Apache Camel 3 - A full-stack integration framework for building cloud-native micro integrations

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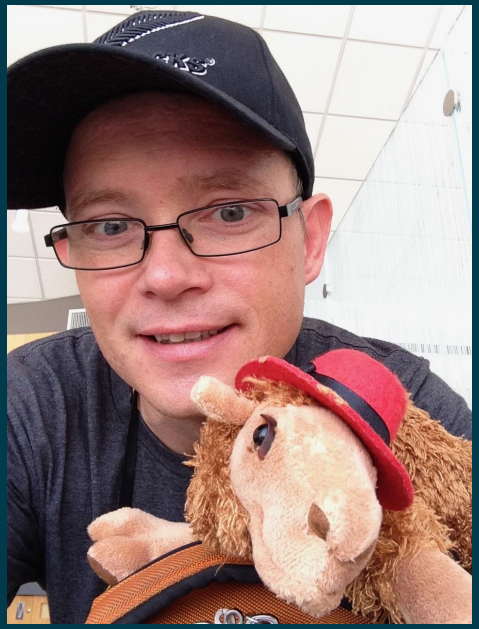
Andrea Cosentino (@oscerd2)

About Claus Ibsen

- Senior Principal Software Engineer at Red Hat
- Java Champion
- 11 years as full time Apache Camel committer
- Author of Camel in Action books
- Based in Denmark



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Linkedin: davsclaus

About Andrea Cosentino

- Senior Software Engineer at Red Hat
- Apache Camel PMC Chair
- Active on multiple open source projects
- Based in Italy

Blog: https://oscerd.github.io/
Twitter: @oscerd2

System Integration

Figure 1.1 Camel is the glue between disparate systems.

Apache Camel

is an

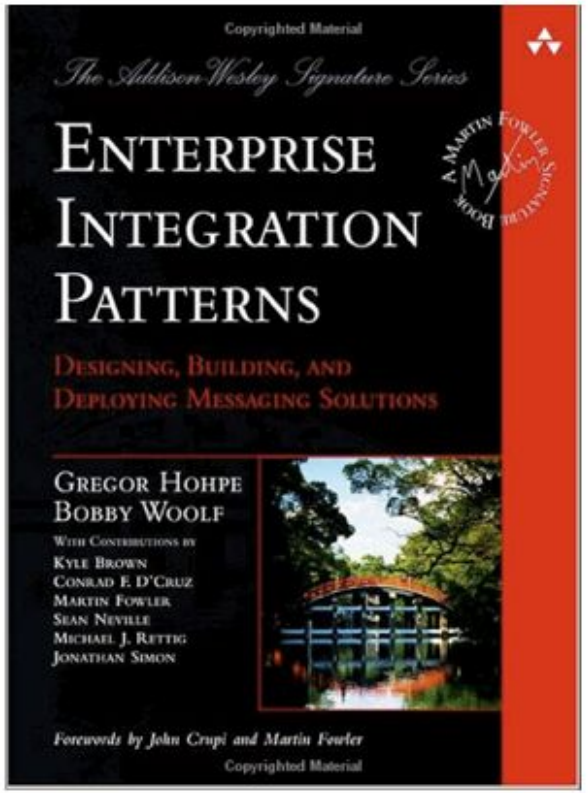
Integration Framework

based on

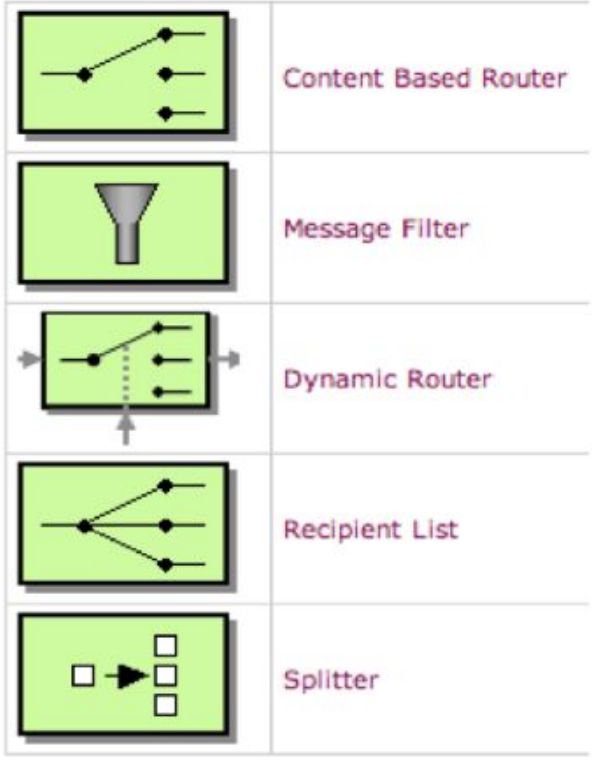
Enterprise Integration Patterns

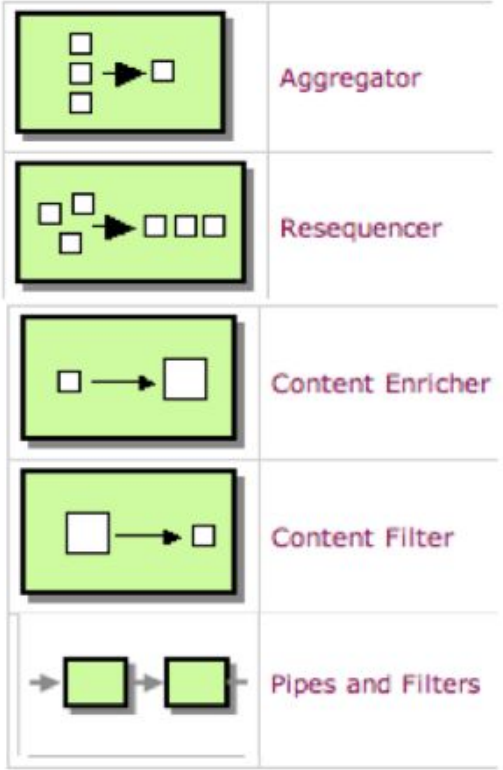
Integration Framework

Enterprise Integration Patterns

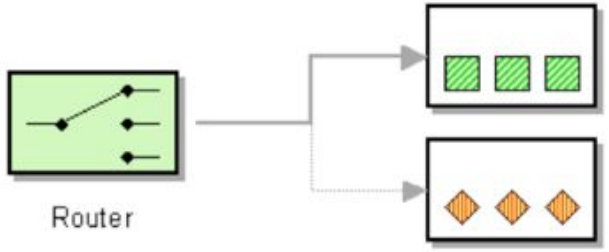


Enterprise Integration Patterns





Camel Routes



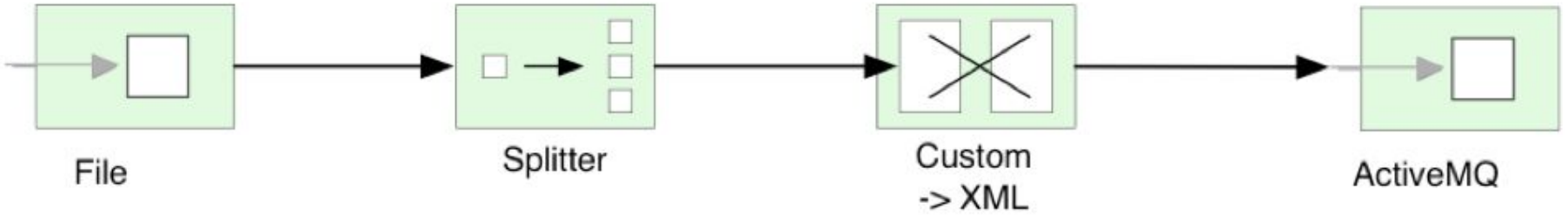

```
from("file:data/inbox")
   .to("jms:queue:order");
```

Java DSL

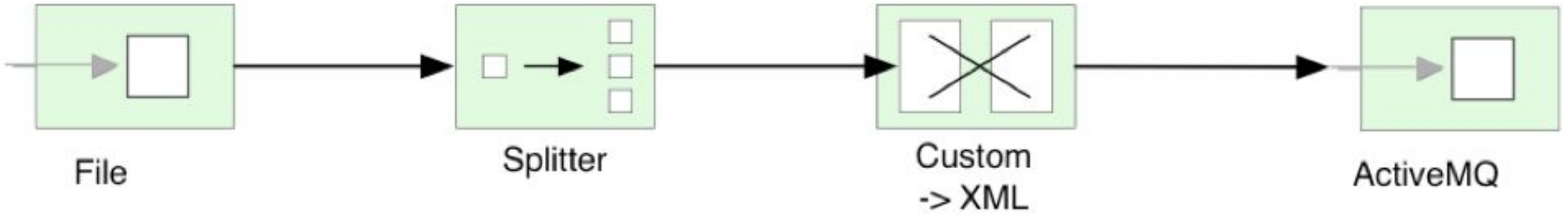
```
<route>
  <from uri="file:data/inbox"/>
  <to uri="jms:queue:order"/>
</route>
```

XML DSL

Camel Routes with Splitter

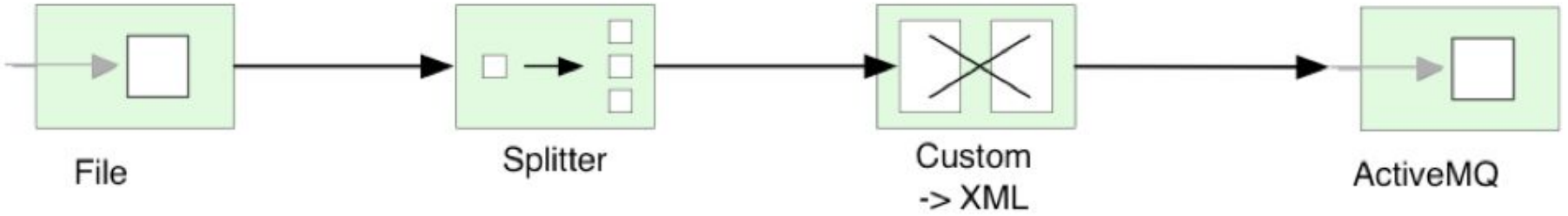


Camel Routes with Splitter



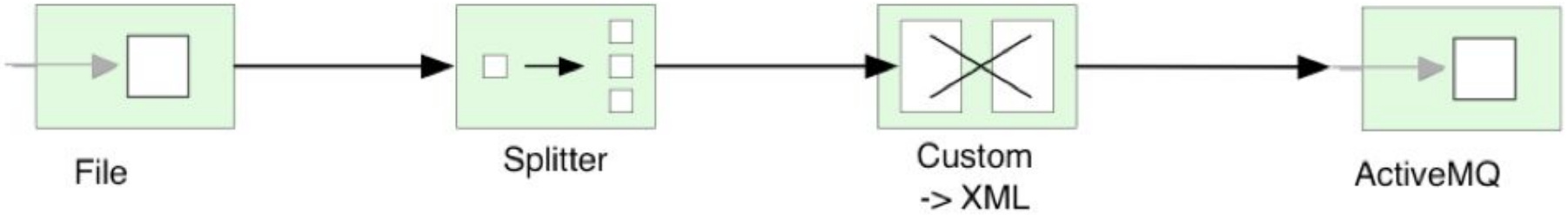

```
from("file:inbox")
```

Camel Routes with Splitter




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

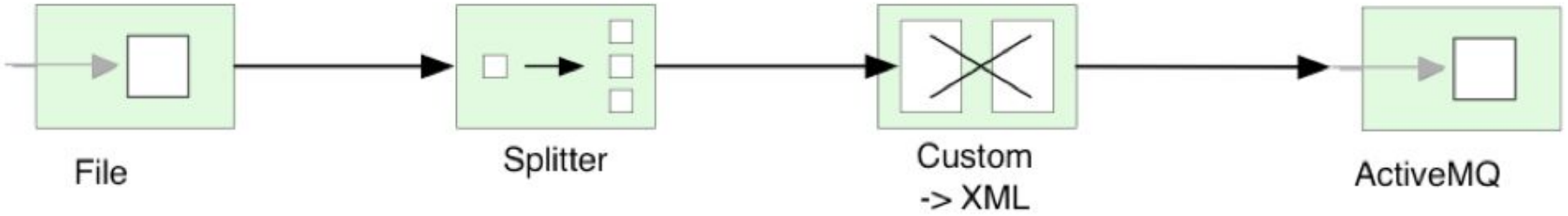
Camel Routes with Splitter




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

Custom data transformation

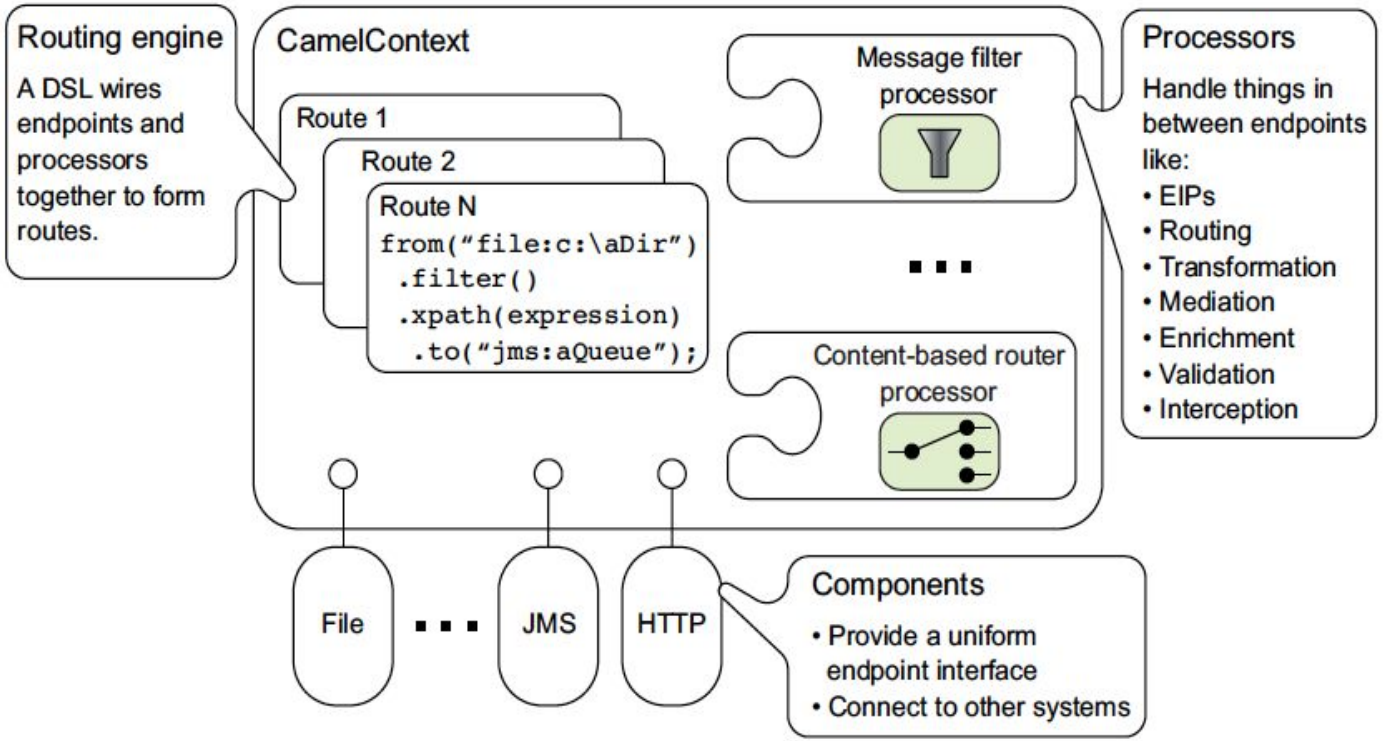
Camel Routes with Splitter



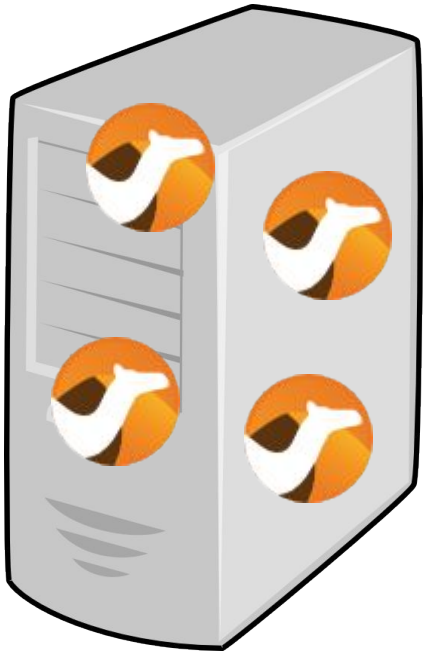

```
from("file:inbox")
    .split(body().tokenize("\n"))
        .marshal(customToXml)
        .to("activemq:line");
```

Custom data transformation

Camel Architecture



Camel runs everywhere

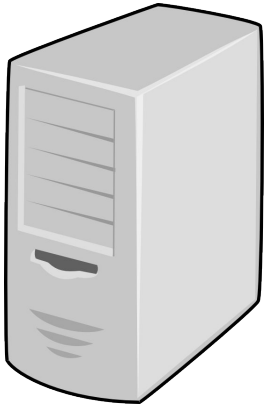


Application
Servers

Linux
Containers

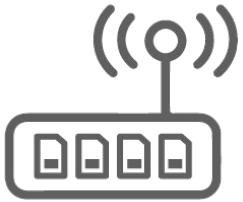
Runs on popular Java Runtimes

Camel connects everything



Enterprise Systems

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



IoT

- CoAP
- MQTT
- PubNub

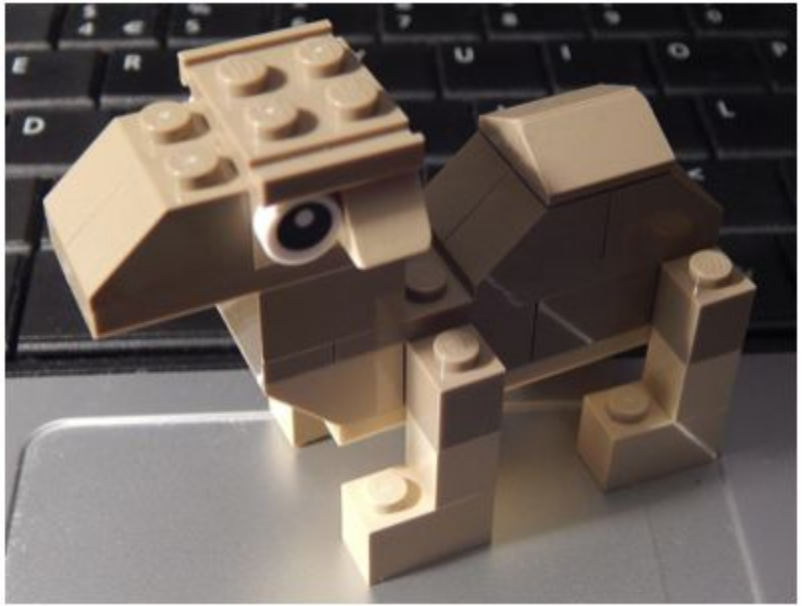
- AWS
  - S3
  - SQS
  - Kinesis
  - ...
- Google
  - BigQuery
  - PubSub
- Azure
  - Blob
  - Queue

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

300+ Components

ahc ahc-ws amqp apns as2 asn1 asterisk atmos atmosphere-websocket atom atomix avro aws aws-xray azure bam barcode base64 beanio beanstalk bean-validator bindy blueprint bonita boon box braintree cache caffeine cassandraql castor cdi chronicle chunk cmis cm-sms coap cometd consul context corda core-osgi core-xml couchbase couchdb crypto crypto-cms csv cxf cxf-transport digitalocean disruptor dns docker dozer drill dropbox eclipse ehcache ejb elasticsearch elasticsearch5 elasticsearch-rest elsql etcd eventadmin exec facebook fastjson fhir flatpack flink fop freemarker ftp ganglia geocoder git github google-bigquery google-calendar google-drive google-mail google-pubsub google-sheets gora grape groovy groovy-dsl grpc gson guava-eventbus guice hawtdb hazelcast hbase hdfs hdfs2 headersmap hessian hipchat hl7 http http4 http-common hystrix ibatis ical iec60870 ignite infinispan influxdb ipfs irc ironmq jackson jacksonxml jasypt javaspace jaxb jbpm jcache jclouds jcr jdbc jetty jetty9 jetty-common jgroups jibx jing jira jms jmx johnzon jolt josql jpa jsch jsonpath json-validator jt400 juel jxpath kafka kestrel krati kubernetes kura ldap ldif leveldb linkedin lra lucene lumberjack lzf mail master metrics micrometer milo mina mina2 mllp mongodb mongodb3 mongodb-gridfs mqtt msv mustache mvel mybatis nagios nats netty netty4 netty4-http netty-http nsq ognl olingo2 olingo4 openshift openstack opentracing optaplanner paho paxlogging pdf pgevent printer protobuf pubnub quartz quartz2 quickfix rabbitmq reactive-streams reactor restlet rest-swagger ribbon rmi routebox rss ruby rx rxjava2 salesforce sap-netweaver saxon scala schematron scr script service servicenow servlet servletlistener shiro sip sjms sjms2 slack smpp snakeyaml snmp soap solr spark spark-rest splunk spring spring-batch spring-boot spring-cloud spring-cloud-consul spring-cloud-netflix spring-cloud-zookeeper spring-integration spring-javaconfig spring-ldap spring-redis spring-security spring-ws sql ssh stax stomp stream stringtemplate swagger swagger-java syslog tagsoup tarfile telegram test test-blueprint test-cdi testcontainers testcontainers-spring test-karaf testng test-spring thrift tika twilio twitter undertow univocity-parsers urlrewrite velocity vertx weather web3j websocket wordpress xchange xmlbeans xmljson xmlrpc xmlsecurity xmpp xstream yammer yql zendesk zipfile zipkin zookeeper zookeeper-master

A little Camel Example



File Copier Example

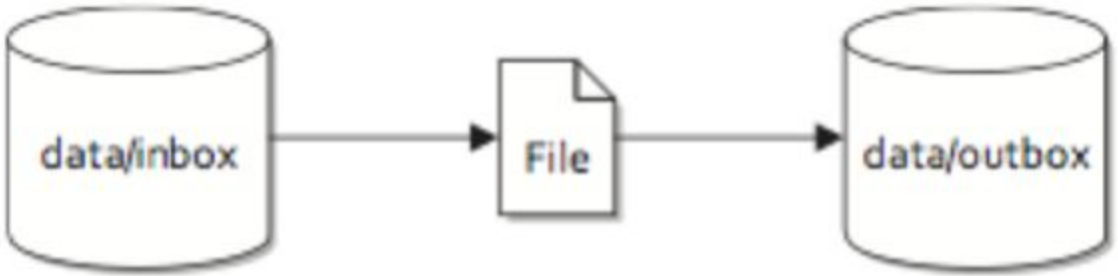


Figure 1.2 Files are routed from the data/inbox directory to the data/outbox directory.

Public Static Void Main

```
public class FileCopierExample {

    public static void main(String[] args) {

    }
}
```

Create CamelContext

```
public class FileCopierExample {

    public static void main(String[] args) {
        CamelContext camel = new DefaultCamelContext();
    }
}
```

Add RouteBuilder

```
public class FileCopierExample {

    public static void main(String[] args) throws Exception {
        CamelContext camel = new DefaultCamelContext();
        camel.addRoutes(new RouteBuilder() {
            @Override
            public void configure() throws Exception {

            }
        });
    }
}
```

Java DSL

```
public class FileCopierExample {

    public static void main(String[] args) throws Exception {
        CamelContext camel = new DefaultCamelContext();
        camel.addRoutes(new RouteBuilder() {
            @Override
            public void configure() throws Exception {
                from("file:inbox")
                    .to("file:outbox");
            }
        });
    }
}
```

Start / Stop

```
public class FileCopierExample {

    public static void main(String[] args) throws Exception {
        CamelContext camel = new DefaultCamelContext();
        camel.addRoutes(new RouteBuilder() {
            @Override
            public void configure() throws Exception {
                from("file:inbox")
                    .to("file:outbox");
            }
        });
        camel.start();
        Thread.sleep(60000);
        camel.stop();
    }
}
```

Camel Main

```
import org.apache.camel.builder.RouteBuilder;
import org.apache.camel.main.Main;

public class FileCopierExample {

    public static void main(String[] args) throws Exception {
        Main main = new Main();
        main.addRouteBuilder(new RouteBuilder() {
            @Override
            public void configure() throws Exception {
                from("file:inbox")
                    .to("file:outbox");
            }
        });

        main.run();
    }
}
```

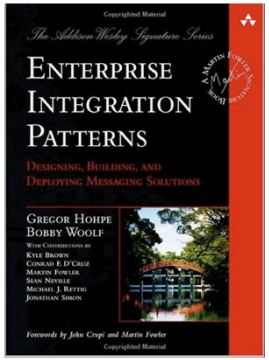
A little Camel K example

file-copier.js

```
1  from('file:inbox')
2      .to('file:outbox');
```

kamel run file-copier.js


TOOL BOX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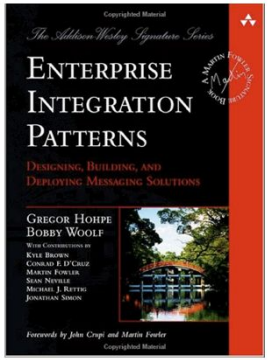
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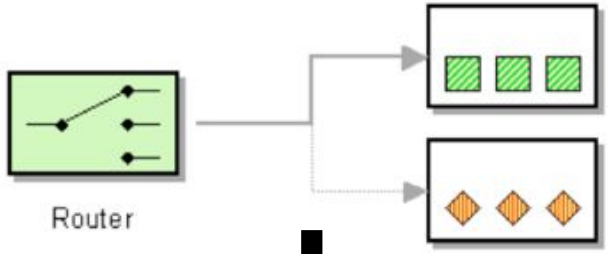
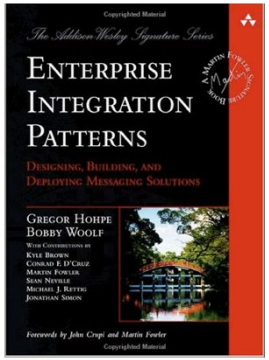

Router


TOOL BOX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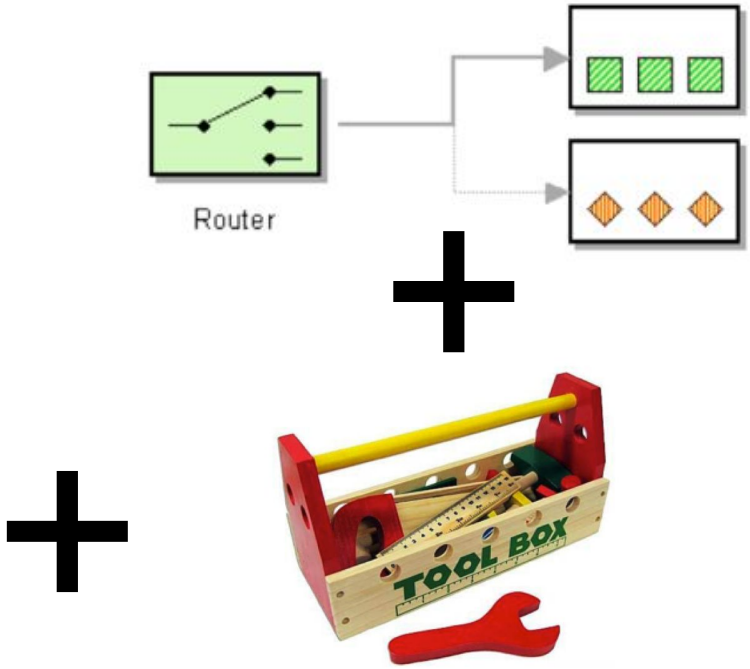
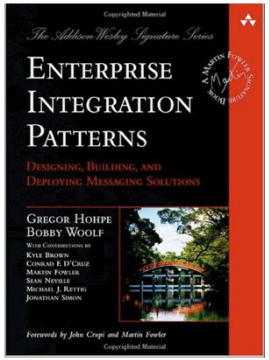

Router
TOOL BOX
File
JMS
HTTP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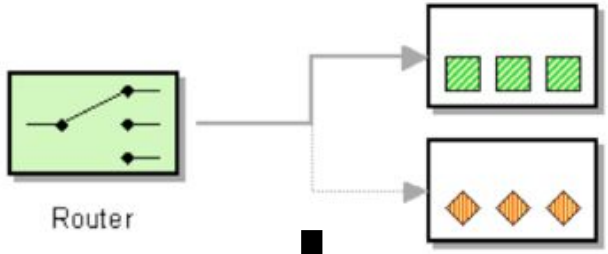
Router

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TOOL BOX

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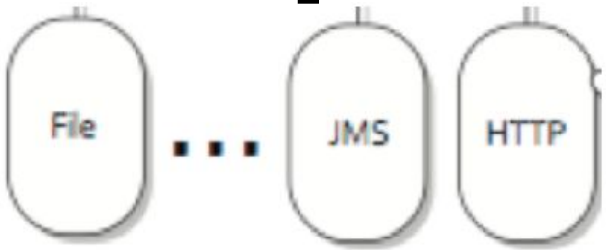
File
JMS
HTTP

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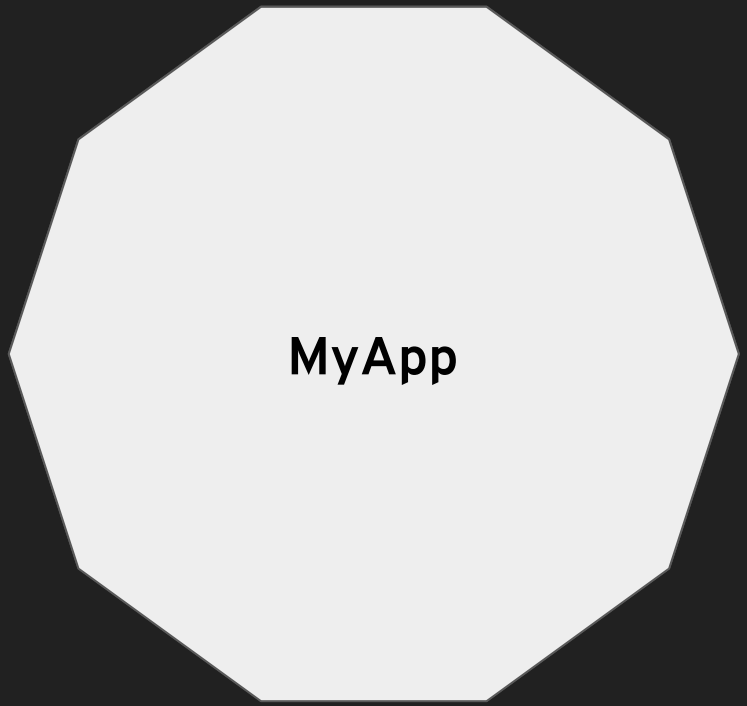
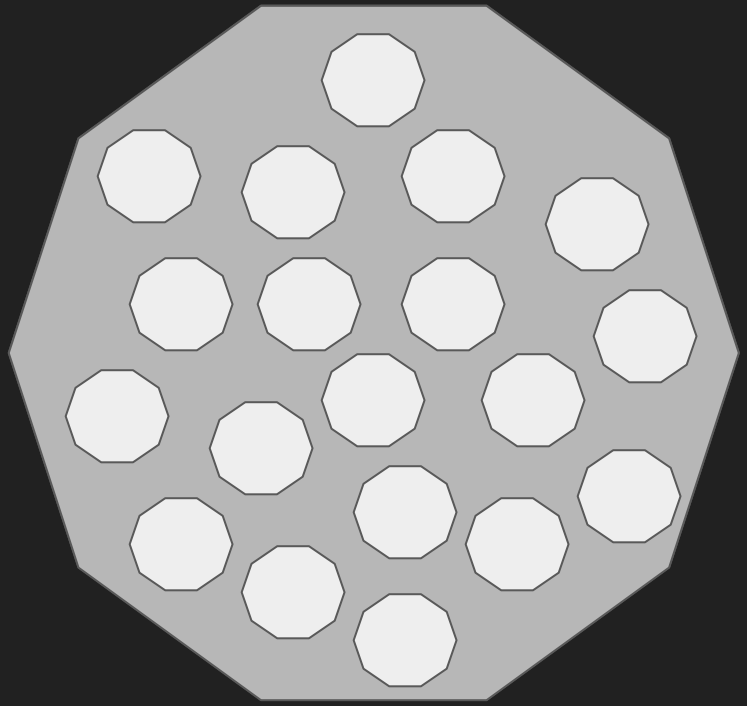
What about Camel
in the Cloud?

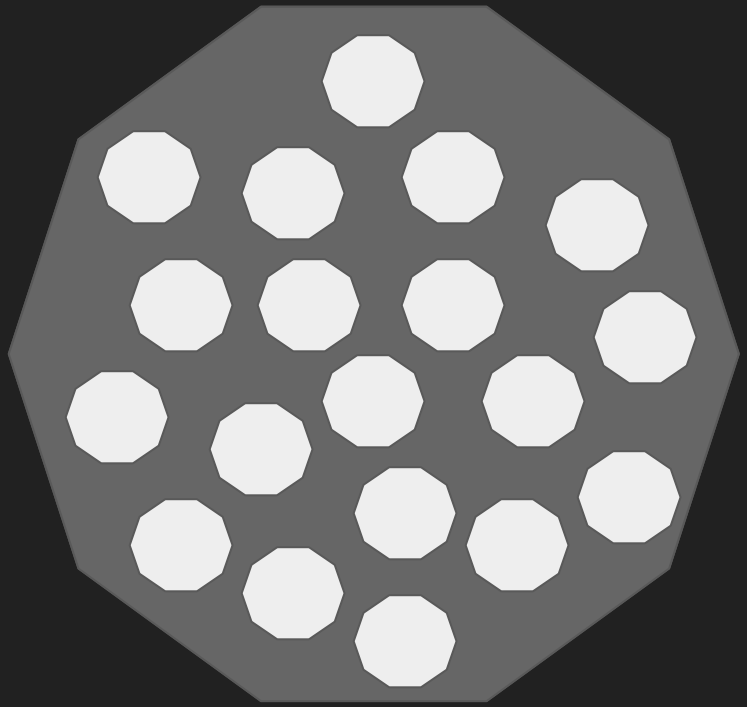
Monolith



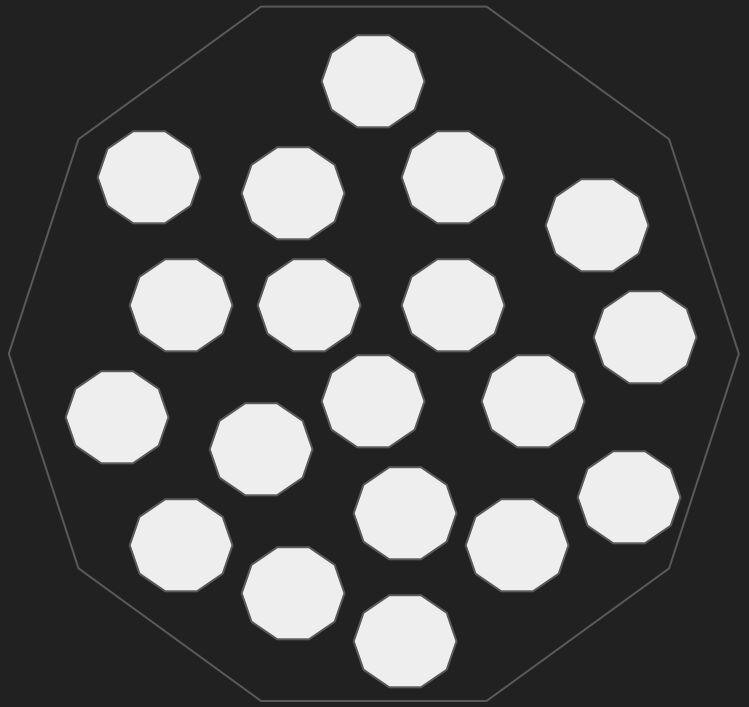
Microservices



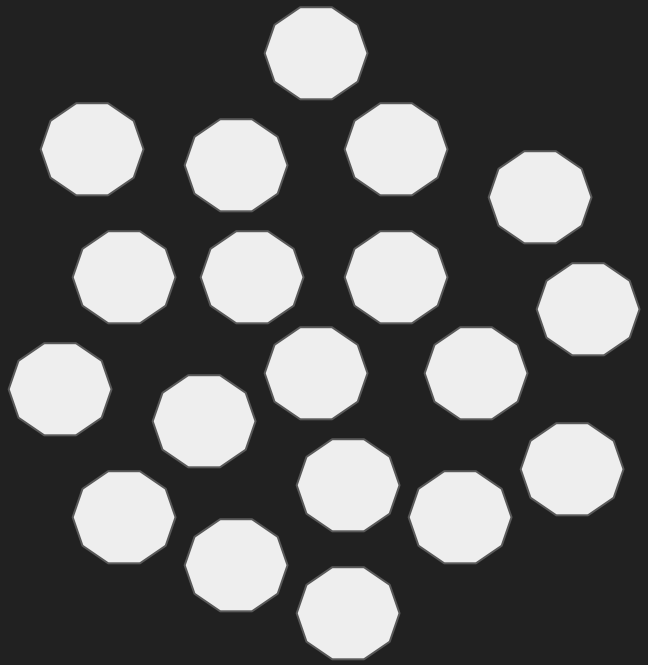
Microservices



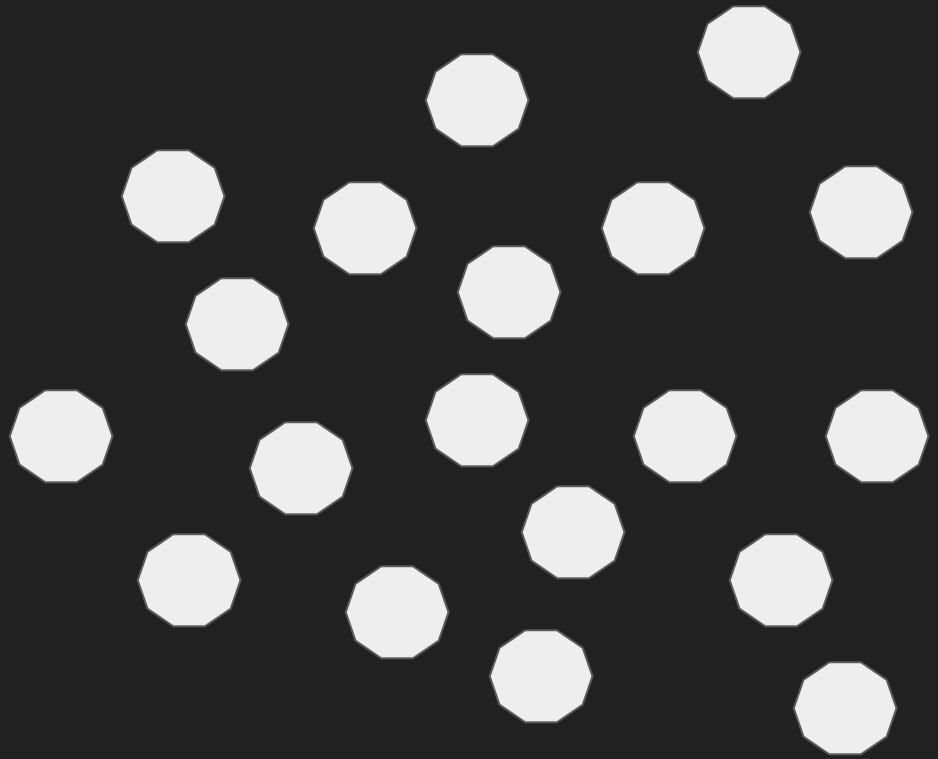
Microservices



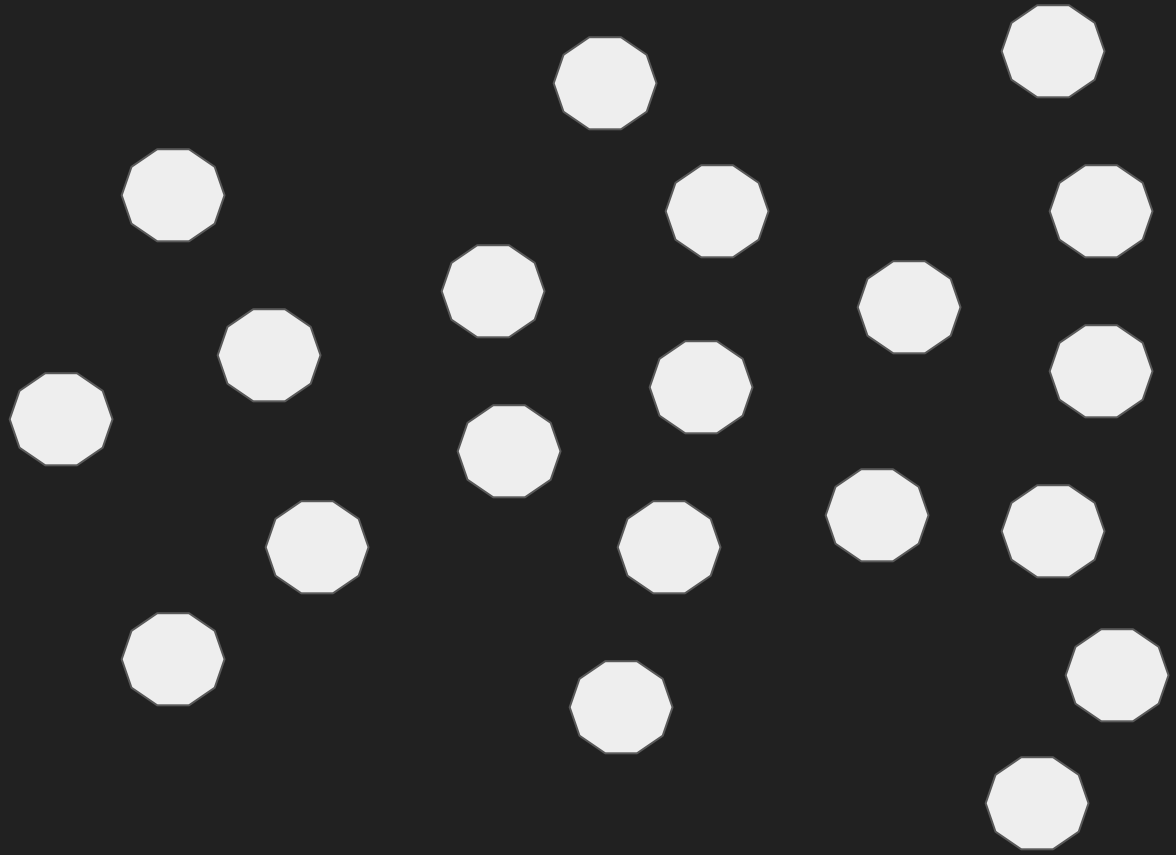
Microservices



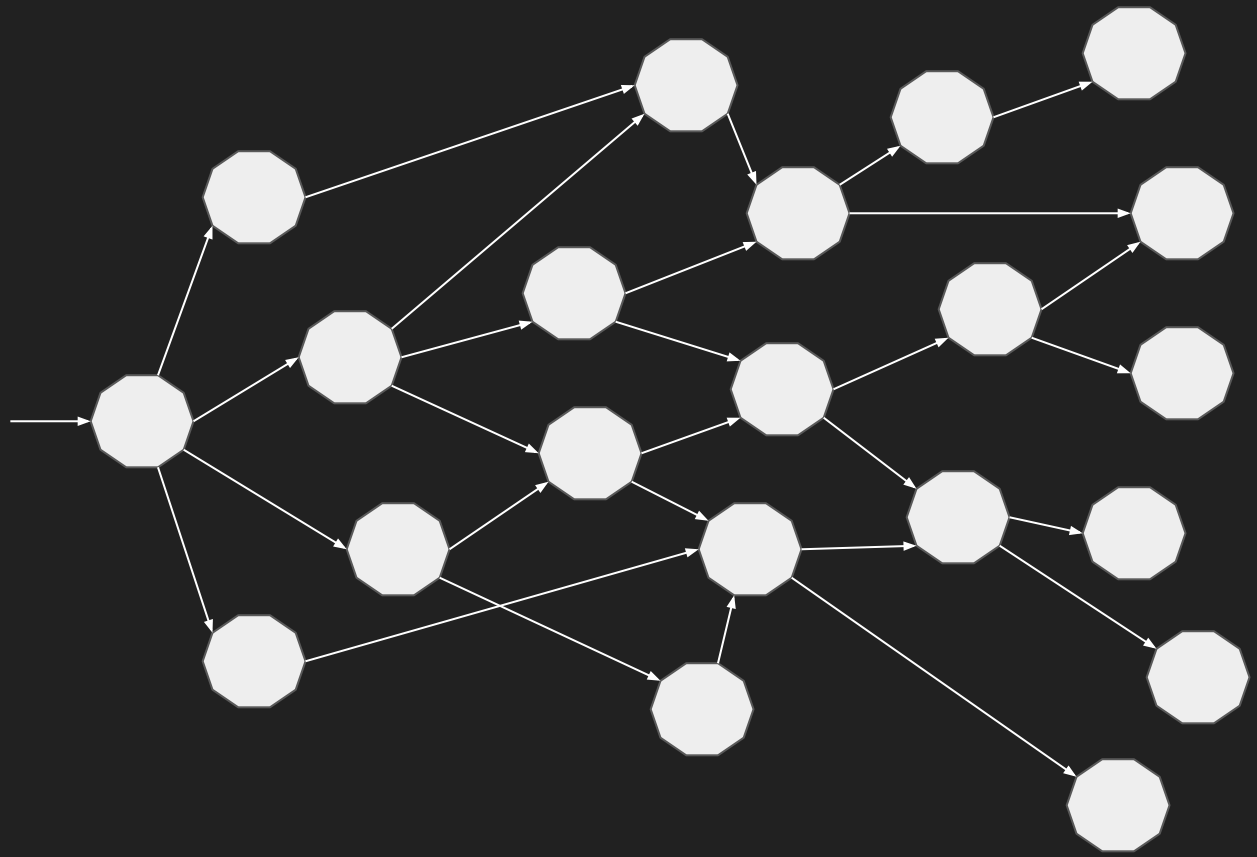
Microservices



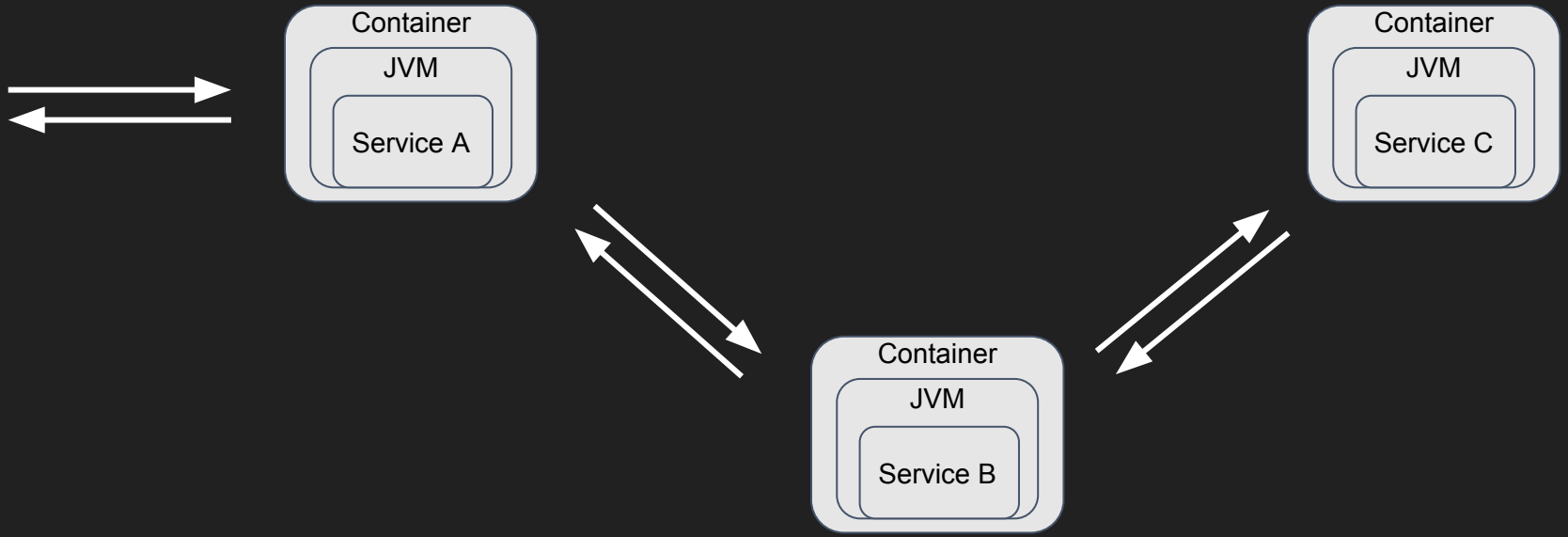
Microservices



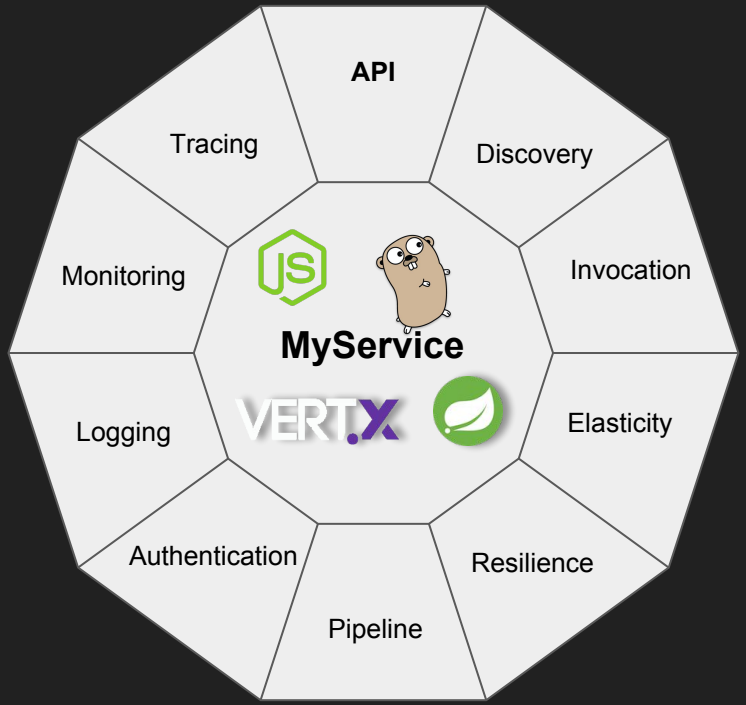
Network of Services



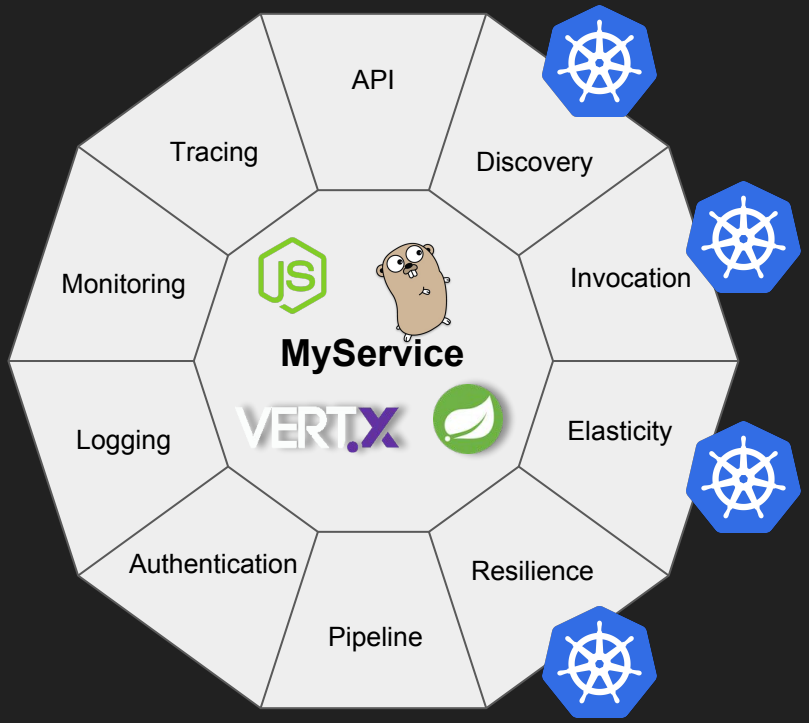
Microservices == Distributed Computing



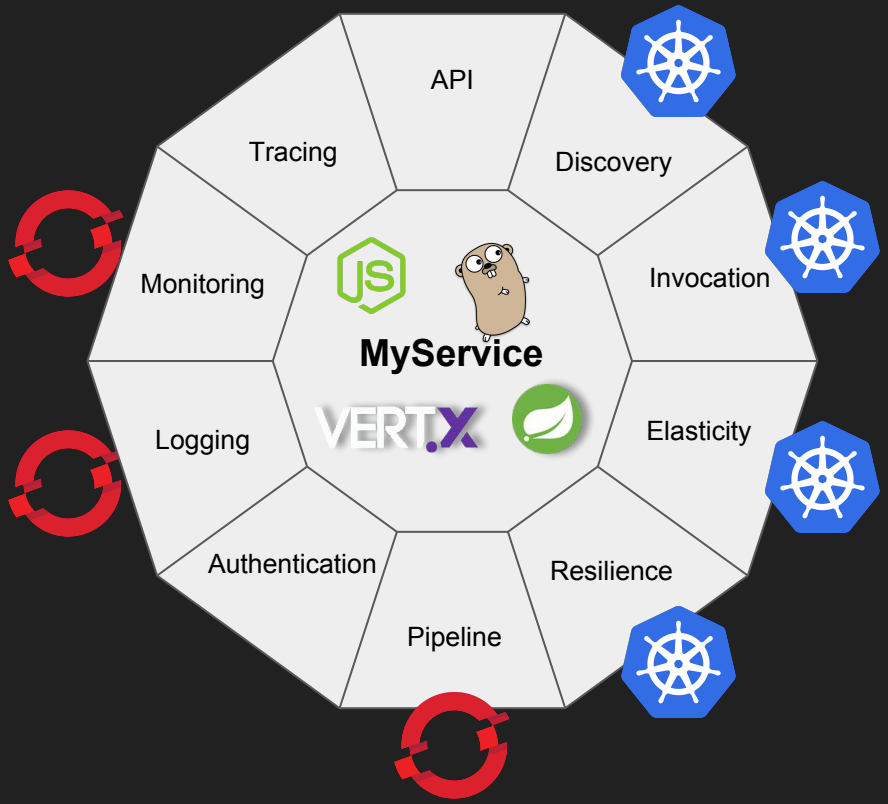
Microservices'ilities



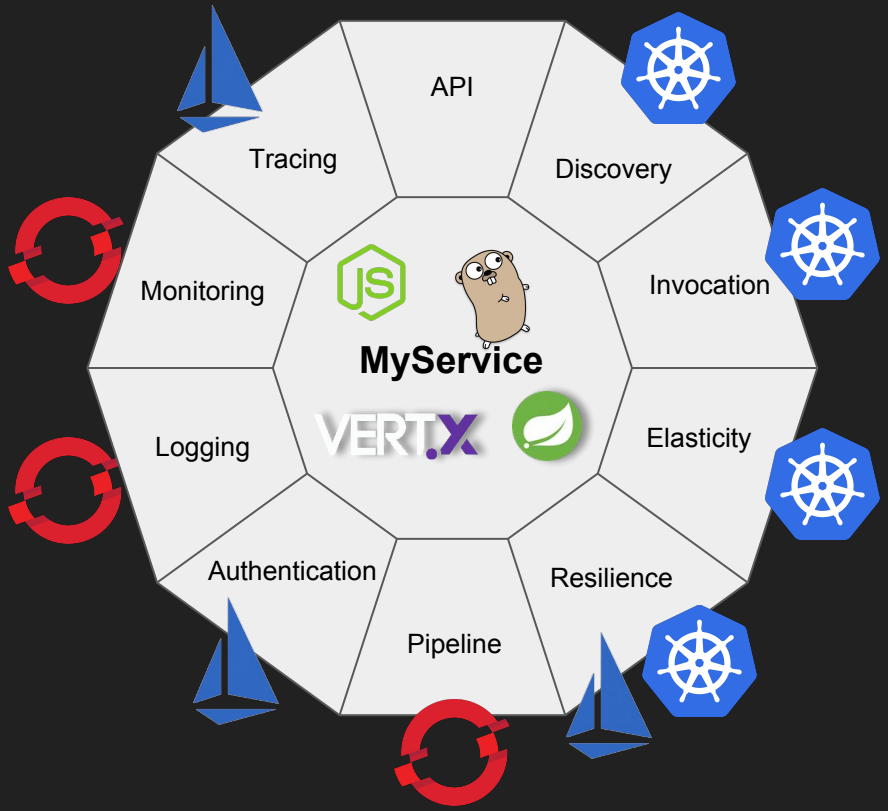
Microservices'ilities + Kubernetes



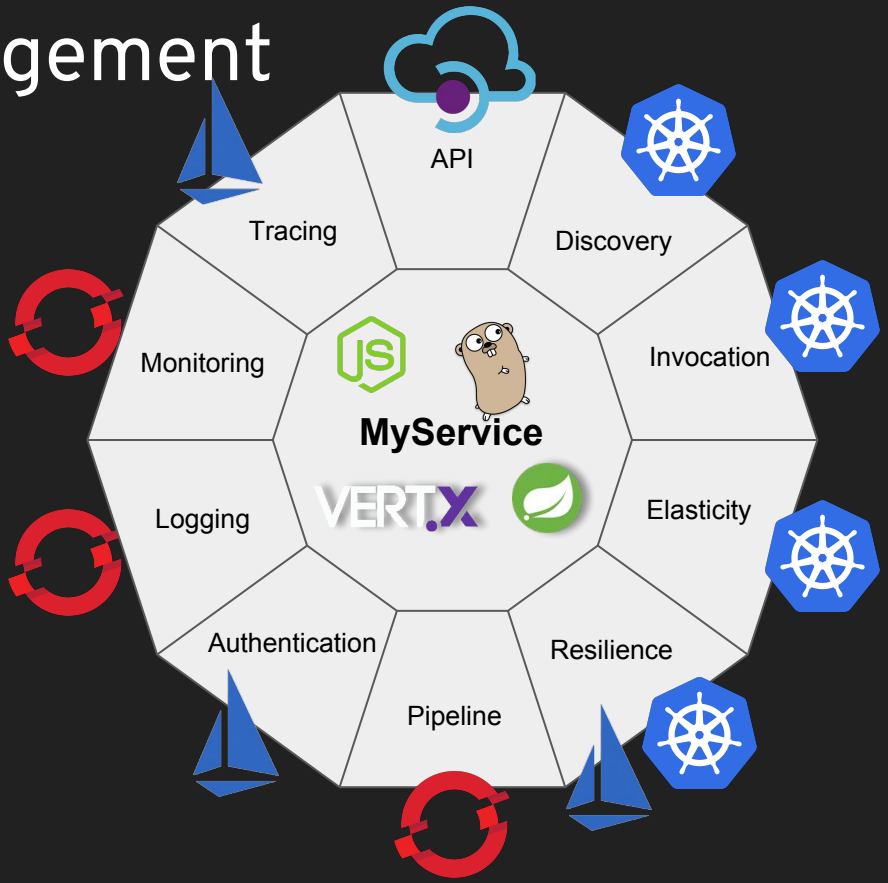
Microservices'ilities + PaaS



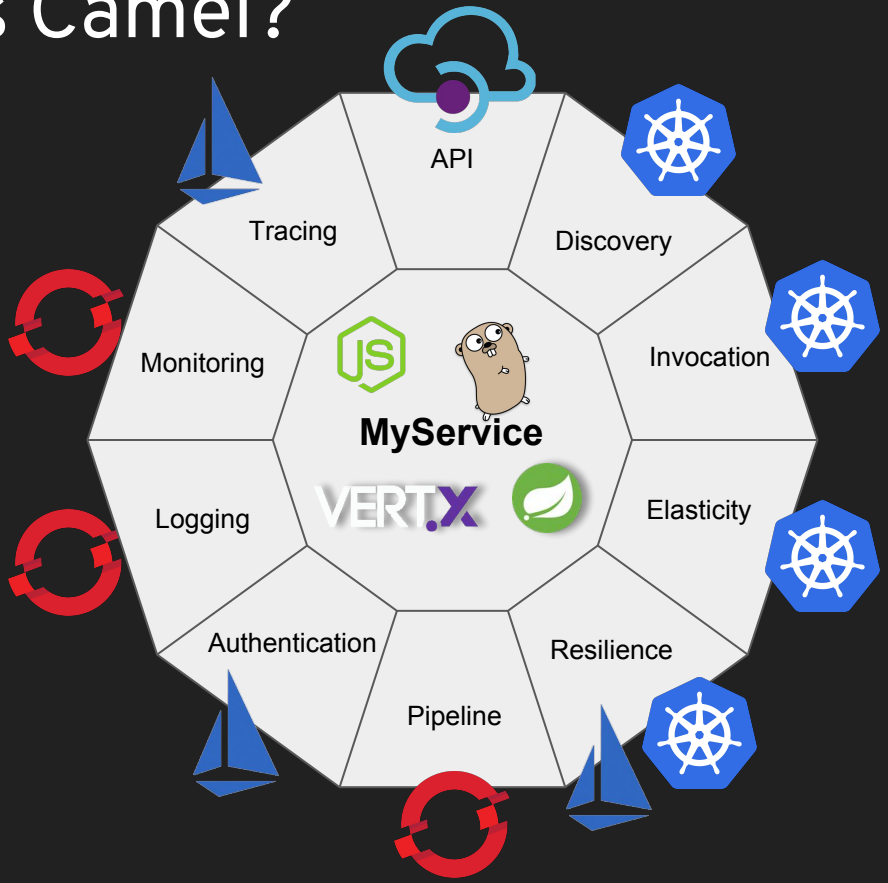
Microservices'ilities + Istio



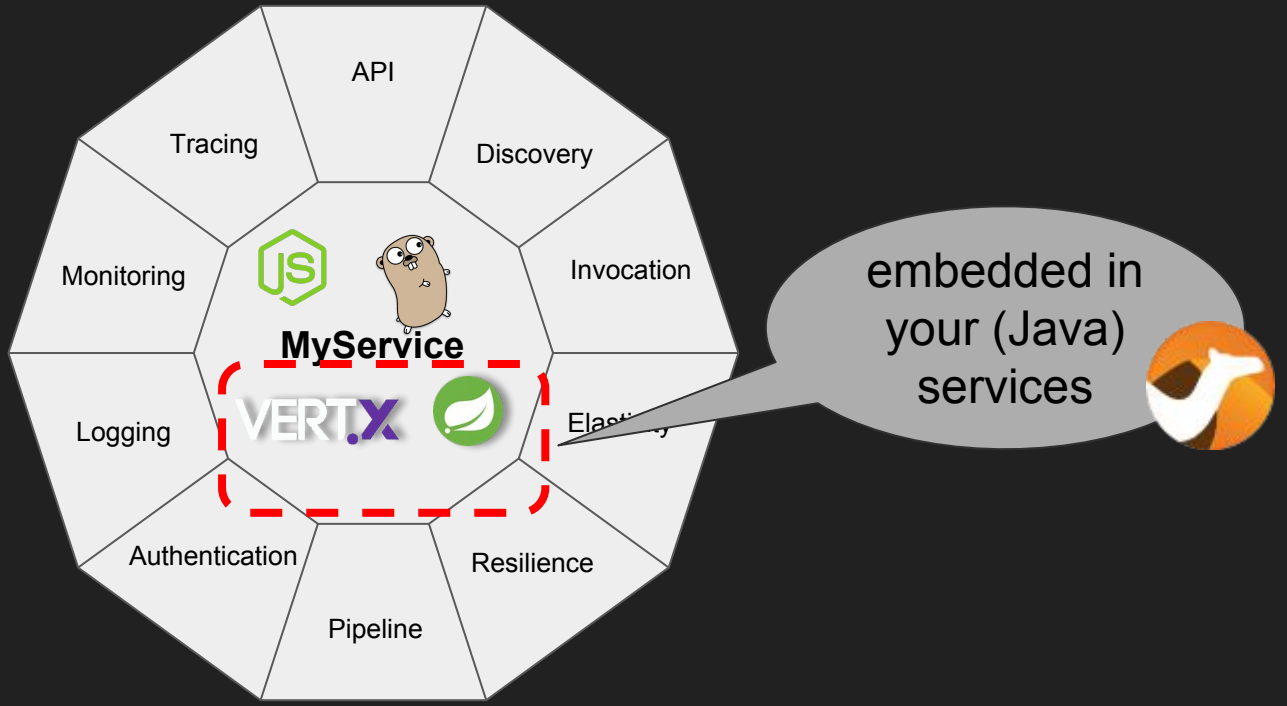
Microservices'ilities + API management



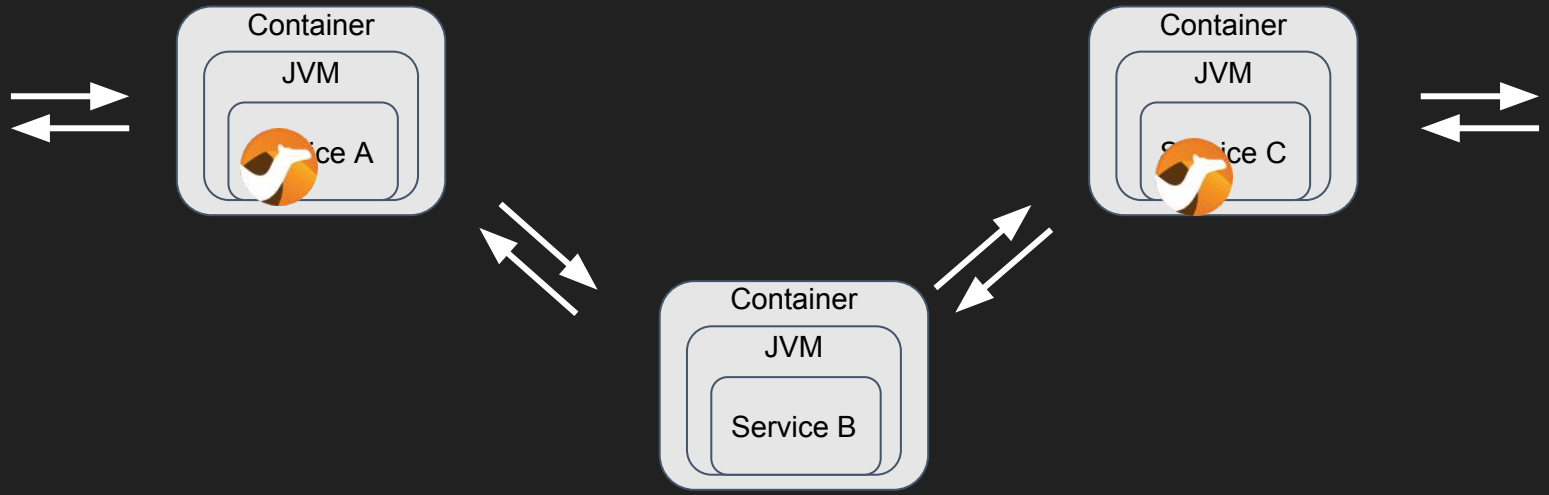
But where is Camel?



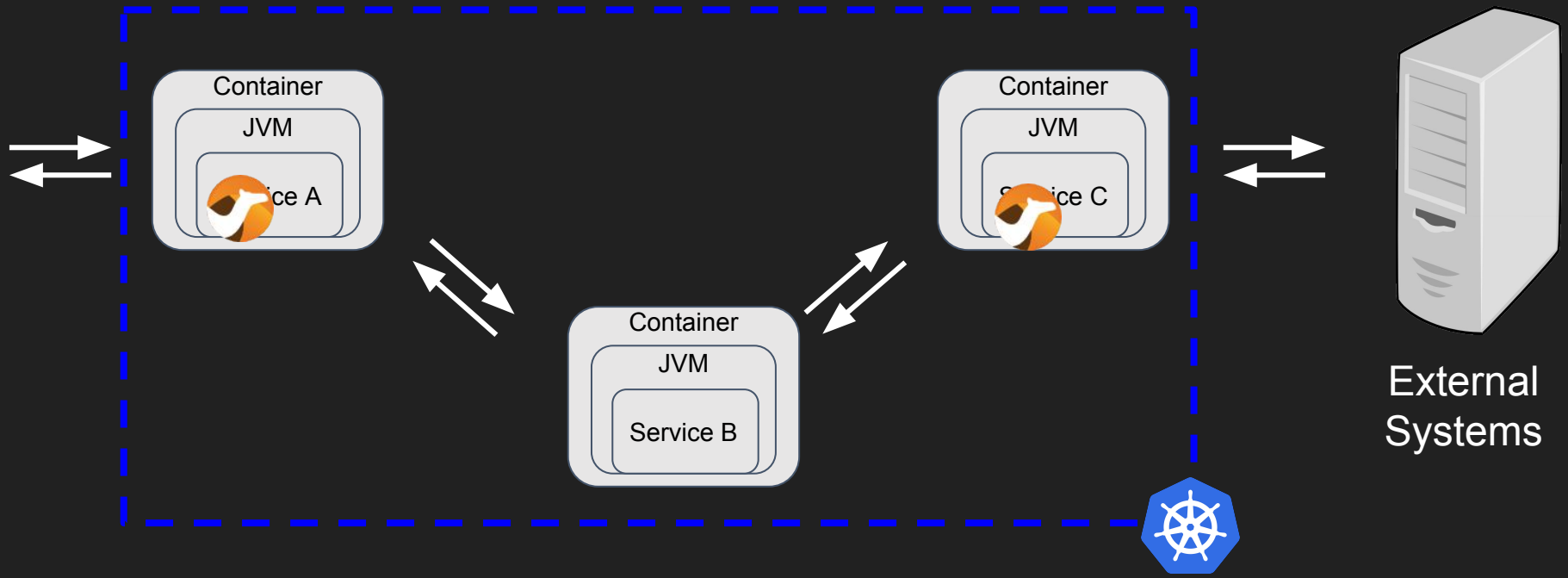
But where is Camel?



Microservices == Distributed Integration



Microservices == Distributed Integration



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

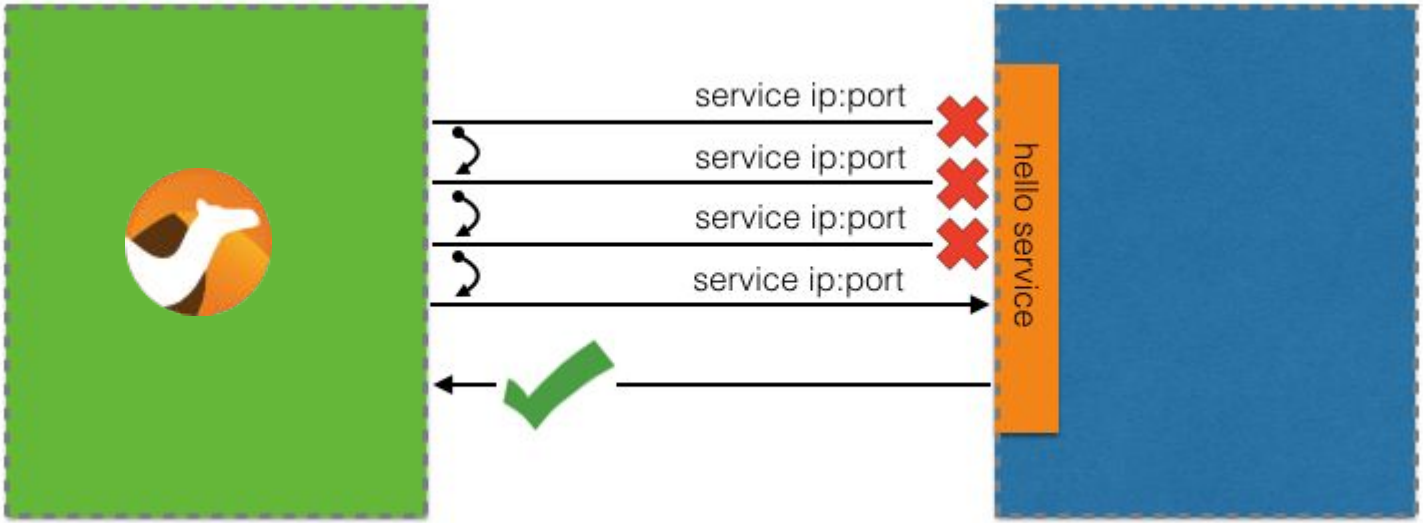
- Camel Retry
  - onException
  - errorHandler

- 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

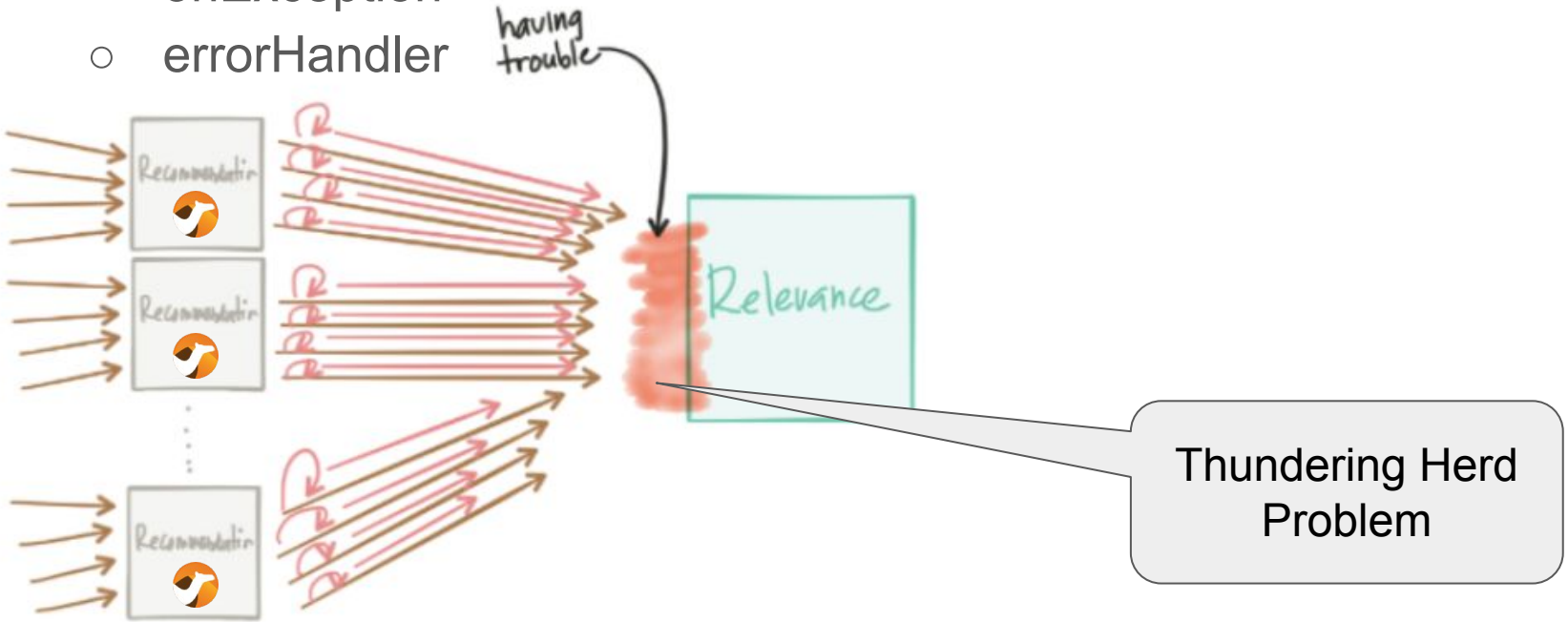
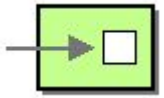


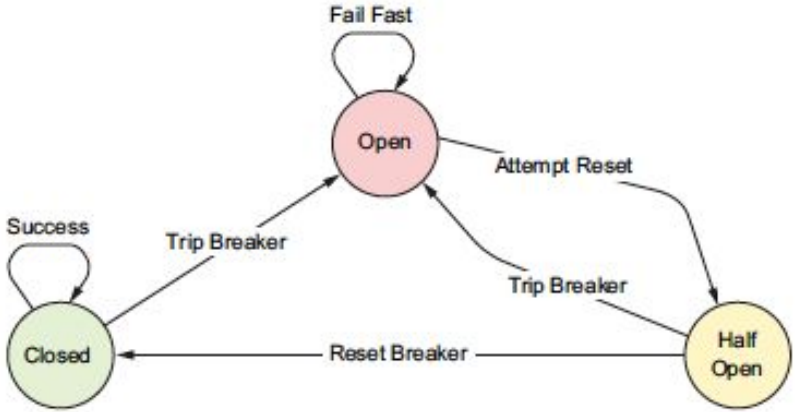
Figure by Christian Posta

Best Practice - Fault Tolerant



Hystrix EIP

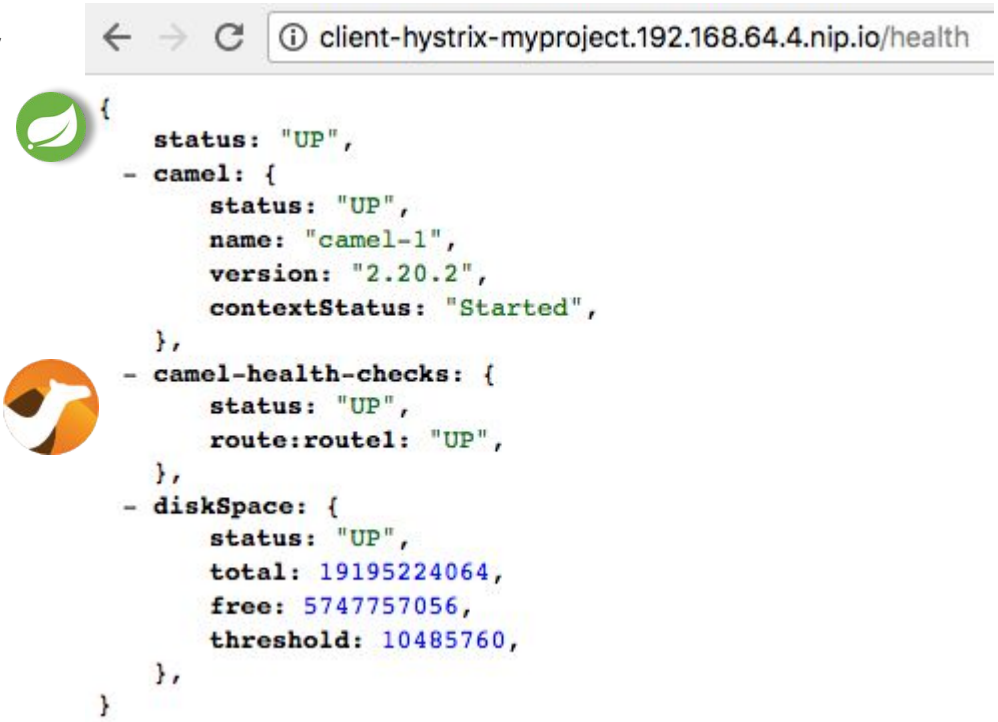
- Circuit Breaker
  - hystrix




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

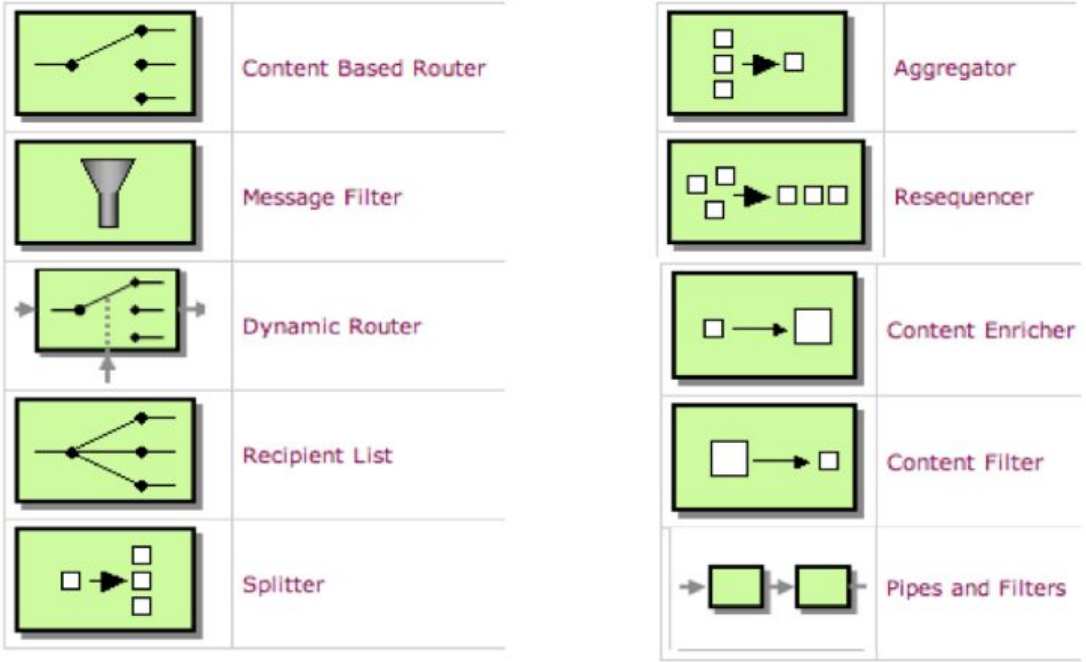
Best Practice - Health Checks

- Health Checks
  - camel-spring-boot actuator
- Readiness Probe
  - Kubernetes
- Liveness Probe
  - Kubernetes



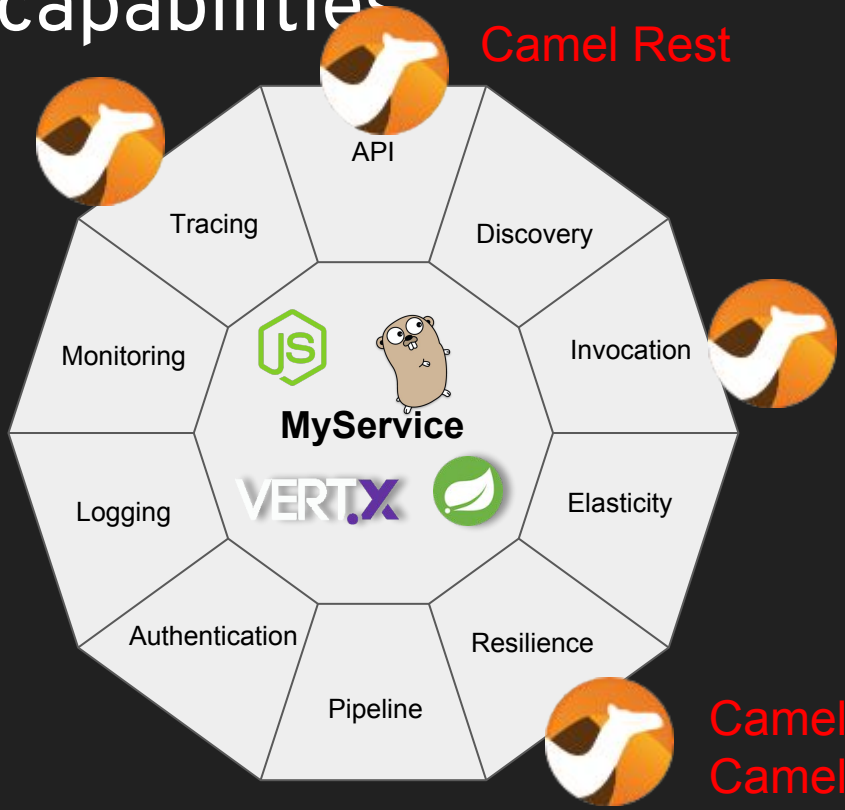
Best Practice - EIP Patterns

- Works anywhere



Usable Camel capabilities

Camel Zipkin
Camel OpenTracing



Camel Rest

Camel
Components

Camel Retry
Camel Hystrix

Apache Camel 3

Apache Camel Community

- Apache Camel has ~475 contributors (from Github)
- It has been around for more than 10 years
- ~2500 stars on Github
- ~3350 forks on Github
- >1000 subscribers on users mailing list
- 8600 questions on StackOverFlow
- 2 new committers in the last months and one new PMC member
- And keep growing...

Camel 3.0 - What to expect

- Overall goals:
  - Backwards compatible (as much as possible)
  - Light-weight & modular camel-core
  - Tidy up APIs & cleanup of technical debt
  - Fluent Builder Endpoint configuration (Java & XML)
  - New Cloud EIP Patterns
  - Quarkus extensions
  - Java 11 support
  - Timeboxed release
  - New website/documentation
  - Camel-K (we'll see in the next talk)

Target Platform

- Java 11
- GraalVM / Quarkus
- Apache Karaf (OSGi)
- Standalone (Java main)
- Spring Boot

Status and next steps

- Final Camel 3 release will (probably) be in September 2019
- Milestone 2 Release has just been released and feedback are welcome
- Milestone 1 is already out from February
  - https://github.com/apache/camel/blob/master/MIGRATION.md
- Two more milestone
- Don’t be ashamed:
  - https://gitter.im/apache/apache-camel
  - https://issues.apache.org/jira/browse/CAMEL
  - users@camel.apache.org, dev@camel.apache.org

Yes, but, show us the timeline..

19/12/2018
Master switched to camel 3

02/2019
M1

- ❑ New Camel API
- ❑ Move components out of camel core
- ❑ Extract basic classes in a support JAR
- ❑ Faster releases

04/2019
M2

- ❑ Quarkus Support for a subset of components
- ❑ Writeable registry
- ❑ Step EIP

Red Hat Summit 05/2019

06/2019
M3

- ❑ Auto-generated Endpoint DSL
- ❑ EIP at scale
- ❑ More Quarkus support

End of Summer
M4

- ❑ Reactive Core
- ❑ Datashape
- ❑ Java 11 support

09/2019
3.0.0

Finalized Release

Milestone 2 - what's new (1/3)

- Camel Main
  - More functionality out of the box
    - dependency injection (IoC) with camel-core Java (RouteBuilder classes)
    - dependency injection (IoC) with camel-spring Java
  - Convention over configuration out of the box
    - application.properties
  - To work better with Camel K

- Properties component
  - Fallback to lookup property as OS ENV variable
  - To work better with Kubernetes / Openshift / Camel K

Milestone 2 - what's new (2/3)

- Writeable registry
  - bind beans to registry
    - `getRegistry().bind("myName", myBean);`
    - `bindToRegistry("myName", myBean);` (in RouteBuilder)
    - `@BindToRegistry`
  - Easier unit testing
  - Easier Camel standalone
- camel-aws
  - Split up into smaller components (21 components)
- camel-management-impl
  - JMX is now fully optional

Milestone 2 - what's new (3/3)

- Quarkus/GraalVM Support
  - Works better with quarkus-camel
  - More minimal/optimized camel-core
  - Works better with Camel K

Milestone 3 (1/3)

- Quarkus/GraalVM Support
  - Generate additional metadata in JARs
  - Better integration with Quarkus
  - More minimal/optimized camel-core
  - Works better with Camel K

Milestone 3 (2/3)

- camel-core-engine
  - Minimal set of dependency
- camel-mock
  - Move Mock out of camel-core (potentially not possible)
- camel-bean
  - Move Bean component / Language out of camel-core (likely not possible)
- camel-xml
  - Move all related to XML out of camel-core

Milestone 3 (3/3)

- Auto generated Endpoint DSL
  - Fluent Builders for endpoint in Java / XML

Milestone 4

- Java 11
  - Builds on Java 11
  - Java 8 to be dropped
- Stabilization and polish
  - Tidy up for GA release
- New website
  - Staging for preview

Generate Fluent Builders for configuring Endpoints

- Generator for both Java DSL and XML DSL (namespace)
- So you can do something like:

```
from(file("inbox").recursive().withDelay(2000)...)
  .to(jms("cheese").withTimeToLive(5000)...);

<from>
  <file directory="inbox" recursive="true" delay="2000"/>
</from>
<to>
  <jms queue="cheese" timeToLive="5000"/>
</to>
```

New website & Documentation

- Currently migrating existing wiki docs to ascii docs (more than 80% has been done)
- Tool to generate website and documentation
- Planned for launch for Camel 3 final release
- We already have something new in staging:
  - https://camel.apache.org/staging/

Quarkus

- Compile to GraalVM native binaries
- Just some components will be supported in native mode
- We'll probably have a git repo containing extension
- Quarkus already contains a set of extensions:
  - Camel-core
  - Camel-salesforce
  - Camel-netty4-http
  - Camel-aws-s3
- For more information https://quarkus.io/

Contributing

- This is probably the best period to start contributing to Apache Camel
  - https://github.com/apache/camel/blob/master/CONTRIBUTING.md

- New features
- New components
- New website

- Anyone who aims to contribute can find stuff to work on.

- Because WE LOVE CONTRIBUTIONS!

Google Summer of Code 2019

- Apache Camel participates to GSoC this year under the ASF organization
- We have a lot of issues to work on, labeled for this event
- Just search for the gsoc2019 label in the Camel JIRA https://issues.apache.org/jira/browse/CAMEL
- Camel PMC members will be mentors

Questions?

THANK YOU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twitter.com/RedHat


youtube.com/user/RedHatVideos