DEVOXX™

Spring Boot Apps on Kubernetes

Thomas Risberg

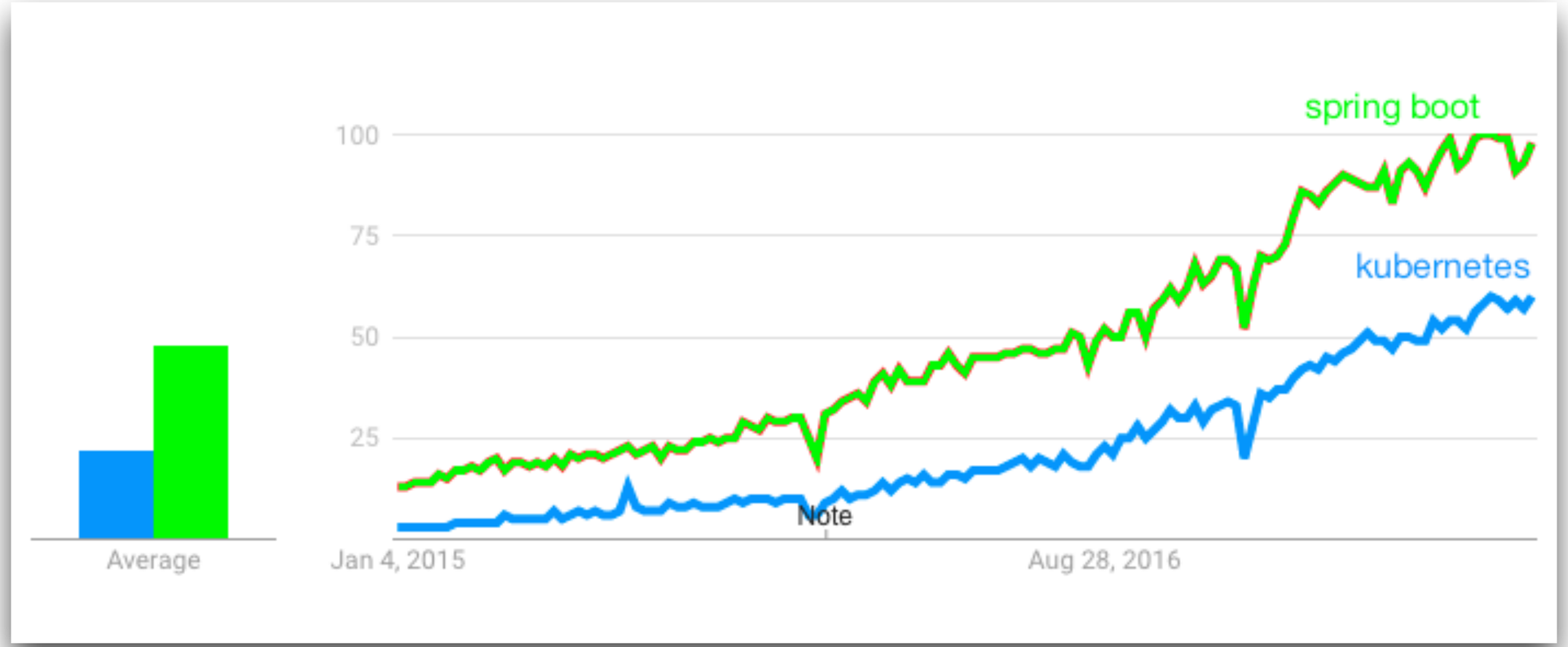
Pivotal

About me

Thomas Risberg (@trisberg)

- Member of the Spring engineering team at Pivotal
- Contributing to Spring Cloud Data Flow, Spring Cloud Deployer for Kubernetes projects
- Joined the Spring Framework open source project in 2003 working on JDBC support

Two Hot Technologies



Based on: https://trends.google.com/trends/explore?q=kubernetes,spring%20boot

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What is Spring Boot?

Spring Boot takes an opinionated view of building production-ready Spring applications. Spring Boot favors convention over configuration and is designed to get you up and running as quickly as possible.

http://projects.spring.io/spring-boot/

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Pair programming with Spring Team

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What is Kubernetes?

Kubernetes is an open-source system for automating deployment, scaling, and management of containerized applications.

It groups containers that make up an application into logical units for easy management and discovery.

https://kubernetes.io/

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Pairing with Google Engineering Team?

Kubernetes builds upon 15 years of experience of running production workloads at Google, combined with best-of-breed ideas and practices from the community.

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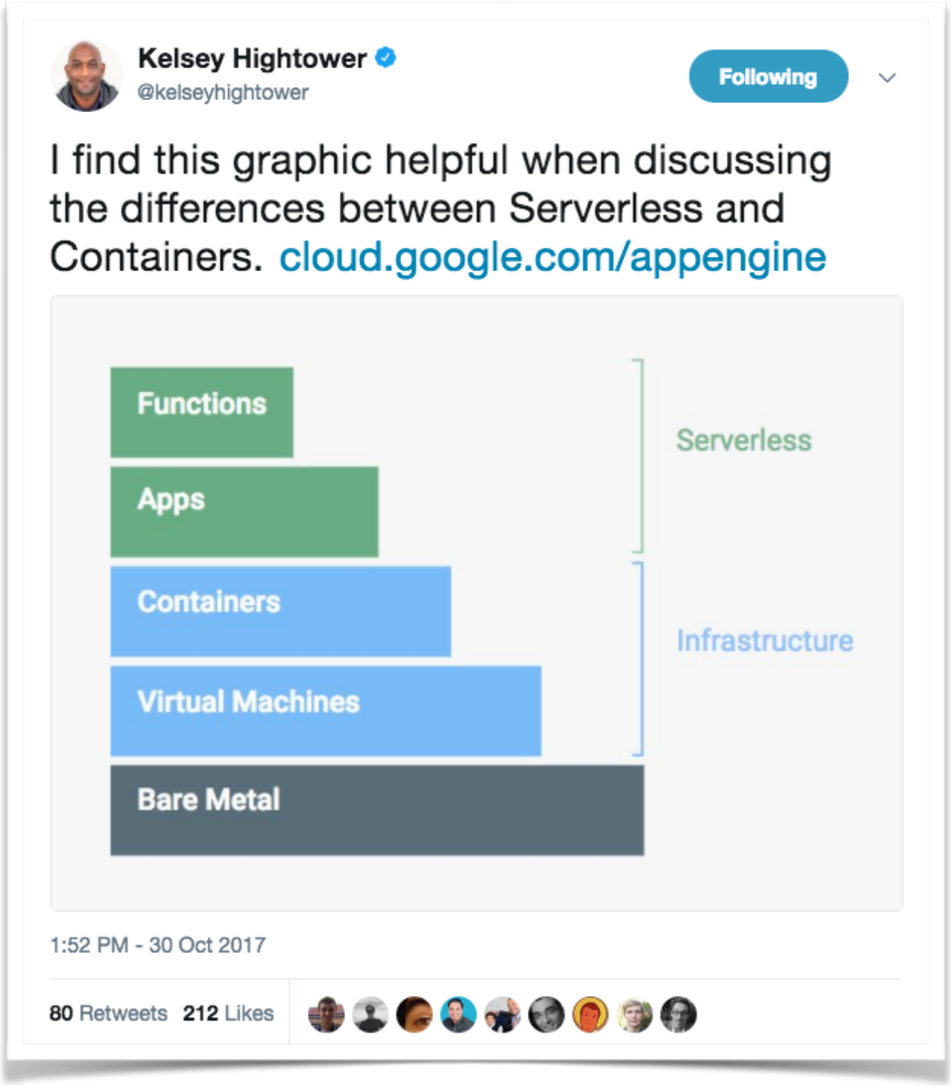
Serverless, Apps and Containers?



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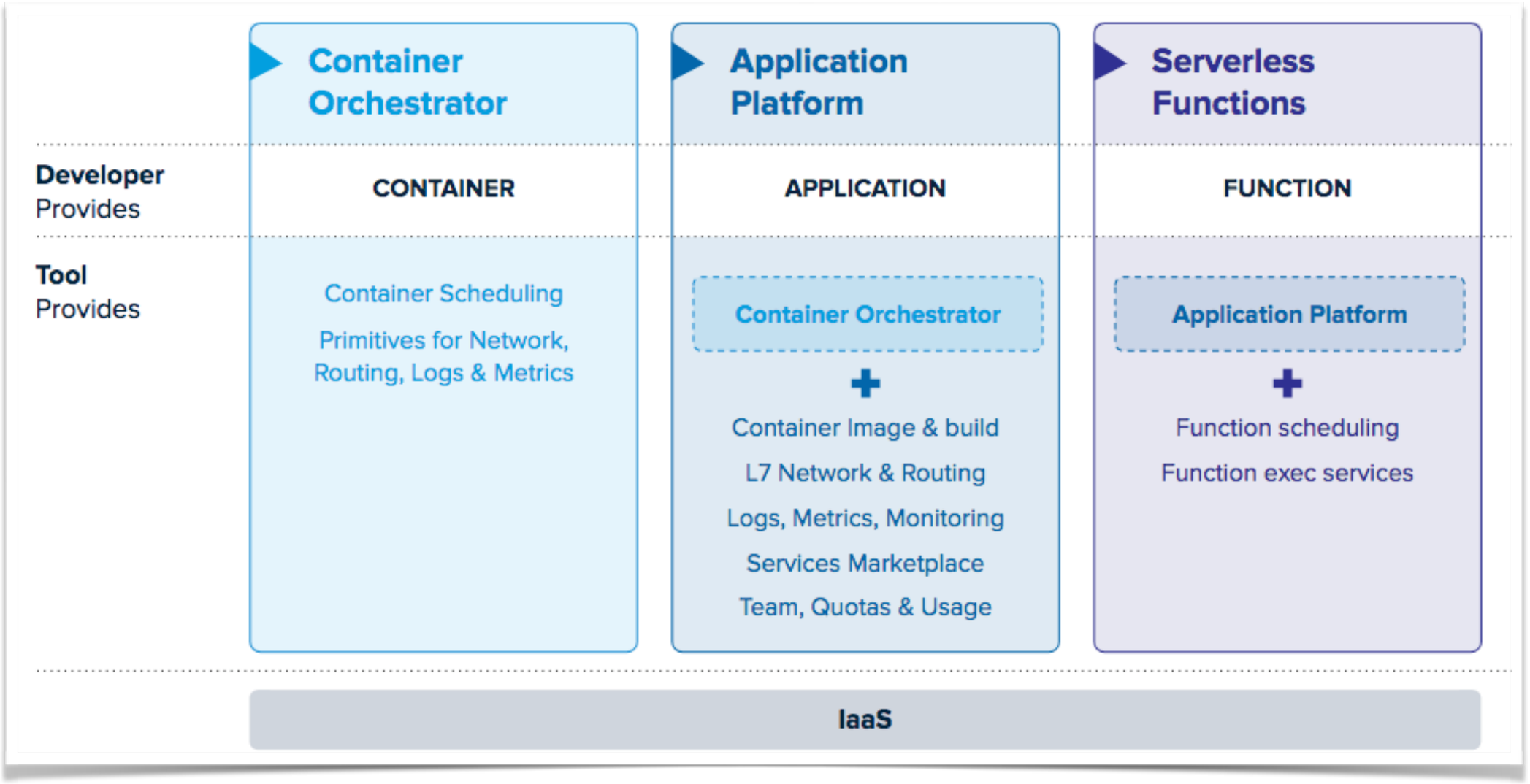
Choose the right tool for the job



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Demo

Simple Hello
Spring Boot/Kubernetes
app deployment

https://github.com/trisberg/devoxx-spring-boot-k8s/blob/master/demo-hello.adoc

Building Apps for Kubernetes

https://twitter.com/kelseyhightower/status/903640408613306369

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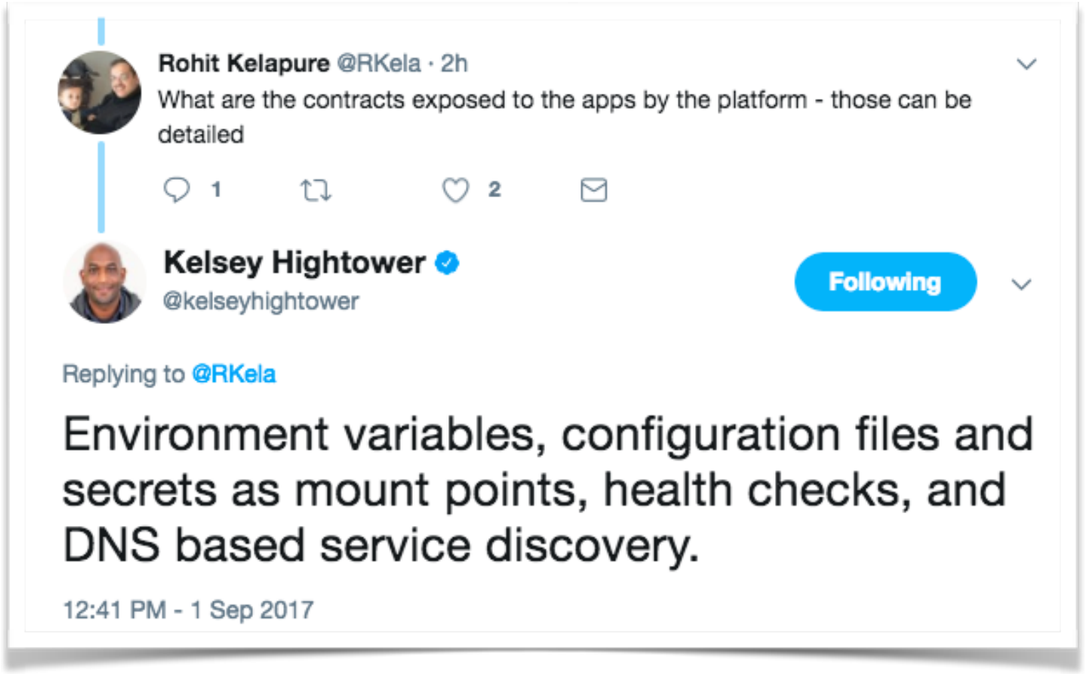
Contracts exposed to the apps by the platform

- Environment variables
- Configuration files
- Secrets as mount points
- Health checks
- DNS based service discovery



https://twitter.com/kelseyhightower/status/903643916599046145

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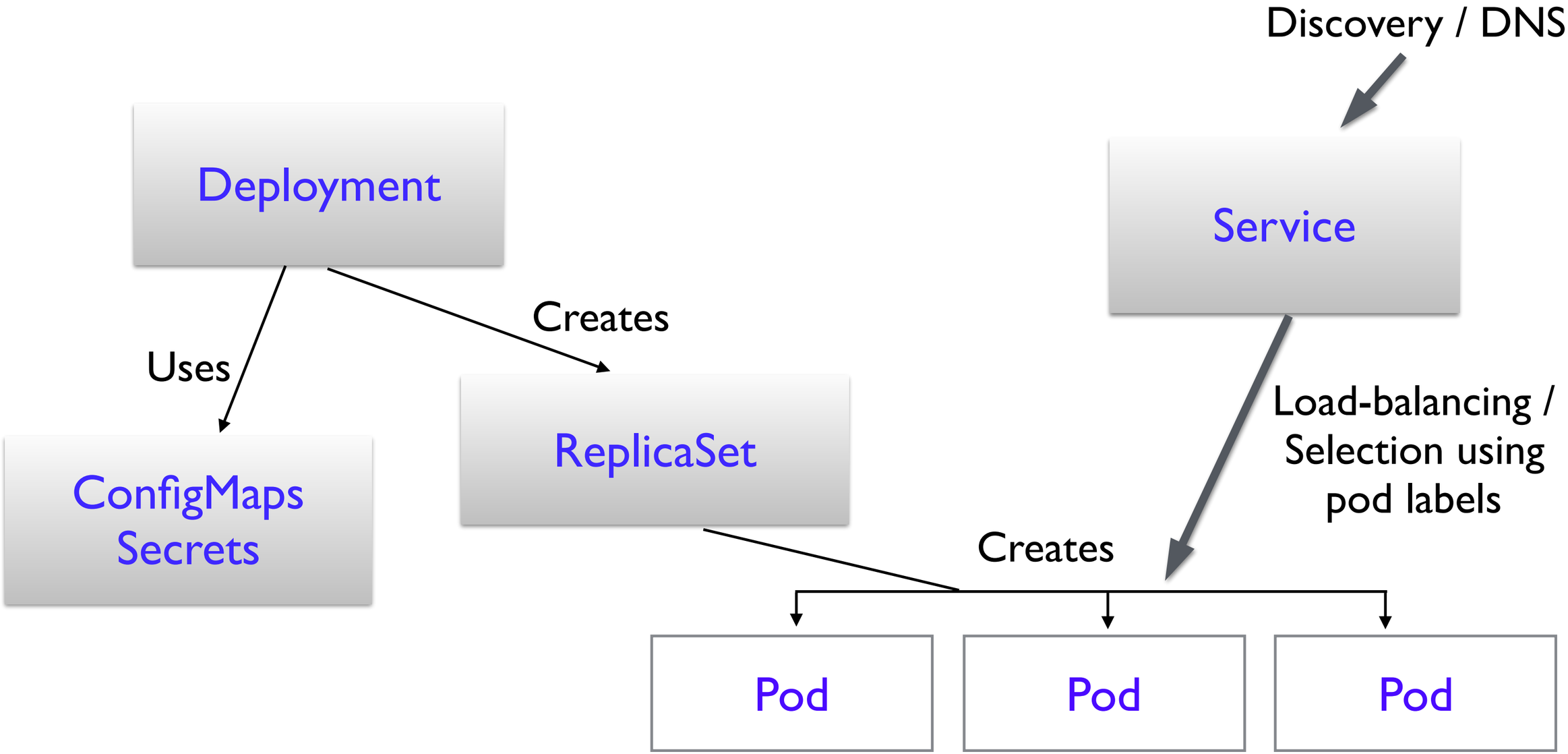
Kubernetes Resources



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Externalized Configuration

- Environment variables
  - Easy to set in `deployment.yaml`
  - Might need to use `SPRING_APPLICATION_JSON` for map based properties
- ConfigMaps and Secrets
  - Can be set using environment or mounted as config files
- Use Spring Cloud Config Server
- Init container can write properties file to shared volume

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Demo

Simple REST Repository App as part of a Microservice Architecture

https://github.com/trisberg/devoxx-spring-boot-k8s/blob/master/demo-actors.adoc

https://github.com/trisberg/devoxx-spring-boot-k8s/blob/master/demo-microservices.adoc

https://github.com/trisberg/boot-k8s-microservices/tree/devoxx-2017

Mount ConfigMaps

```
spec:
  containers:
  - name: actors
    image: trisberg/actors:0.0.1-SNAPSHOT
…
   volumeMounts:
    - name: application-config
      mountPath: "/config"
      readOnly: true
  volumes:
  - name: application-config
    configMap:
      name: actors
      items:
      - key: application.yaml
        path: application-kubernetes.yaml
```

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: actors
  labels:
    app: actors
data:
  application.yaml: |-
    security:
      basic:
        enabled: false
    spring:
      datasource:
        url: jdbc:mysql://${MYSQL_SERVICE_HOST}:${MYSQL_SERVICE_PORT}/mysql
        username: root
        password: ${MYSQL_ROOT_PASSWORD}
        driverClassName: com.mysql.jdbc.Driver
        testOnBorrow: true
        validationQuery: "SELECT 1"
```

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Access Secrets in Env Var

```
apiVersion: v1
kind: Secret
metadata:
  name: mysql
  labels:
    app: mysql
data:
  mysql-root-password: eW91cnBhc3N3b3Jk
```

```
env:
- name: SERVER_PORT
  value: '80'
- name: SPRING_PROFILES_ACTIVE
  value: kubernetes
- name: MYSQL_ROOT_PASSWORD
  valueFrom:
    secretKeyRef:
      name: mysql
      key: mysql-root-password
```

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Spring Cloud / Netflix OSS

https://projects.spring.io/spring-cloud/

- Spring Cloud Config
- Service Discovery
  - Netflix Eureka
  - Consul
- Load balancing / routing
  - Netflix Ribbon & Zuul
- Circuit Breakers
  - Netflix Hystrix

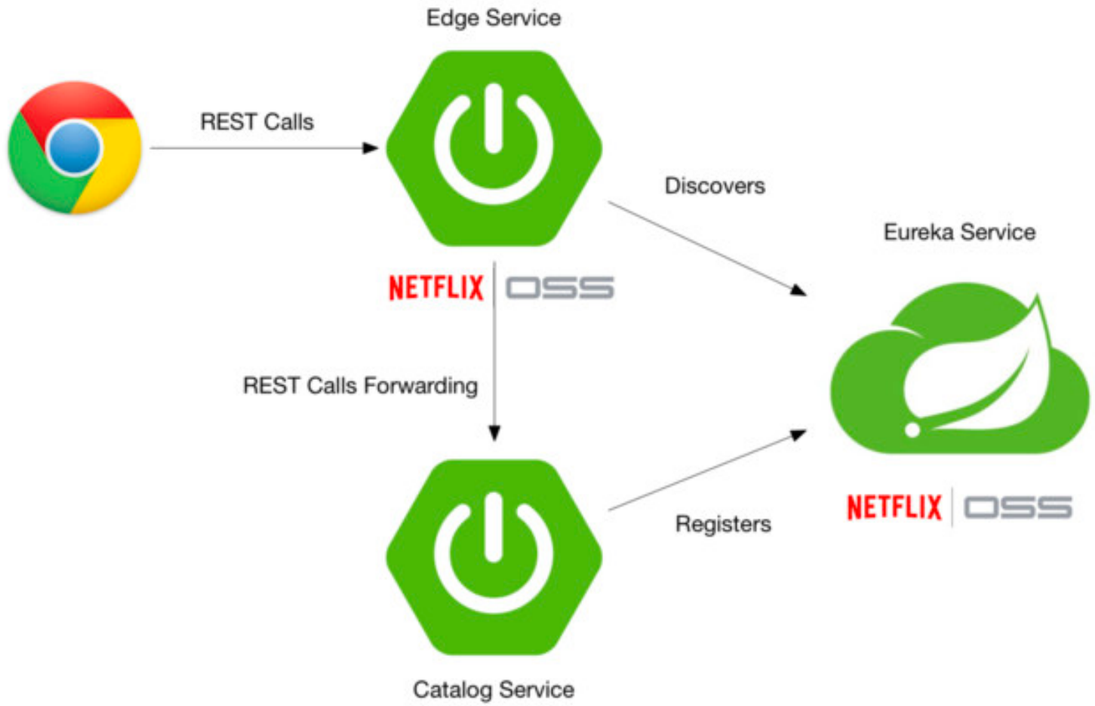

Image from: https://www.slideshare.net/mraible/develop-hip-apis-and-apps-with-spring-boot-and-angular-connecttech-2017/16?src=clipshare

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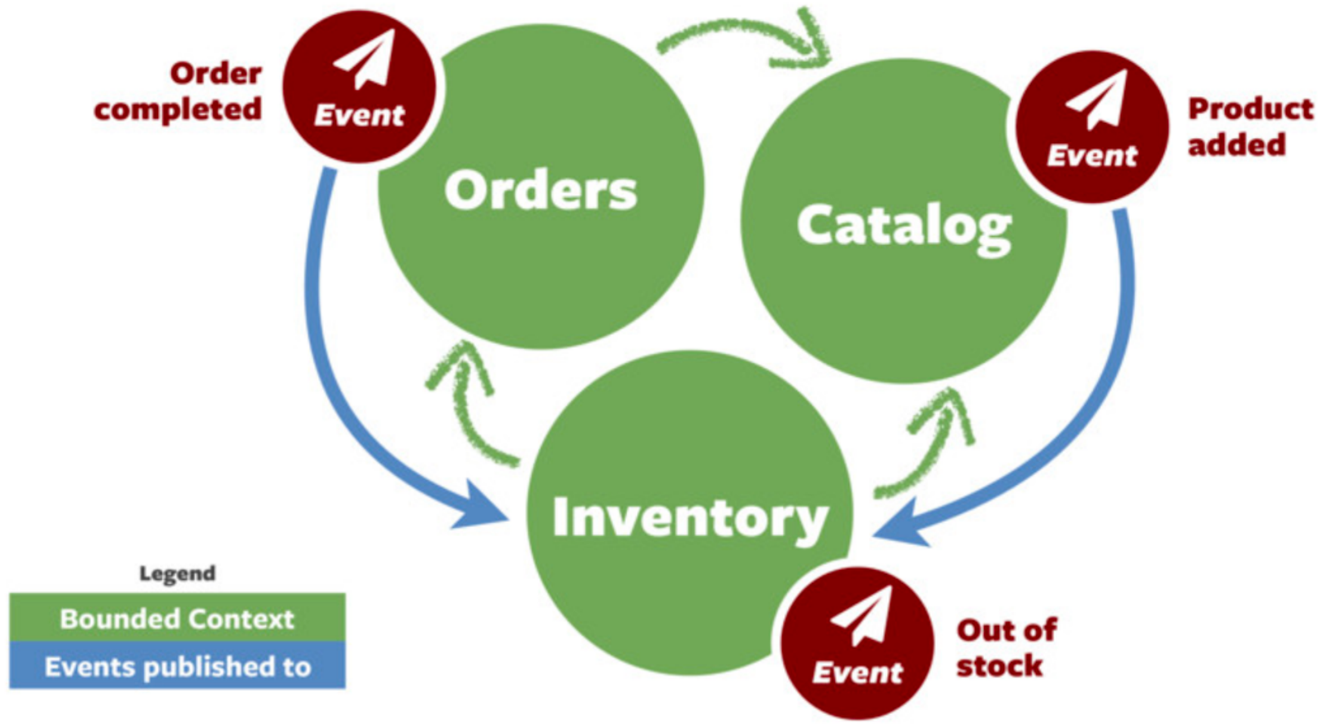
Microservice Architecture Concerns

- Externalized Configuration ✔
  - ConfigMap and Secrets
- Service Discovery ✔
  - DNS, DiscoveryClient
- Circuit-breaker
- Distributed Tracing
- Metrics
- Log aggregation



https://speakerdeck.com/olivergierke/refactoring-to-a-system-of-systems?slide=29

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Microservice Runtime Management

- Circuit-breaker - Netflix Hystrix
- Distributed Tracing - Spring Cloud Sleuth / Zipkin
- Metrics - Spring Boot Actuator / Micrometer

- Service Mesh - Istio
  - load balancing / routing
  - policy enforcement
  - telemetry and reporting

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Log Aggregation

- Spring Cloud Sleuth
  - https://cloud.spring.io/spring-cloud-sleuth/
- Stackdriver
  - https://kubernetes.io/docs/tasks/debug-application-cluster/logging-stackdriver/
- Elasticsearch and Kibana
  - https://kubernetes.io/docs/tasks/debug-application-cluster/logging-elasticsearch-kibana/
- Loggly
  - https://www.weave.works/blog/log-aggregation-kubernetes-loggly/

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Packaging

- **Helm**
  - The package manager for Kubernetes
  - https://docs.helm.sh/using_helm/#quickstart-guide
- **KubeApps**
  - Discover & launch great Kubernetes-ready apps
  - https://kubeapps.com/
- **Example**
  - https://github.com/trisberg/boot-k8s-microservices/tree/devoxx-2017

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Helm Repos

- Stable/Incubator official published charts
  - https://github.com/kubernetes/charts
- Your own repo
  - Use `helm init` to create and then publish the repo with any HTTP server
  - Use `helm repo add` to add it to helm CLI
- Local repo
  - Use `helm serve`

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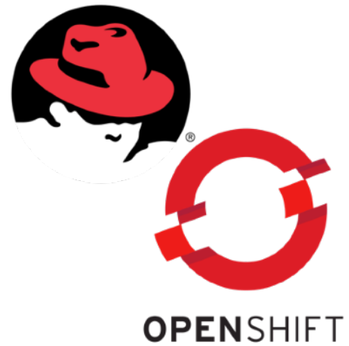
Spring Cloud for Kubernetes

- Fabric8 team created `spring-cloud-kubernetes`
  - `DiscoveryClient for Kubernetes`
  - `ConfigMap and Secrets PropertySource`
  - `Ribbon discovery in Kubernetes`
  - `Zipkin discovery in Kubernetes`
  - `and more …`
- Now available in `spring-cloud-incubator` on GitHub



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Summary / Recommendations

- Mount ConfigMaps as `application-kubernetes.yaml`
- Access Secrets in Environment Variables
- Use Spring Cloud Sleuth for Tracing with Zipkin
- Use Micrometer for Metrics with Prometheus/Grafana
- Keep an eye on Istio for Service Mesh features
- Use Helm for Packaging to simplify installation of your app

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Questions?

Useful Links

- https://github.com/trisberg/devoxx-spring-boot-k8s
- https://projects.spring.io/spring-boot/
- https://kubernetes.io/
- https://projects.spring.io/spring-cloud/
- http://www.oreilly.com/programming/free/kubernetes-for-java-developers.csp
- https://github.com/spring-cloud-incubator/spring-cloud-kubernetes
- https://developers.redhat.com/blog/2017/10/03/configuring-spring-boot-kubernetes-configmap/
- https://developers.redhat.com/blog/2017/10/04/configuring-spring-boot-kubernetes-secrets/