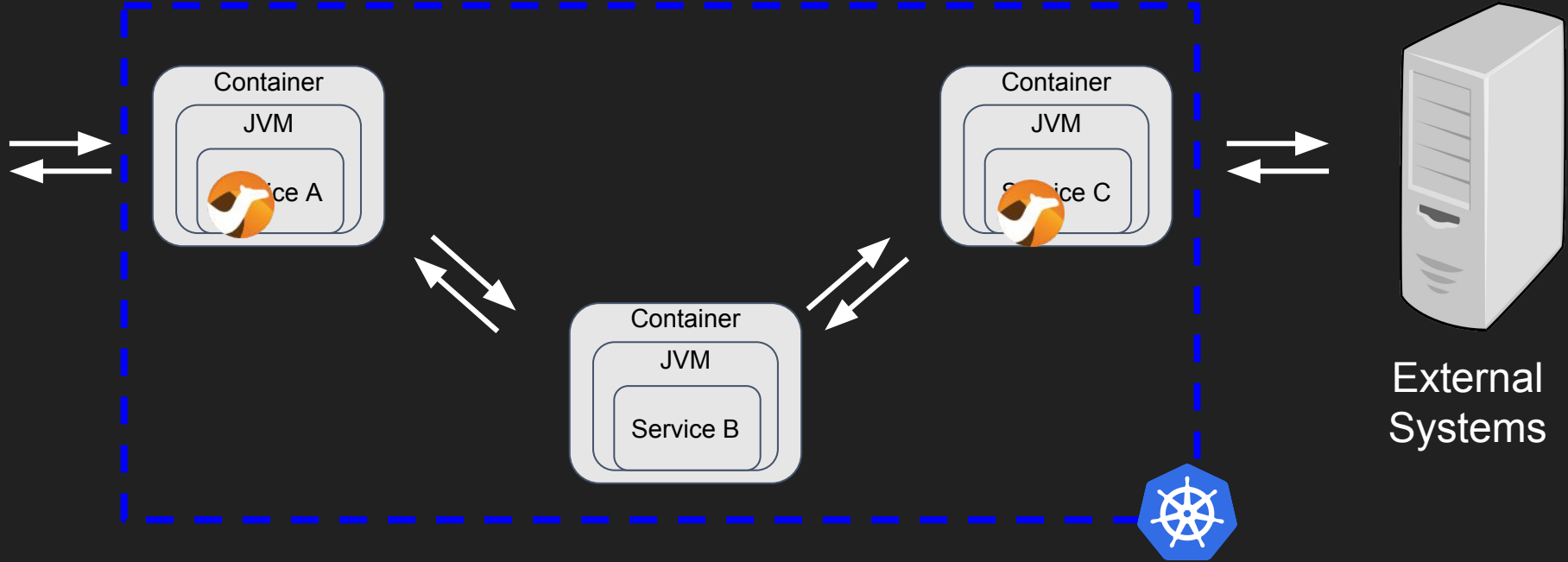
But where is Camel?



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



```
// inject configuration via spring-style @Value  
@Value("${fallback}")  
private String fallback;
```



```
.simple( text: "{{fallback}}")
```

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

Best Practice - Fault Tolerant

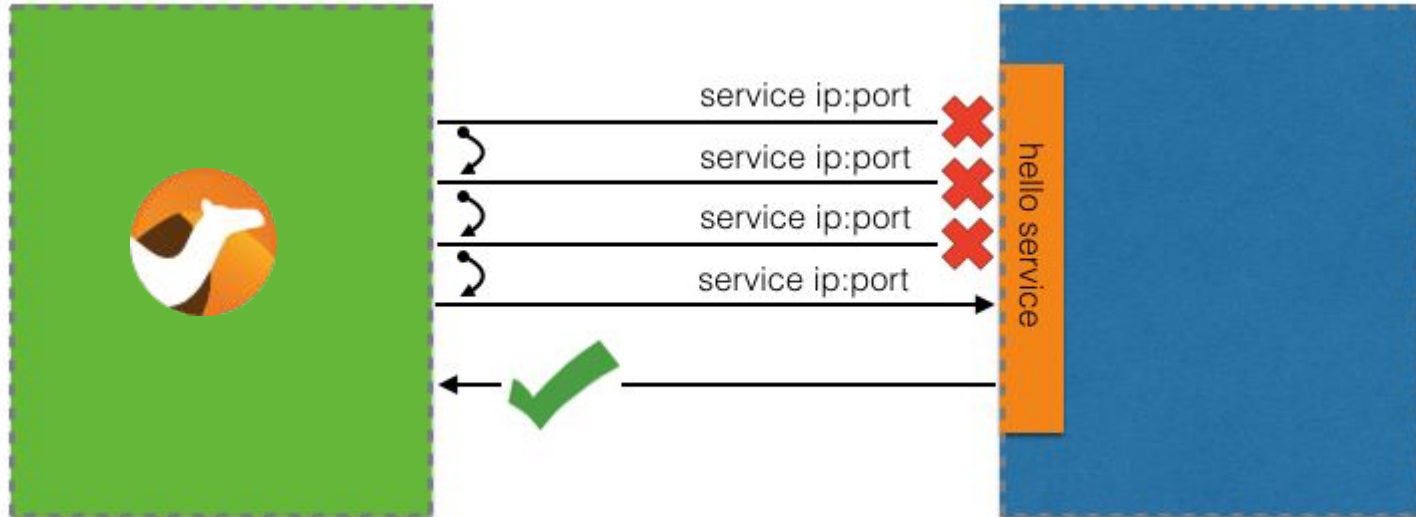
- Camel Retry
 - onException
 - errorHandler
- Camel Hystrix
 - circuit breaker



Best Practice - Fault Tolerant

- Camel Retry
 - `onException`
 - `errorHandler`

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



Best Practice - Fault Tolerant

- Camel Retry
 - `onException`
 - `errorHandler`

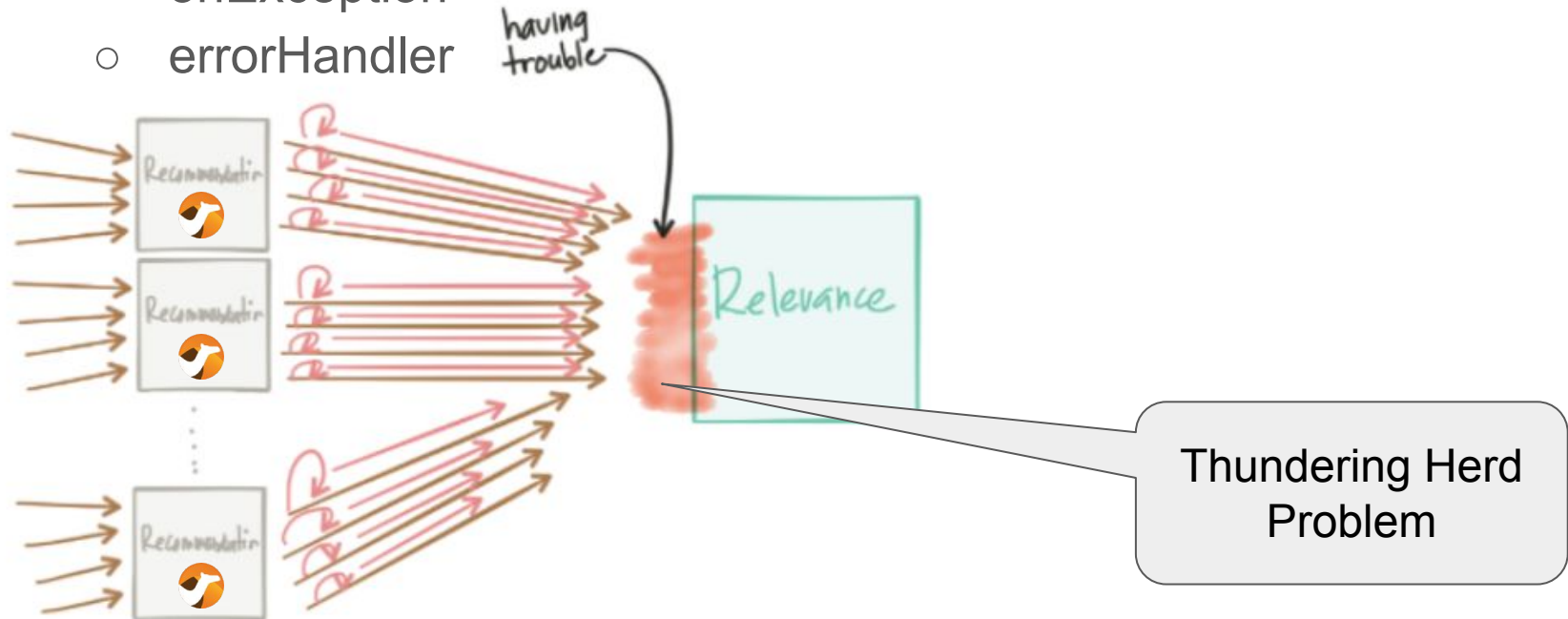


Figure by Christian Posta

Best Practice - Health Checks

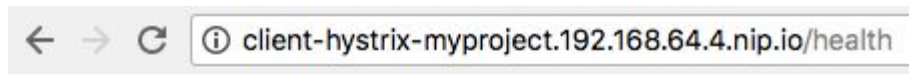
- Health Checks
 - camel-spring-boot actuator
 - wildfly-swarm monitor



- Readiness Probe
 - Kubernetes



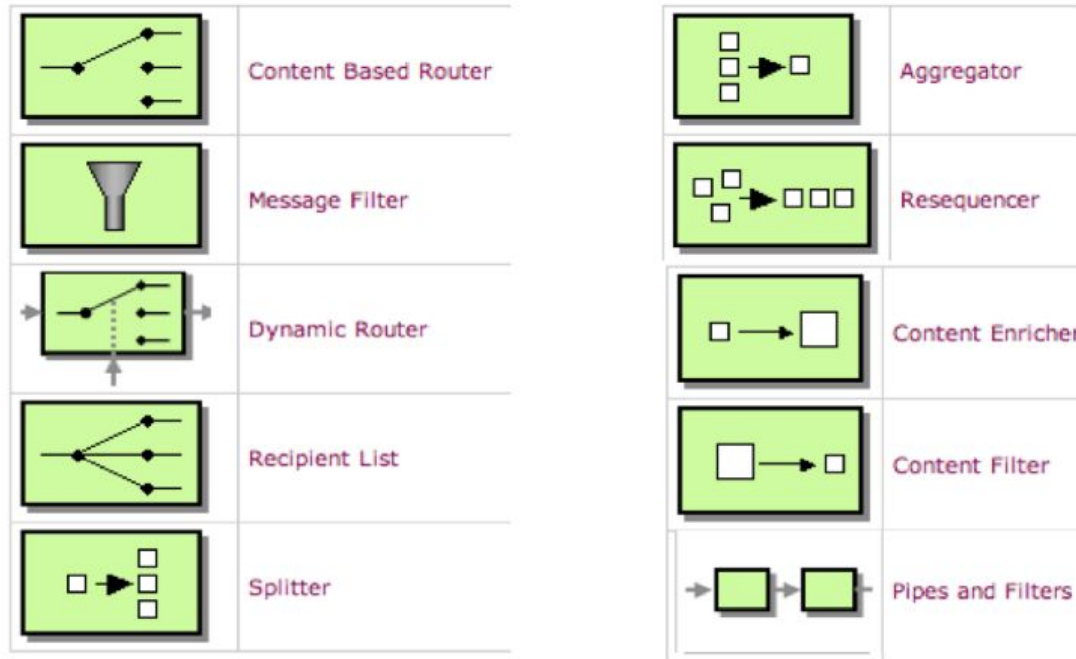
- Liveness Probe
 - Kubernetes



```
{
  status: "UP",
  - camel: {
    status: "UP",
    name: "camel-1",
    version: "2.20.2",
    contextStatus: "Started",
  },
  - camel-health-checks: {
    status: "UP",
    route:routel: "UP",
  },
  - diskSpace: {
    status: "UP",
    total: 19195224064,
    free: 5747757056,
    threshold: 10485760,
  },
}
```


Best Practice - EIP Patterns

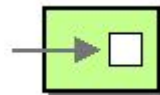
- Works anywhere



Plugins

- Consul
- Etcd
- Kubernetes
- Ribbon
- Zookeeper

EIP Cloud Patterns



Service Call

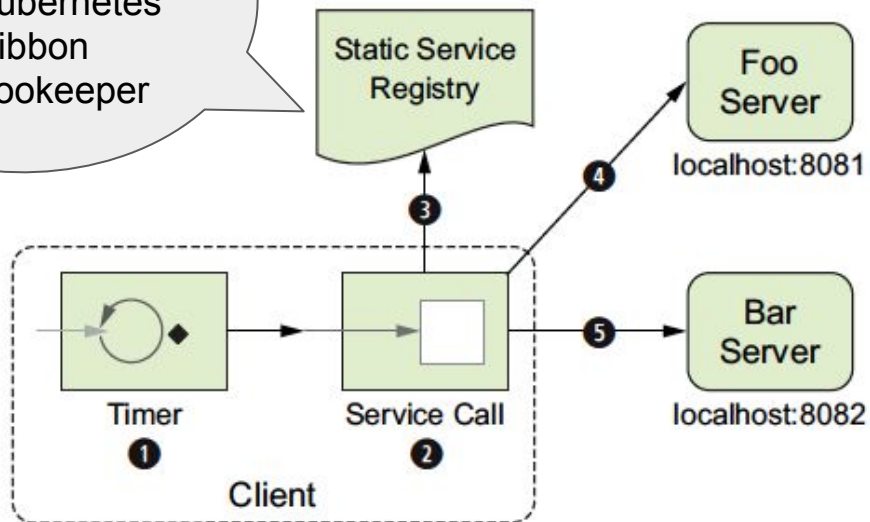
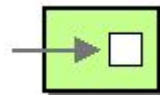


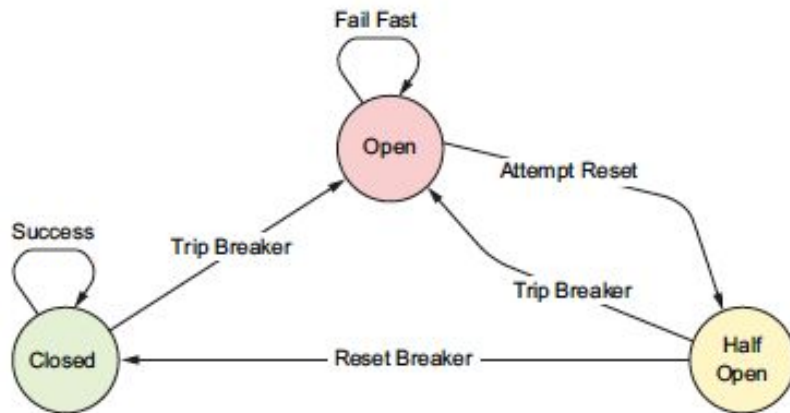
Figure 17.9 A timer ① triggers the Service Call EIP ② to call a clustered service. The physical locations of the service are looked up in the service registry ③. The service is then called in a round-robin fashion by calling either Foo server ④ or Bar server ⑤.

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

EIP Cloud Patterns

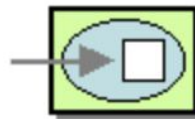


Hystrix EIP

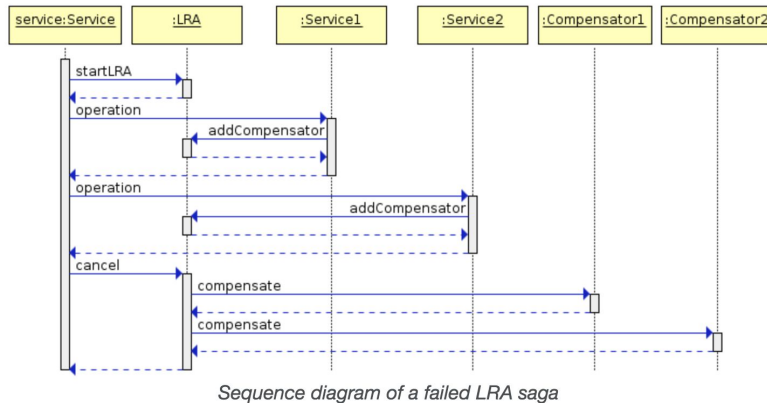


```
from("timer:foo")
  .hystrix()
    .to("http:myservice")
  .onFallback()
    .to("bean:myfallback")
  .end()
```

EIP Cloud Patterns



Saga EIP



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

EIP Cloud Patterns

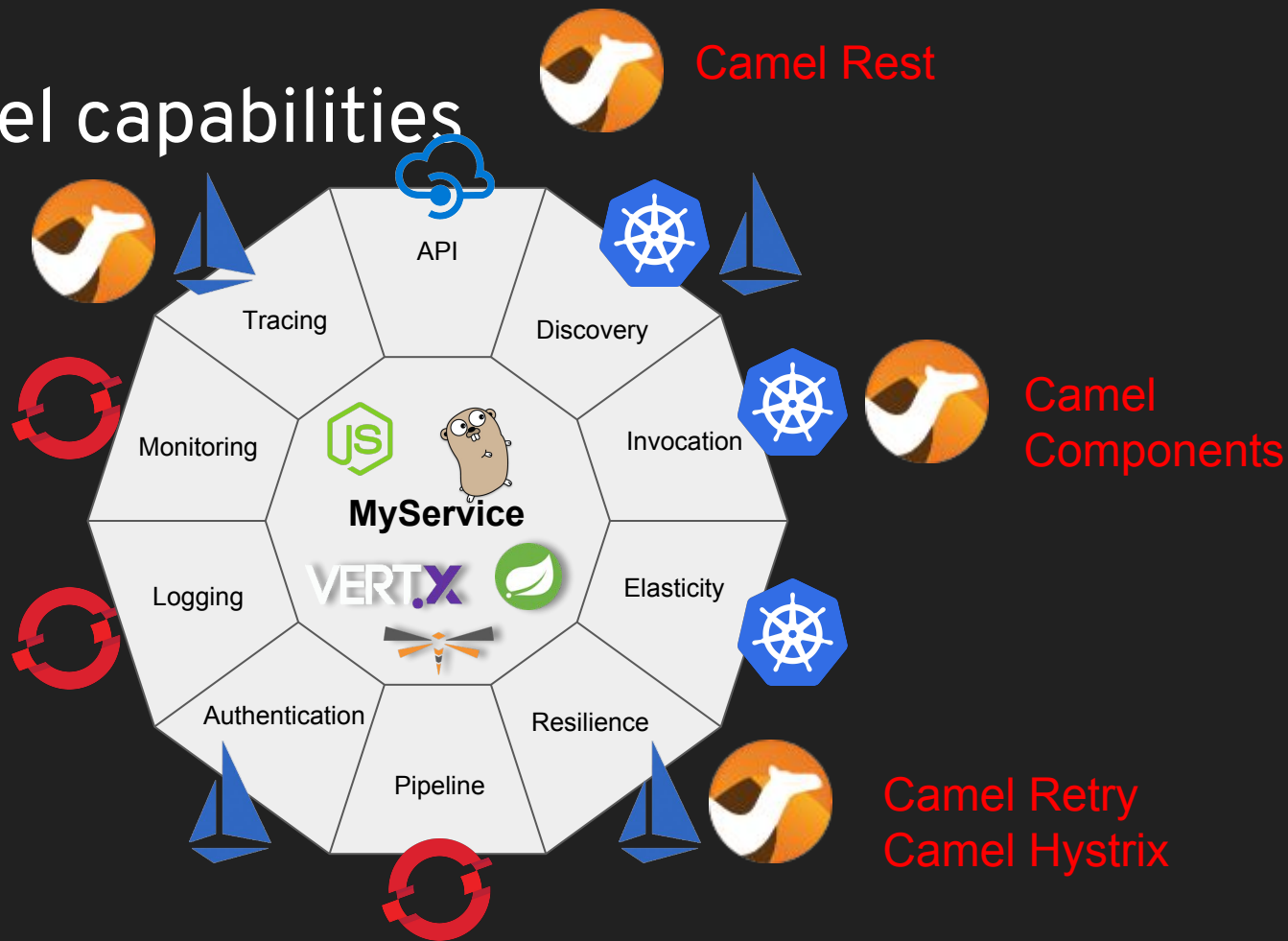


Distributed
Tracing

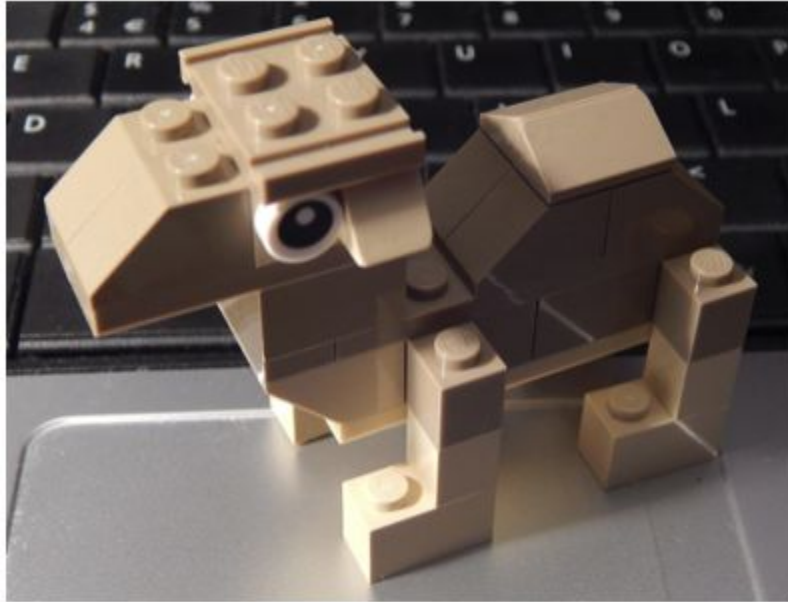


Usable Camel capabilities

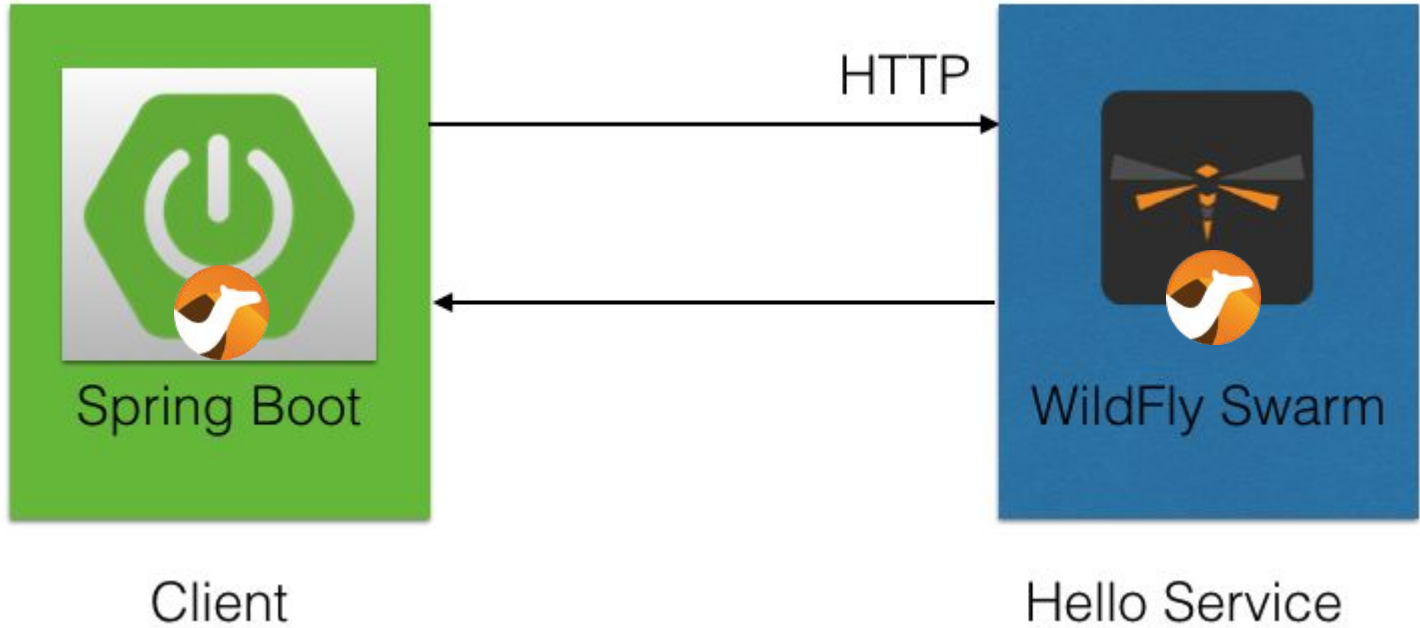
Camel Zipkin
Camel OpenTracing



Demo Time



Basic Demo

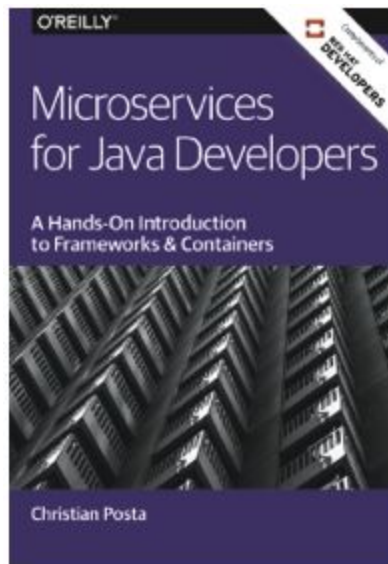


Tip of the iceberg



Figure by Bilgin Ibryam

Free book



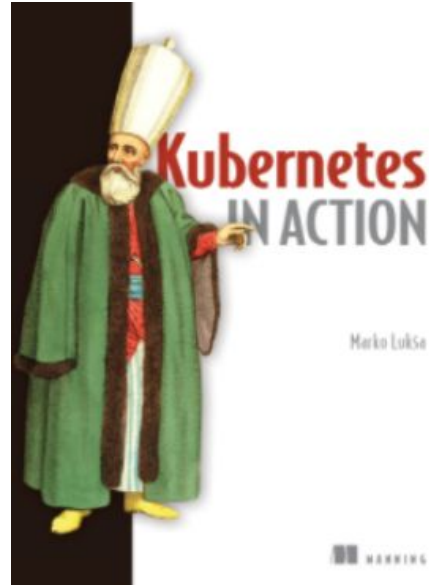
<http://developers.redhat.com/promotions/microservices-for-java-developers>

Free book



<https://developers.redhat.com/books/introducing-istio-service-mesh-microservices/>

Not so free book



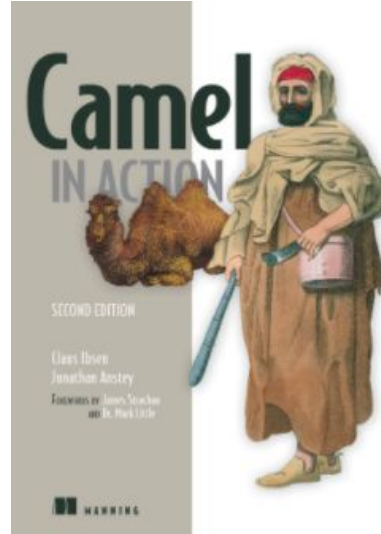
<https://www.manning.com/books/kubernetes-in-action>

Not so free book

- Discount code (39%):

came139

(ordering from Manning)



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

Future of Apache Camel

- New website and documentation
 - Later this year
- Apache Camel 2.23
 - October/November
- Camel 3 currently being planned
 - To be released in 2019 (summer or before)

Future of Apache Camel

- Camel on GraalVM

- <https://lburgazzoli.github.io/2018/09/04/Adventures-in-GraalVM-polyglot-Camel-routes-with-native-image.html>

Now, let's write a simple JavaScript route:

```
from('timer:js')  
  .setBody('test')  
  .to('log:js')
```

And finally, let's run it:

```
sources/route.js  
t - Apache Camel 2.23.0-SNAPSHOT (CamelContext: camel-1) is starting  
t - StreamCaching is not in use. If using streams then its recommended to enable  
t - Route: route1 started and consuming from: timer://js  
t - Total 1 routes, of which 1 are started  
t - Apache Camel 2.23.0-SNAPSHOT (CamelContext: camel-1) started in 0.001 seconds  
xchange[ExchangePattern: InOnly, BodyType: String, Body: test]  
xchange[ExchangePattern: InOnly, BodyType: String, Body: test]  
xchange[ExchangePattern: InOnly, BodyType: String, Body: test]
```

Future of Apache Camel

- Camel K
 - <https://github.com/apache/camel-k>

Apache Camel K (a.k.a. Kamel) is a lightweight integration framework built from Apache Camel that runs natively on Kubernetes and is specifically designed for serverless and microservice architectures.

More Information

- Slides and Demo source code:
<https://github.com/davsclaus/camel-riders-in-the-cloud>
- 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>

Q & A