RED HAT SUMMIT

redhat.

Developing Cloud Ready Camel Microservices

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- Senior Principal Software Engineer at Red Hat
- Apache Camel
  8 years working with Camel
- Author of
  Camel in Action books

@davsclaus
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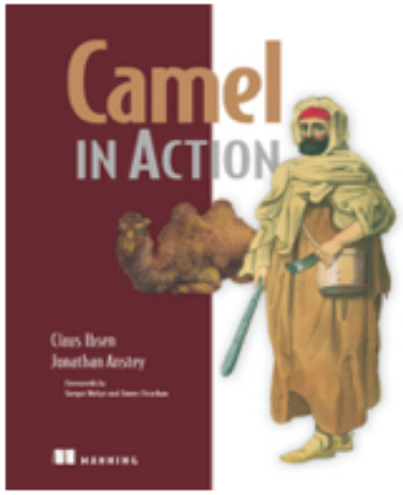
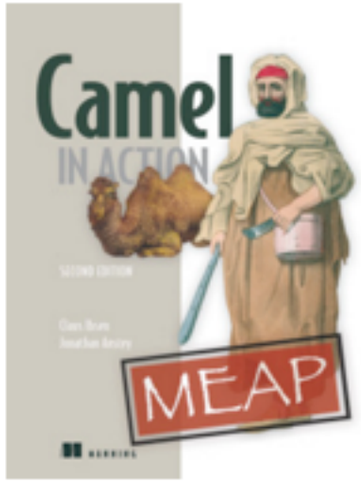
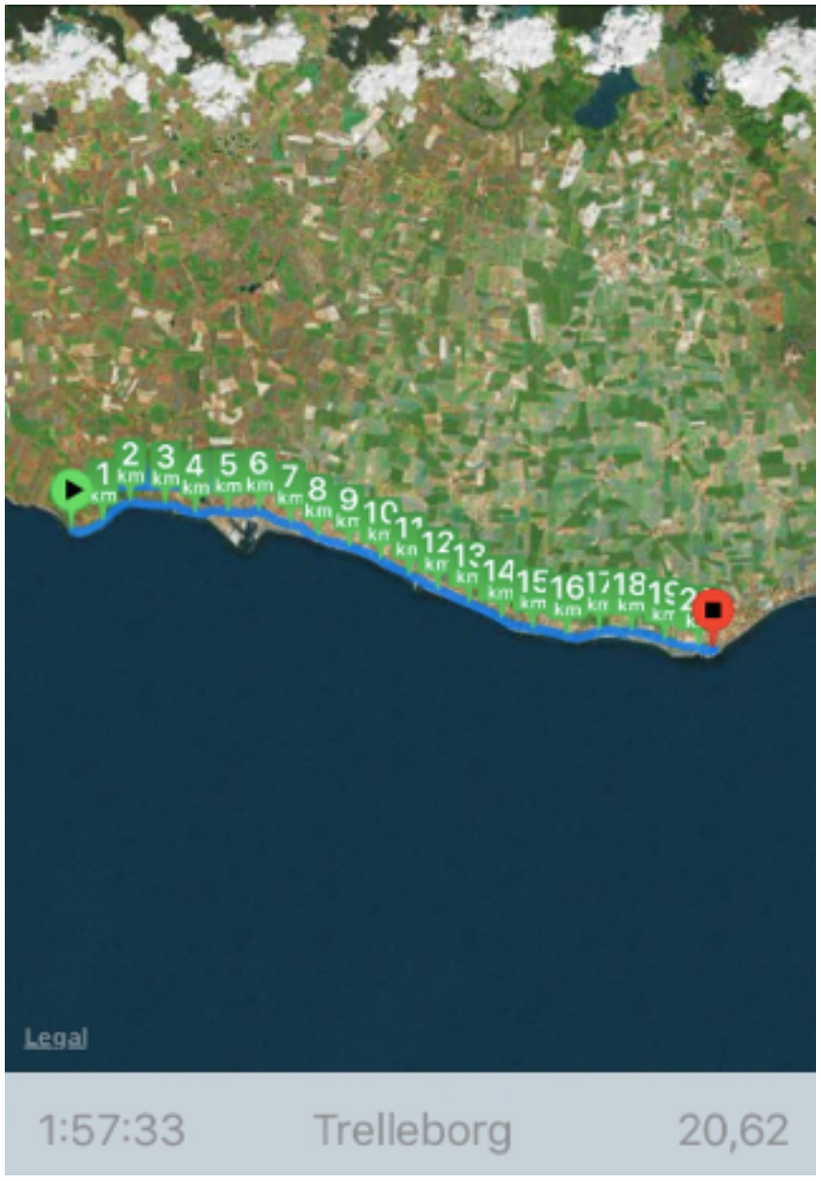


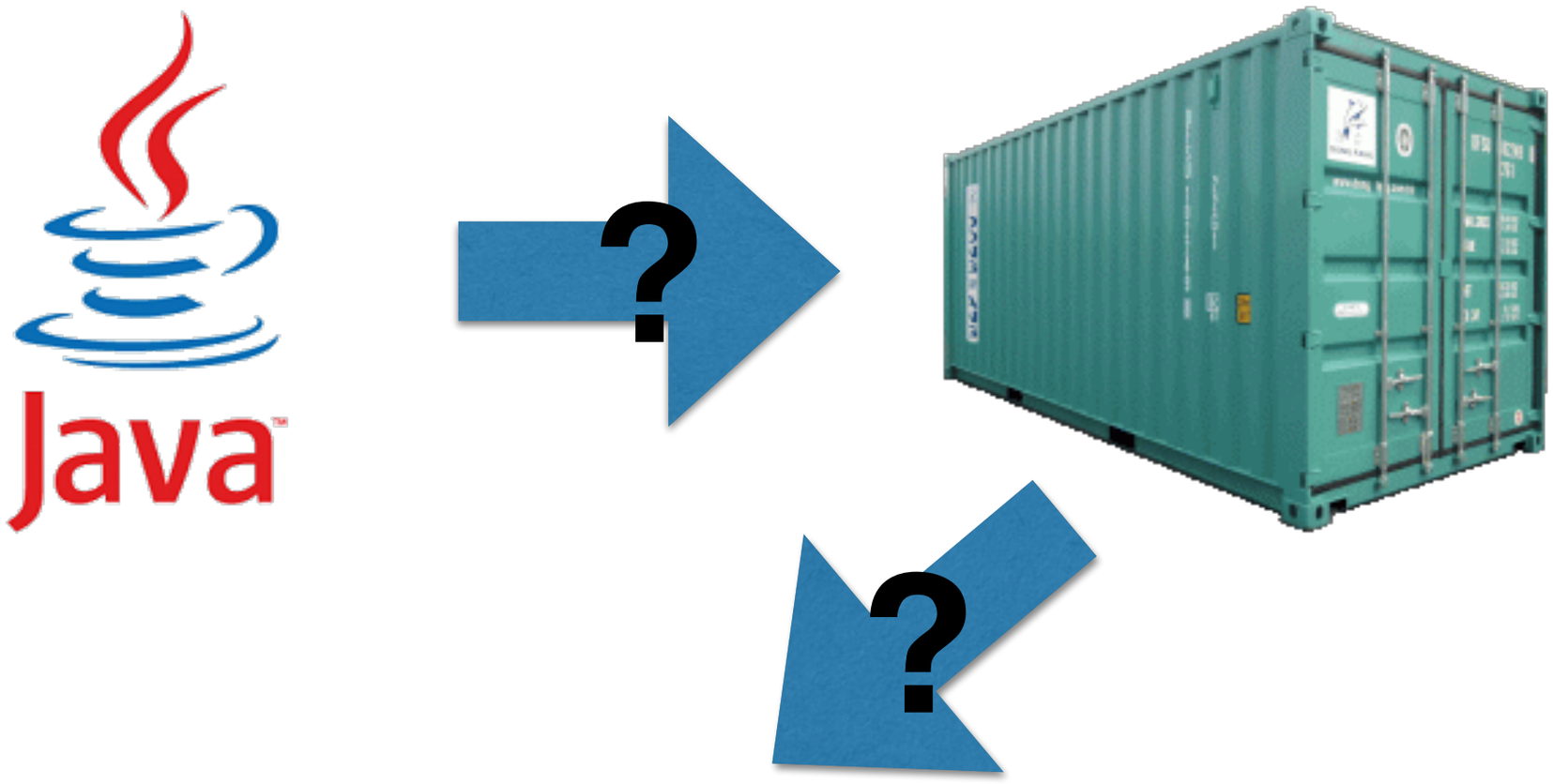


Senior Developer vs Real Life

- Completed my first half marathon 3 days ago

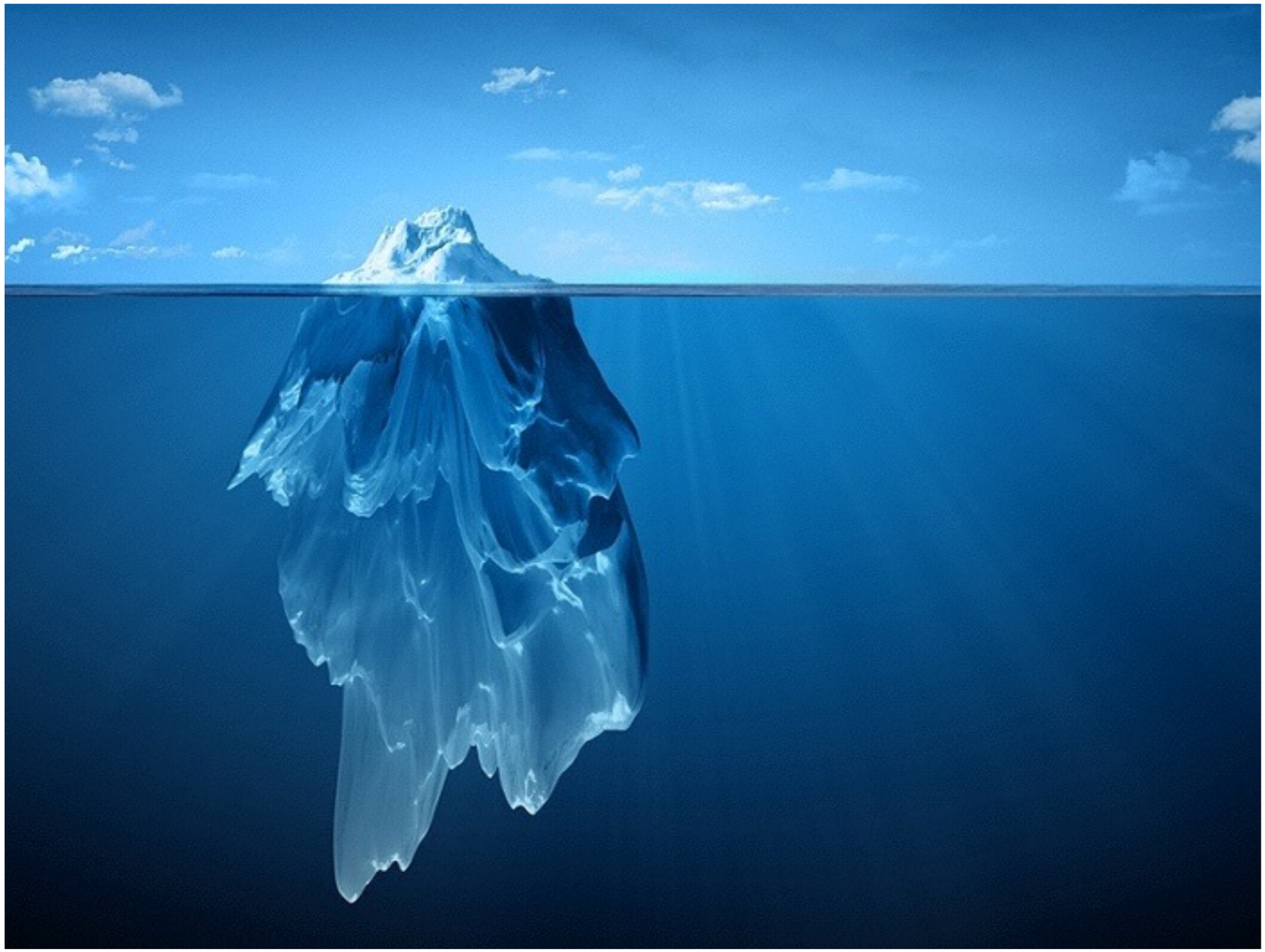


Key Message



OPENSHIFT or

Tip of Iceberg



Running Local OpenShift / Kubernetes

- MiniShift
- OpenShift CDK
- MiniKube (Kubernetes)

Running OpenShift Locally

- Download MiniShift

  https://github.com/minishift/minishift/releases

- Start MiniShift

  minishift start --openshift-version v1.5.0

minishift config set openshift-version 1.5.0

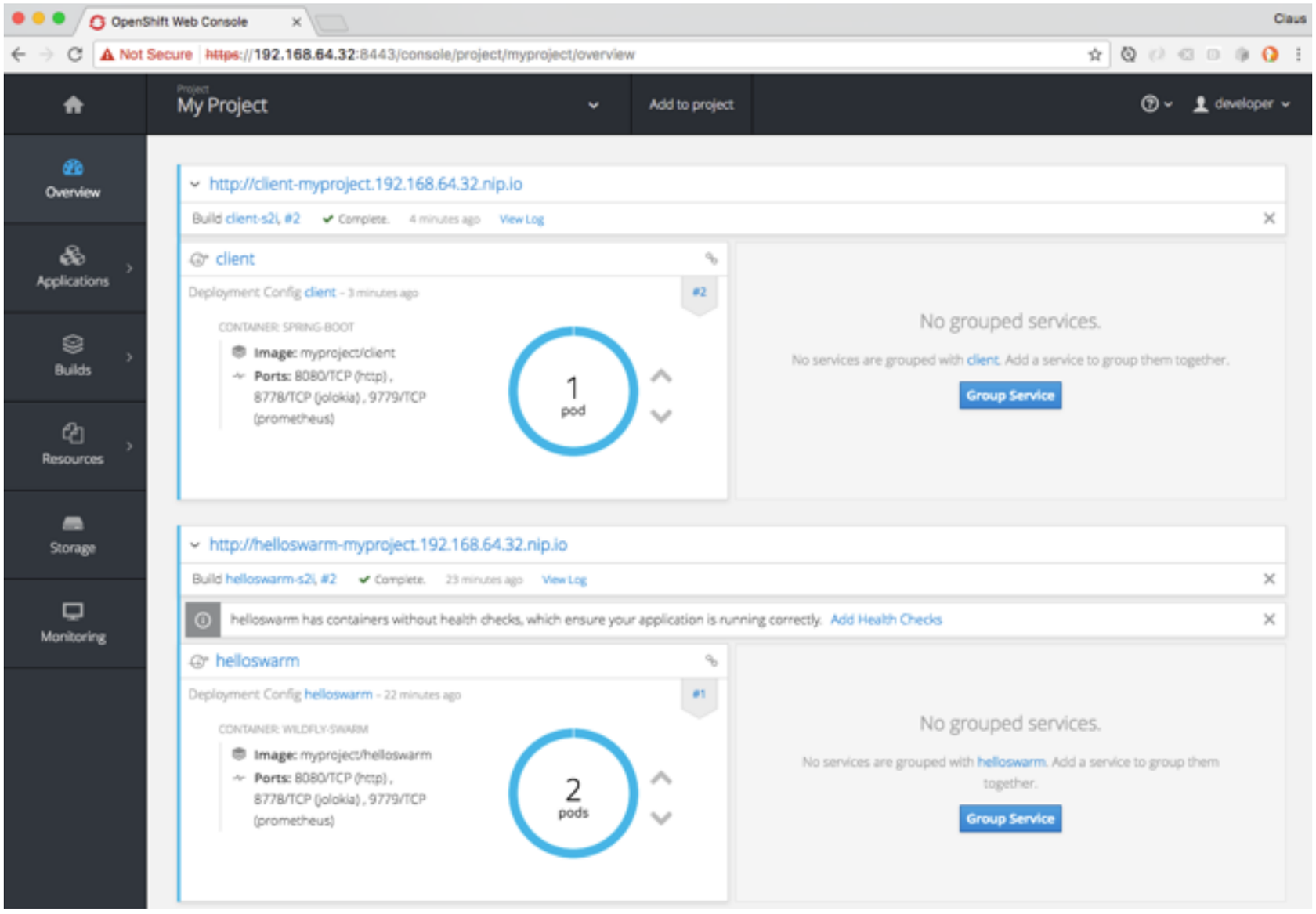
TIP To force a specific version

https://www.openshift.org/minishift/

How I installed OpenShift locally

```
davsclaus:/Users/davsclaus/$ minishift start --openshift-version v1.5.0
Starting local OpenShift cluster using 'xhyve' hypervisor...
Downloading ISO 'https://github.com/minishift/minishift-b2d-iso/releases/download/v1.0.2/minishift-b2d.iso'
 40.00 MB / 40.00 MB [==========================================================================
Downloading OpenShift binary 'oc' version 'v1.5.0'
 18.93 MB / 18.93 MB [==========================================================================
-- Checking OpenShift client ... OK
-- Checking Docker client ... OK
-- Checking Docker version ... OK
-- Checking for existing OpenShift container ... OK
-- Checking for openshift/origin:v1.5.0 image ...
   Pulling image openshift/origin:v1.5.0
   Pulled 0/3 layers, 3% complete
   Pulled 1/3 layers, 72% complete
   Pulled 2/3 layers, 99% complete
   Pulled 3/3 layers, 100% complete
   Extracting
   Image pull complete
-- Checking Docker daemon configuration ... OK
-- Checking for available ports ... OK
-- Checking type of volume mount ...
   Using Docker shared volumes for OpenShift volumes
-- Creating host directories ... OK
```

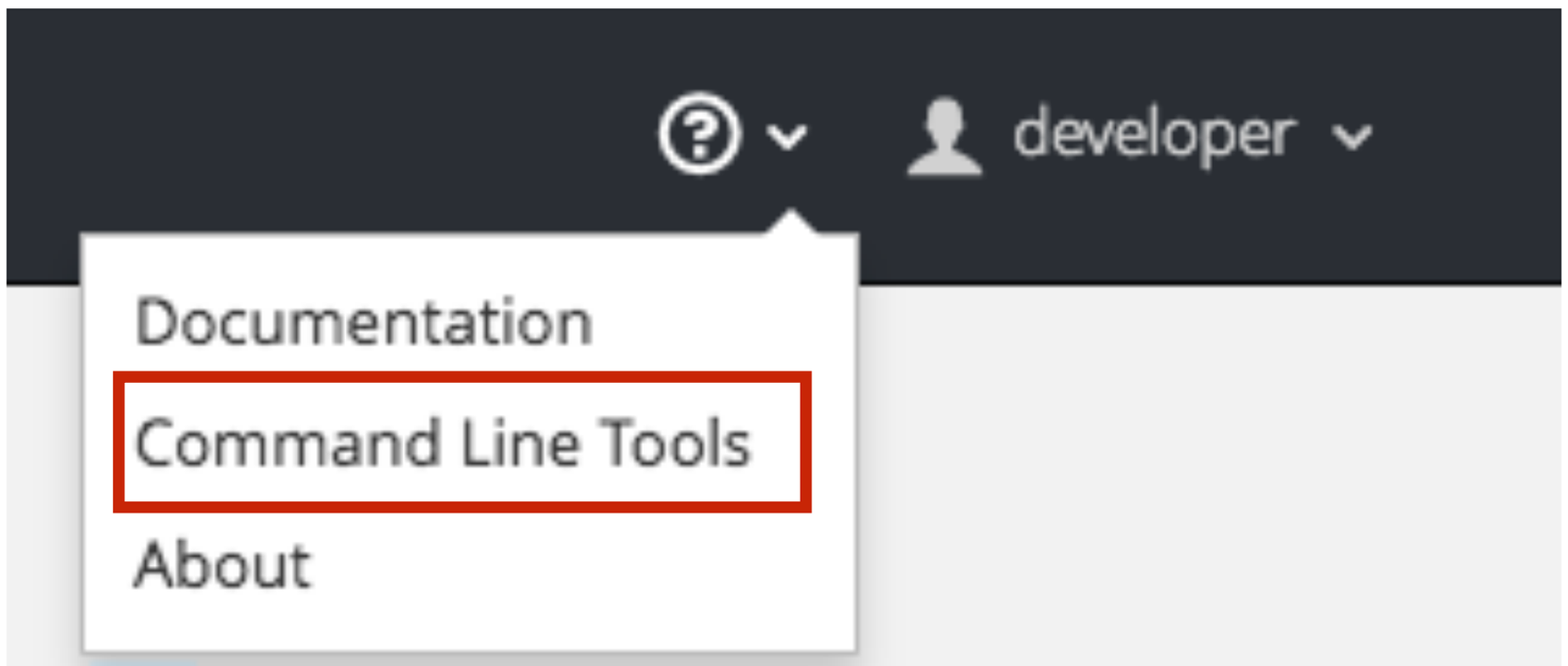
OpenShift Web Console



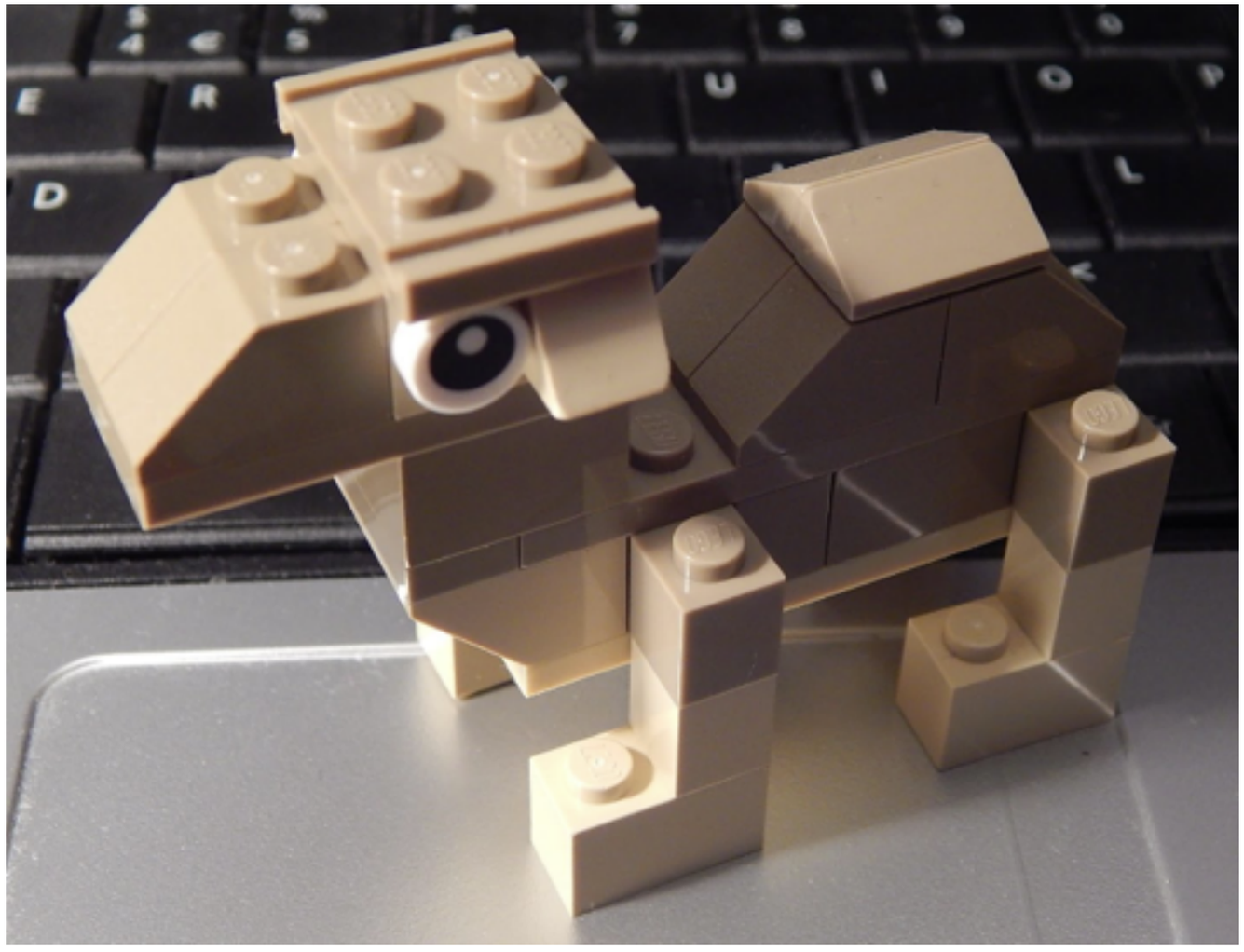
minishift console

OpenShift CLI (oc) Installation

- Instructions from Web Console



Build a Camel Demo Time



Source Code & Slides

davsclaus/minishift-hello: Two

GitHub, Inc. [US] https://github.com/davsclaus/minishift-hello

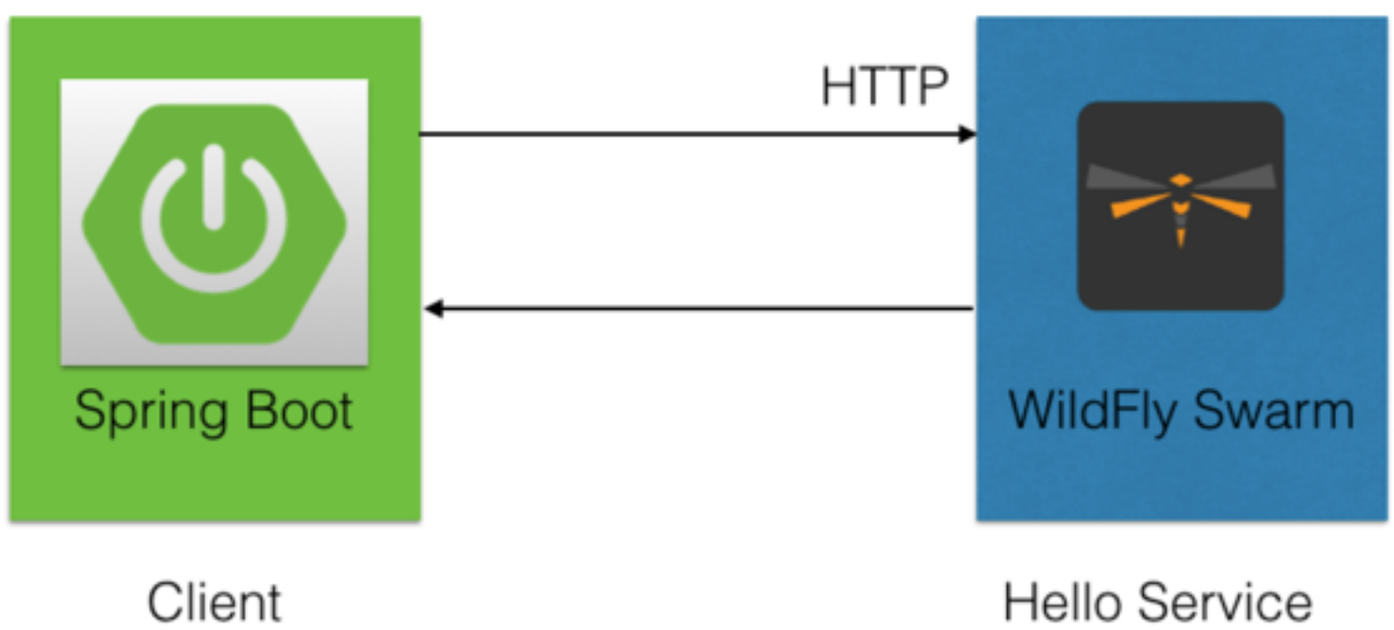
minishift-hello

Two microservices using Spring Boot and WildFly Swarm with Apache Camel running in MiniShift

There are three Maven projects:

- client - Spring Boot application with Camel that triggers every 2nd second to call the hello service and log the response. The client uses Camel client side retry for error handling.
- client-hystrix - A client that uses Hystrix as circuit breaker for error handling.
- helloswarm - WildFly Swarm application hostin a hello service which returns a reply message.

The diagram below illustrates this:



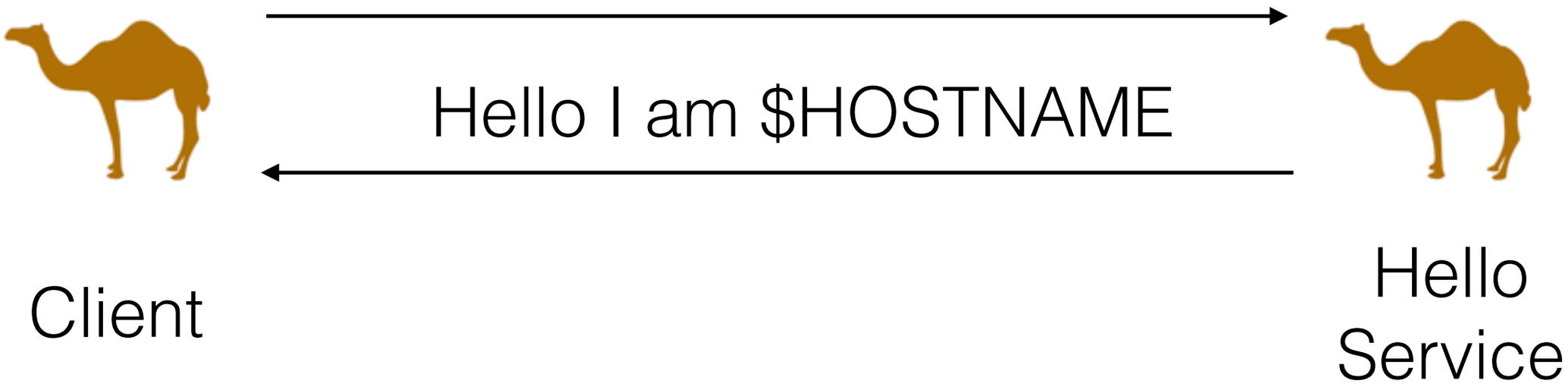
https://github.com/davsclaus/minishift-hello

Hello Service

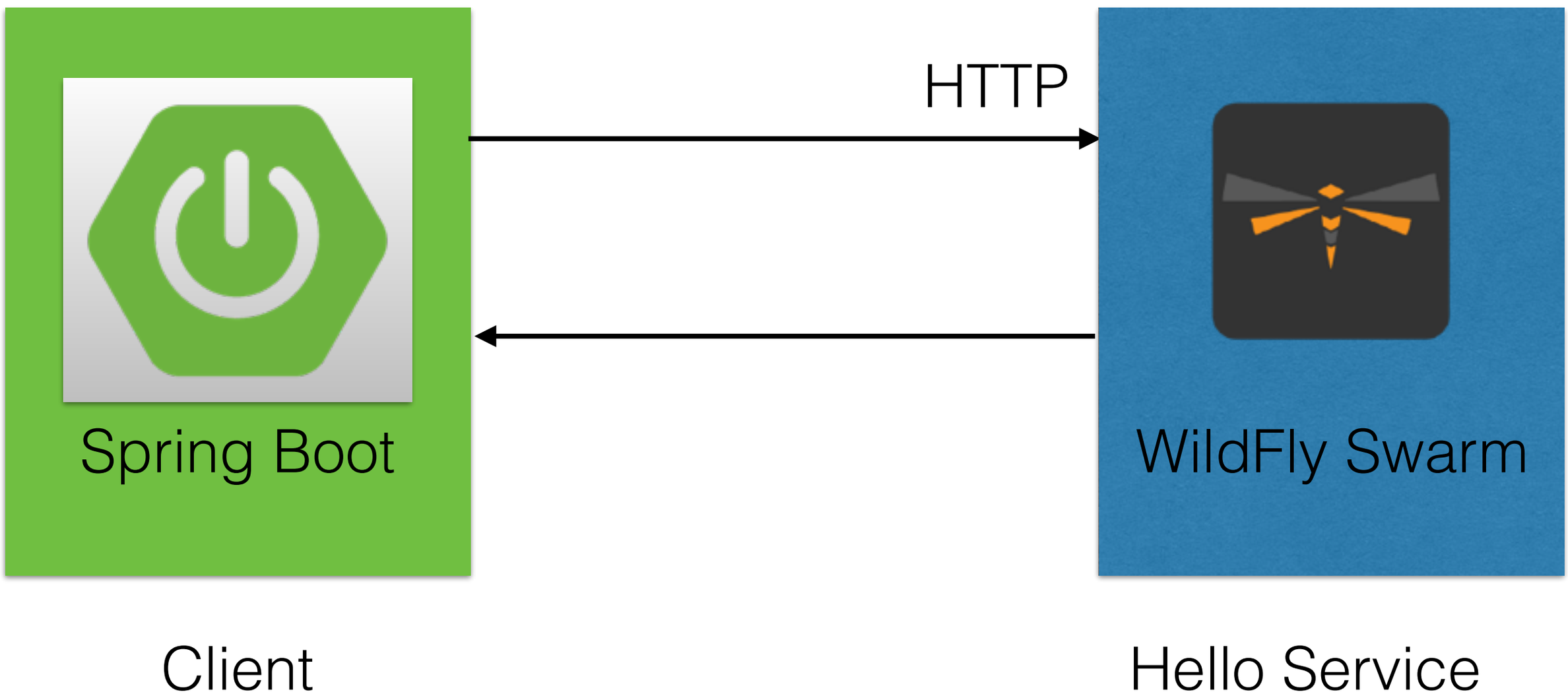
Client

Hello
Service

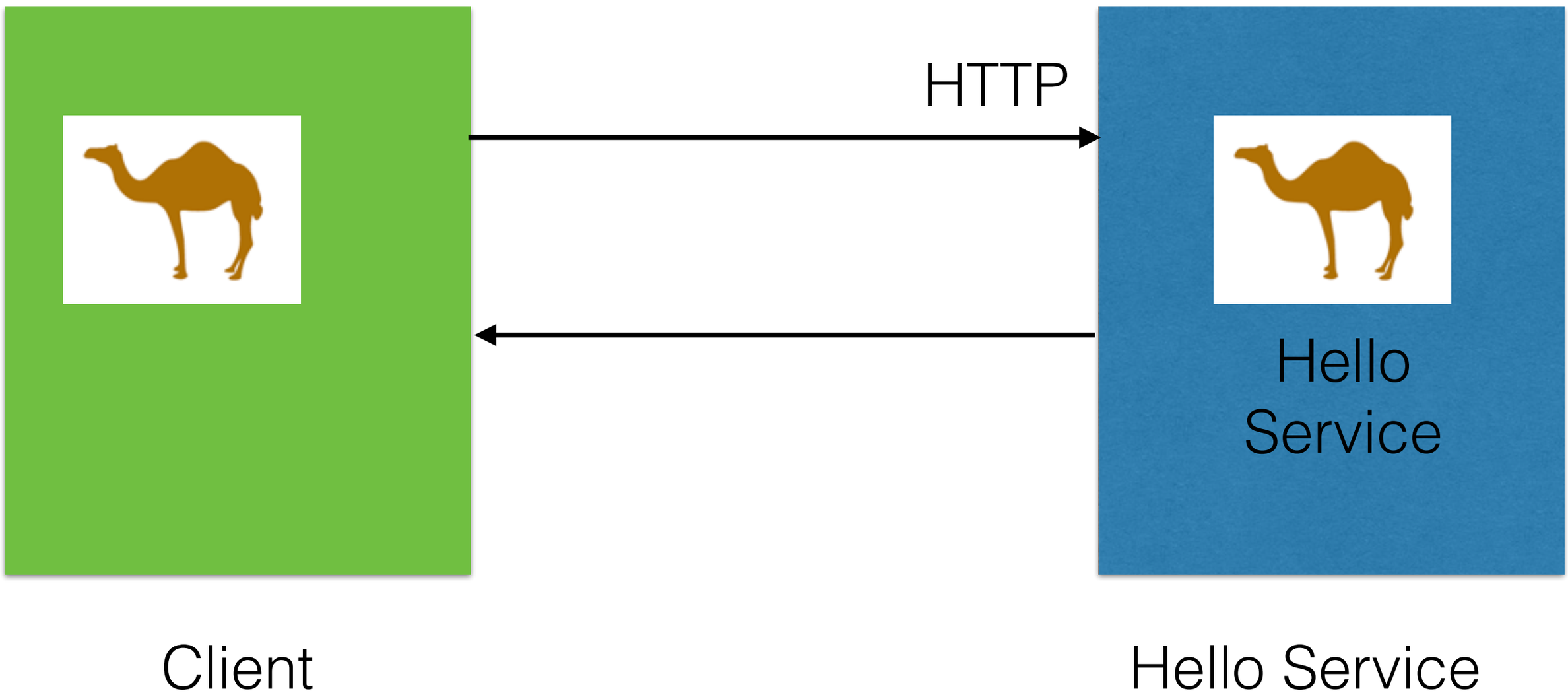
Hello Service



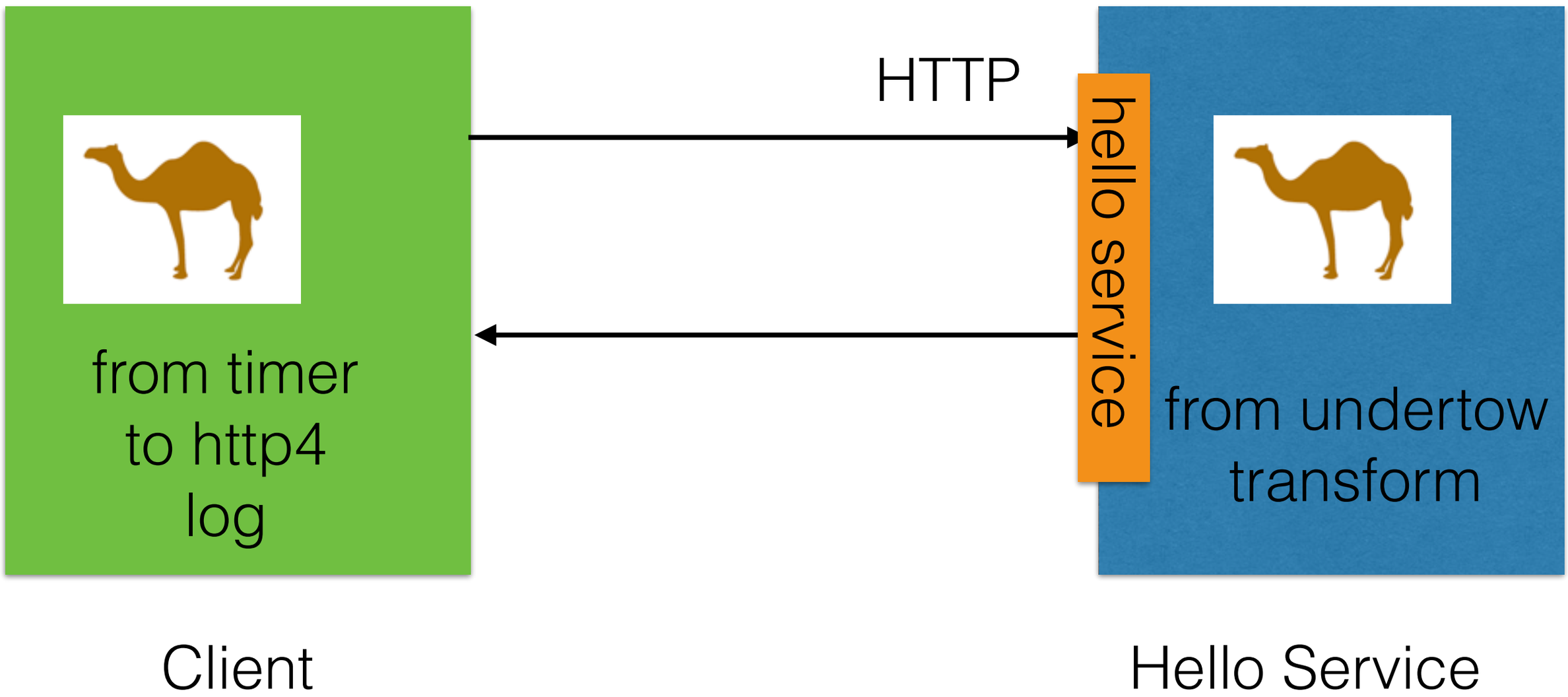
Implementation



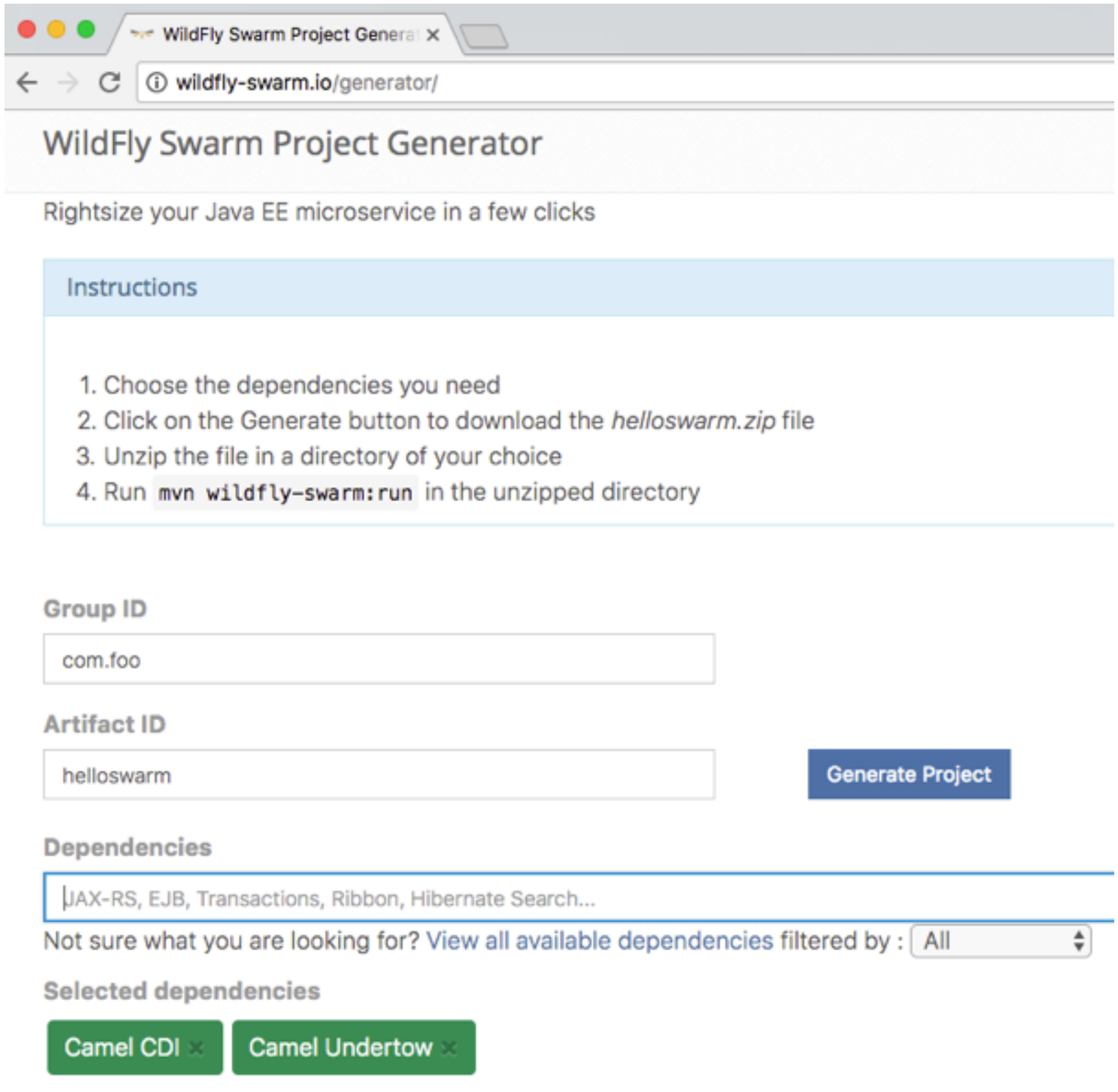
Implementation



Implementation



WildFly Swarm Generator



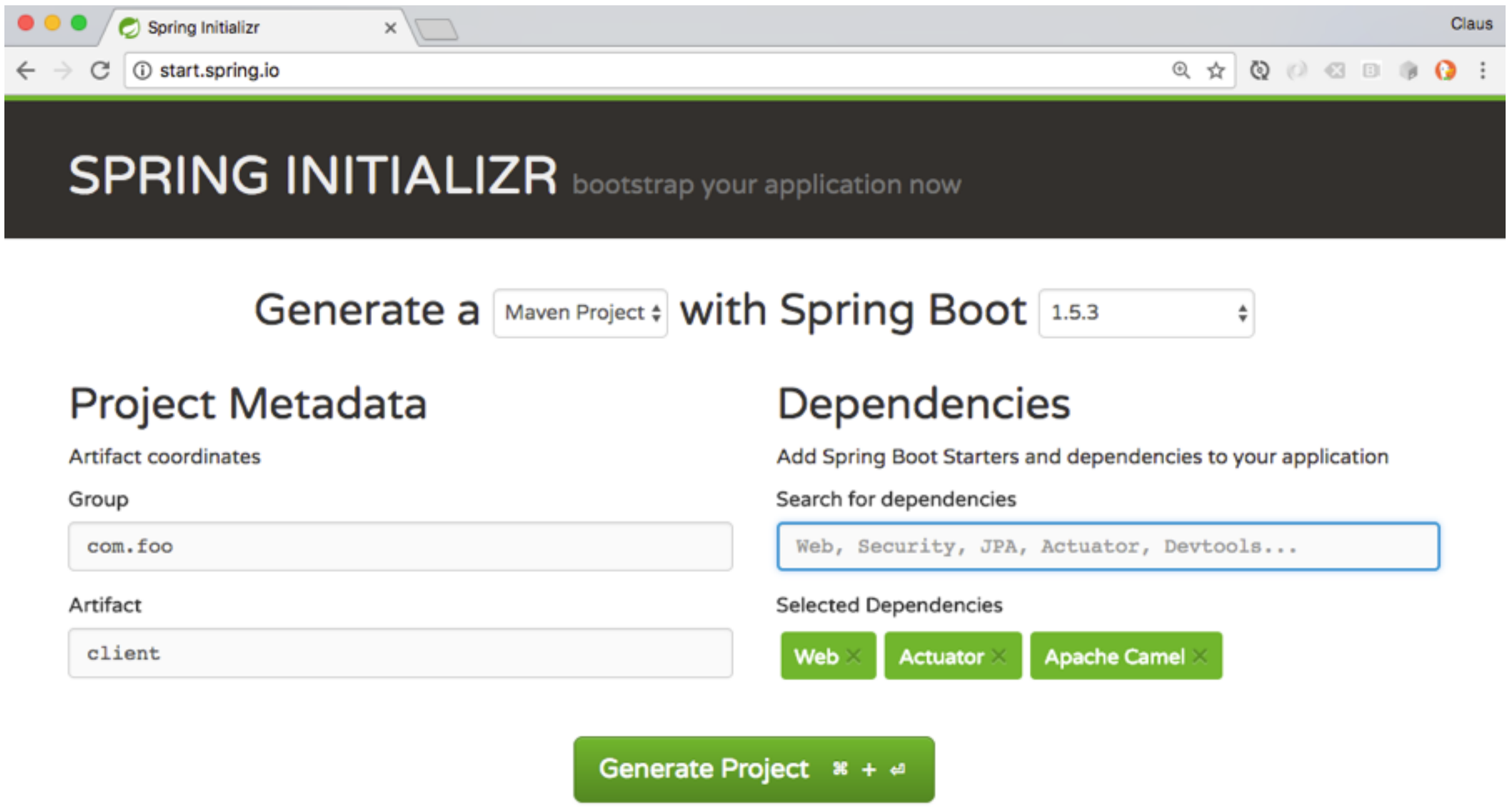
Hello Service

```
@Singleton
public class HelloRoute extends RouteBuilder {

    @Inject
    @Uri("undertow:http://0.0.0.0:8080/hello")
    private Endpoint undertow;

    @Inject
    private HelloBean hello;

    @Override
    public void configure() throws Exception {
        from(undertow).bean(hello);
    }
}
```

Hello Service

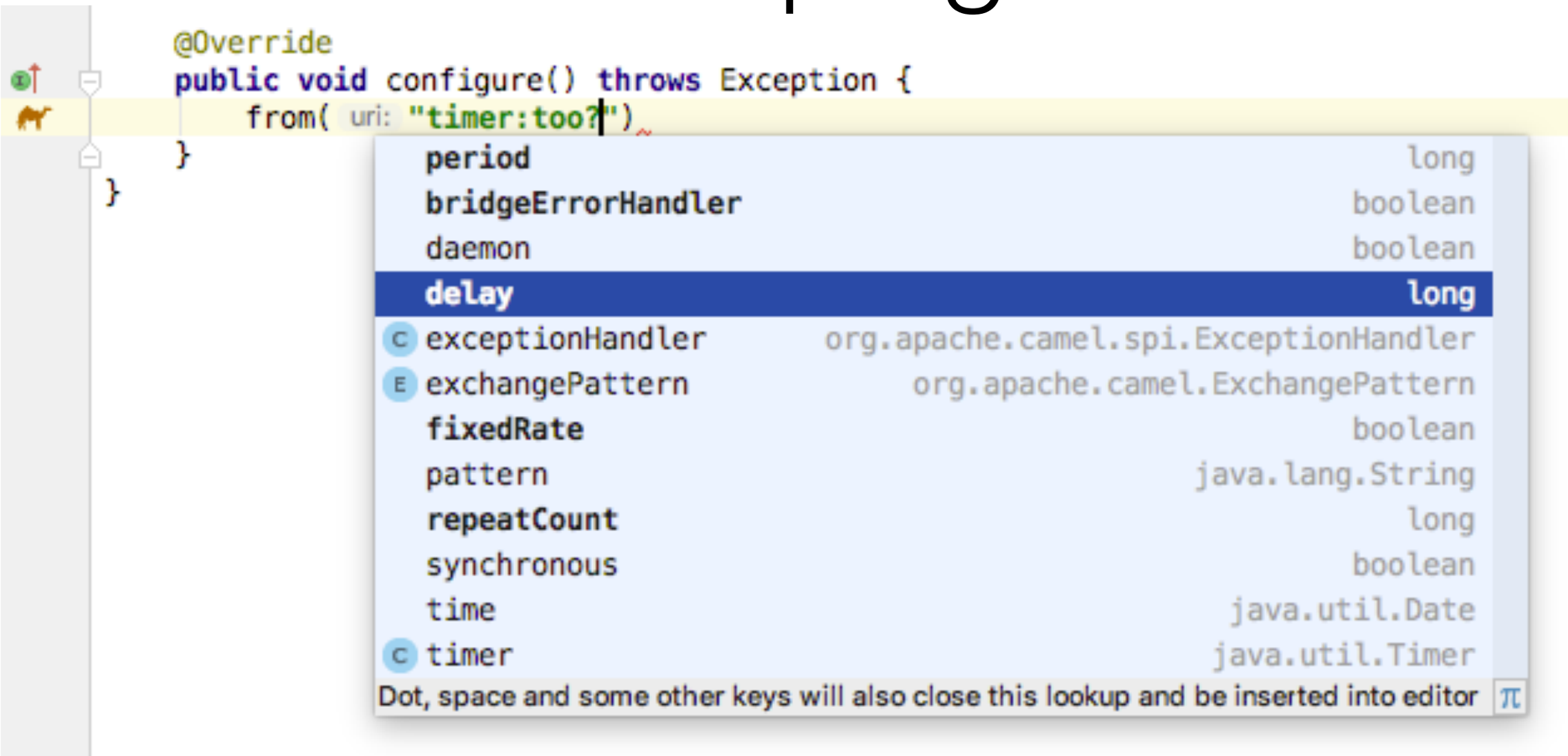
```
@Singleton
public class HelloBean {

    public String sayHello() throws Exception {
        String answer = "Swarm says hello from "
            + InetAddressUtil.getLocalHostName();
        return answer;
    }
}
```

Spring Boot Starter



Great plugin for IDEA users

Apache Camel IDEA plugin

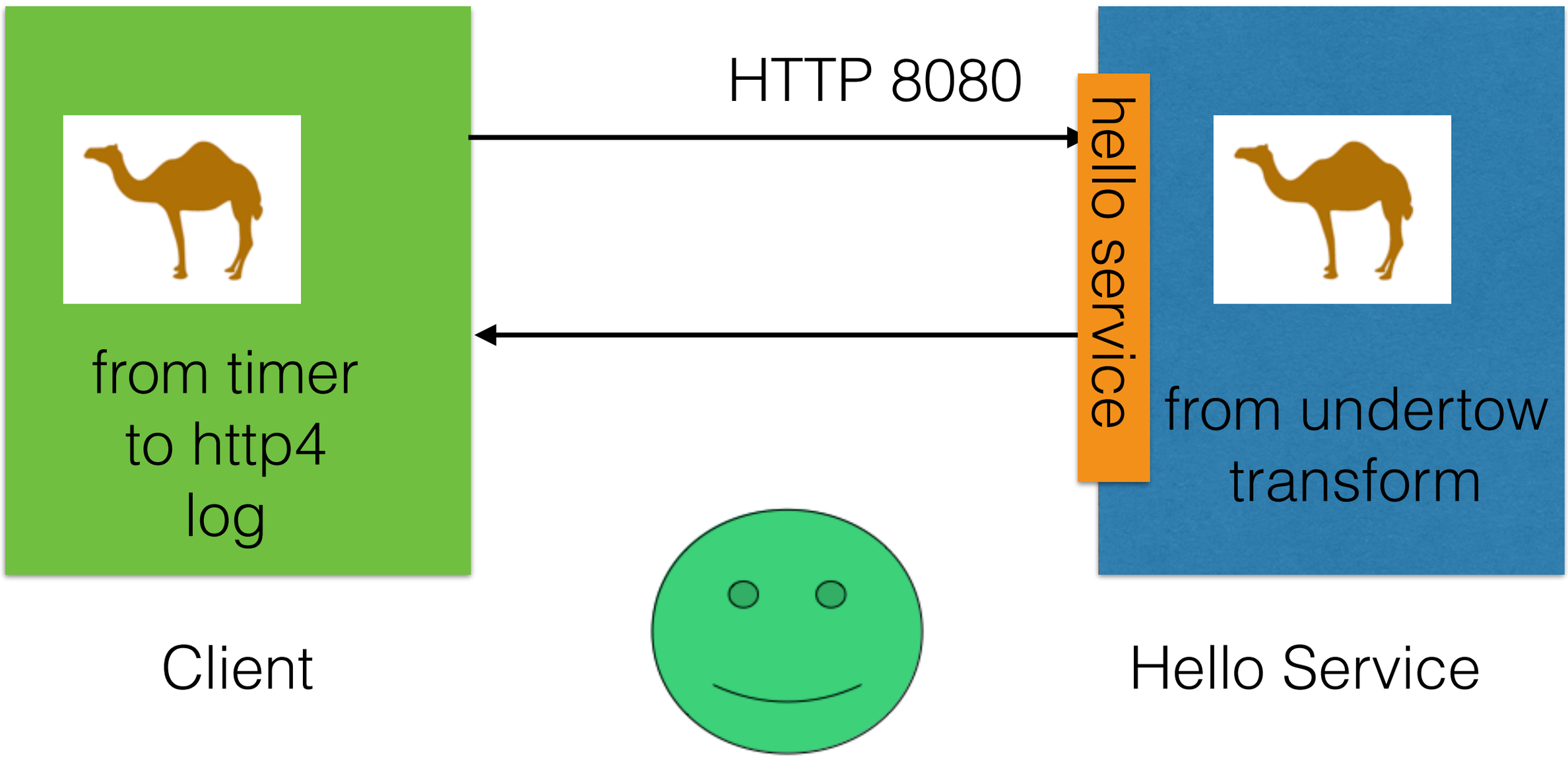


https://github.com/camel-idea-plugin/camel-idea-plugin

Client

```
@Component
public class MyRoute extends RouteBuilder {

    @Override
    public void configure() throws Exception {
        from( uri: "timer:foo?period=2000")
                .to("http4:localhost:8080/hello")
                .log("${body}");
    }
}
```

Ready to run local

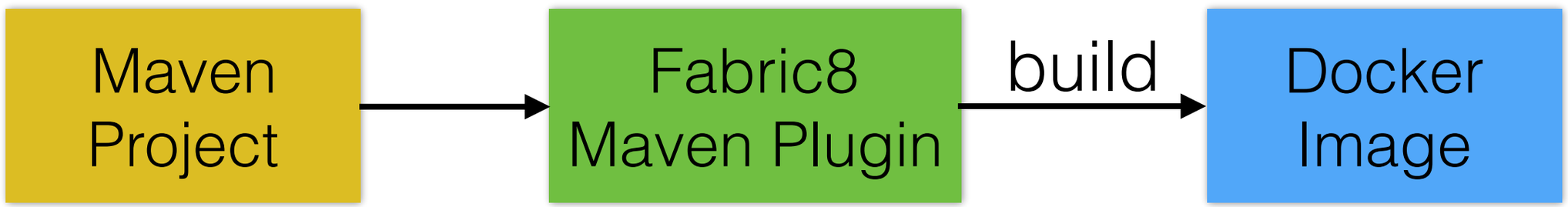


How to build Docker Image?

Maven Project

Docker Image

Fabric8 Maven Plugin



https://maven.fabric8.io

Fabric8 Maven Plugin


```
<plugin>
  <groupId>io.fabric8</groupId>
  <artifactId>fabric8-maven-plugin</artifactId>
  <version>3.3.5</version>
</plugin>
```

https://maven.fabric8.io

Installing Fabric8 Maven Plugin


```
mvn
io.fabric8:fabric8-maven-plugin:3.3.5:setup
```

https://maven.fabric8.io

Fabric8 Maven Plugin


```
<plugin>
  <groupId>io.fabric8</groupId>
  <artifactId>fabric8-maven-plugin</artifactId>
  <version>3.3.5</version>
  <executions>
    <execution>
      <id>fmp</id>
      <goals>
        <goal>resource</goal>
        <goal>helm</goal>
        <goal>build</goal>
      </goals>
    </execution>
  </executions>
</plugin>
```

Build Docker Image

OpenShift
S2I Build

```
[INFO] F8: Using OpenShift build with strategy S2I
[INFO] F8: Running generator wildfly-swarm
[INFO] F8: wildfly-swarm: Using Docker image fabric8/s2i-java:2.0 as base / builder
[INFO] Copying files to /Users/davsclaus/Documents/workspace/minishift-hello/helloswarm/
[INFO] Building tar: /Users/davsclaus/Documents/workspace/minishift-hello/helloswarm/tar
[INFO] F8: [helloswarm:latest] "wildfly-swarm": Created docker source tar /Users/davscla
rget/docker/helloswarm/latest/tmp/docker-build.tar
[INFO] F8: Creating BuildServiceConfig helloswarm-s2i for Source build
[INFO] F8: Creating ImageStream helloswarm
[INFO] F8: Starting Build helloswarm-s2i
[INFO] F8: Waiting for build helloswarm-s2i-1 to complete...
[INFO] F8: Receiving source from STDIN as archive ...
[INFO] F8: ==========================================================================
[INFO] F8: Starting S2I Java Build .....
[INFO] F8: S2I binary build from fabric8-maven-plugin detected
[INFO] F8: Copying binaries from /tmp/src/maven to /deployments ...
[INFO] F8: ... done
```

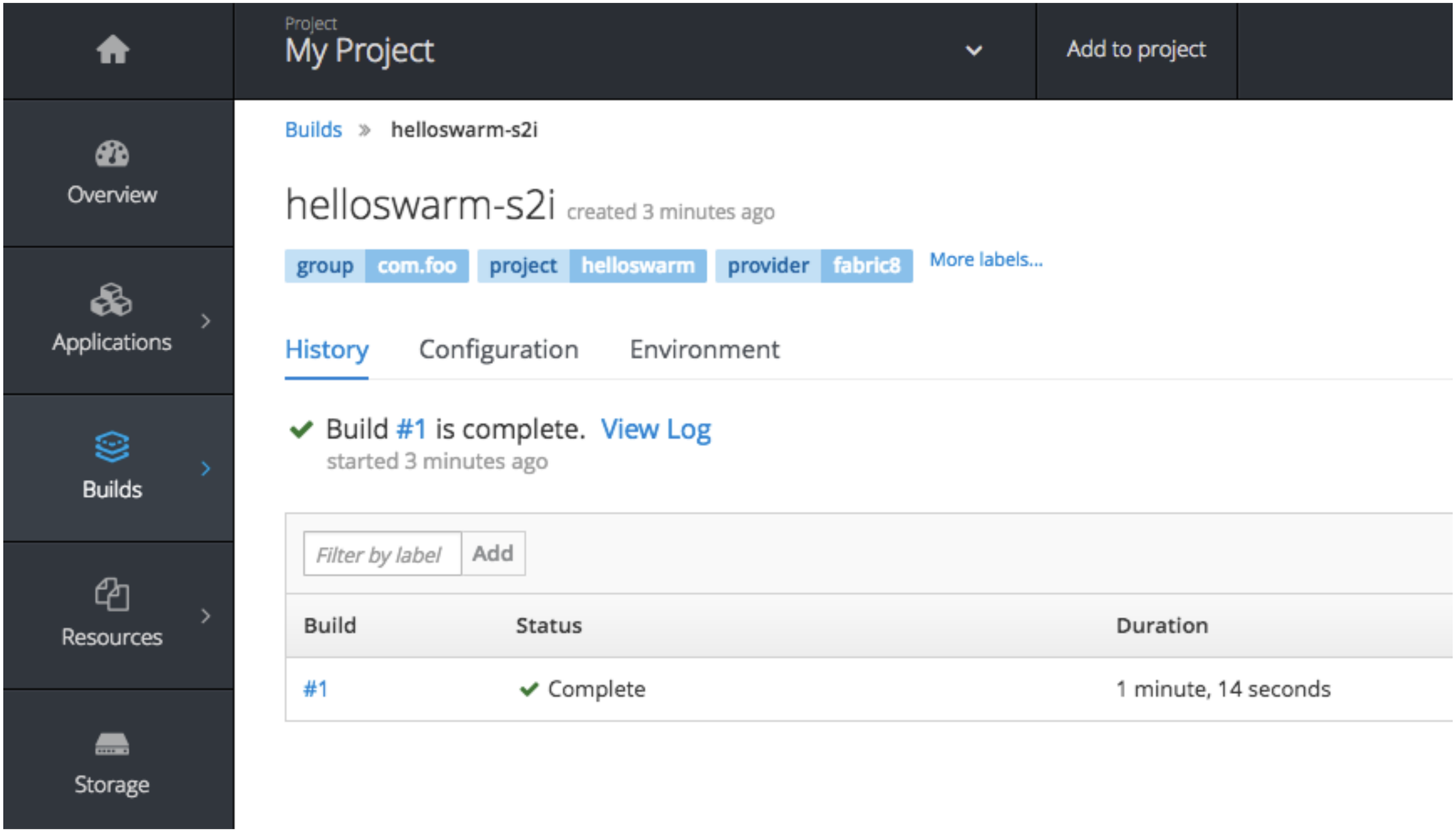
mvn package fabric8:build

OpenShift S2I Build

```
[INFO] F8:
[INFO] F8: Pushing image 172.30.1.1:5000/myproject/helloswarm:latest ...
[INFO] F8: Pushed 0/23 layers, 0% complete
[INFO] F8: Pushed 1/23 layers, 4% complete
[INFO] F8: Pushed 2/23 layers, 9% complete
[INFO] F8: Pushed 3/23 layers, 13% complete
[INFO] F8: Pushed 4/23 layers, 17% complete
[INFO] F8: Pushed 5/23 layers, 22% complete
[INFO] F8: Pushed 6/23 layers, 26% complete
[INFO] F8: Pushed 7/23 layers, 30% complete
[INFO] F8: Pushed 8/23 layers, 35% complete
[INFO] F8: Pushed 9/23 layers, 39% complete
[INFO] F8: Pushed 10/23 layers, 43% complete
[INFO] F8: Pushed 11/23 layers, 48% complete
[INFO] F8: Pushed 12/23 layers, 52% complete
[INFO] F8: Pushed 13/23 layers, 57% complete
[INFO] F8: Pushed 14/23 layers, 61% complete
[INFO] F8: Pushed 15/23 layers, 65% complete
[INFO] F8: Pushed 16/23 layers, 70% complete
[INFO] F8: Pushed 17/23 layers, 74% complete
[INFO] F8: Pushed 18/23 layers, 78% complete
[INFO] F8: Pushed 19/23 layers, 83% complete
[INFO] F8: Pushed 20/23 layers, 87% complete
[INFO] F8: Pushed 21/23 layers, 91% complete
[INFO] F8: Pushed 22/23 layers, 96% complete
[INFO] F8: Pushed 23/23 layers, 100% complete
[INFO] F8: Build helloswarm-s2i-1 Complete
[INFO] F8: Found tag on ImageStream helloswarm tag: sha256:f5fb6be5e26113967b6bd3
[INFO] F8: ImageStream helloswarm written to /Users/davsclaus/Documents/workspace
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
```

Live
Build Log
Output

OpenShift S2I Build



MiniShift
Docker Repository

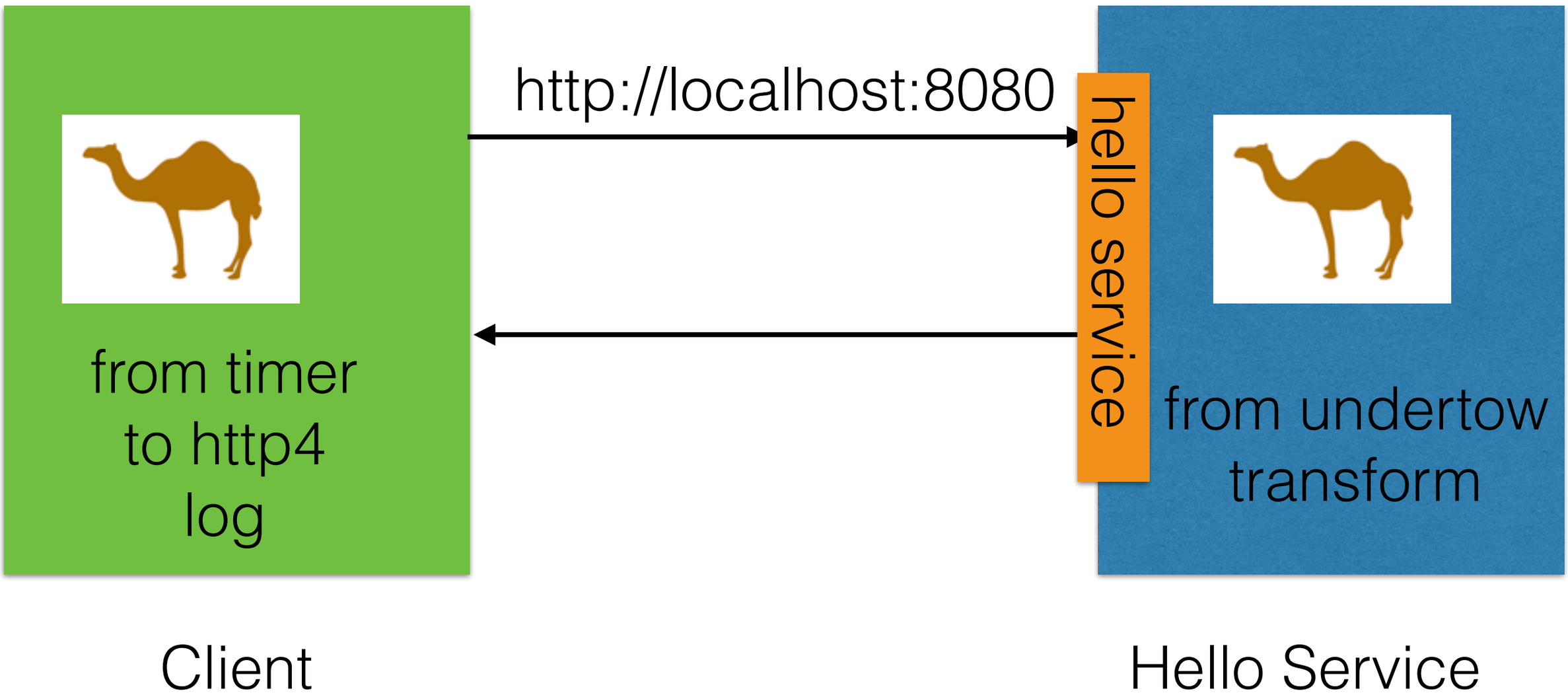
TIP Run minishift docker-env to setup Docker CLI

```
$ docker images
REPOSITORY                                          TAG
172.30.1.1:5000/myproject/client                    latest
172.30.1.1:5000/myproject/helloswarm                latest
openshift/origin-sti-builder                        v1.5.0
openshift/origin-deployer                           v1.5.0
openshift/origin-docker-registry                    v1.5.0
openshift/origin-haproxy-router                     v1.5.0
openshift/origin                                    v1.5.0
openshift/origin-pod                                v1.5.0
fabric8/s2i-java                                    2.0
```

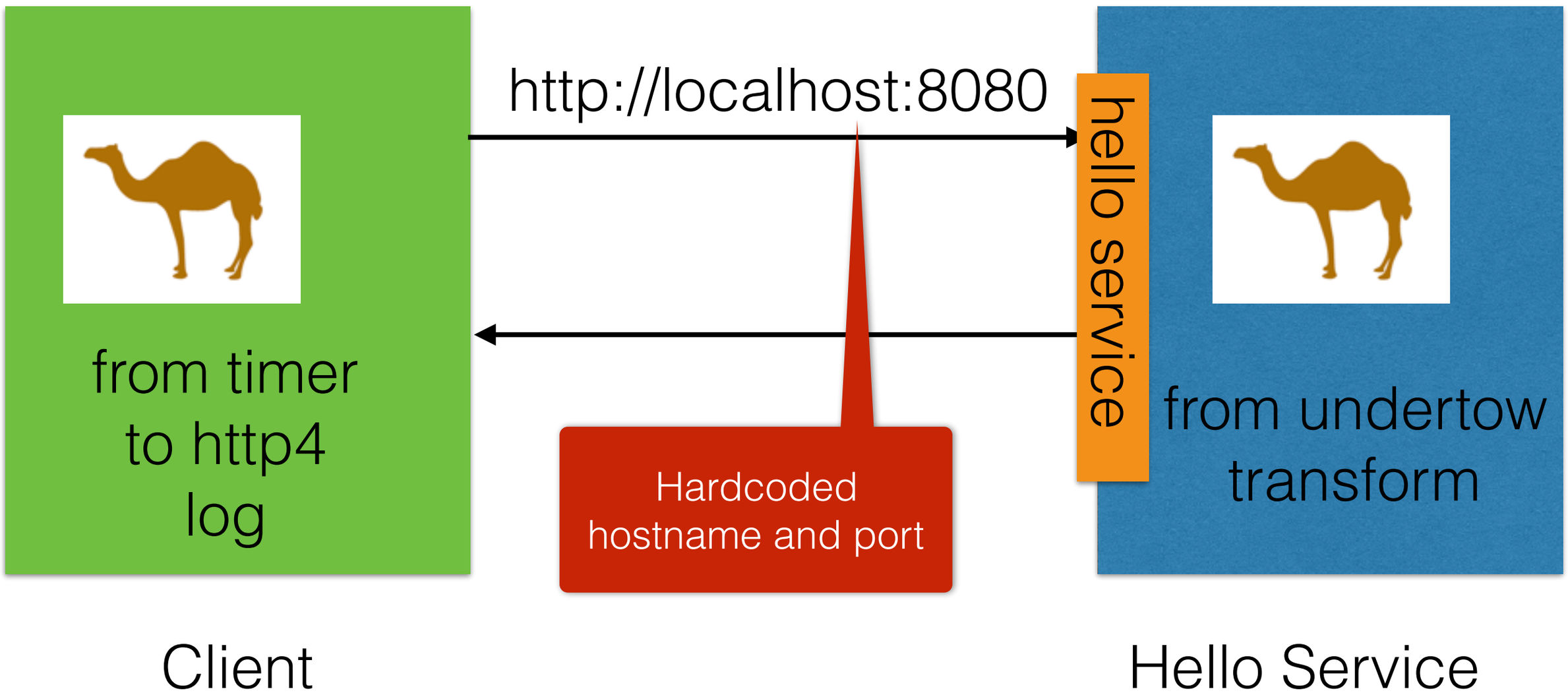
Client

Hello Service

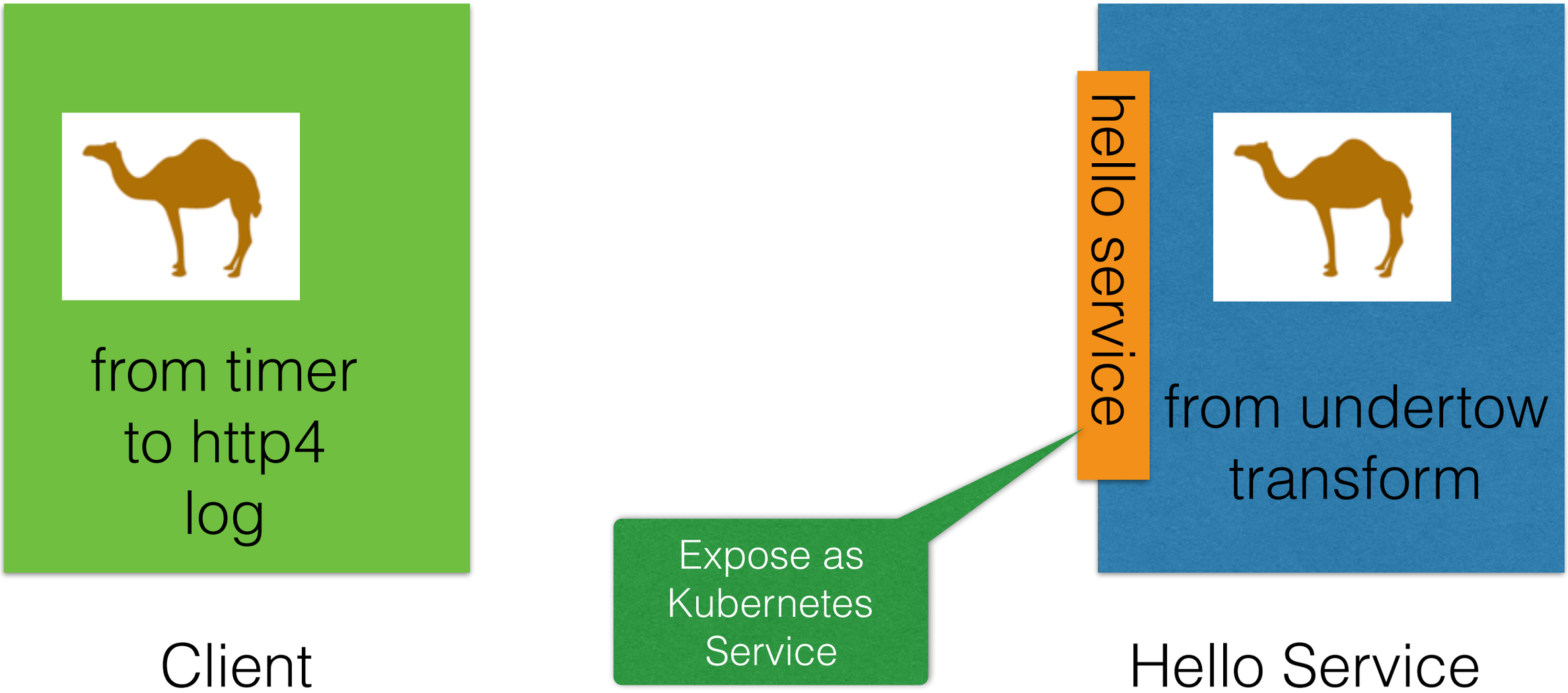
Our Demo


http://localhost:8080
hello service
from timer
to http4
log
from undertow
transform
Client
Hello Service

Static vs Dynamic Platform



Dynamic Platform



Dynamic Platform

Client

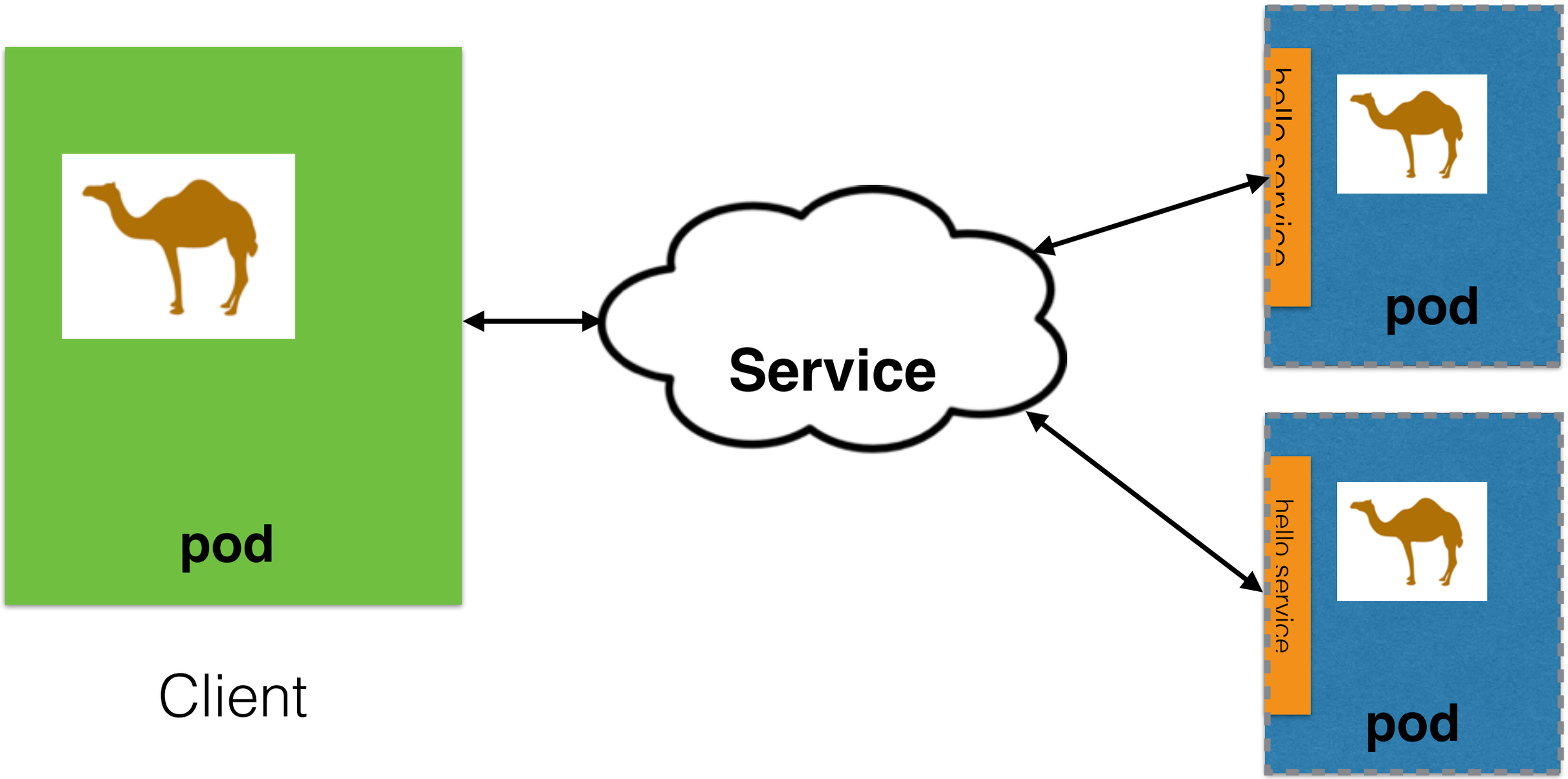
Hello Service

Dynamic Platform

Client

Hello Service

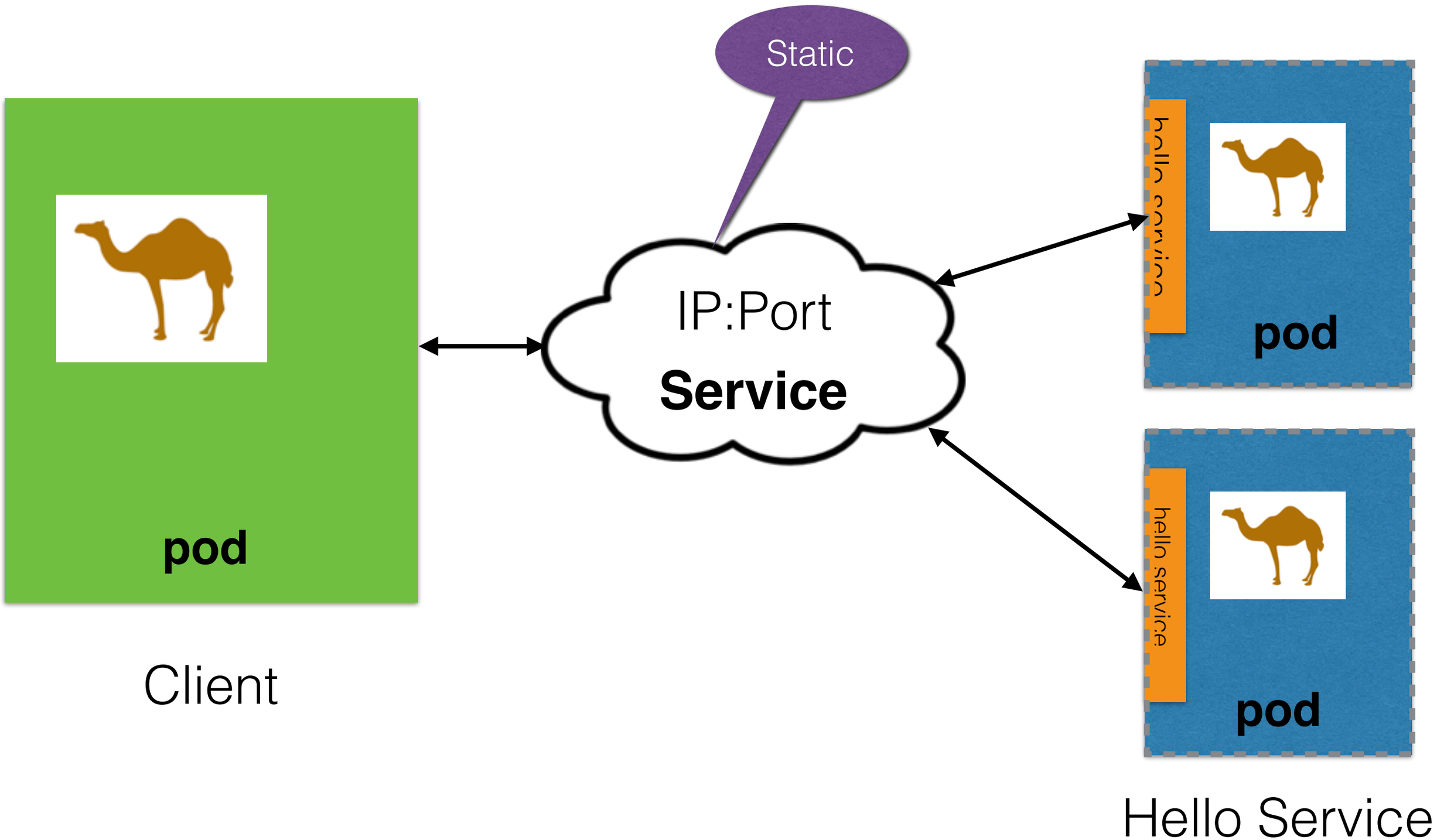
Dynamic Platform



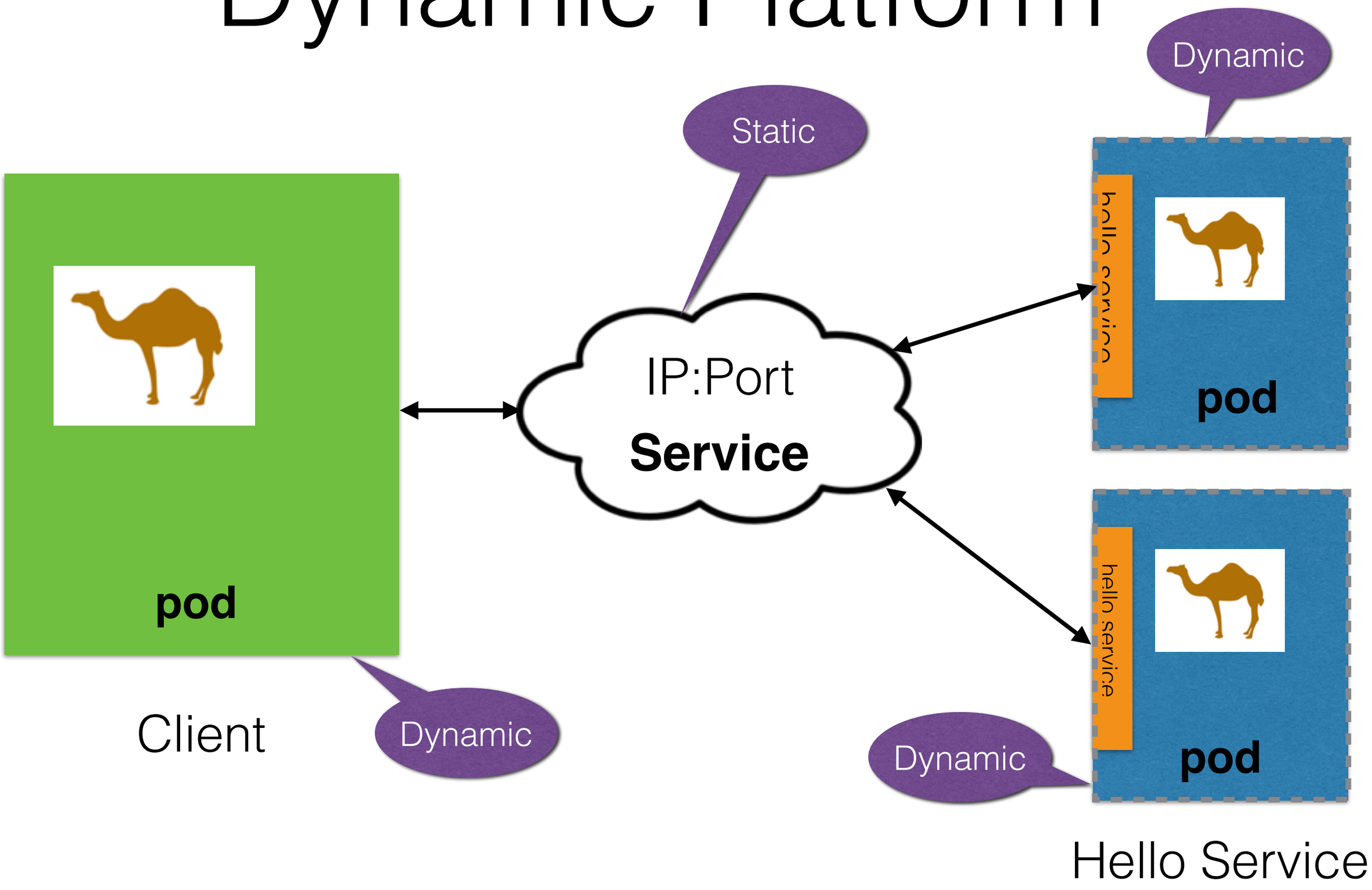
Client

Hello Service

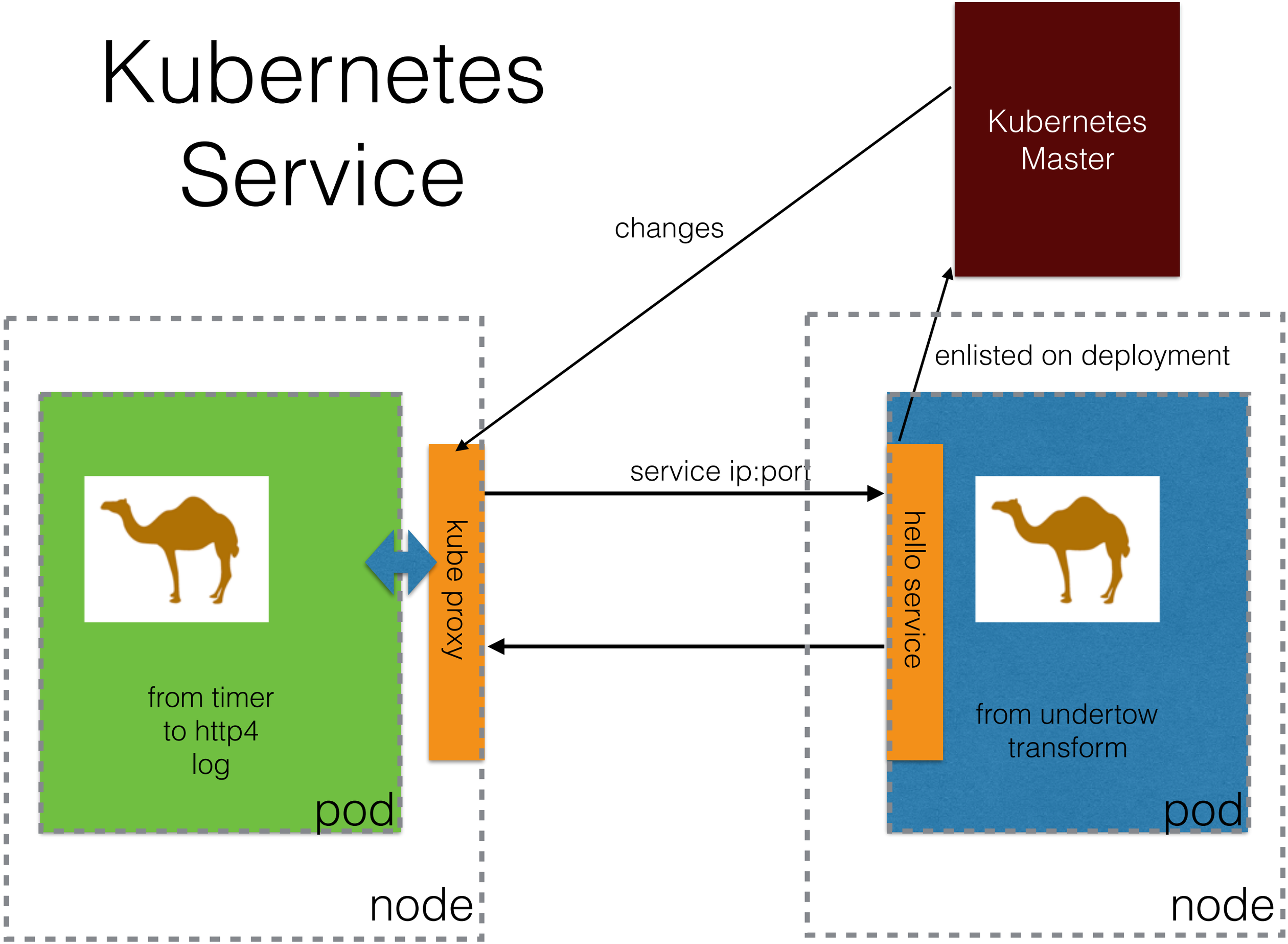
Dynamic Platform



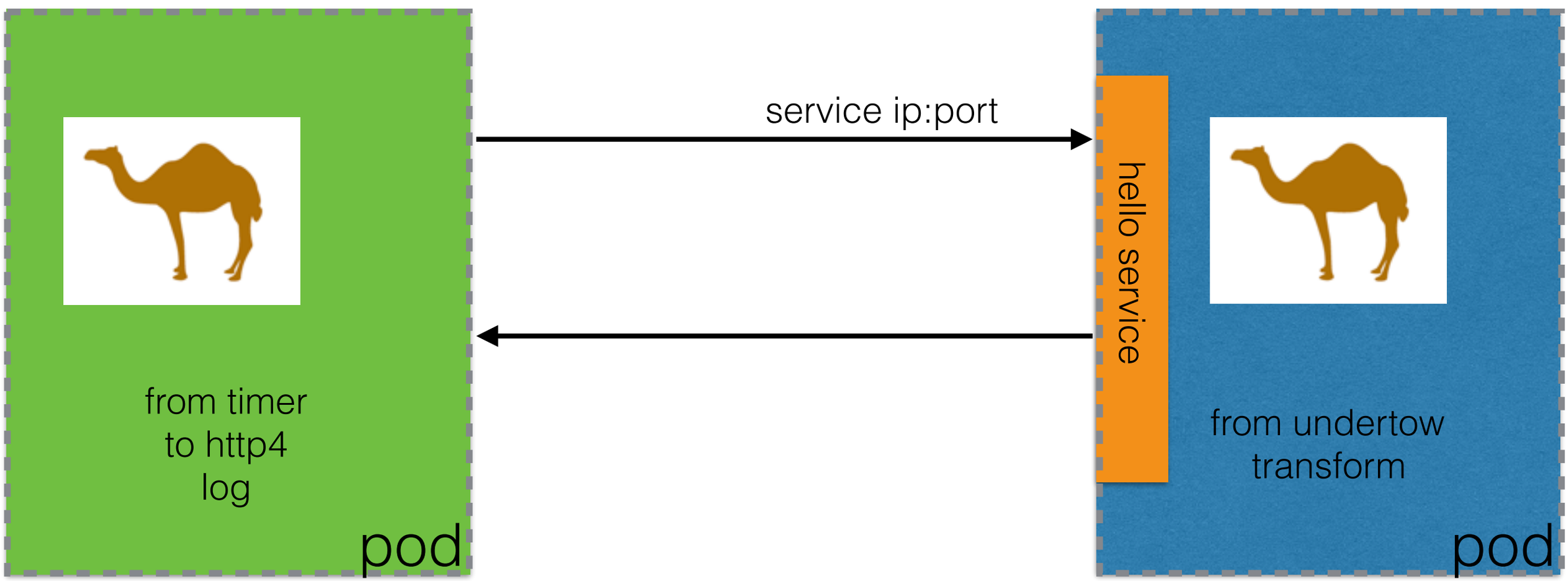
Dynamic Platform



Kubernetes Service



Kubernetes Service from user point of view



Using Kubernetes Service

from timer
to http4
log

Client

We want to use hello service

How do we do that?

Using Kubernetes Service

Client

- Environment Variables
  - Hostname
  - Port

```
export HELLOSWARM_SERVICE_HOST="172.30.237.105"
export HELLOSWARM_SERVICE_PORT="8080"
```

Service Discovery using DNS is also available

Service using ENV

Client

- {{service:name}}

```
@Component
public class MyRoute extends RouteBuilder {

    @Override
    public void configure() throws Exception {
        from( uri: "timer:too?period=2000")
                .to("http4:{{service:helloswarm}}/hello")
                .log("${body}");
    }
}
```

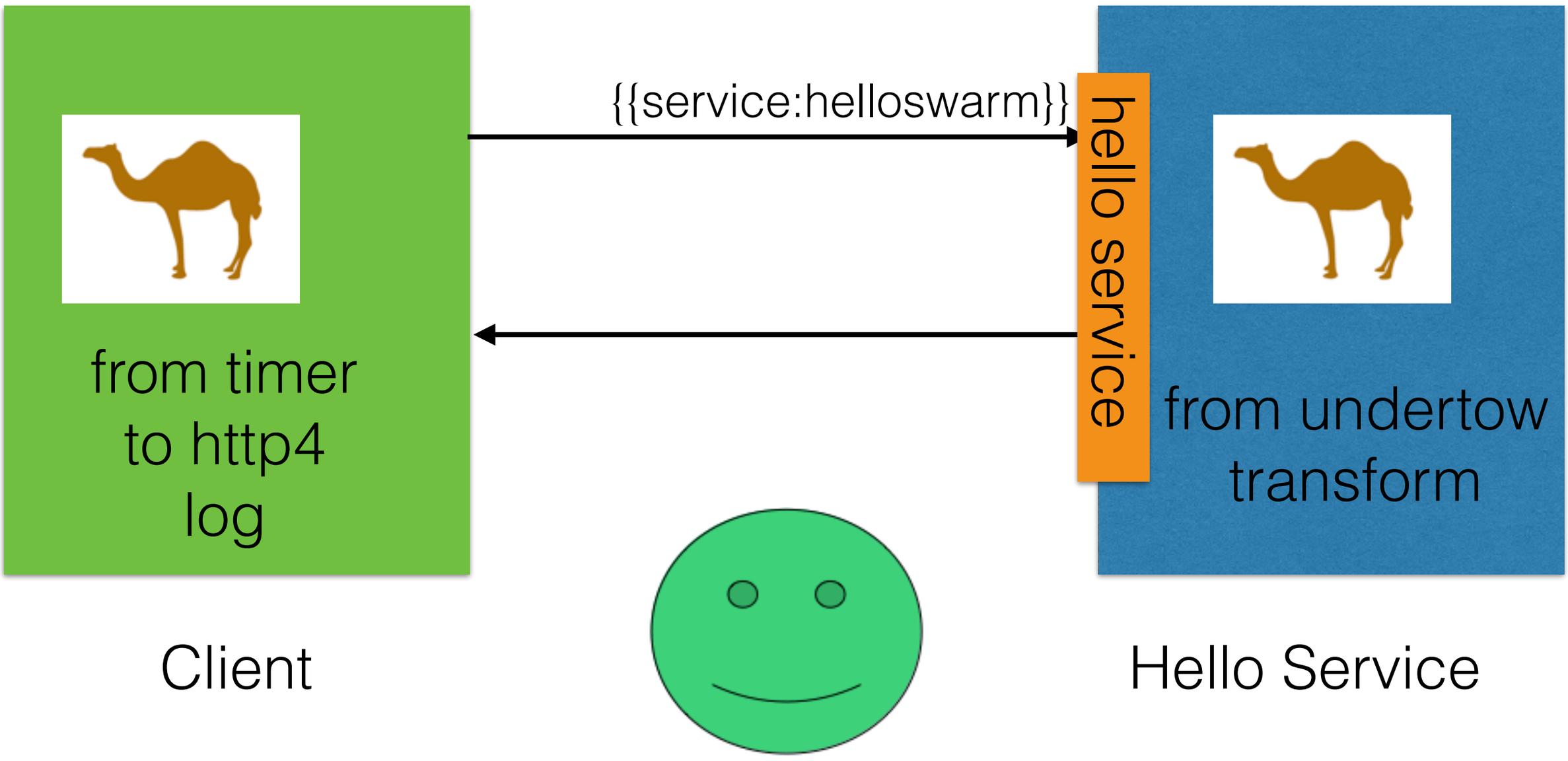
Service using DNS

Client

- servicename:port

```
@Component
public class MyRoute extends RouteBuilder {

    @Override
    public void configure() throws Exception {
        from( uri: "timer:too?period=2000")
                .to("http4:helloswarm:8080/hello")
                .log("${body}");
    }
}
```

Ready to run in OpenShift

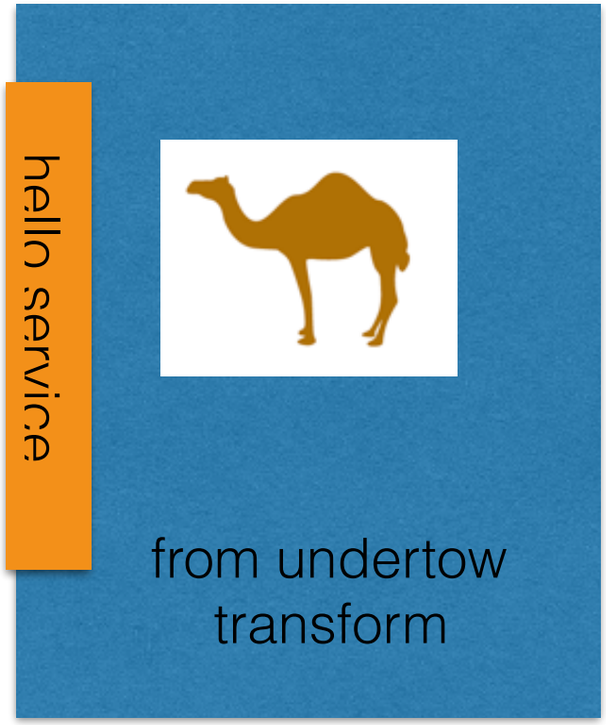


How to deploy to OpenShift?

Maven Project

How to deploy to OpenShift?

Deploy - Hello Service



Hello Service

- mvn fabric8:deploy

```
davsclaus:/Users/davsclaus/Documents/workspace/minishift-hello/helloswarm (master)/$ mvn fabric8:deploy
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building Wildfly Swarm Example 1.0-SNAPSHOT
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] >>> fabric8-maven-plugin:3.3.5:deploy (default-cli) > install @ helloswarm >>>
[INFO]
[INFO] --- maven-resources-plugin:2.6:resources (default-resources) @ helloswarm ---
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] Copying 1 resource
[INFO]
[INFO] --- fabric8-maven-plugin:3.3.5:resource (fmp) @ helloswarm ---
[INFO] F8: Running in OpenShift mode
[INFO] F8: Using docker image name of namespace: myproject
[INFO] F8: Running generator wildfly-swarm
[INFO] F8: wildfly-swarm: Using Docker image fabric8/java-jboss-openjdk8-jdk:1.2 as base / builder
[INFO] F8: fmp-controller: Adding a default Deployment
[WARNING] F8: fmp-service: Implicit service port mapping to port 80 has been disabled for the used port
either use set the config port = 80 or use legacyPortMapping = true. See https://maven.fabric8.io/#fmp-s
[INFO] F8: fmp-service: Adding a default service 'helloswarm' with ports [8080]
```

Deploy - Client

from timer
to http4
log

Client

- mvn fabric8:deploy

```
davsclaus:/Users/davsclaus/Documents/workspace/minishift-hello/client (master)/$ mvn fabric8:deploy
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building client 1.0-SNAPSHOT
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] >>> fabric8-maven-plugin:3.3.5:deploy (default-cli) > install @ client >>>
[INFO]
[INFO] --- maven-resources-plugin:2.6:resources (default-resources) @ client ---
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] Copying 1 resource
[INFO] Copying 0 resource
[INFO]
[INFO] --- fabric8-maven-plugin:3.3.5:resource (fmp) @ client ---
[INFO] F8: Running in OpenShift mode
[INFO] F8: Using docker image name of namespace: myproject
[INFO] F8: Running generator spring-boot
[INFO] F8: spring-boot: Using Docker image fabric8/java-jboss-openjdk8-jdk:1.2 as base / builder
[INFO] F8: fmp-controller: Adding a default Deployment
[WARNING] F8: fmp-service: Implicit service port mapping to port 80 has been disabled for the used port
either use set the config port = 80 or use legacyPortMapping = true. See https://maven.fabric8.io/#fmp-
[INFO] F8: fmp-service: Adding a default service 'client' with ports [8080]
[INFO] F8: spring-boot-health-check: Adding readiness probe on port 8080, path='/health', scheme='HTTP'
```

Run - Client

from timer
to http4
log

Runs in foreground, tail log,
undeploys when ctrl + c

- mvn fabric8:run

Client

```
[INFO] Updated DeploymentConfig: target/fabric8/applyJson/myproject/deploymentconfig-client-3.json
[INFO] F8: HINT: Use the command `oc get pods -w` to watch your pods start up
[INFO] F8: Scaling DeploymentConfig myproject/client to replicas: 1
[INFO] F8: Watching pods with selector LabelSelector(matchExpressions=[], matchLabels={project=client,
erties={}) waiting for a running pod...
[INFO] F8:[NEW] client-2-4vrdk status: Running Ready
[INFO] F8:[NEW] Tailing log of pod: client-2-4vrdk
[INFO] F8:[NEW] Press Ctrl-C to scale down the app and stop tailing the log
[INFO] F8:[NEW]
[INFO] F8: Starting the Java application using /opt/run-java/run-java.sh ...
[INFO] F8: exec java -javaagent:/opt/jolokia/jolokia.jar=config=/opt/jolokia/etc/jolokia.properties -c
[INFO] F8: I> No access restrictor found, access to any MBean is allowed
[INFO] F8: Jolokia: Agent started with URL https://172.17.0.6:8778/jolokia/
[INFO] F8:
[INFO] F8:   .   ____          _            __ _ _
[INFO] F8:  /\\ / ___'_ __ _ _(_)_ __  __ _ \ \ \ \
[INFO] F8: ( ( )\___ | '_ | '_| | '_ \/ _` | \ \ \ \
[INFO] F8:  \\/  ___)| |_)| | | | | || (_| |  ) ) ) )
[INFO] F8:   '  |____| .__|_| |_|_| |_\__, | / / / /
[INFO] F8:  =========|_|==============|___/=/_/_/_/
[INFO] F8:  :: Spring Boot ::        (v1.5.3.RELEASE)
```

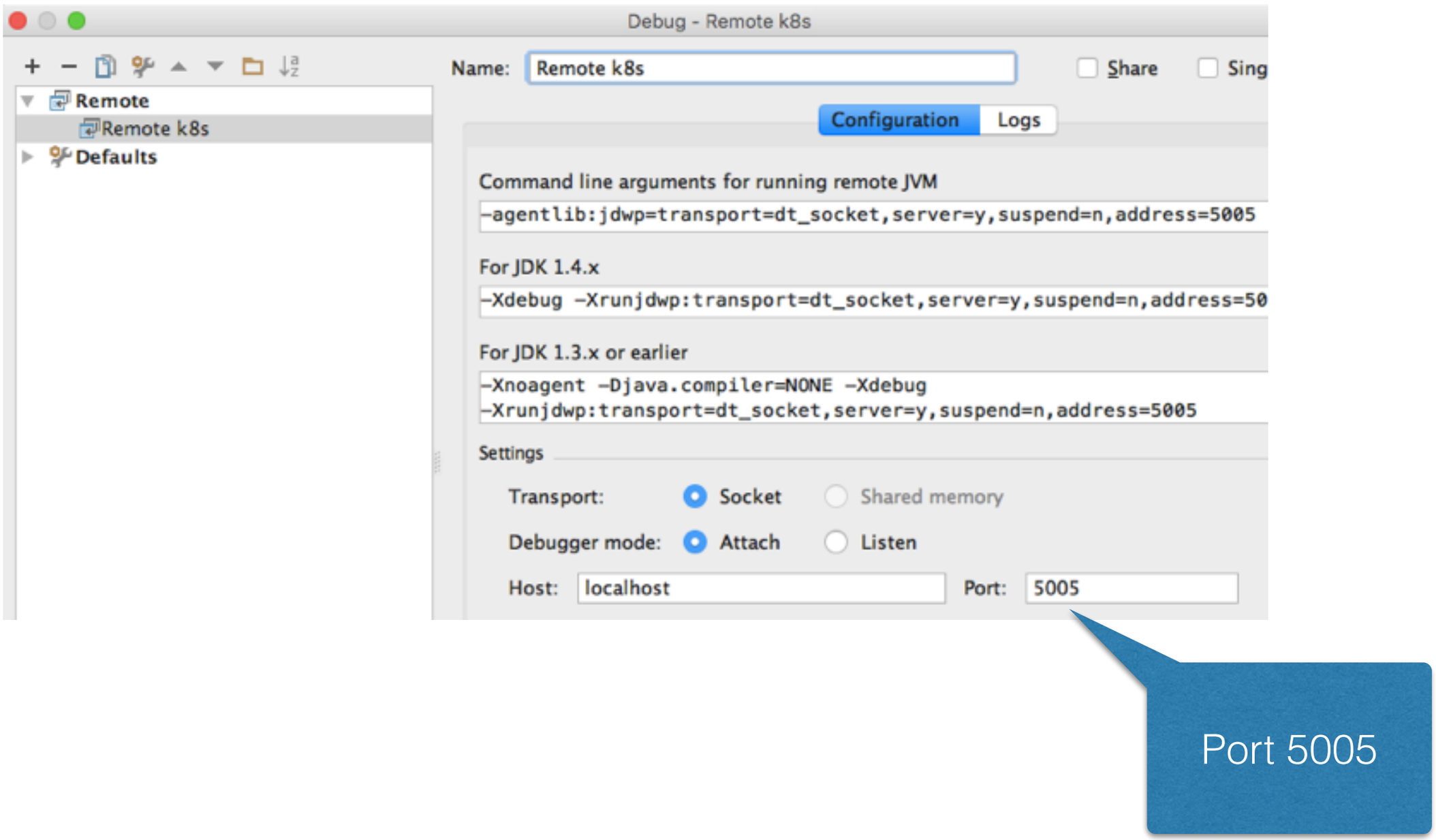
Debugging

- Debugging Pods

```
mvn fabric8:debug
```

```
[INFO] F8> Port forwarding to port 5005 on pod helloswarm-1942392107-13p2p using command: kubectl
[INFO] F8> Executing command: kubectl port-forward helloswarm-1942392107-13p2p 5005:5005
[INFO] F8>
[INFO] F8> Now you can start a Remote debug execution in your IDE by using localhost and the debug port 5005
[INFO] F8>
[INFO] kubectl> Forwarding from 127.0.0.1:5005 -> 5005
[INFO] kubectl> Forwarding from [::1]:5005 -> 5005
[INFO] kubectl> Handling connection for 5005
```

Remote Debug



Remote Debug

HelloBean.java - helloswarm - [~/Documents/workspace/minishift-hello/helloswarm]

Remote k8s

helloswarm > src > main > java > com > foo > HelloBean

Project | Packages | Project Files

- helloswarm ~/Documents/workspace/minishift-hello/h
  - .idea
  - src
    - main
      - java
        - com
          - foo
            - HelloBean
            - HelloRoute
      - resources
        - META-INF
          - beans.xml
  - target
    - classes

HelloBean.java

HelloBean | sayHello()

```
1  package com.foo;
2
3  import javax.inject.Singleton;
4
5  import org.apache.camel.util.InetAddressUtil;
6
7  @Singleton
8  public class HelloBean {
9
10     public String sayHello() throws Exception {
11         String answer = "Swarm says hello from "   answer: "Swarm says hello
12             + InetAddressUtil.getLocalHostName();
13         return answer;   answer: "Swarm says hello from helloswarm-5-5d02t"
14     }
15 }
16
```

Breakpoint hit

Debug | Remote k8s

Debugger | Console

Frames | Threads

"default task-1"@10,817 in group "main":...

sayHello:13, HelloBean *(com.foo)*

invoke0:-1, NativeMethodAccessorImpl *(sun.reflect)*

Variables

- this = {com.foo.HelloBean@10851}
- answer = "Swarm says hello from helloswarm-5-5d02t"

OpenShift CLI

You can also use CLI from docker & kubernetes

- oc get pods

```
davsclaus:/Users/davsclaus/$ oc get pods
NAME                        READY     STATUS      RESTARTS   AGE
client-2-j7142              1/1       Running     0          4m
client-s2i-1-build          0/1       Completed   0          10m
client-s2i-2-build          0/1       Completed   0          4m
helloswarm-1-bjdbj          1/1       Running     2          16m
helloswarm-1-s5rfh          1/1       Running     0          22m
helloswarm-s2i-1-build      0/1       Completed   0          28m
helloswarm-s2i-2-build      0/1       Completed   0          24m
```

OpenShift CLI

- oc logs -f <pod name>

```
davsclaus:/Users/davsclaus/Documents/workspace/minishift-hello (master)/$ oc logs -f client-2-7fnn9
Starting the Java application using /opt/run-java/run-java.sh ...
exec java -javaagent:/opt/jolokia/jolokia.jar=config=/opt/jolokia/etc/jolokia.properties -cp . -jar
I> No access restrictor found, access to any MBean is allowed
Jolokia: Agent started with URL https://172.17.0.5:8778/jolokia/

  .   ____          _            __ _ _
 /\\ / ___'_ __ _ _(_)_ __  __ _ \ \ \ \
( ( )\___ | '_ | '_| | '_ \/ _` | \ \ \ \
 \\/  ___)| |_)| | | | | || (_| |  ) ) ) )
  '  |____| .__|_| |_|_| |_\__, | / / / /
 =========|_|==============|___/=/_/_/_/
 :: Spring Boot ::        (v1.5.3.RELEASE)
Swarm says hello from helloswarm-4-p1wxr
Swarm says hello from helloswarm-4-p1wxr
Swarm says hello from helloswarm-4-p1wxr
Swarm says hello from helloswarm-4-p1wxr
Swarm says hello from helloswarm-4-p1wxr
Swarm says hello from helloswarm-4-p1wxr
Swarm says hello from helloswarm-4-p1wxr
Swarm says hello from helloswarm-4-p1wxr
```

OpenShift CLI

- oc get service

```
davsclaus:/Users/davsclaus/$ oc get services
NAME          CLUSTER-IP       EXTERNAL-IP   PORT(S)    AGE
client        172.30.232.162   <none>        8080/TCP   11m
helloswarm    172.30.167.101   <none>        8080/TCP   23m
```

OpenShift CLI

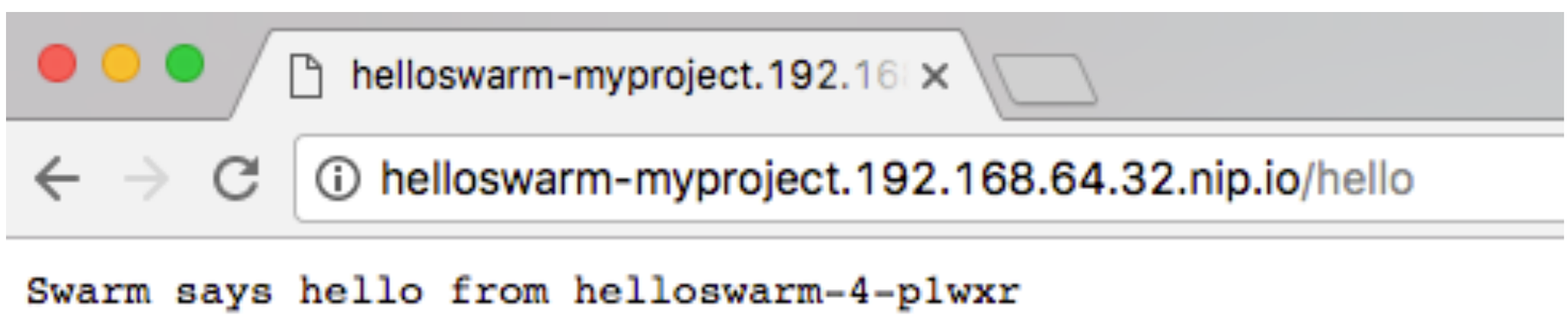
- oc get routes

```
davsclaus:/Users/davsclaus/$ oc get routes
NAME          HOST/PORT                                    PATH      SERVICES     PORT
client        client-myproject.192.168.64.32.nip.io                  client       8080
helloswarm    helloswarm-myproject.192.168.64.32.nip.io              helloswarm   8080
```

Can call service from your computer

Access Service from your computer

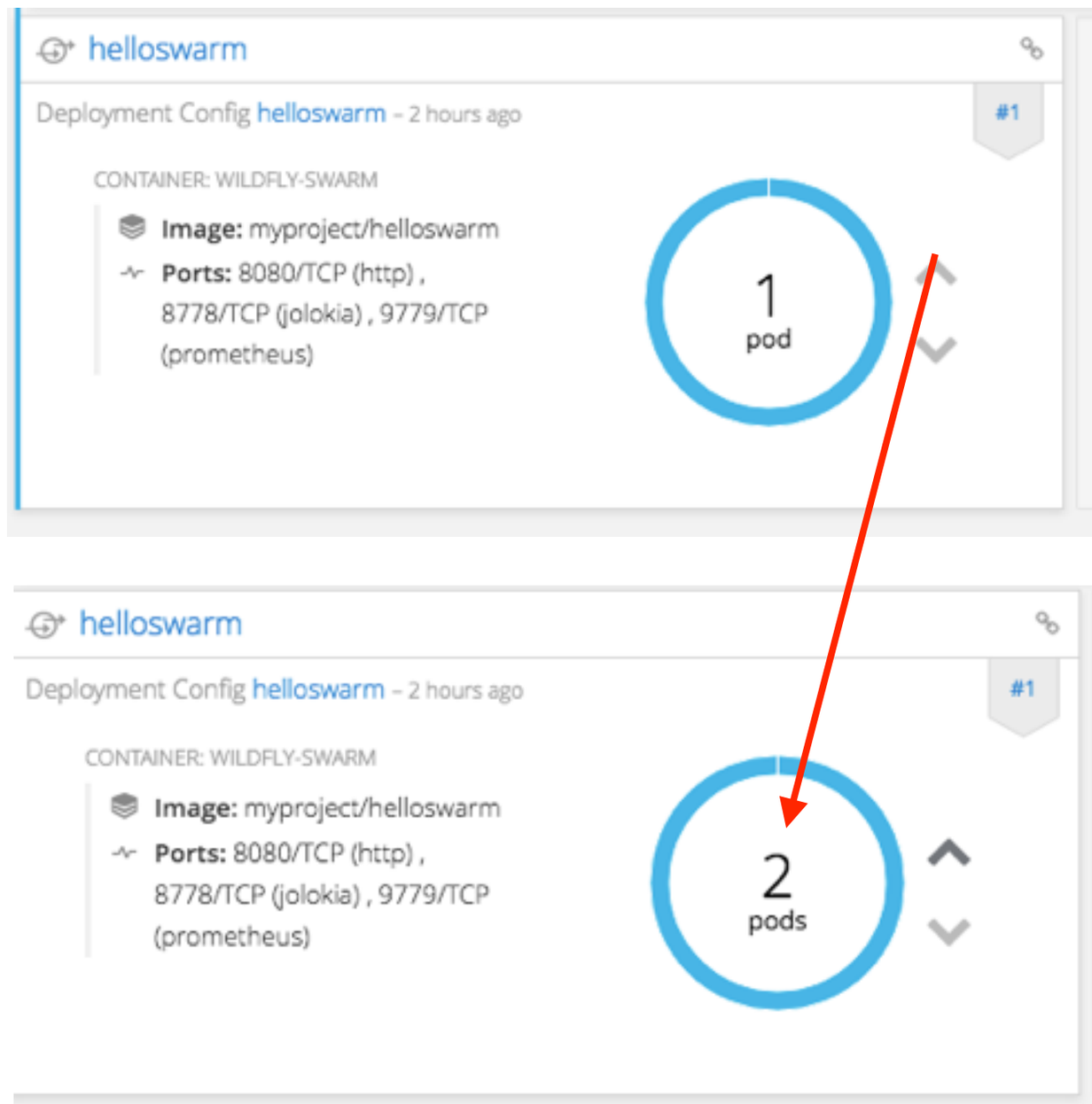
- minishift openshift service helloswarm -n myproject



Name of project (namespace)

Scaling

- Change deployment replicas



Scaling

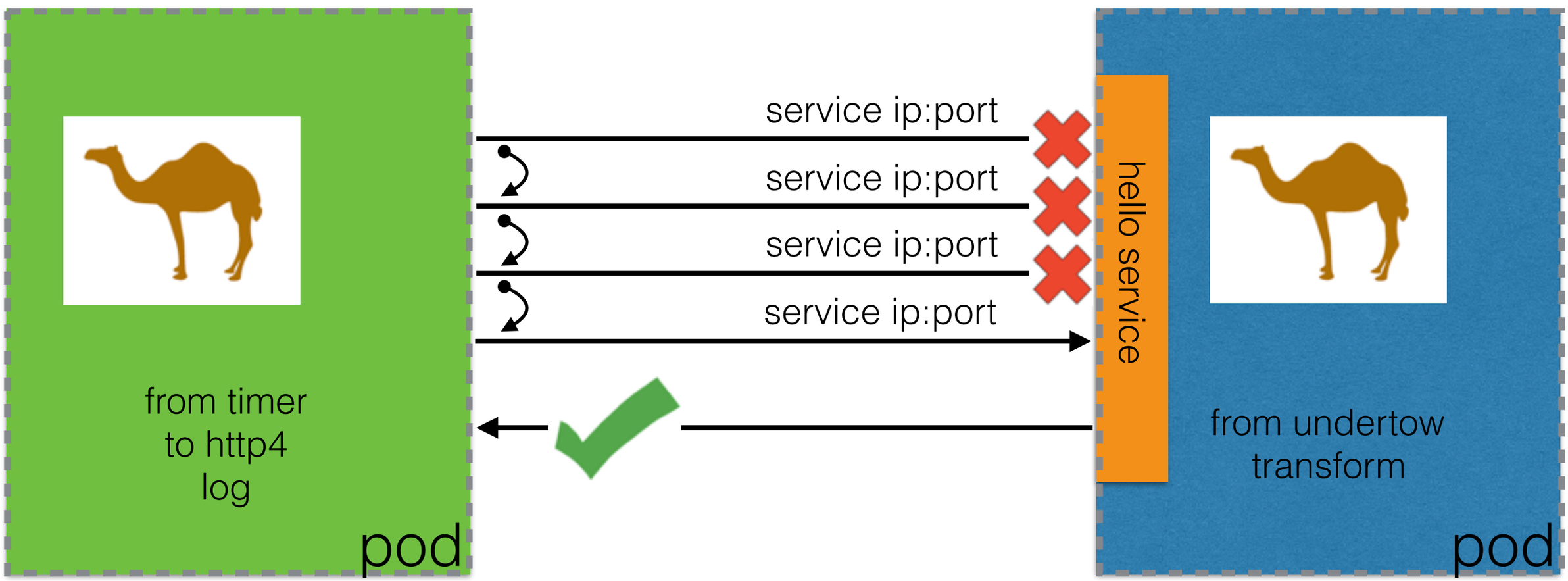
Load balancing is random

- Service load balancing

```
: Swarm says hello from helloswarm-1-bjdbj
: Swarm says hello from helloswarm-1-bjdbj
: Swarm says hello from helloswarm-1-bjdbj
: Swarm says hello from helloswarm-1-bjdbj
: Swarm says hello from helloswarm-1-s5rfh
: Swarm says hello from helloswarm-1-s5rfh
: Swarm says hello from helloswarm-1-bjdbj
: Swarm says hello from helloswarm-1-bjdbj
: Swarm says hello from helloswarm-1-bjdbj
: Swarm says hello from helloswarm-1-bjdbj
: Swarm says hello from helloswarm-1-s5rfh
: Swarm says hello from helloswarm-1-s5rfh
: Swarm says hello from helloswarm-1-bjdbj
: Swarm says hello from helloswarm-1-s5rfh
: Swarm says hello from helloswarm-1-bjdbj
```

Error Handling

- Client Side Retry



Error Handling

- Client Side Retry

```
@Component
public class MyRoute extends RouteBuilder {

    @Override
    public void configure() throws Exception {
        // try to call the service again
        onException(Exception.class)
                .maximumRedeliveries(10)
                .redeliveryDelay(1000);

        from( uri: "timer:foo?period=2000")
                .to("http4:{{service:helloswarm}}/hello")
                .log("${body}");
    }
}
```

Error Handling

- Client Side Retry

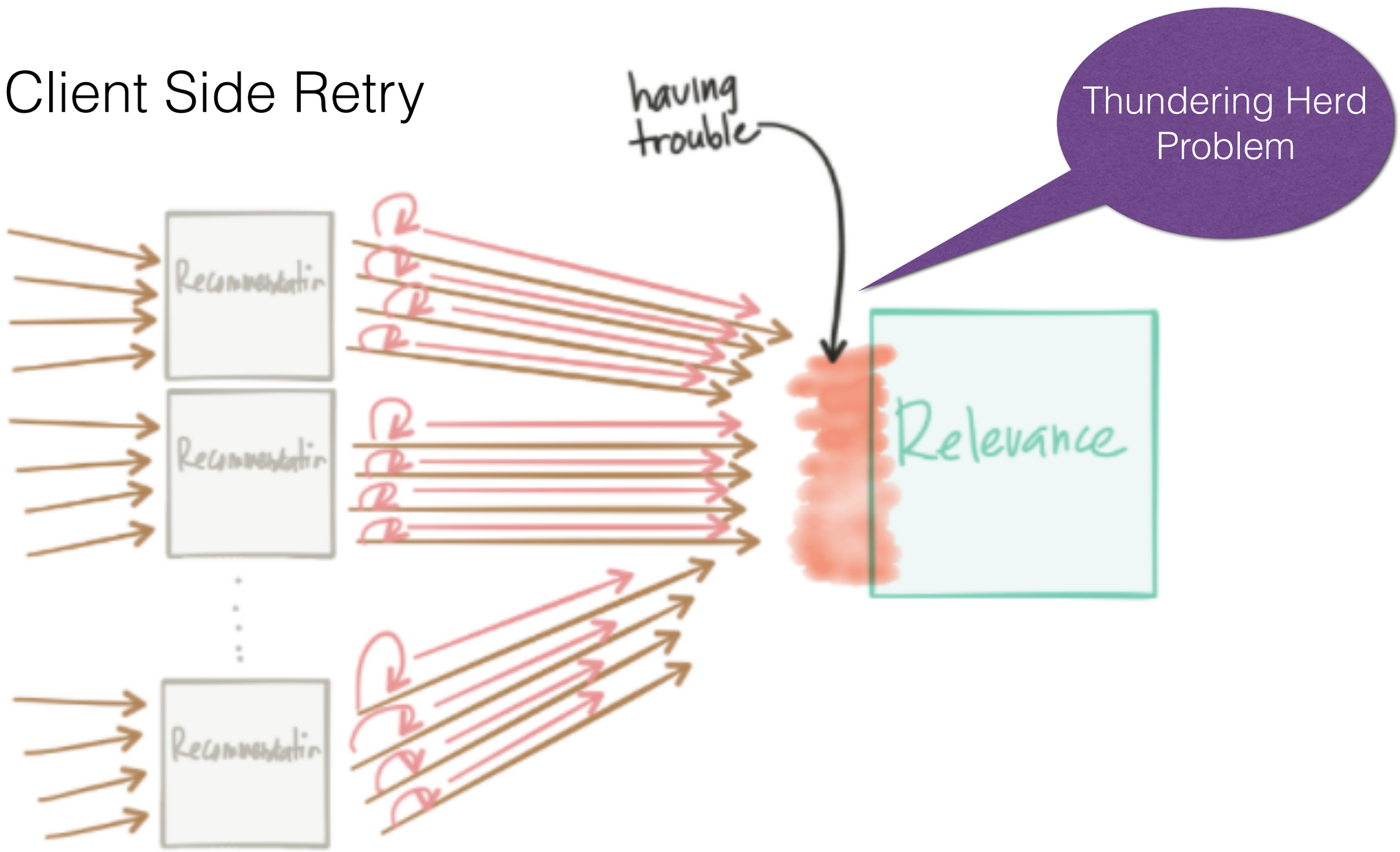
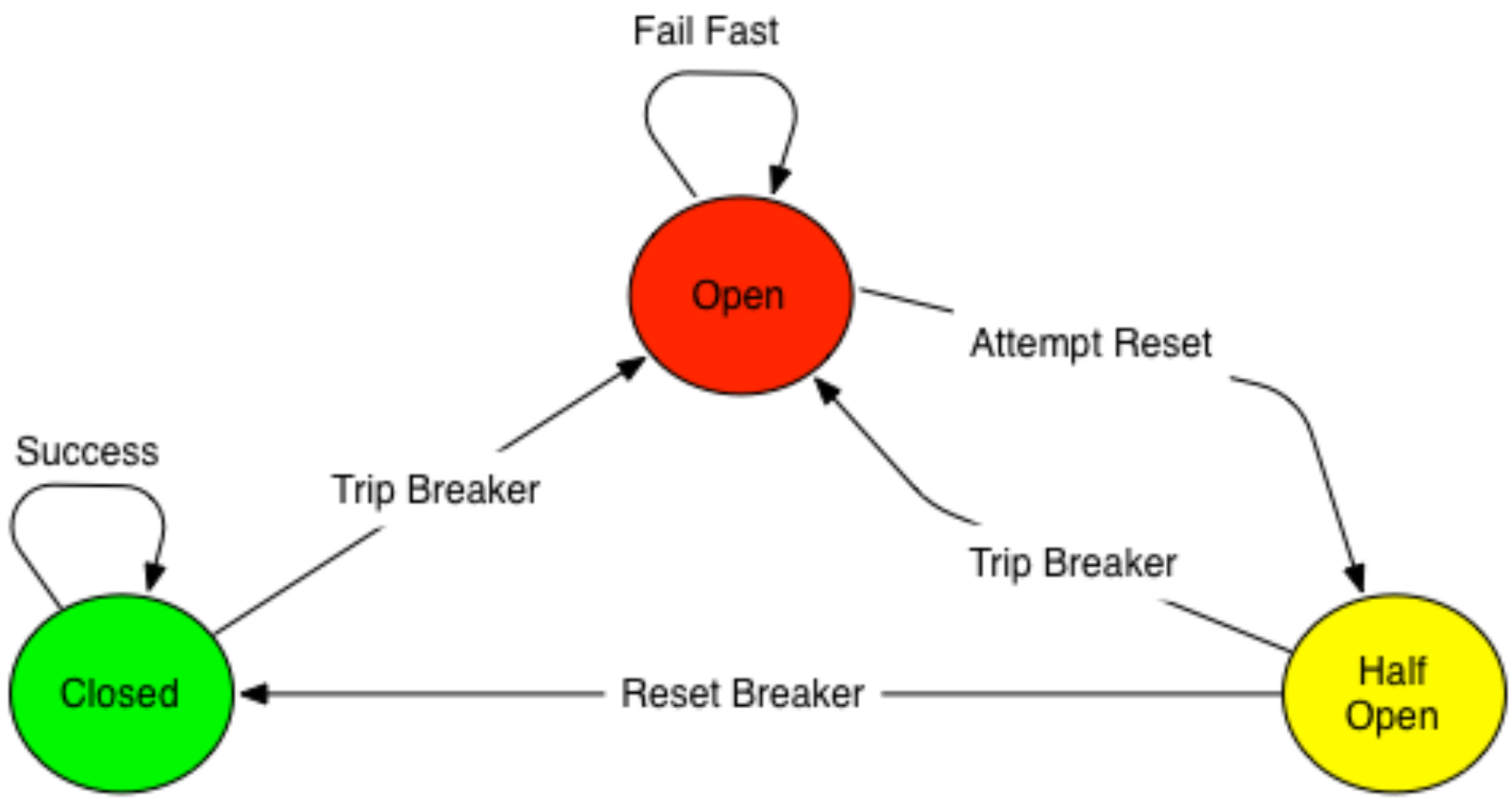


Figure by Christian Posta

Error Handling

- Client Side Circuit Breaker with Hystrix

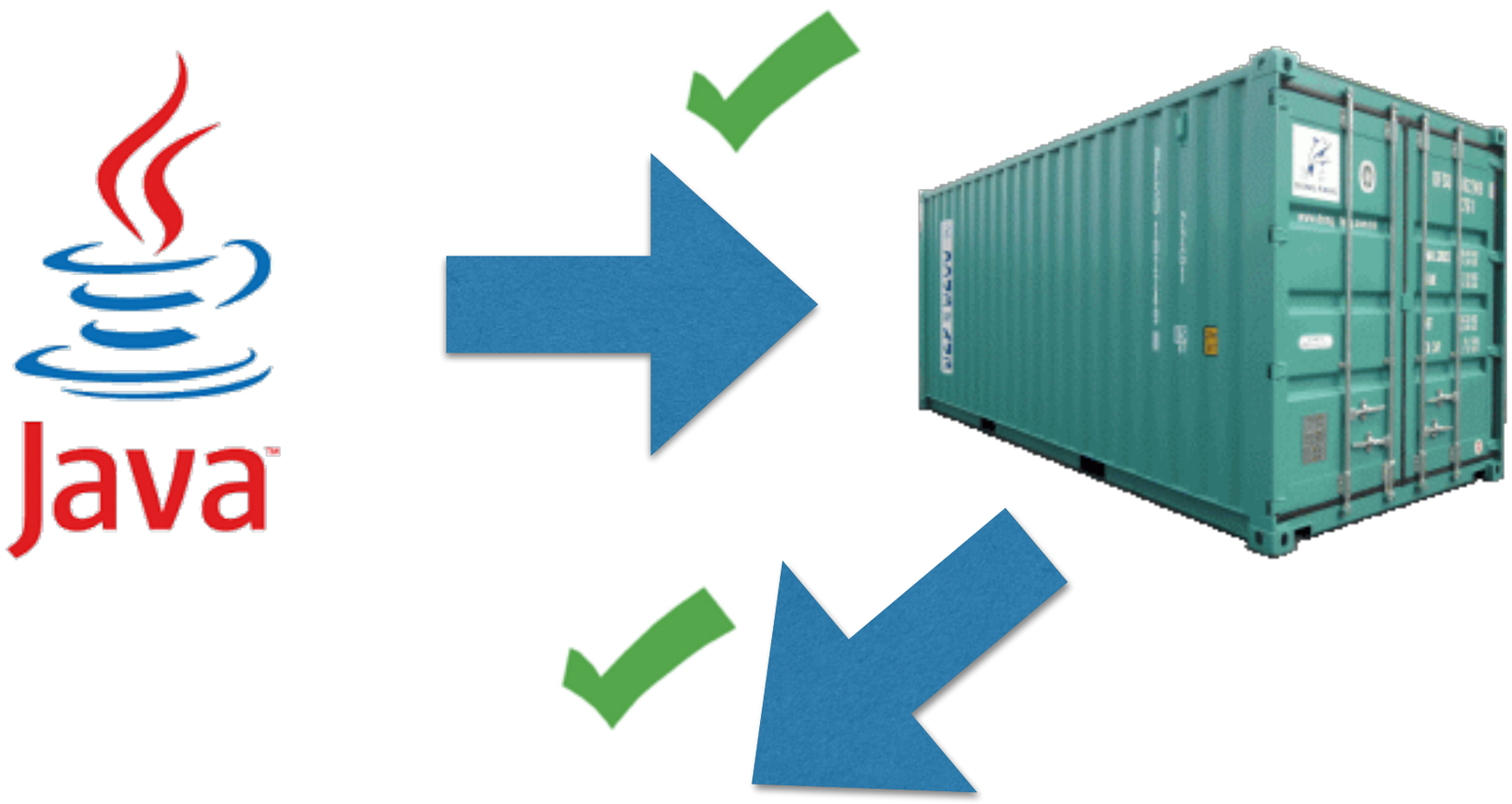


Error Handling

- Client Side Circuit Breaker with Hystrix

```
@Component
public class MyRoute extends RouteBuilder {

    @Override
    public void configure() throws Exception {
        from( uri: "timer:foo?period=2000")
            .hystrix()
                .to("http4:{{service:helloswarm}}/hello")
            .onFallback()
                .setBody().constant( value: "Nobody want to talk to me")
            .end()
                .log("${body}");
    }
}
```

Key Message

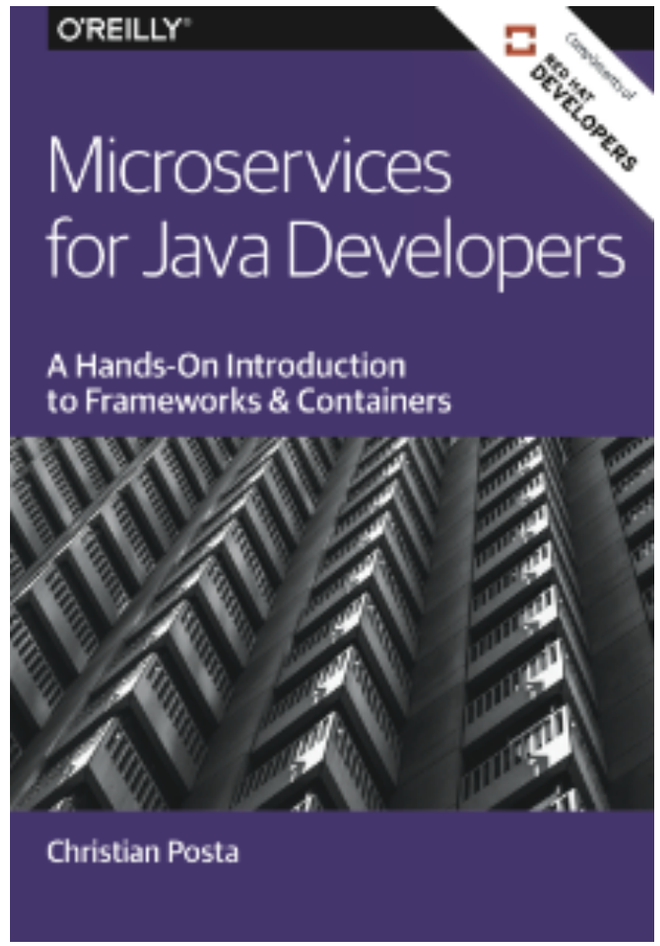


OPENSHIFT or

Tip of Iceberg

Figure by Bilgin Ibryam

More Details

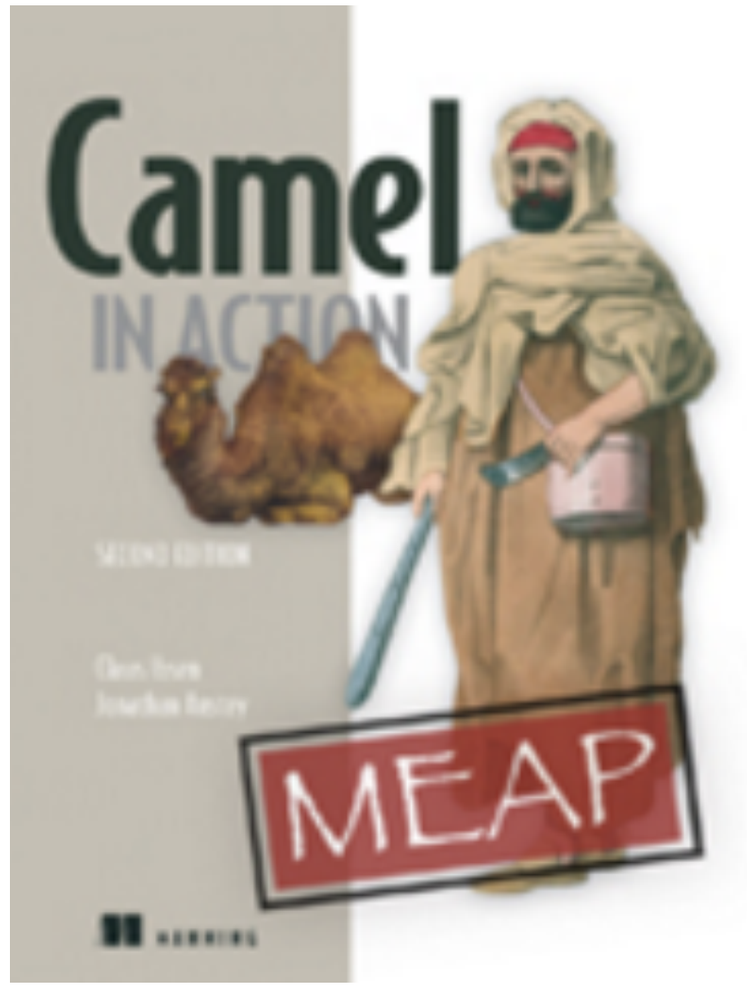


http://developers.redhat.com/promotions/microservices-for-java-developers/

More Details

https://www.openshift.com/promotions/for-developers.html

Shameless Promotion



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gives 39% discount

http://manning.com/ibsen2

Other Camel Talks

INTERACT | DISCUSS | DESIGN

CONVERTING A TIBCO BUSINESSWORKS APPLICATION TO APACHE CAMEL

Ashwin Karpe, Integration Practice Lead
Sundar Rajendran, Architect - Integration

Thursday, May 4, 11:30 AM - 12:15 PM

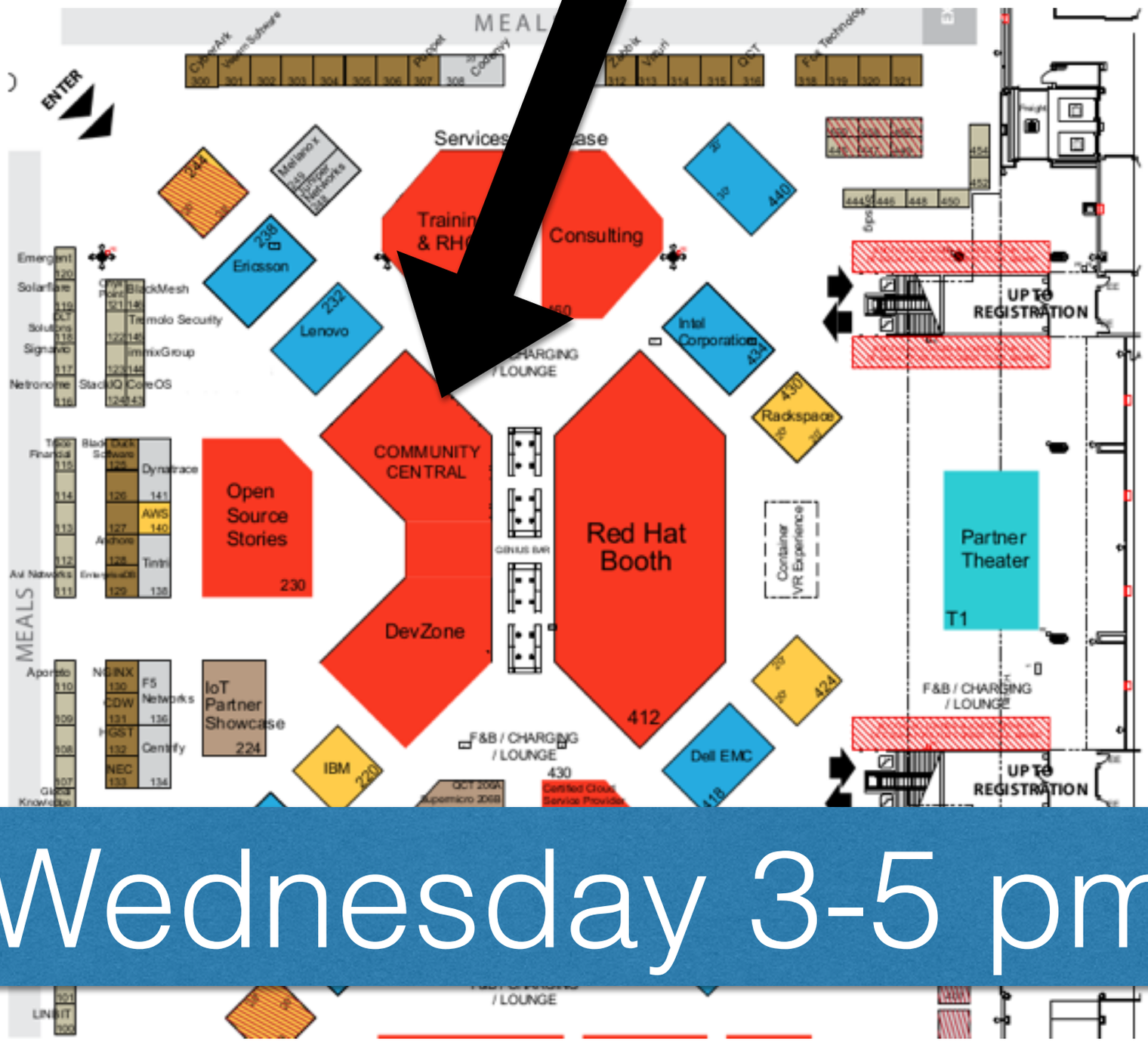
Located at the Consulting Discovery Zone at the Services Showcase in the Partner Pavilion

To learn more, **visit red.ht/discoveryzone**

Boot Session
Community Central

Christian Posta

Claus Ibsen



Wednesday 3-5 pm

Links

@davsclaus
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- MiniShift
  - https://www.openshift.org/minishift
- fabric8 Maven Tool
  - https://maven.fabric8.io
- Slides and demo source code
  - https://github.com/davsclaus/minishift-hello