

Fabric8: Better Software Faster with Docker, Kubernetes, Jenkins

Burr Sutter

saltmarch
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DEVELOP
SUMMIT



PERTM



RED HAT DEVELOPERS

Fabric8: Better Software Faster
with Docker, Kubernetes, Jenkins

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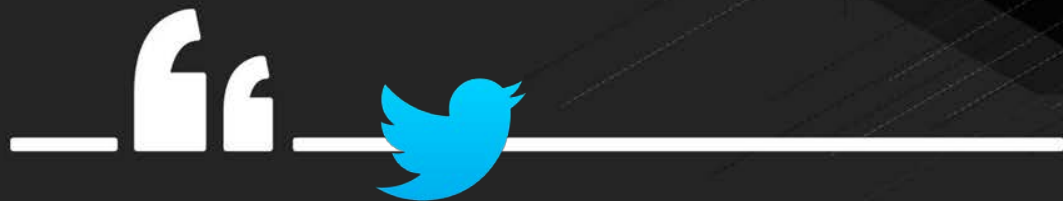
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Change History

1.0 - Great Indian Developer Summit

developers.redhat.com



Continuous improvement
is better than delayed
perfection. Mark Twain
(American Writer, Satirist)



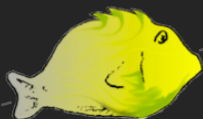
Your Journey to Awesomeness



Re-Org to
DevOps



Self-Service,
On-Demand,
Elastic
Infrastructure



Automation
Puppet, Chef,
Ansible,
Kubernetes



CI & CD
Deployment
Pipeline



Advanced
Deployment
Techniques



Microservices

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

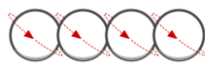
HTTP, HTTP/2, TCP,
UDP, Websockets,
etc. (out of the box)



Our IT World Morphs

Development Process

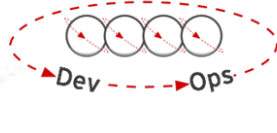
Waterfall



Agile



DevOps



Application Architecture

Monolithic



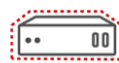
N-Tier

Microservices



Deployment & Packaging

Physical Servers



Virtual Servers

Containers



Application Infrastructure

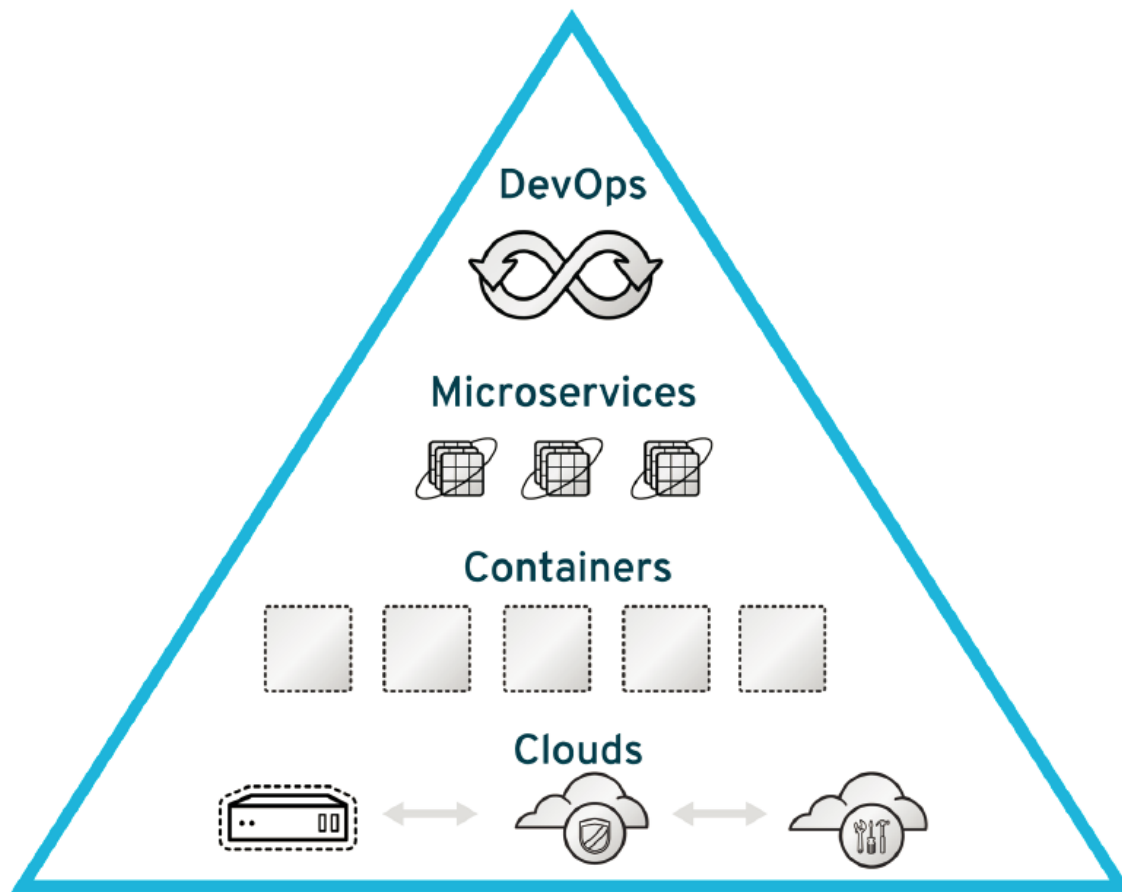
Datacenter

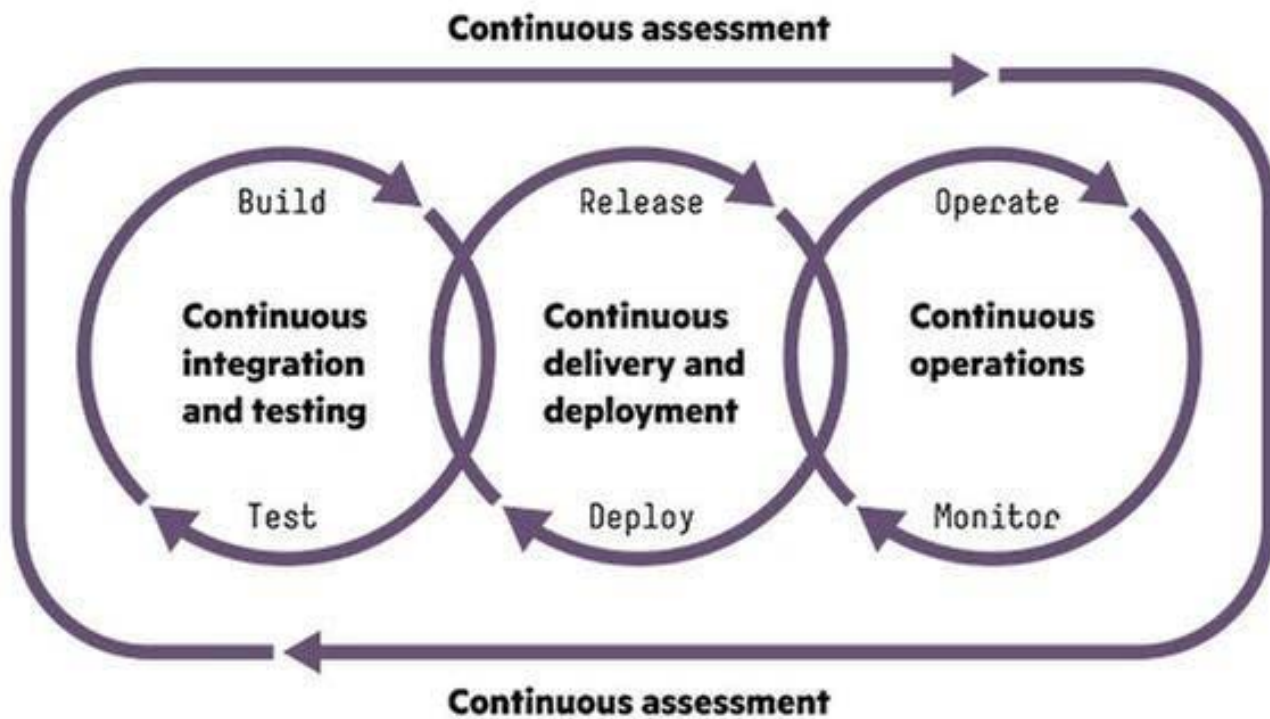


Hosted

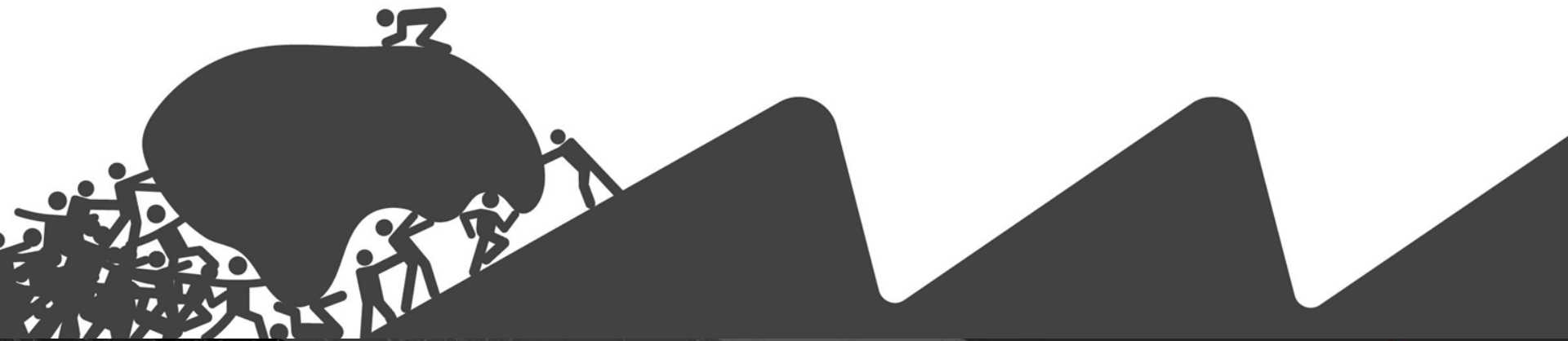
Cloud







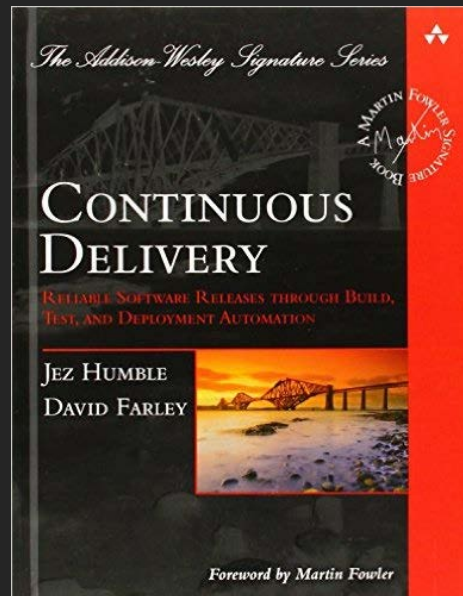






Jez Humble Continuous Integration

- Software (trunk) is always deployable
- Everyone is checking into trunk daily (at least)—not feature branches
- If the build breaks, it's fixed in 10 minutes (all hands on deck)
- A new engineer can be on-boarded in 1 day—with a production-like environment on the developer workstation
- Deployment is a low-risk, push-button affair

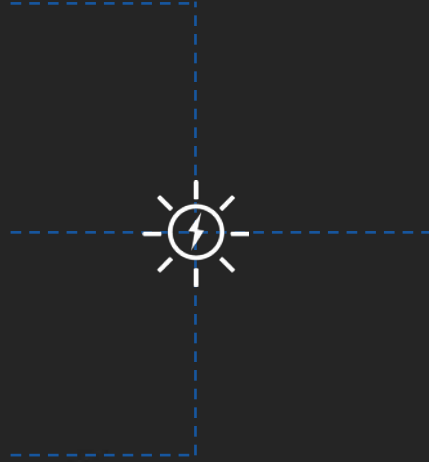


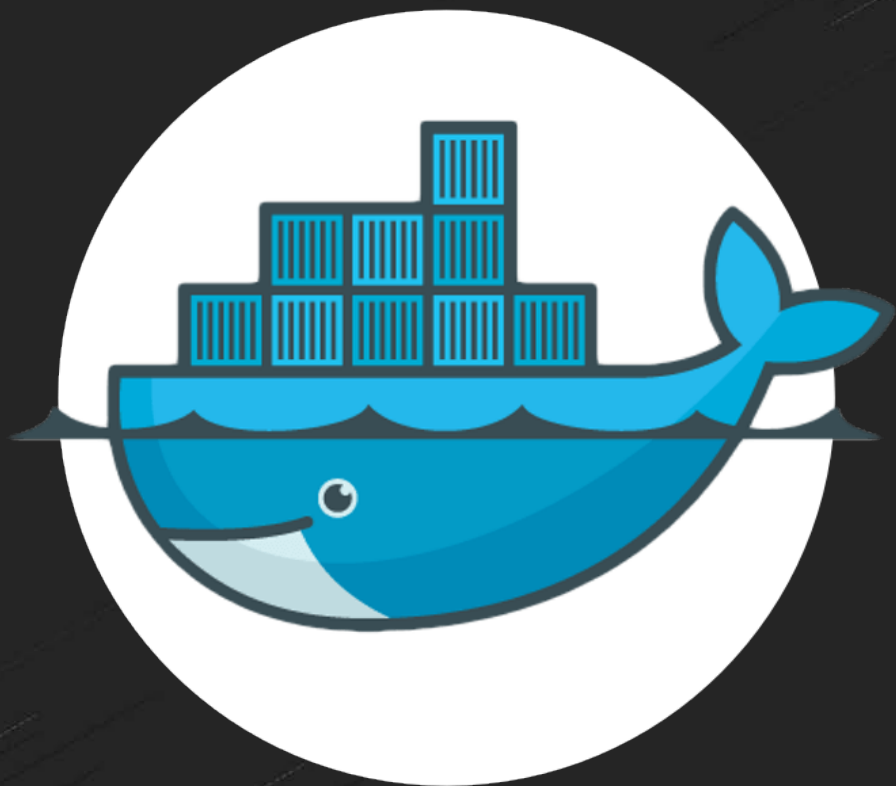


<https://fabric8.io/>

Fabric8 (<https://fabric8.io/>)

- **Create** wizards to create microservices
- **Build** packaging into immutable container images
- **Release** rolling upgrades across teams environments
- **Runtime** service discovery, scaling, failover, load balancing
- **Manage** centralize logs, metrics, alerts, tracing, circuit breakers
- **Feedback** dashboards and metrics to get feedback!
- **Platform** on premise, public or hybrid cloud





Your Stack Matters

your.war
Custom Configuration
Application Server
Java Virtual Machine
Operating System
Server Hardware

JDBC driver, datasource, JMS queue, users

Weblogic 10.x.y, Tomcat 6.x.y, JBoss EAP 6.x.y

Java 1.6.6_45 or Java 1.7.0_67

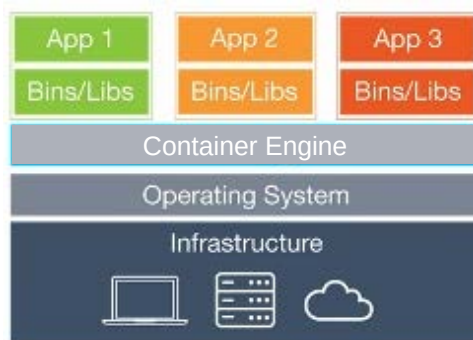
Linux Kernel Version & Distribution

Container Advantages

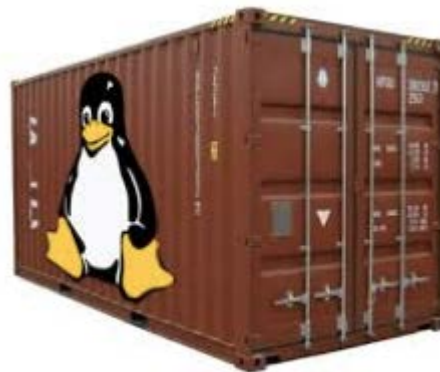
- Lightweight footprint, minimal overhead
- Portability across machines
- Simplify DevOps practices
- Speed up Continuous Integration
- Empower Microservices architectures
- Isolation



Virtual Machines



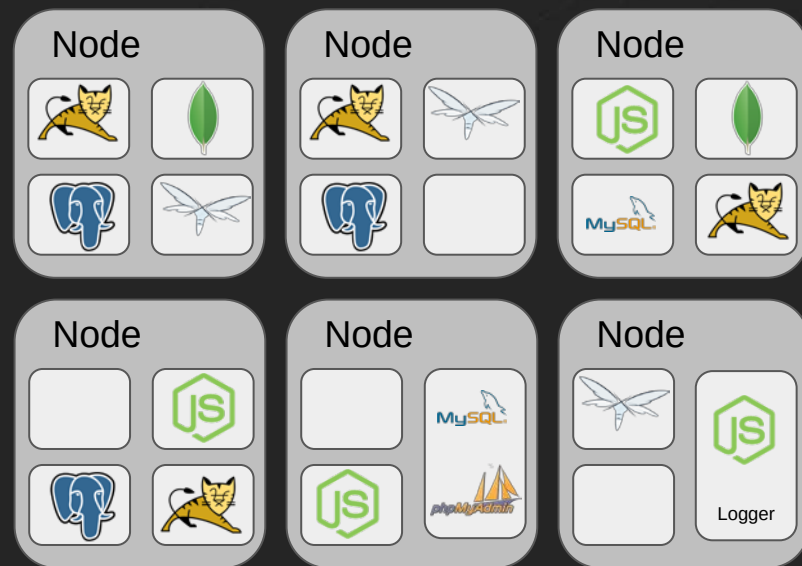
Containers



Docker Demo

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?



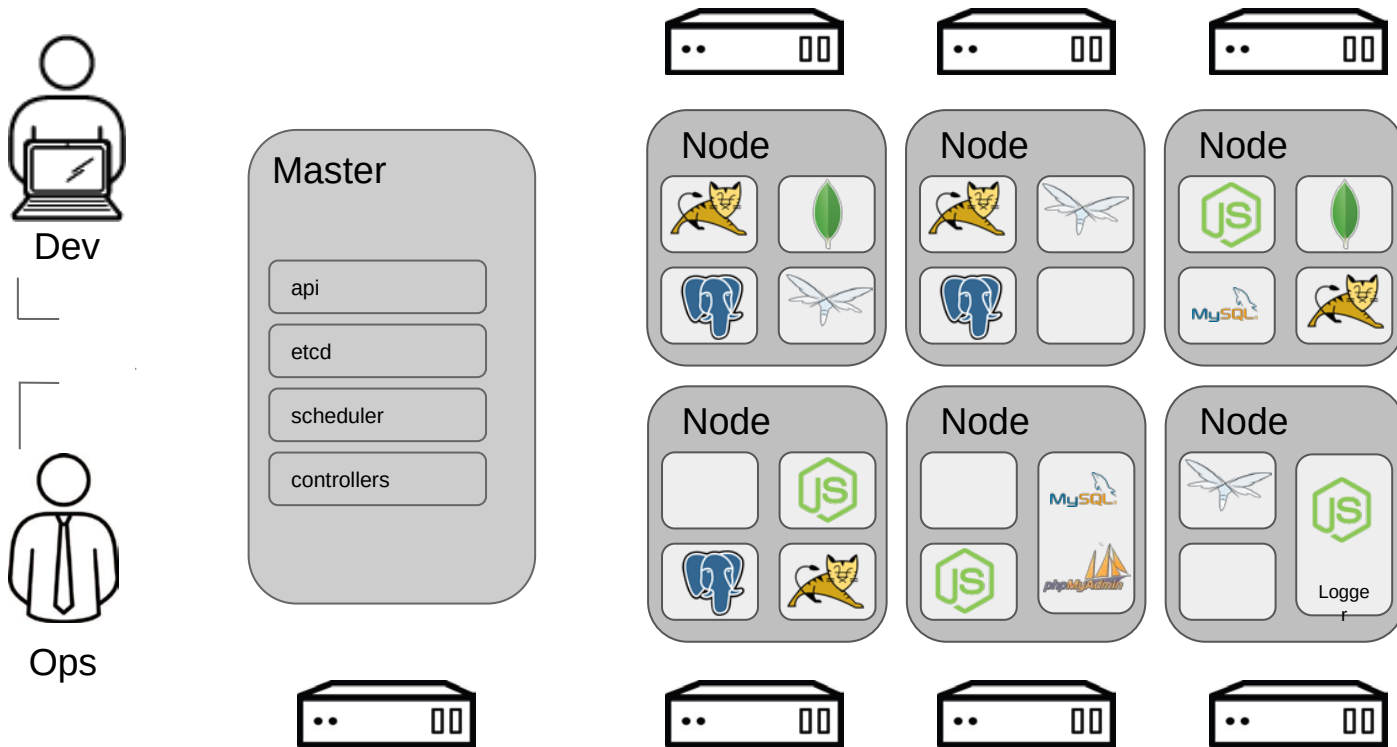


Meet Kubernetes

- 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

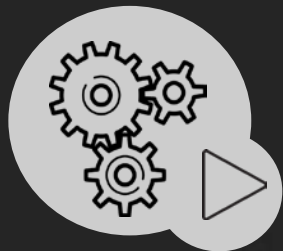


Kubernetes Cluster



Kubernetes Cluster

Pod



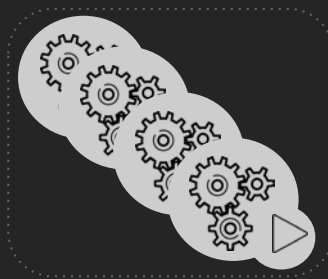
- ✓ 1+ containers
- ✓ Shared IP
- ✓ Shared storage volume
- ✓ Shared resources
- ✓ Shared lifecycle

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



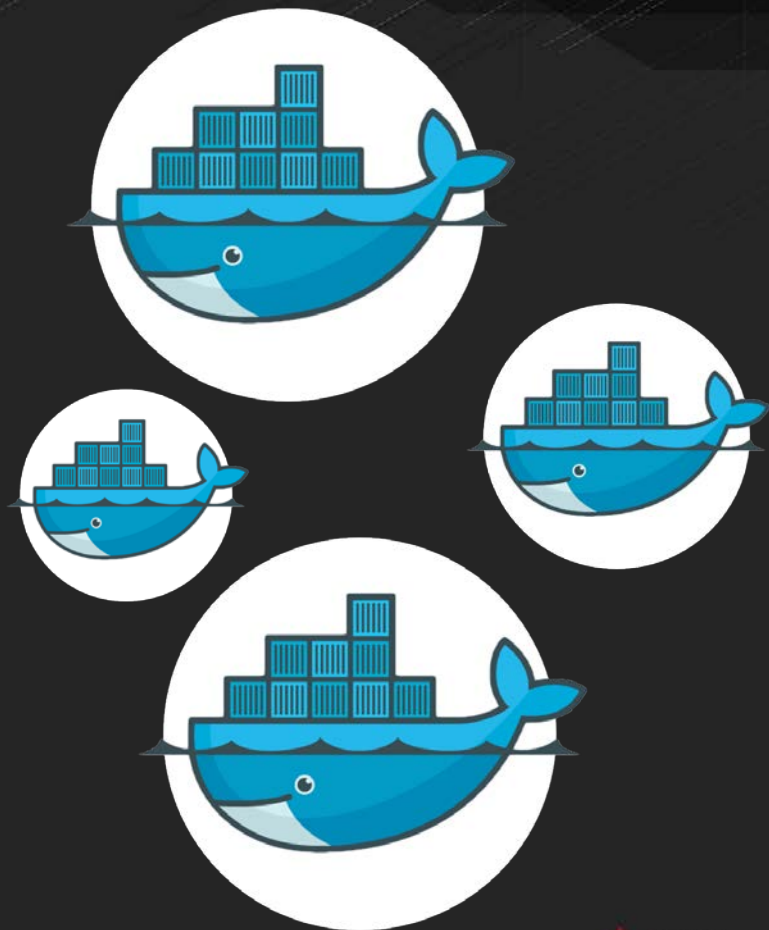
- ✓ Key/Value pairs associated with Kubernetes objects (env=production)

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/>



Key Kubernetes Capabilities

- Self-healing
- Horizontal manual & auto scaling
- Automatic restarting
- Scheduled across hosts
- Built-in load-balancer
- Rolling upgrades



Dev

SCM
(Git/Svn)

CI/CD

Automation



Ops

Registry

Master

API Server

Kubernetes

OpenShift

- Builds

- ImageStreams

Controllers

- Scheduler

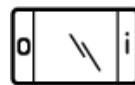
- Deployments

- Services

- Builds

- Routes

- DeploymentConfigs



Routing Layer

Node



Node



Node



SDN Overlay Network

Node



Node



Node



Service Layer



Physical



Virtual



Private



Public



Persistent
Storage





OPENSIFT



OPENSIFT



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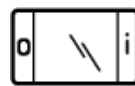
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Logger

Service Layer



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SDN Overlay Network

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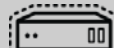
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Routing Layer

Node



Node



Node



SDN Overlay Network

Node



Node



Node

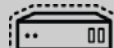


Logger

Service Layer



Physical



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OPENSIFT



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Registry

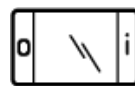
Master

API Server

Kubernetes

OpenShift
- Builds
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Routing Layer

Node



Node



Node



SDN Overlay Network

Node



Node



Node



Service Layer



Physical



Virtual



Private



Public



Persistent
Storage

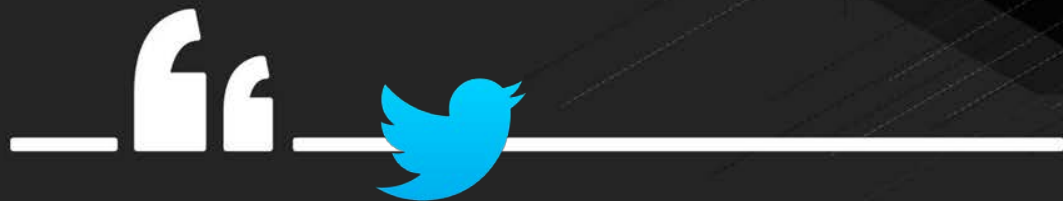


Kubernetes Demo

<https://github.com/burrsutter/kube4docker>

Recorded Demo: <https://youtu.be/AoDhQt8PtUQ>





The job of a deployment pipeline
is to prove that the release
candidate is unreleasable.

Jez Humble



Jenkins for Continuous Delivery

Jenkins Pipeline implements CD:

- ✓ orchestrator of build, test, promote, approve steps
- ✓ old name is *Jenkins Workflow plugin*

A Jenkinsfile:

- ✓ a Groovy DSL for defining the pipeline steps, pods, docker images, secret
- ✓ maps to a single Jenkins job with minimal configuration
- ✓ Label parts of the pipeline with stages to simplify pipeline progress visualisation
- ✓ Pipeline as code!

Fabric8 adds a reusable library of:

- ✓ Jenkinsfiles (pipelines) for different technologies
- ✓ functions for reuse of code across the Jenkinsfiles

Jenkinsfile

Simple

```
node('maven') {  
  stage 'validate'  
    echo 'Test some stuff'  
    sleep 10  
    input "Approve?"  
  stage 'build'  
    openshiftBuild(buildConfig: 'ruby-sample-build', showBuildLogs: 'true')  
  stage 'deploy'  
    openshiftDeploy(deploymentConfig: 'frontend')  
}
```

Leveraging “oc”

```
node('maven') {
  stage 'Git'
    git url: 'https://github.com/burrsutter/ola'
  stage 'Maven build'
    sh "mvn package"
  stage 'Unit Tests'
    echo "Unit Tests"
  stage 'Docker build'
    echo "Login"
    withCredentials([[$class: 'UsernamePasswordMultiBinding', credentialsId: 'developer',
      usernameVariable: 'USERNAME', passwordVariable: 'PASSWORD']]) {
      sh "oc login --insecure-skip-tls-verify=true -u $env.USERNAME -p $env.PASSWORD https://10.1.2.2:8443"
    }
    echo "OpenShift Docker Build"
    sh "oc new-build --binary --name=ola -l app=ola || echo 'Build exists'"
    sh "oc start-build ola --from-dir=. --follow"
  stage 'Integration Tests'
    echo "Integration Tests"
  stage 'Deploy'
    echo "Deploy, Deploy, Deploy"
    sh "oc new-app ola -l app=ola,hystrix.enabled=true || echo 'Application already Exists'"
    sh "oc expose service ola || echo 'Service already exposed'"
}
```

Other Jenkinsfile Examples

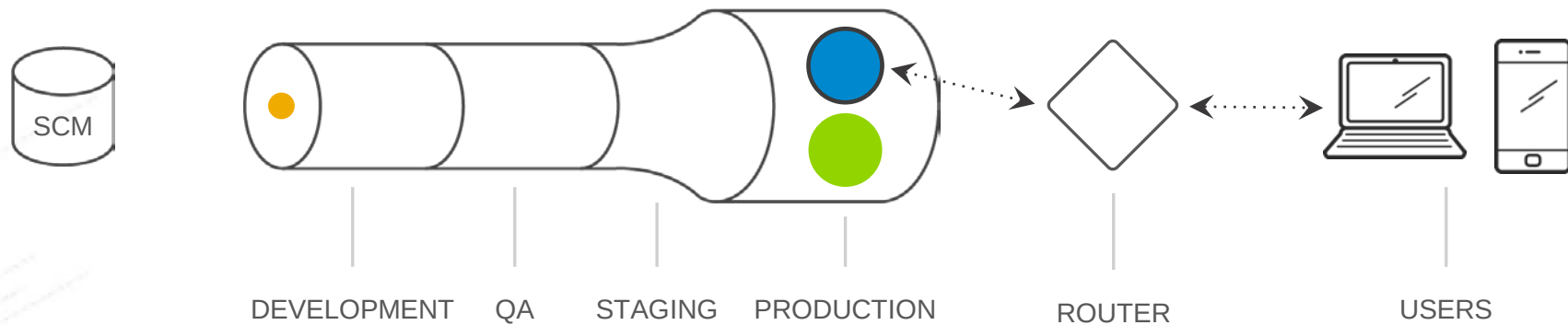
<https://github.com/redhat-helloworld-msa/aloha/blob/master/Jenkinsfile>

<https://github.com/Red-Hat-Middleware-Keynote/cicd/blob/master/blue-green>

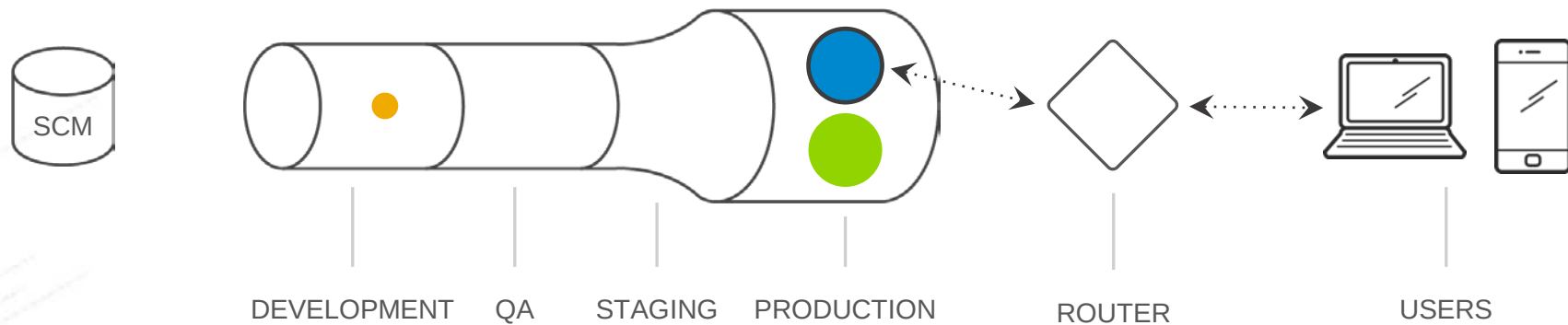
<https://github.com/Red-Hat-Middleware-Keynote/cicd/blob/master/canary>

Jenkins Demo

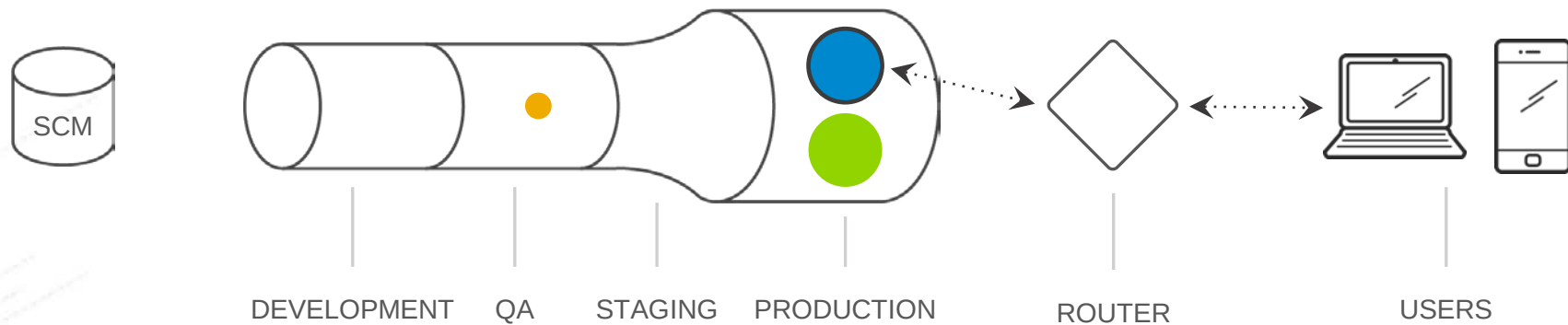
Canary Deployment



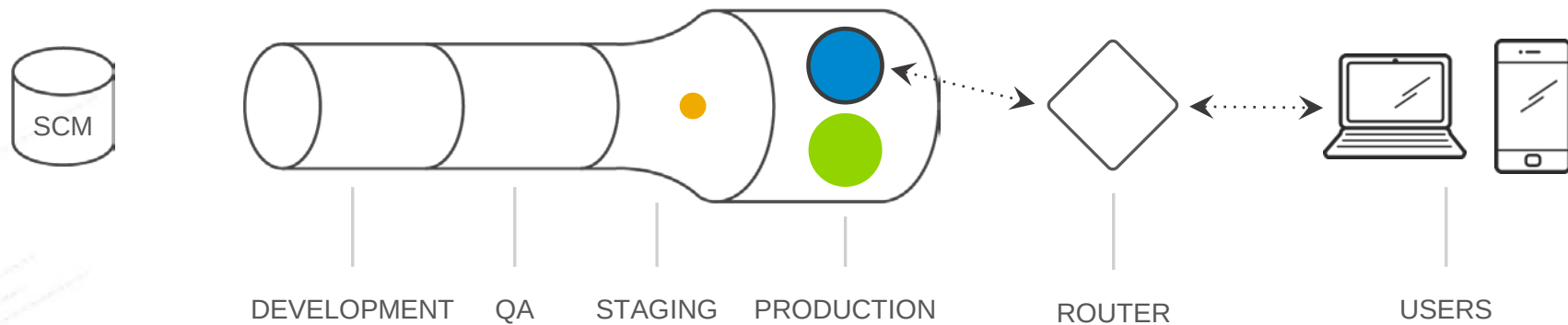
Canary Deployment



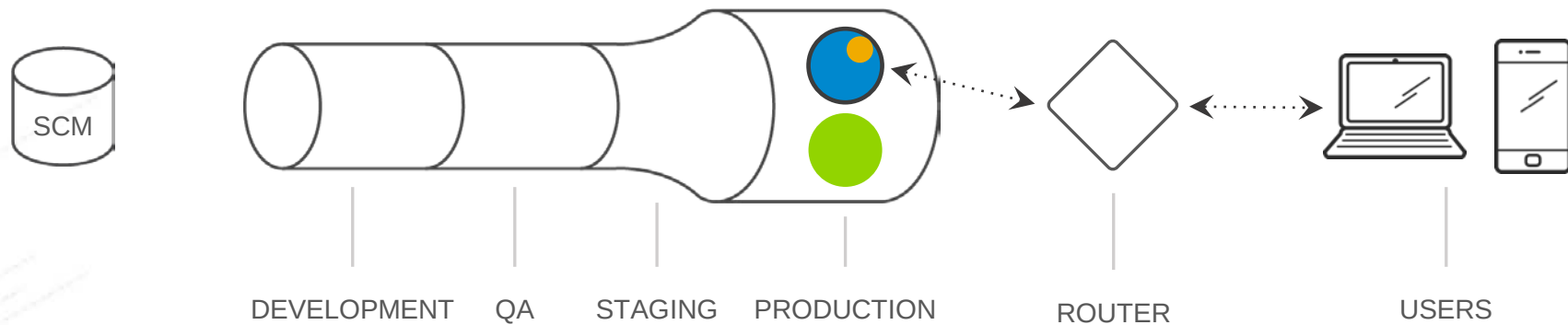
Canary Deployment



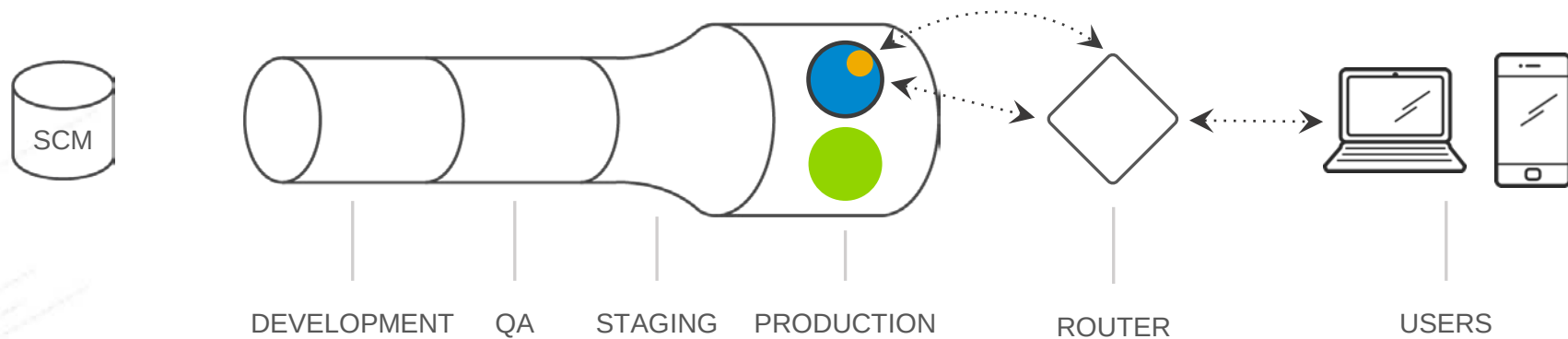
Canary Deployment



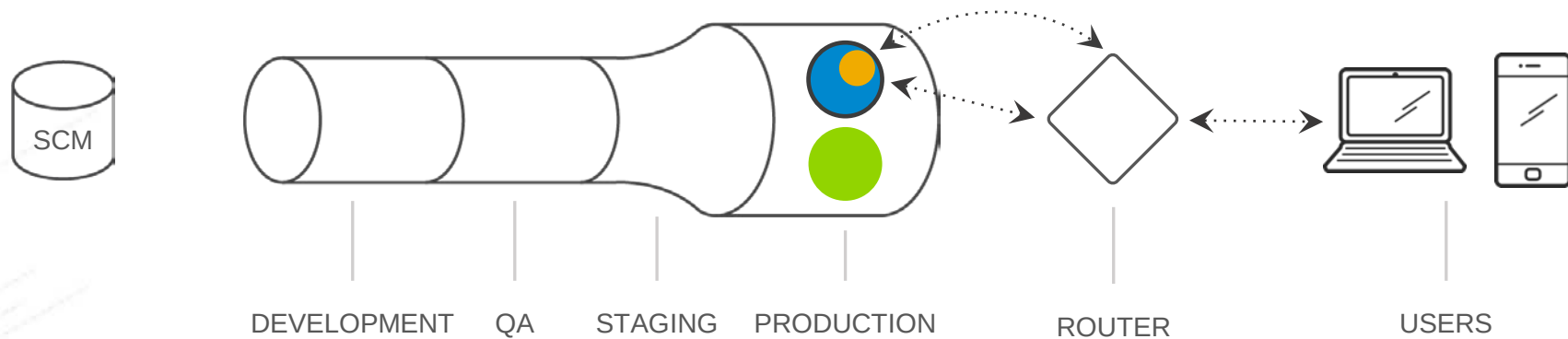
Canary Deployment



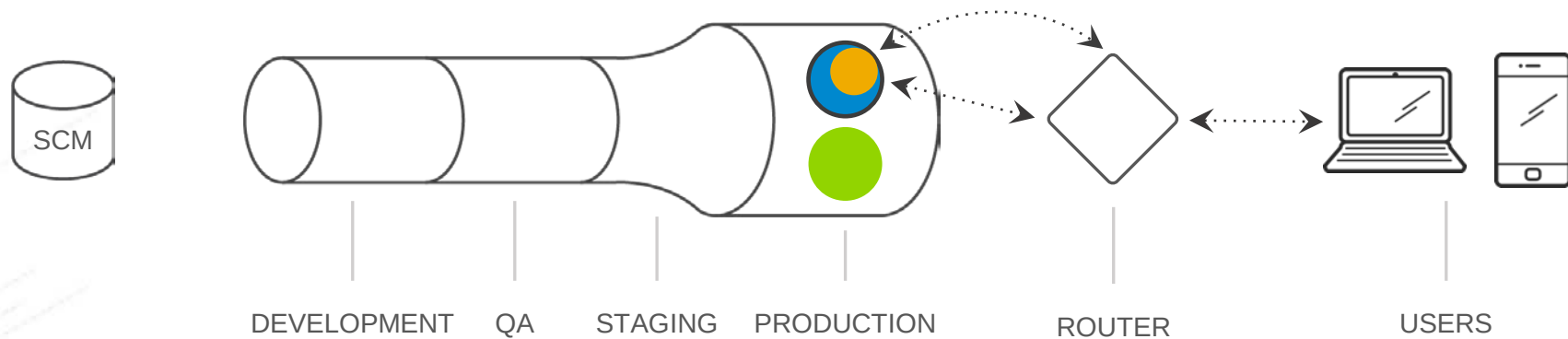
Canary Deployment



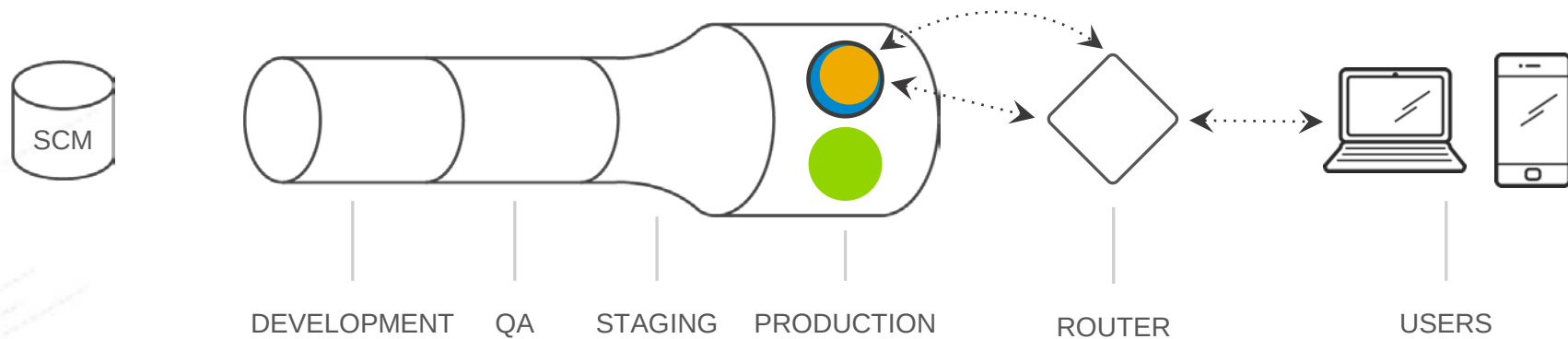
Canary Deployment



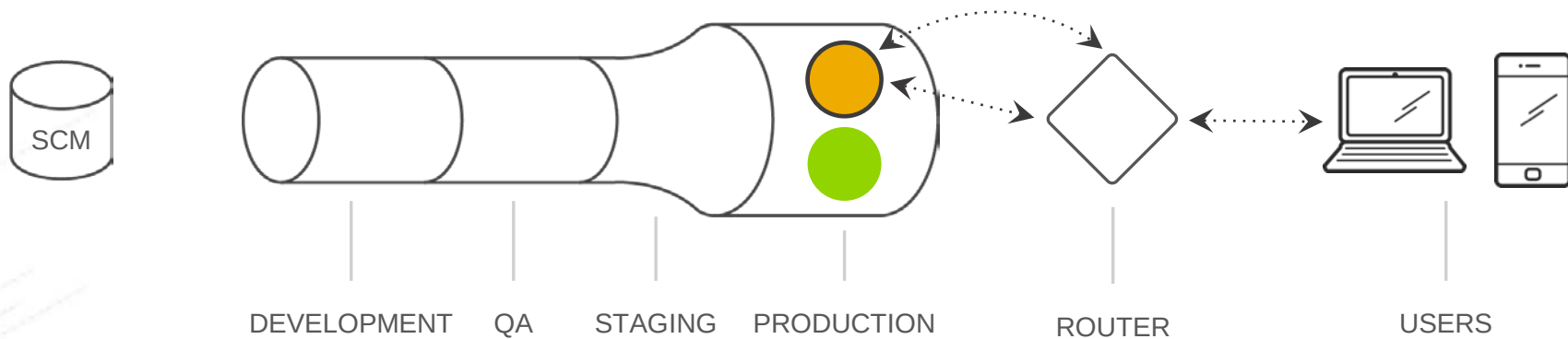
Canary Deployment



Canary Deployment



Canary Deployment





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THANK YOU!

More Information

<http://bit.ly/msa-instructions>



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