RED HAT
DEVELOPERS

8 Steps to Becoming Awesome with Kubernetes

Link

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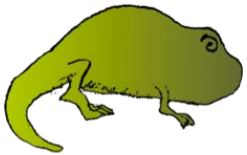
https://developers.redhat.com/devnationlive/
http://bit.ly/8stepsawesome

Your Journey to Awesomeness

Re-Org to DevOps

Self-Service, On-Demand, Elastic Infrastructure

Automation Puppet, Chef, Ansible, **Kubernetes**



CI & CD Deployment Pipeline

Advanced Deployment Techniques

Microservices

8 Steps

0 - Introduction

1 - Installation & Getting Started

2 - Building Images, Running Containers

3 - oc/kubectl exec magic

4 - Logs

5 - Service discovery & load-balancing

6 - Live & Ready

7 - Rolling updates, Canaries, Blue/Green

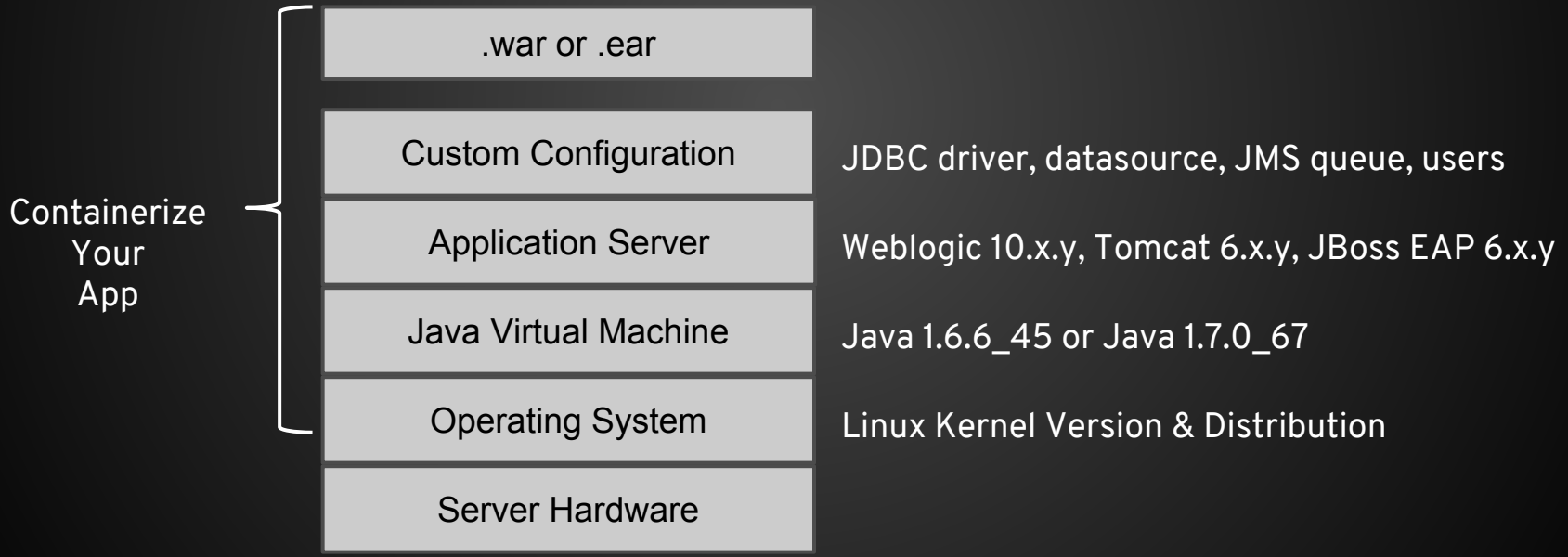
8 - Debugging

Bonus

Step 0: Introduction

A Challenge

Have you ever had “/” vs “\” break your app? Or perhaps needed a unique version of a JDBC driver? Or had a datasource with a slightly misspelled JNDI name? Or received a patch for the JVM or app server that broke your code?



Email

MyApp.war has been tested with the following

On my Windows 7 desktop

JDK 1.8.43

Wildfly 9

Configuration:

Datasource: MySQLDS

Tested with: mysql-connector-java-5.1.31-bin.jar

Production Environment

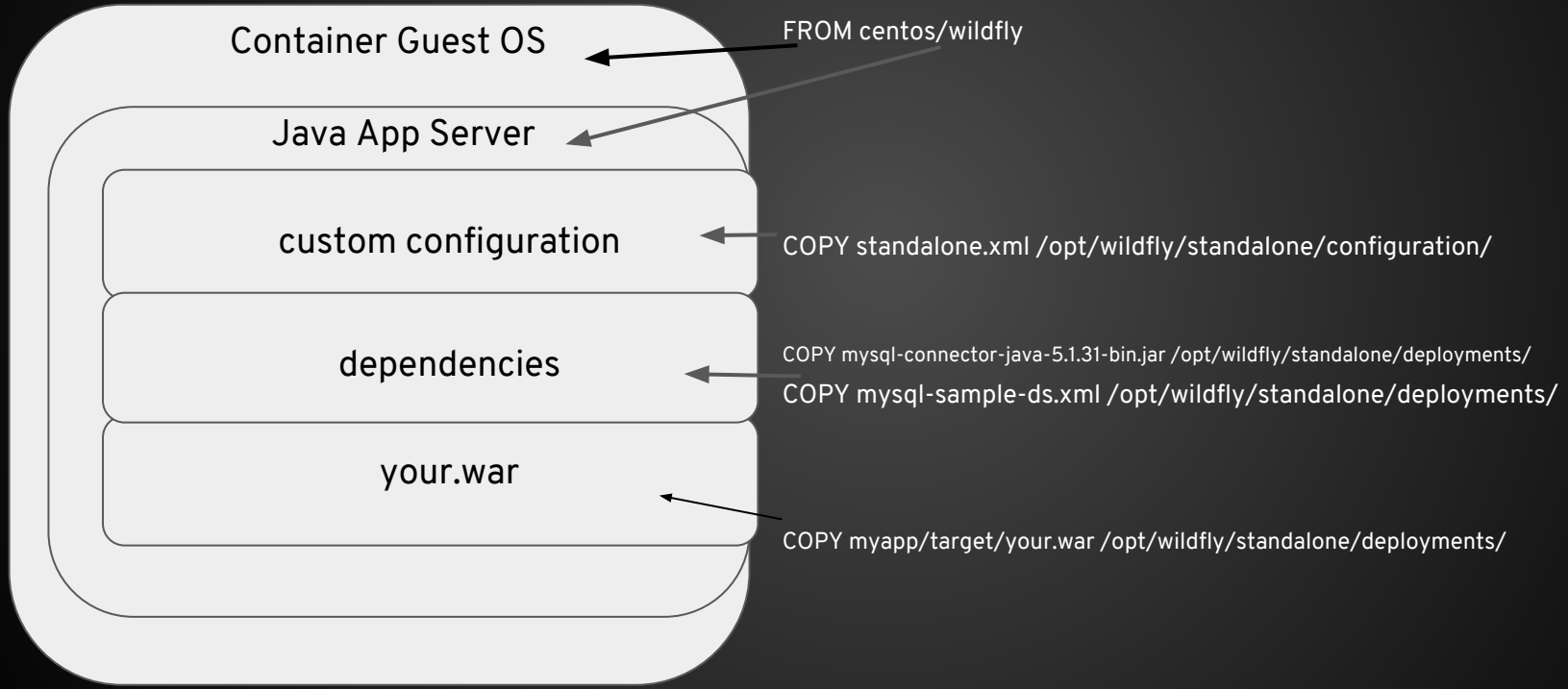
Red Hat Enterprise Linux 6.2

JRE 1.7.3

WebSphere 8.5.5

Oracle 9

Dockerfile



Note: There are better ways to handle Java apps, this is for illustration purposes

Docker Tutorial
bit.ly/docker-devnexus2017

DevOps Challenges for Multiple Containers

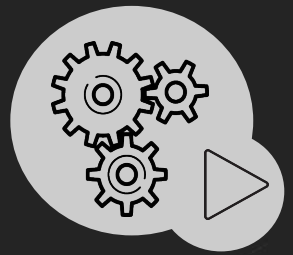
- How to scale?
- How to avoid port conflicts?
- How to manage them on multiple hosts?
- What happens if a host has trouble?
- How to keep them running?
- How to update them?
- Where are my containers?

Meet Kubernetes

- Greek for “Helmsman,” also the root of the word “Governor” (from latin: gubernator)
- Container orchestrator
- Supports multiple cloud and bare-metal environments
- Inspired by Google’s experience with containers
- Open source, written in Go
- Manage applications, not machines

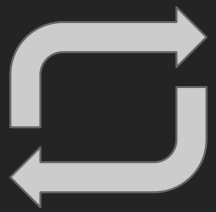
Kubernetes Cluster

Pod



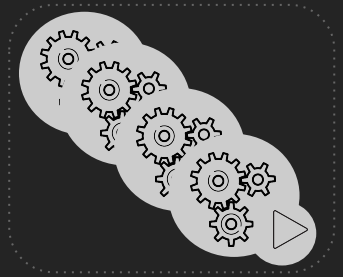
- ✓ 1+ containers
- ✓ Shared IP
- ✓ Shared storage volume
- ✓ Shared resources
- ✓ Shared lifecycle

Replication Controller/ Deployment



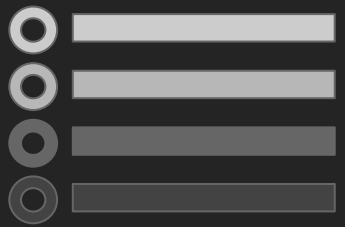
- ✓ Ensures that a specified number of pod replicas are running at any one time

Service



- ✓ Grouping of pods (acting as one) has stable virtual IP and DNS name

Label



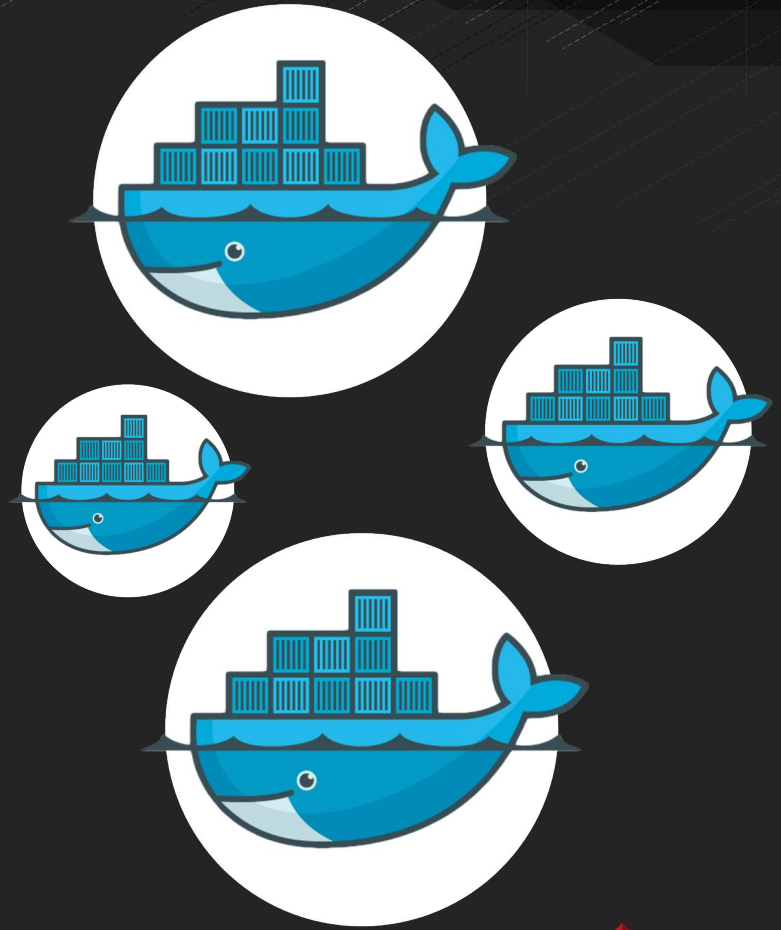
- ✓ Key/Value pairs associated with Kubernetes objects (env=production)

Pods

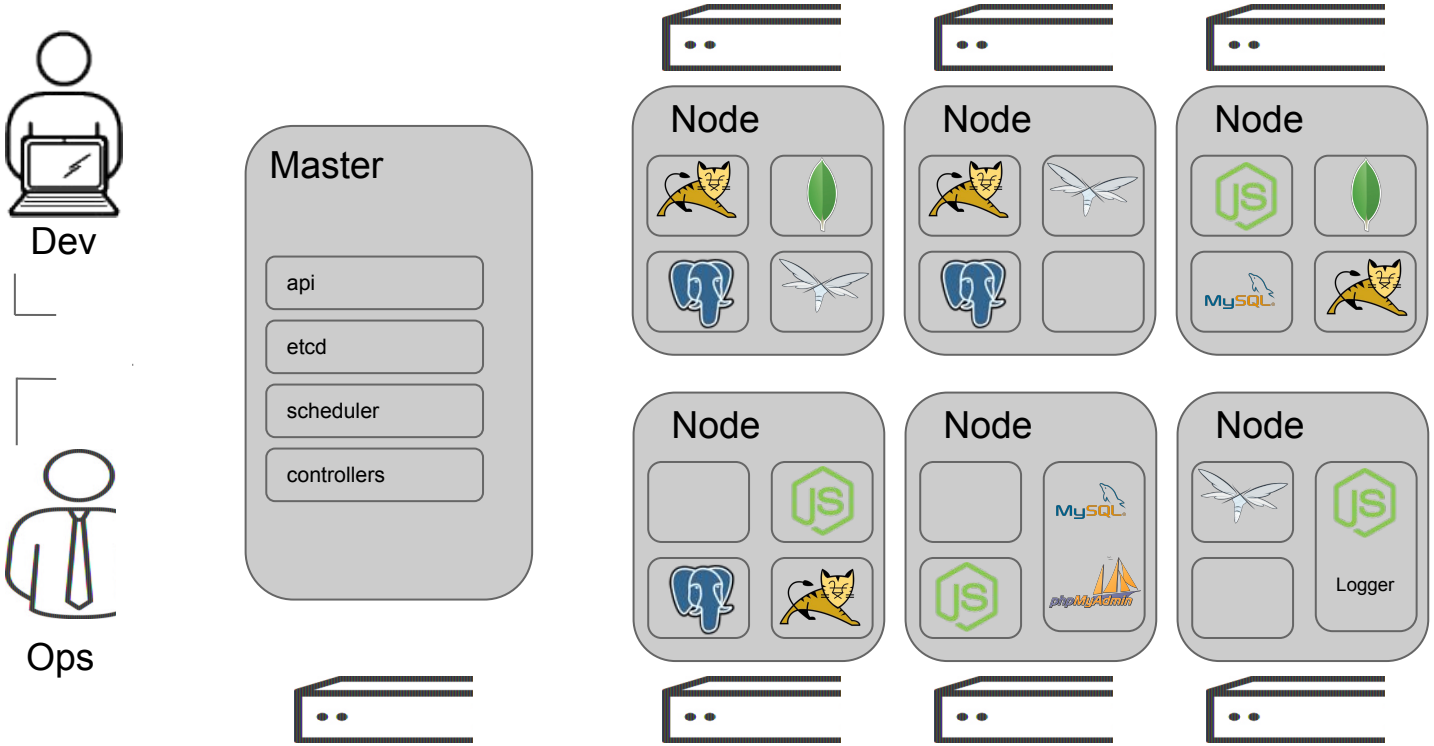
A group of whales is commonly referred to as a pod and a pod usually consists a group of whales that have bonded together either because of biological reasons or through friendships developed between two or more whales.

In many cases a typical whale pod consists of anywhere from 2 to 30 whales or more.*

*http://www.whalefacts.org/what-is-a-group-of-whales-called/



Kubernetes Cluster



Key Kubernetes Capabilities

- Self-healing
- Horizontal Manual & Auto Scaling
- Automatic Restarting
- Scheduled across hosts
- Built-in load-balancer
- Rolling upgrades

Kubernetes Commands

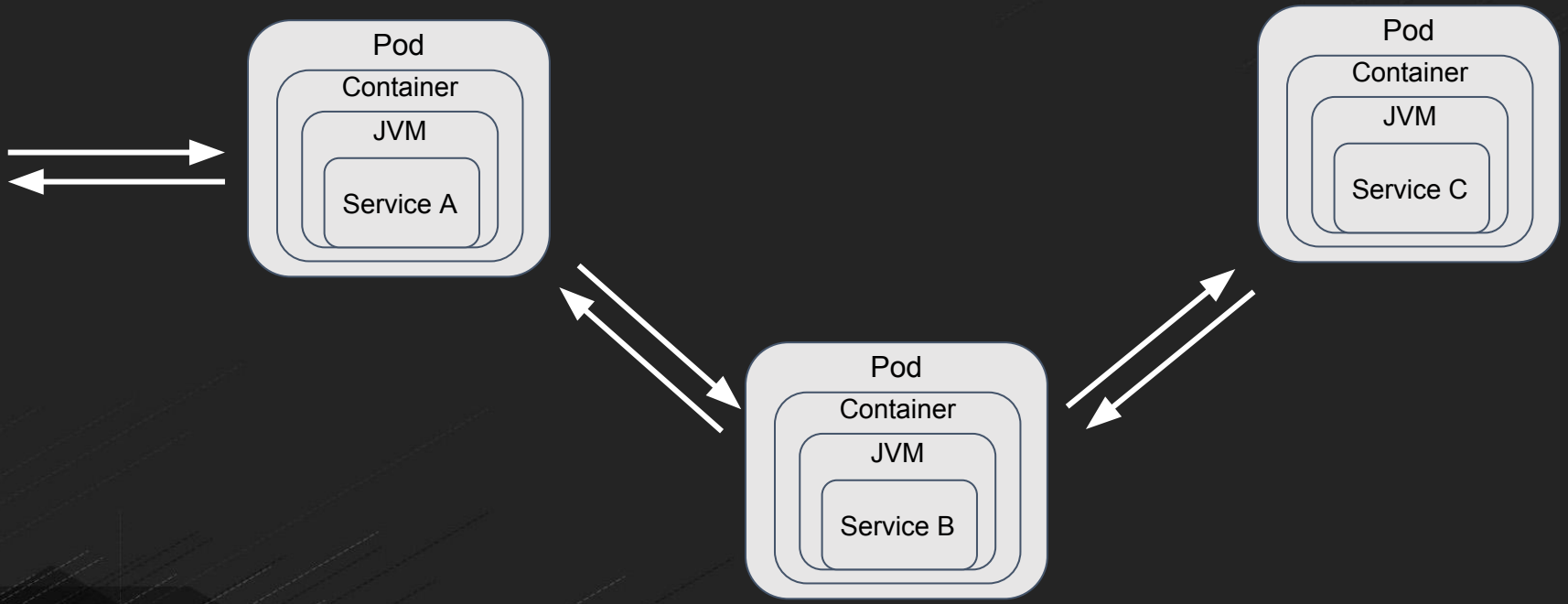
https://kubernetes.io/docs/user-guide/kubectl/

```
kubectl get namespaces
kubectl get pods
kubectl run myvertx --image=burr/myvertx:v1 --port=8080
kubectl logs myvertx-kk605
kubectl expose deployment --port=8080 myvertx --type=LoadBalancer
kubectl scale deployment myvertx --replicas=3
kubectl set image deployment/myvertx myvertx=burr/myvertx:v2
```

Kubernetes Tutorial

kubernetesbyexample.com

Microservices == Distributed Computing



java -jar myapp.jar

DropWizard

www.dropwizard.io

JAX-RS API

First to market

DropWizard Metrics

Embeddable servers: Jetty

Spring Boot

projects.spring.io/spring-boot

Spring API (@RestController)

'Starter' POMs: start.spring.io

Embeddable servers: Tomcat, Jetty, Undertow

WildFly Swarm

wildfly-swarm.io

Java EE 7 APIs

'Starter' POMs: wildfly-swarm.io/generator

Embeddable servers: WildFly (Undertow)

Vert.x

vertx.io

Reactive Async/non-blocking

vertx run myhttp.java

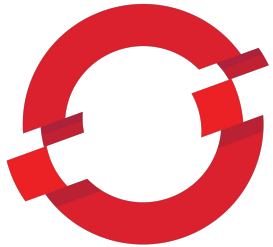
HTTP, HTTP/2, TCP, UDP, Websockets, etc. (out of the box)

Java Microservices Platform circa 2015

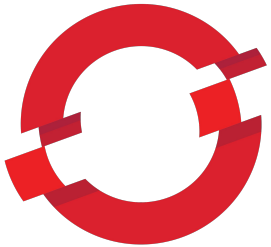
Config Server

NETFLIX Ribbon

Better Microservices Platform circa 2016

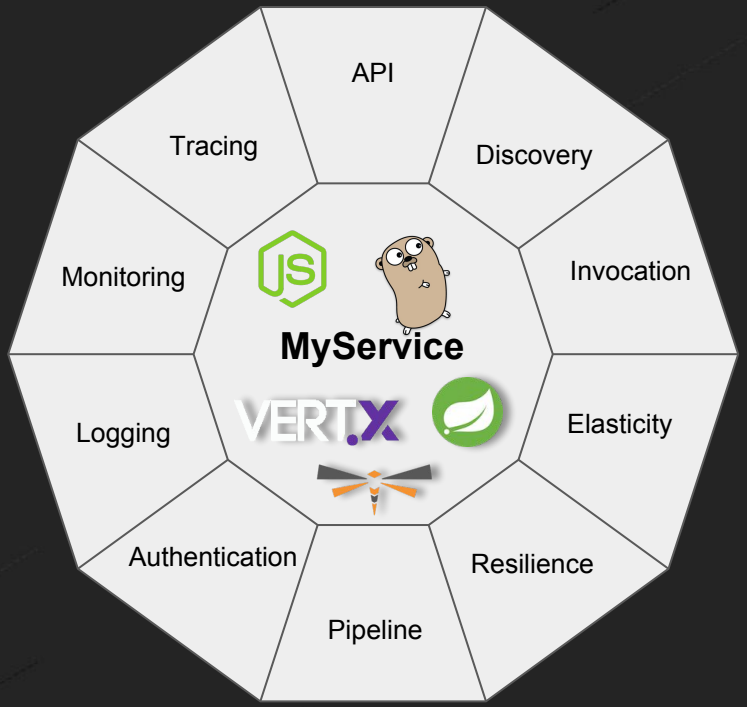


Better Microservices Platform circa 2017



Better Microservices Platform circa 2018

Polyglot Microservices Platform circa 2018



Polyglot Microservices Platform

8 Steps

Step 1: Installation

Step 1 - Installation

Lots of Options

1. minikube (kubectl) (docs)
2. minishift (oc) (docs)
3. Google Cloud Platform
4. Openshift.com
5. AWS
6. oc cluster up (requires a docker daemon)
7. Red Hat DevSuite: Windows Installer + CDK
8. Many more…
   https://kubernetes.io/docs/setup/pick-right-solution/#turnkey-cloud-solutions

Demo

Step 2: Building Images

Step 2: Building Images, Running Containers

1. docker build + kubectl run or kubectl create -f deploy.yml
2. Fabric8 maven plugin (fabric8.io)
3. Helm Charts - and Tiller
4. Kompose - converts docker-compose.yml to kubernetes yaml
5. Kedge - Concise Application Definitions for Kubernetes
6. Ansible - Playbooks for Kubernetes/Openshift deployment
7. s2i - source to image
8. kpod - building Linux container images sans d-o-c-k-e-r

```java
package stuff.demo;

import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.bind.annotation.RestController;

@RestController
public class MyRESTEndpoint {
    String hostname = System.getenv().getOrDefault("HOSTNAME", "unknown");
    @RequestMapping("/")
    public String index() {
        return "Hello Spring " + new java.util.Date() + " " + hostname;
    }
}
```

Fabric8 Maven Plugin

https://maven.fabric8.io/#fabric8:setup

oc new-project stuff (or kubectl create -f namespace.yml)

cd myspringbootapp/ or cd myvertxapp/

mvn clean compile package

mvn io.fabric8:fabric8-maven-plugin:3.5.28:setup

mvn fabric8:deploy

Demo

https://github.com/burrsutter/kube4docker

Step 3: oc or kubectl exec

Step 3: oc or kubectl exec

ssh into your containers and explore

```
kubectl get pods --namespace=microworld
kubectl exec -it --namespace=microworld $POD cat /sys/fs/cgroup/memory/memory.limit_in_bytes
or
kubectl exec -it --namespace=microworld microspringboot1-2-nz8f8 /bin/bash
ps -ef | grep java
Note: the following apply if using the fabric8 generated image, otherwise consult your Dockerfile
java -version
javac -version
# now find that fat jar
find / -name *.jar
cd /deployments (based on use of the fabric8 maven plugin)
ls
exit
```

Demo

Step 4: logs

Step 4: logs

System.out.println("Where am I?");

Spring Boot logs by default just go to the console.

kubectl get pods

kubectl logs microspringboot1-2-nz8f8

OR ./kubetail.sh

https://raw.githubusercontent.com/johanhaleby/kubetail/master/kubetail

Demo

Step 5: service discovery & load-balancing

Step 5: service discovery

1. Services are internal to the cluster and can be mapped to pods via a label selector
2. Just refer to a Service by its name, it is just DNS

```
String url = "http://producer:8080/";
ResponseEntity<String> response =
restTemplate.getForEntity(url, String.class);
```

Samples

https://github.com/burrsutter/kube4docker/tree/master/discovery

https://github.com/redhat-developer-demos/microspringboot1

https://github.com/redhat-developer-demos/microspringboot2

https://github.com/redhat-developer-demos/microspringboot3

Step 6: Live and Ready

Step 5: Live and Ready

```
spec:
  containers:
    - name: myvertx
      image: burr/myvertx:v1
      livenessProbe:
        httpGet:
          port: http
          path: /hello
        initialDelaySeconds: 10
        periodSeconds: 5
        timeoutSeconds: 3
      readinessProbe:
        httpGet:
          path: /hello
          port: 8080
        initialDelaySeconds: 10
        periodSeconds: 3
```

Demo

http://movies.app.burr.red/

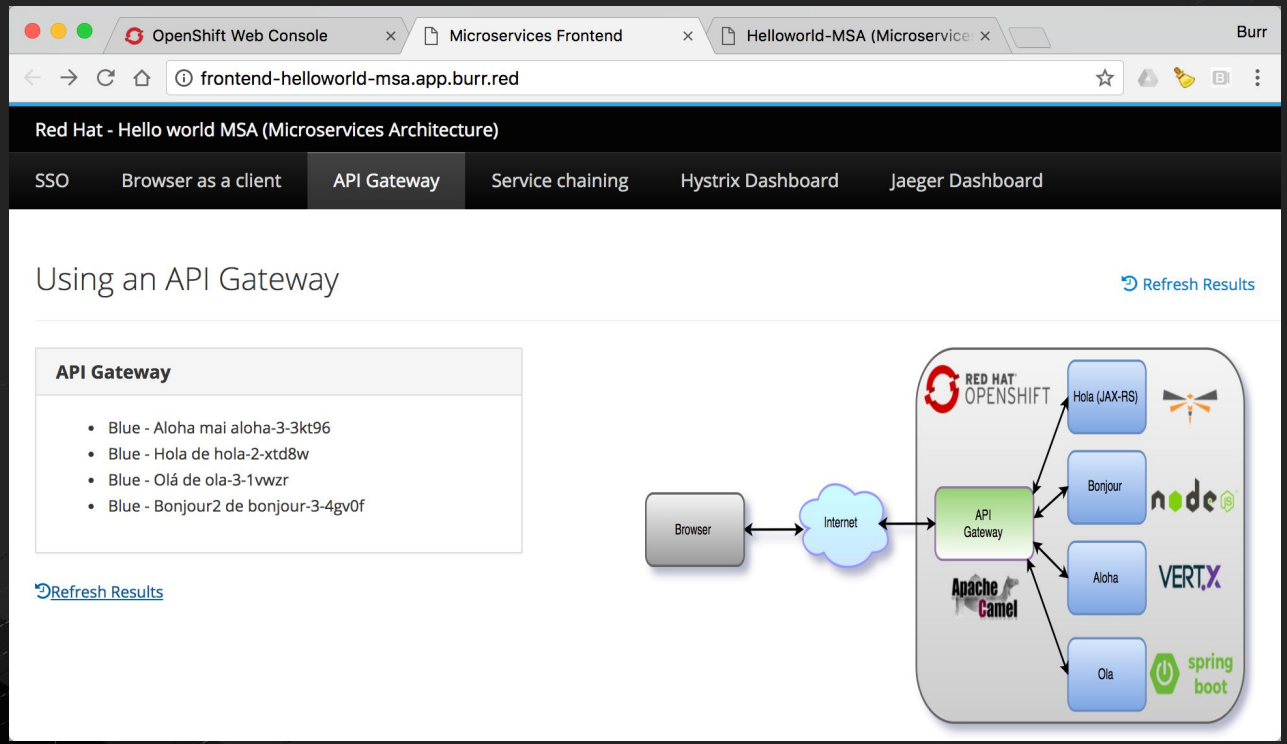
https://github.com/redhat-developer-demos/popular-movie-store/blob/master/src/main/java/org/workspace7/moviestore/controller/HomeController.java#L158-L159

https://github.com/redhat-developer-demos/popular-movie-store/blob/master/src/main/fabric8/deployment.yml#L38-L42

Step 7: Rolling Updates, Blue/Green Canary

Step 7: Rolling, Blue/Green, Canary

bit.ly/msa-instructions



Demo

Step 8: Debugging

Step 8: Debugging

https://maven.fabric8.io/#fabric8:debug

mvn fabric8:deploy

mvn fabric8:debug

https://code.visualstudio.com/blogs/2017/09/28/java-debug

https://github.com/VeerMuchandi/openshift-local/blob/master/DebuggingUsingIDE.md

Demo

Bonus: Istio

Istio - Sail

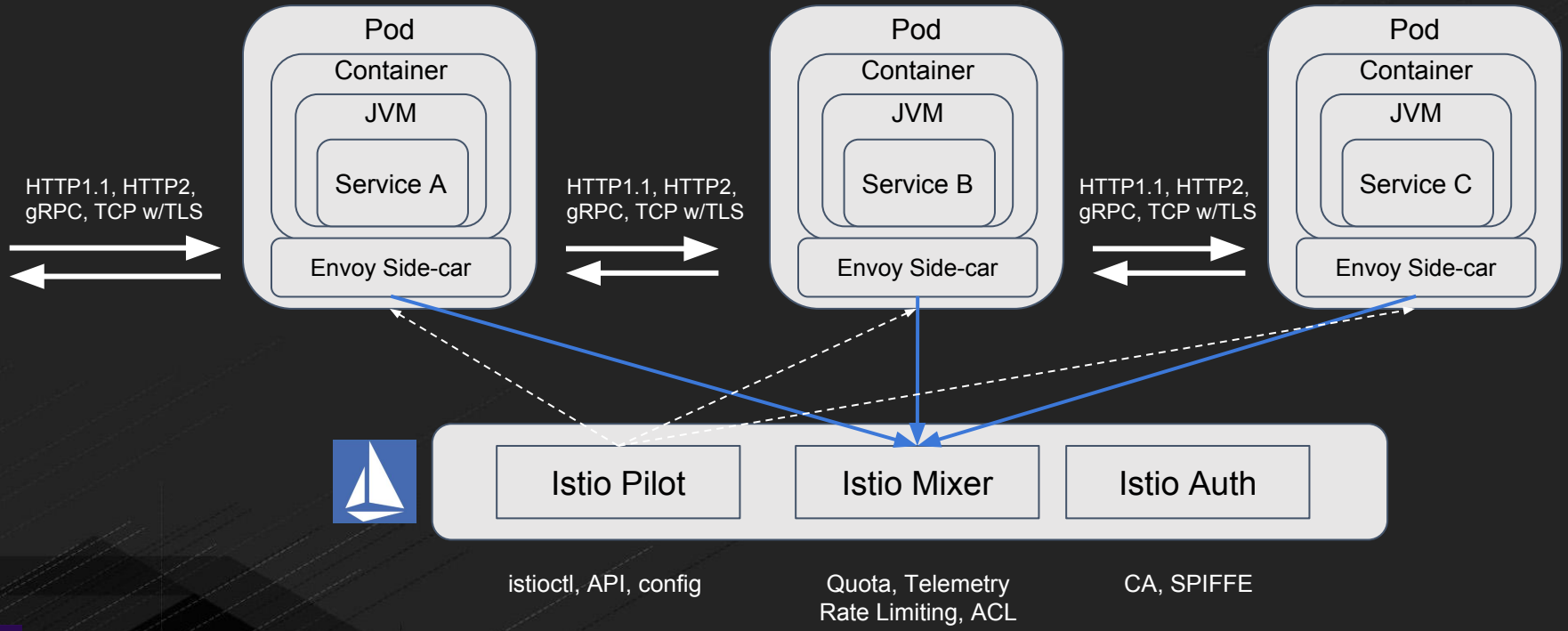
(Kubernetes - Helmsman or ship’s pilot)

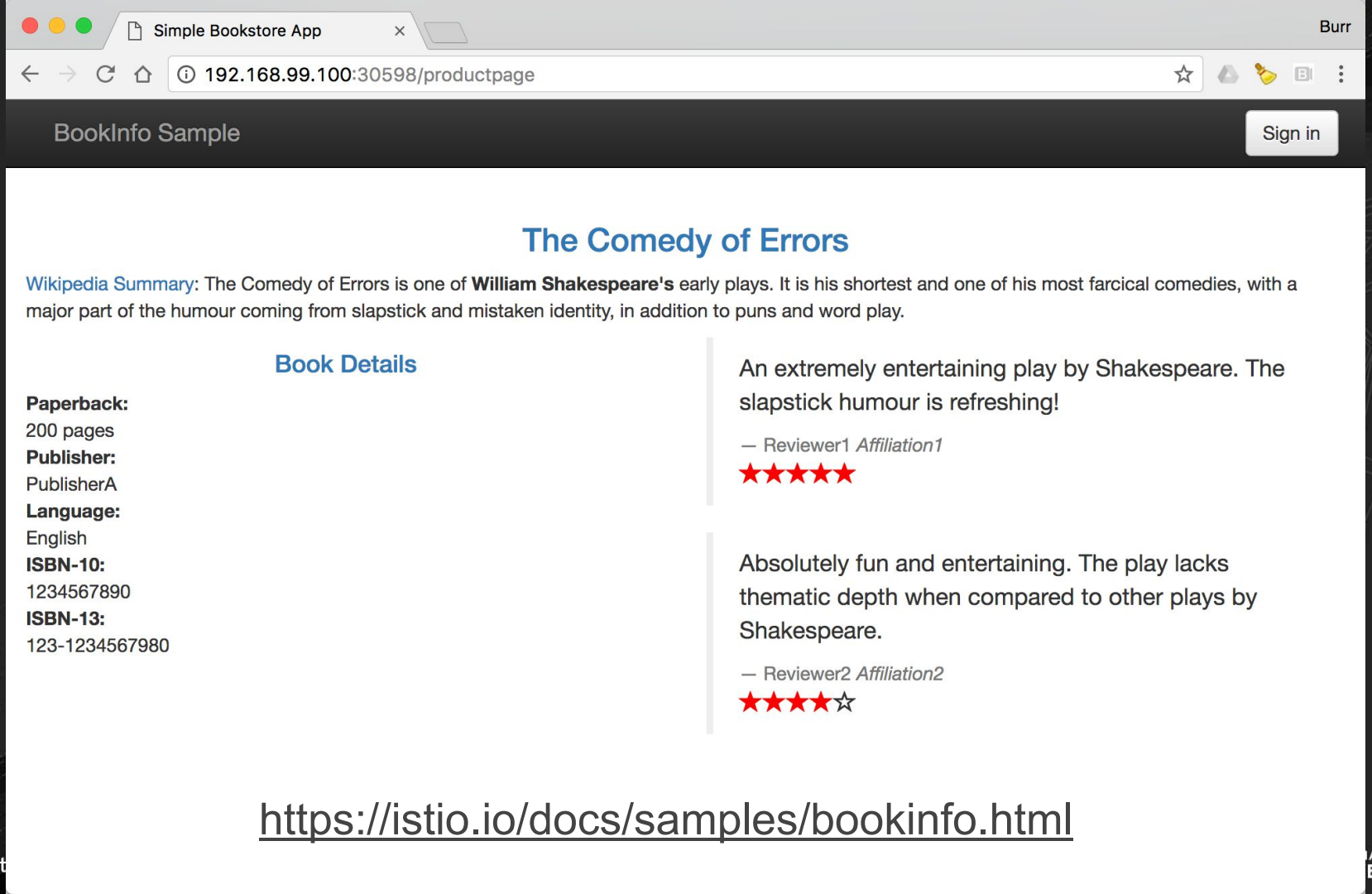
Next Gen Microservices - Service Mesh

Code Independent

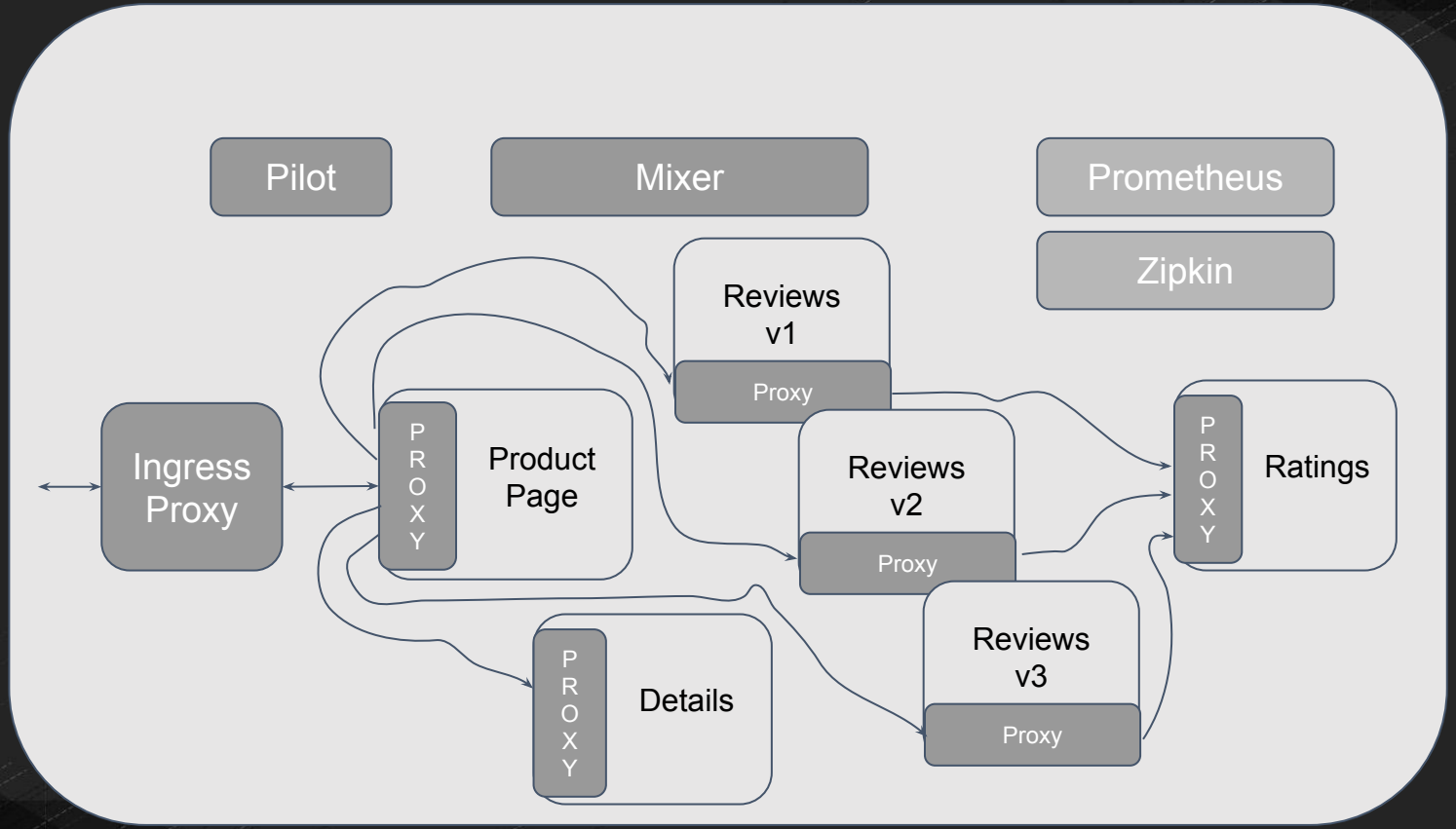
- Intelligent Routing and Load-Balancing
  - A/B Tests
  - Canary Releases
  - Dark Launches
- Distributed Tracing
- Circuit Breakers
- Fine grained Access Control
- Telemetry, metrics and Logs
- Fleet wide policy enforcement

Istio Control Plane





https://istio.io/docs/samples/bookinfo.html



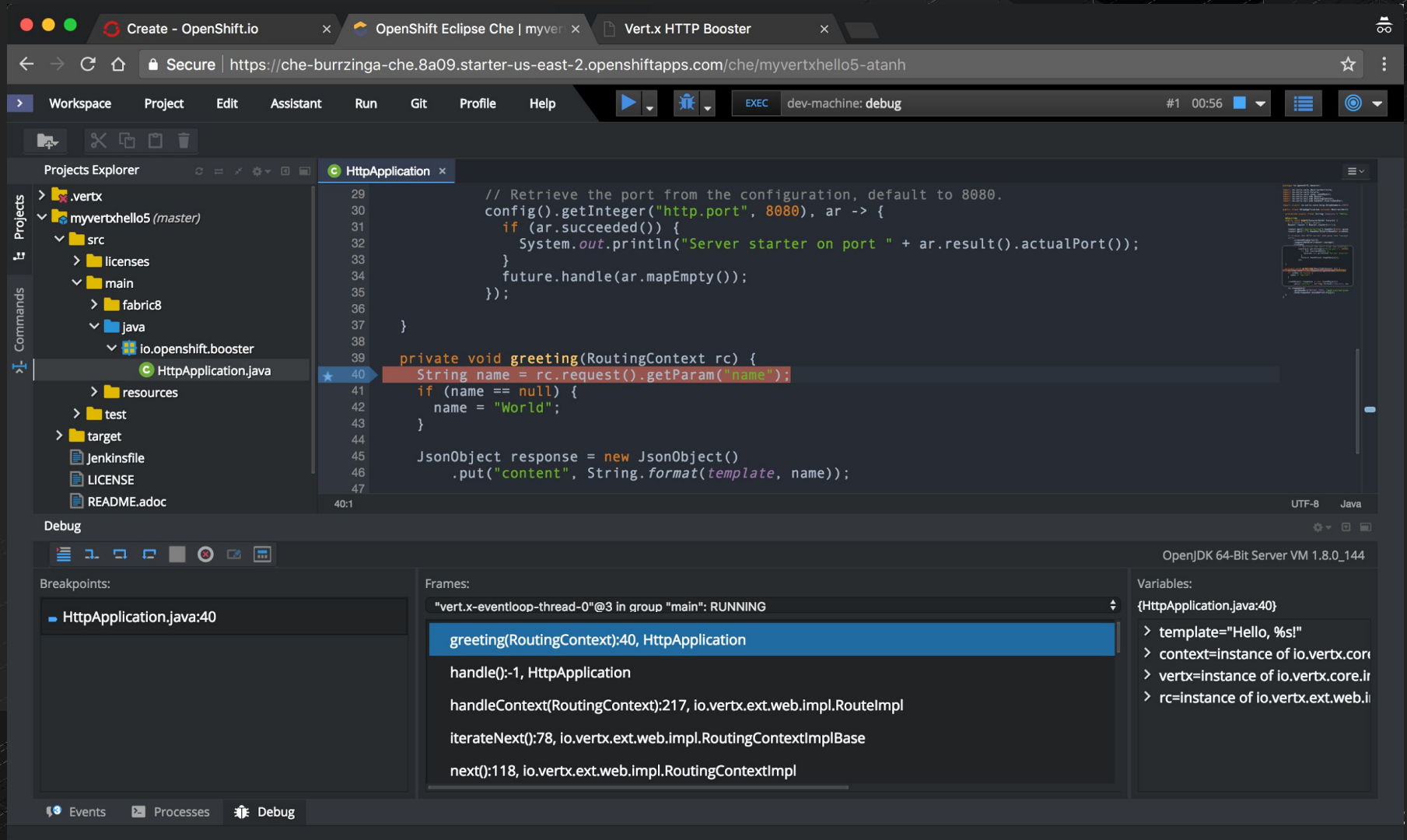
https://www.youtube.com/watch?v=1SjJhwLrdbw&t=1s&index=11&list=PLuWlr4oKSRUYjjwDOaZOX-54X4_OIUUeS

Bonus: Eclipse Che

Container Native IDE - Eclipse Che

Allows you to launch a browser-based IDE inside of a Linux container that matches your production environment

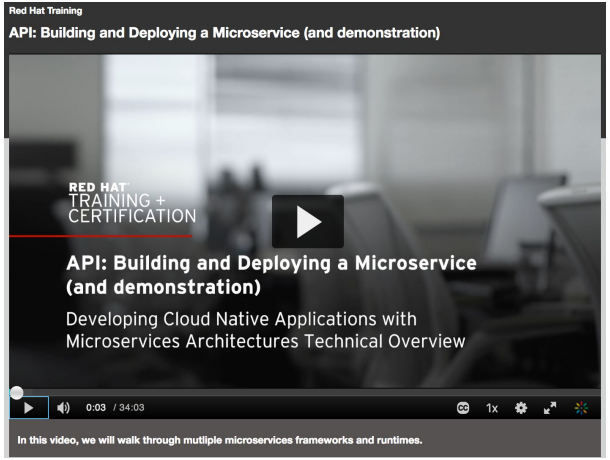
http://www.eclipse.org/che/docs/setup/openshift/index.html


Create - OpenShift.io
OpenShift Eclipse Che | myver
Vert.x HTTP Booster
Secure https://che-burrzinga-che.8a09.starter-us-east-2.openshiftapps.com/che/myvertxhello5-atanh
Workspace Project Edit Assistant Run Git Profile Help
EXEC dev-machine: debug #1 00:56
Projects Explorer
.vertx
myvertxhello5 (master)
src
licenses
main
fabric8
java
io.openshift.booster
HttpApplication.java
resources
test
target
Jenkinsfile
LICENSE
README.adoc
HttpApplication
// Retrieve the port from the configuration, default to 8080.
config().getInteger("http.port", 8080), ar -> {
if (ar.succeeded()) {
System.out.println("Server starter on port " + ar.result().actualPort());
}
future.handle(ar.mapEmpty());
});
}
private void greeting(RoutingContext rc) {
String name = rc.request().getParam("name");
if (name == null) {
name = "World";
}
JsonObject response = new JsonObject()
.put("content", String.format(template, name));
40:1 UTF-8 Java
Debug
OpenJDK 64-Bit Server VM 1.8.0_144
Breakpoints:
HttpApplication.java:40
Frames:
"vert.x-eventloop-thread-0"@3 in group "main": RUNNING
greeting(RoutingContext):40, HttpApplication
handle():-1, HttpApplication
handleContext(RoutingContext):217, io.vertx.ext.web.impl.RouteImpl
iterateNext():78, io.vertx.ext.web.impl.RoutingContextImplBase
next():118, io.vertx.ext.web.impl.RoutingContextImpl
Variables:
{HttpApplication.java:40}
template="Hello, %s!"
context=instance of io.vertx.cor
vertx=instance of io.vertx.core.i
rc=instance of io.vertx.ext.web.i
Events Processes Debug

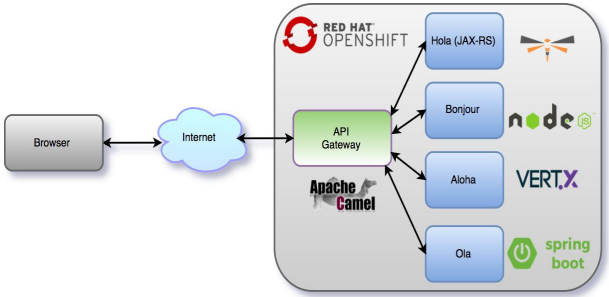
Resources

bit.ly/javamicroservicesbook

bit.ly/reactivemicroservicesbook



bit.ly/microservicesvideo

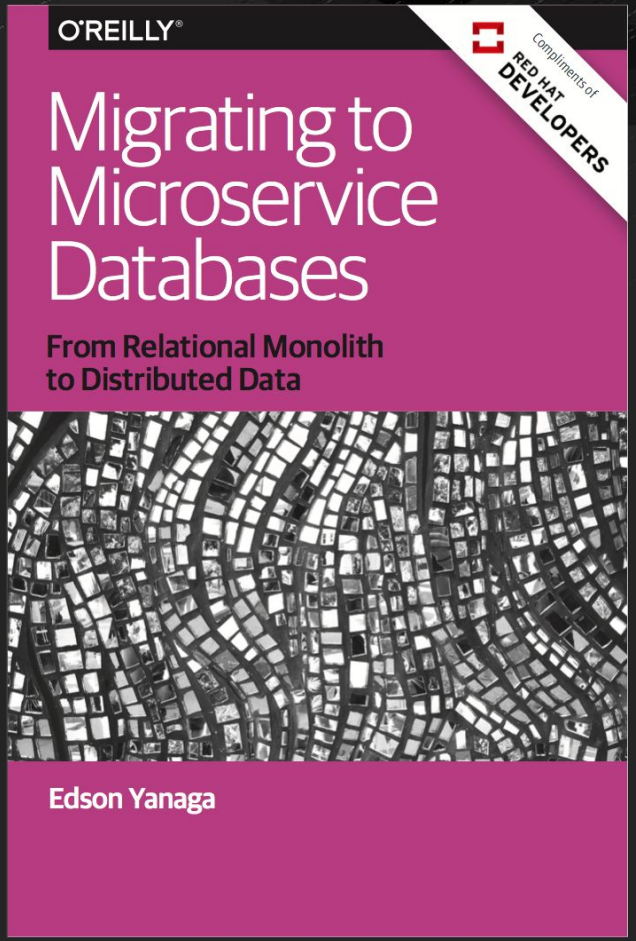


bit.ly/msa-instructions

There's an Elephant in the Room

Your Monolithic Database
(Your DBA will kill you.)

Download a copy
of Edson's book at
http://bit.ly/mono2microdb



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