



# Red Hat OpenShift 4

The Kubernetes Platform For Big Ideas

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# EXPAND YOUR POSSIBILITIES

Join us at Red Hat® Forum 2019, a place to build on what you have, build toward what you want, and build up your expectations of possibilities to come.

On October 8th we invite you to join hundreds of open-minded, tech-hungry and inspiration-craving guests to our legendary Red Hat Forum. Due to the enormous growth over the past few years, we decided it was time to host **the first BeLux edition at the Event Lounge in Brussels!**

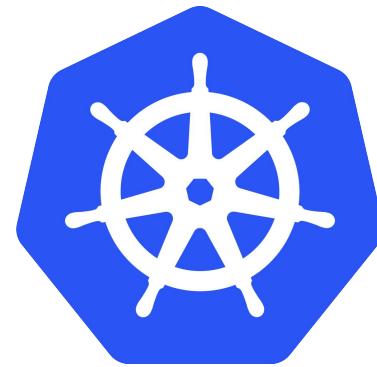
Register at [red.ht/RedHatForumBeLux](http://red.ht/RedHatForumBeLux)



A **secure** and **enterprise-grade** container application platform based on **Kubernetes** for traditional and cloud-native applications

Openshift is specifically designed to bring  
**developers** and **operations** teams **together**

Kubernetes is an open-source system for automating deployment, operations, and scaling of containerized applications across multiple hosts



# kubernetes

# KUBERNETES DOES A LOT FOR YOU

Orchestration

Storage plugins

Deployment

Networking plugins

Discovery

Scheduling

Health Monitoring

Scaling

(Some) Security

Service Load Balancing

# KUBERNETES DONE RIGHT IS HARD

## INSTALL

- Templating
- Validation
- OS Setup
- Provision Infrastructure

## DEPLOY

- Identity & Security Access
- App Monitoring & Alerts
- Storage & Persistence
- Egress, Ingress & Integration
- Host Container Images
- Build/Deploy Methodology

## HARDEN

- Platform Monitoring & Alerts
- Metering & Chargeback
- Platform Security Hardening
- Image Hardening
- Security Certifications
- Network Policy
- Disaster Recovery
- Resource Segmentation

## OPERATE

- OS Upgrade & Patch
- Platform Upgrade & Patch
- Image Upgrade & Patch
- App Upgrade & Patch
- Security Patches
- Continuous Security Scanning
- Multi-environment Rollout
- Enterprise Container Registry
- Cluster & App Elasticity
- Monitor, Alert, Remediate
- Log Aggregation

# THE KUBERNETES NEWS YOU DON'T WANT



- K8s dashboard exposed
- AWS environment with telemetry data compromised
- Tesla's infrastructure was used for crypto mining



Unnecessary Costs



- No security on K8s dashboard
- IT infrastructure credentials exposed
- Enabled access to a large part of Weight Watchers' network



Increased Risk



- K8S and etcd bug introduced to servers during update
- New features and changes deployed cause failures
- Restart backend components leading to full platform outage



Unrealized Value

# k8s DOES NOT DO EVERYTHING

Multi-tenancy

Metrics and Logging

Application Lifecycle Management

Self-Service

Application Services

Networking

Image Registry

Teams and Collaboration

Chargeback

Routing & Load Balancing

Quota Management

Dynamic Storage

CI/CD Pipelines

Image Build Automation

Infrastructure Visibility

Role-based Authorization

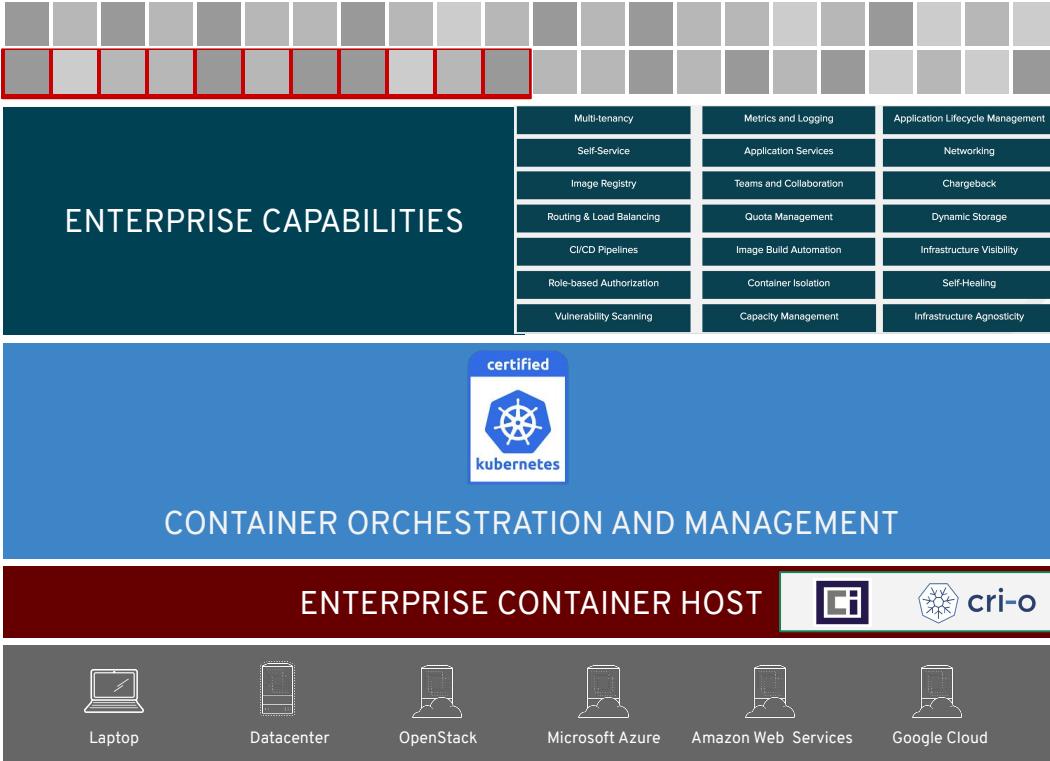
Container Isolation

Ease of Use

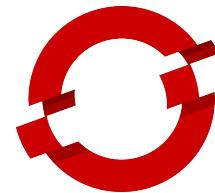
Vulnerability Scanning

Capacity Management

Infrastructure Agnosticity



ANY OCI COMPLIANT  
CONTAINER



**RED HAT®  
OPENSHIFT**

+ a wide range of  
value added  
products

ANY  
INFRASTRUCTURE



# OPENSHIFT IS THE BEST CHOICE FOR KUBERNETES

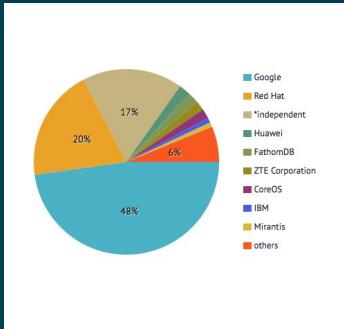
## CUSTOMERS



1000+ customers and the largest amount of reference customers running in production.

Years of experience running OpenShift Online and OpenShift Dedicated services.

## CODE



Red Hat is the leading Kubernetes developer and contributor with Google since day 1.

We make container development easy, reliable, and more secure.

## CLOUD



Amazon Web Services™

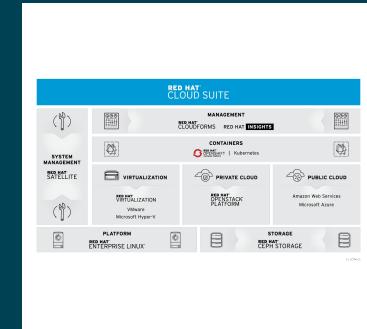
Microsoft Azure

Google Cloud Platform

Strong partnerships with cloud providers, ISVs, CCSPs, (G)SIs.

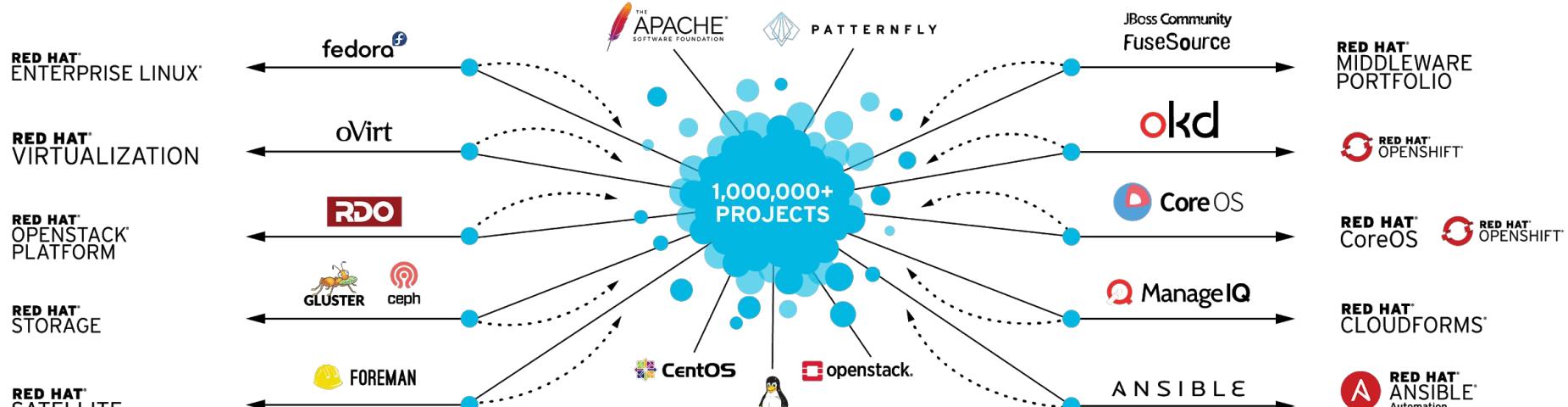
Extensive container catalog of certified partner images.

## COMPREHENSIVE



Comprehensive portfolio of container products and services for the enterprise, including developer tools, security, application services, storage, and management.

# FROM COMMUNITIES TO ENTERPRISE



communities-to-enterprise-201806rm

# RED HAT CONTRIBUTIONS TO KUBERNETES



Operators Framework | ClusterRole Aggregation |  
RBAC Authorization | StatefulSets | Init Containers |  
Rolling Update Status | Pod Security Policy Limits |  
Memory based Pod Eviction | Quota Controlled Services |  
1,000+ Nodes | Dynamic PV Provisioning | Multiple  
Schedulers | SECCOMP | Audit | Job Scheduler | Access  
Review API | Whitelisting Sysctls | Secure Cluster Policy |  
Evict Pods | Disk IO | Storage Classes | Azure Data Disk |  
etcdv3 | RBAC API | Auth to kubelet API | Pod-level  
cGroups | QoS | Kublet Eviction Model | RBAC | Storage  
Class | CustomResourceDefinitions | API Aggregation |  
Encrypted secrets in etcd | Limit Node Access | HPA |  
Status Conditions | Network Policy | CRI Validation Test  
Suite | Local Persistent Storage | Audit Logging |



OPENSHIFT



# VALUE PROPOSITIONS OF A RED HAT SUBSCRIPTION

1. **Stable open source** technology, organized and optimized for enterprise use
2. **Security** and accountability from a trusted advisor
3. **Knowledge** and influence in open source communities to pursue innovation and development
4. Access to world-class technical **support**, documentation, and tools
5. Flexibility for your plans with compatible, **vendor-agnostic** solutions, and longer life cycles
6. Partnership with Red Hat from proof of concept (POC) to deployment and beyond
7. Broad **ecosystem** of partners: original equipment manufacturers (OEM), channel, hardware, software, and cloud certification (CCSP) (and more)
8. Red Hat product certification provides the assurance that your third-party solutions are tested specifically on the Red Hat platform.



[try.openshift.com](http://try.openshift.com)

## Trusted enterprise Kubernetes

- Trusted Host, Content, Platform
- Full Stack Automated Install
- Over the Air Updates & Day 2 Mgt

## A cloud-like experience, everywhere

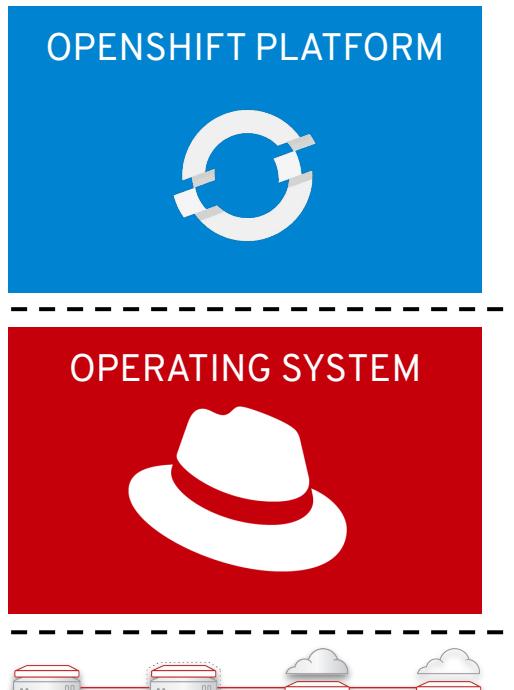
- Hybrid, Multi-Cluster Management
- Operator Framework
- Operator Hub & Certified ISVs

## Empowering developers to innovate

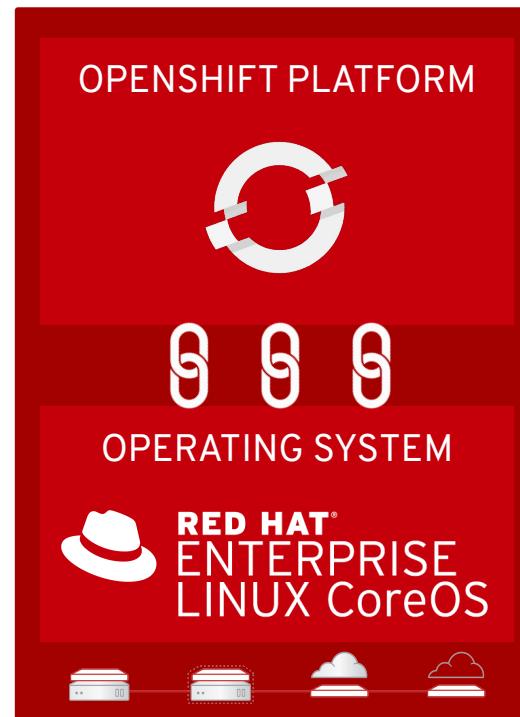
- OpenShift Service Mesh (Istio)
- OpenShift Serverless (Knative)
- CodeReady Workspaces (Che)

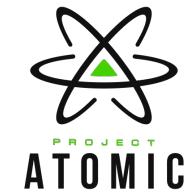
# FULL STACK AUTOMATED INSTALL

OPENShift 3



OPENSIFT 4





# RHEL COREOS



**Red Hat**  
Enterprise Linux  
CoreOS

Minimal Linux distribution

Optimized for running  
containers

Decreased attack surface

Over-the-air automated  
updates

Immutable foundation for  
OpenShift clusters

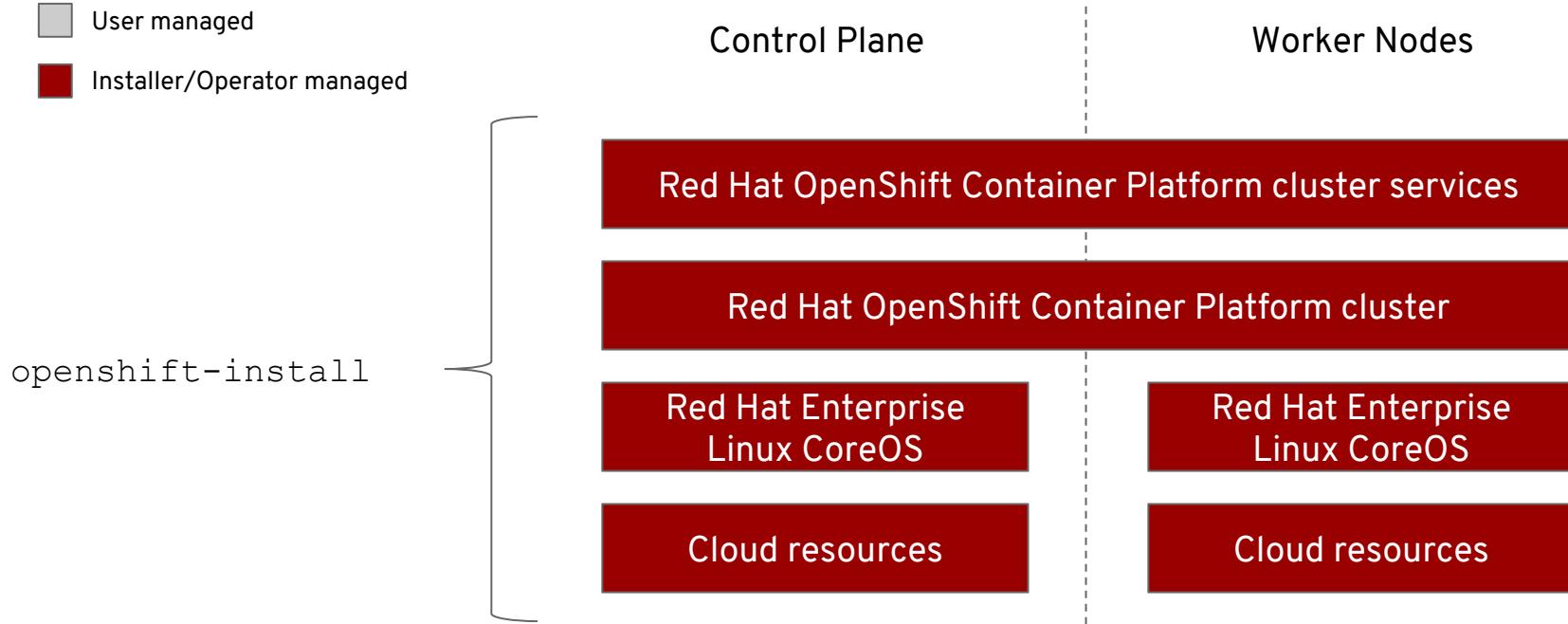
Ignition-based Metal and Cloud  
host configuration



# INSTALLER PROVISIONED INFRASTRUCTURE (IPI)

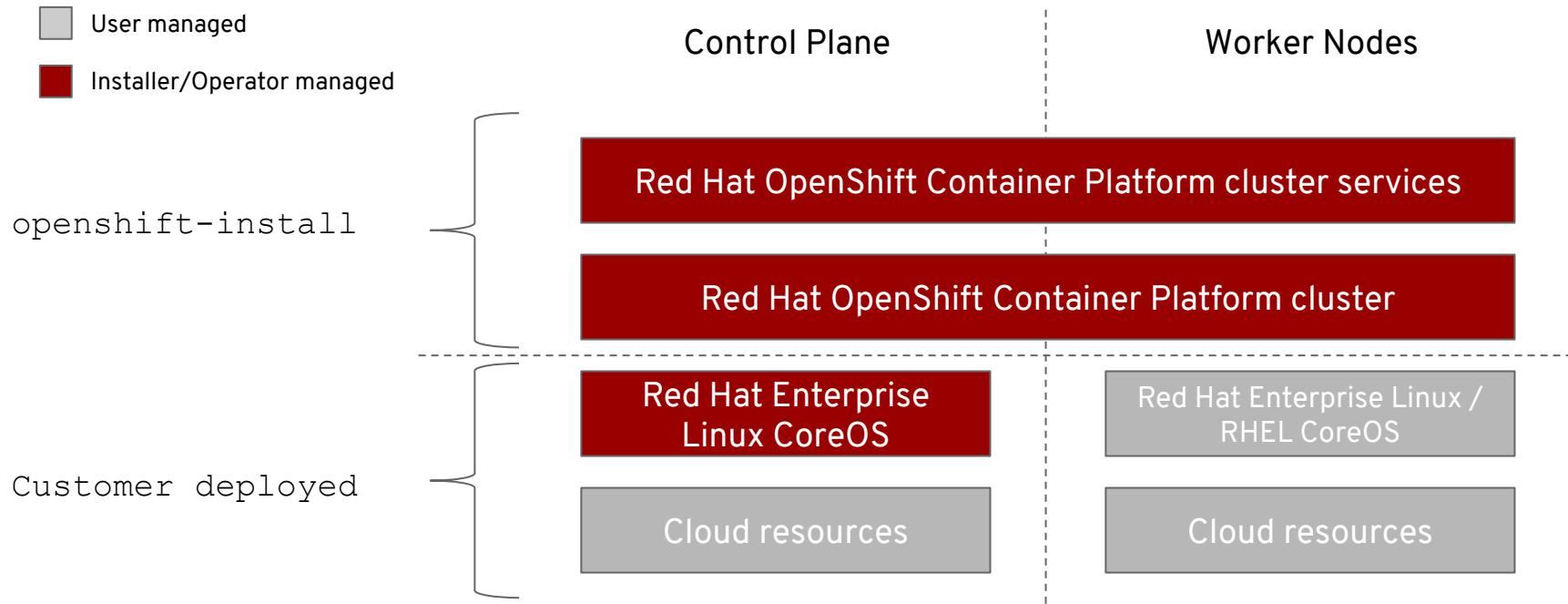
Day 1: OpenShift install - Day 2: Operators

- User managed
- Installer/Operator managed

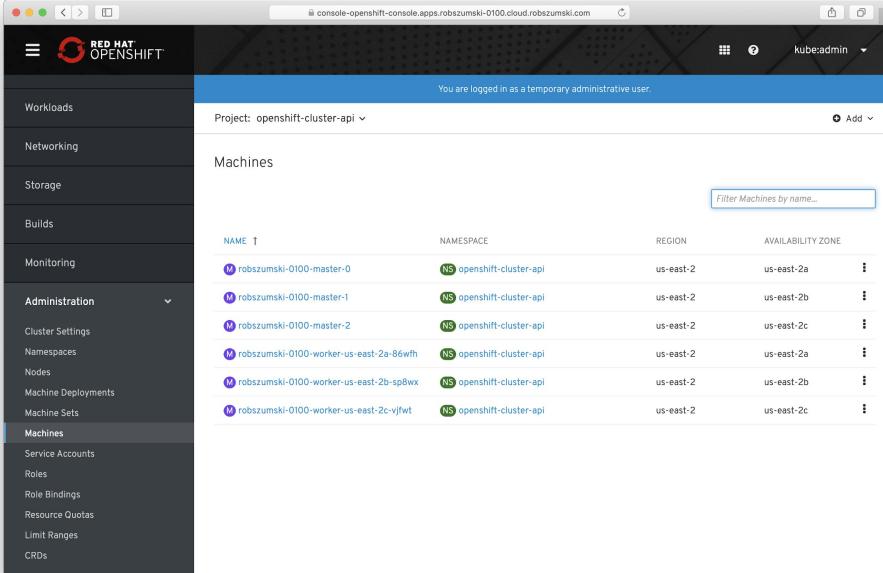


# USER PROVISIONED INFRASTRUCTURE (UPI)

Day 1: OpenShift install - Day 2: Operators + Customer Managed Nodes & Infra

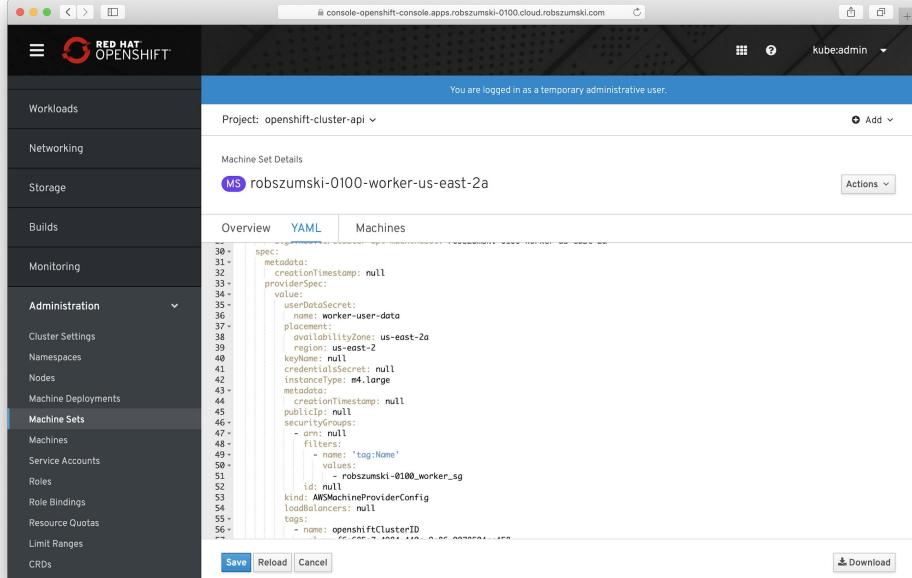


# USING KUBERNETES TO PROVISION KUBERNETES CLUSTERS KUBERNETES MACHINE API OPERATOR



The screenshot shows the Red Hat OpenShift web console interface. The left sidebar is titled "RED HAT OPENSHIFT" and includes navigation links for Workloads, Networking, Storage, Builds, Monitoring, Administration (Cluster Settings, Namespaces, Nodes, Machine Deployments, Machine Sets), and CRDs. The main content area is titled "Machines" and displays a table of machine details. The table columns are NAME, NAMESPACE, REGION, and AVAILABILITY ZONE. The machines listed are:

NAME	NAMESPACE	REGION	AVAILABILITY ZONE
robszumski-0100-master-0	openshift-cluster-api	us-east-2	us-east-2a
robszumski-0100-master-1	openshift-cluster-api	us-east-2	us-east-2b
robszumski-0100-master-2	openshift-cluster-api	us-east-2	us-east-2c
robszumski-0100-worker-us-east-2a-86wfh	openshift-cluster-api	us-east-2	us-east-2a
robszumski-0100-worker-us-east-2b-sp8wx	openshift-cluster-api	us-east-2	us-east-2b
robszumski-0100-worker-us-east-2c-vjfwf	openshift-cluster-api	us-east-2	us-east-2c



The screenshot shows the Red Hat OpenShift web console interface. The left sidebar is titled "RED HAT OPENSHIFT" and includes navigation links for Workloads, Networking, Storage, Builds, Monitoring, Administration (Cluster Settings, Namespaces, Nodes, Machine Deployments, Machine Sets), and CRDs. The main content area is titled "Machine Set Details" and displays the YAML configuration for a machine set named "robszumski-0100-worker-us-east-2a". The "YAML" tab is selected.

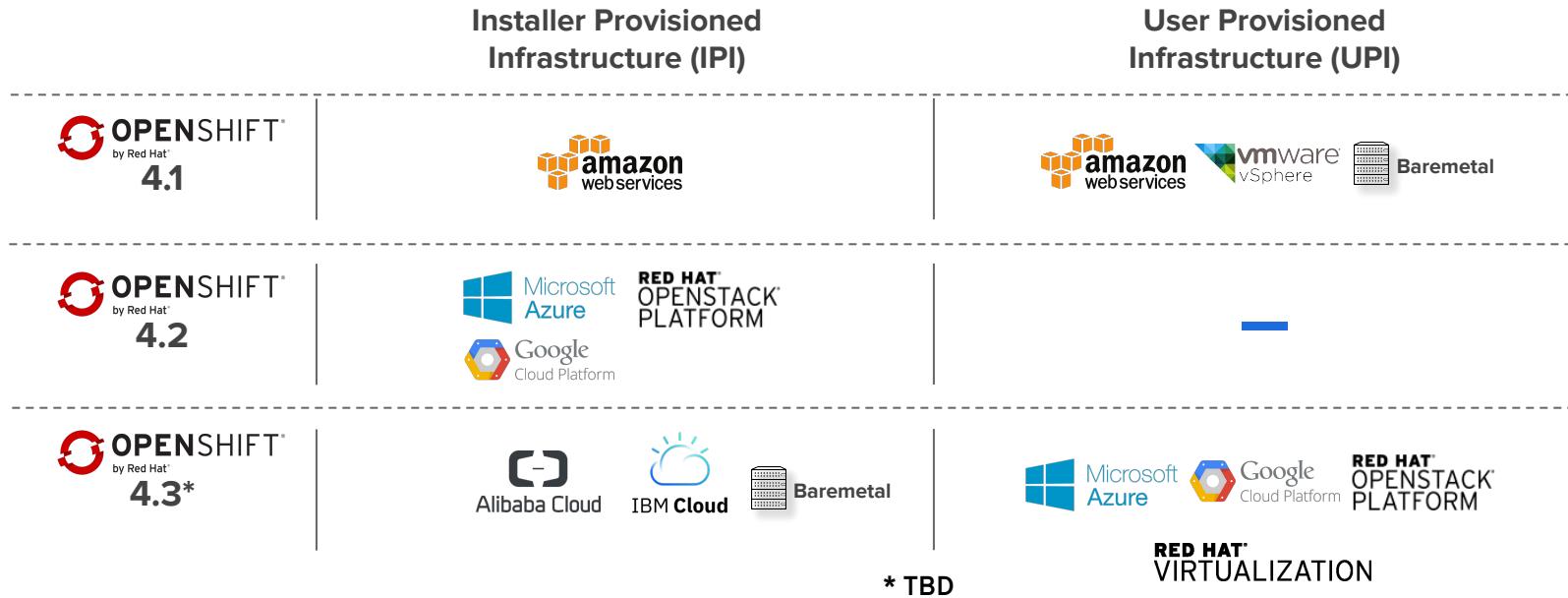
```
apiVersion: machine.openshift.io/v1
kind: MachineSet
metadata:
  creationTimestamp: null
  name: robszumski-0100-worker-us-east-2a
spec:
  selector:
    matchLabels:
      robszumski-0100-worker-us-east-2a: "true"
  template:
    metadata:
      creationTimestamp: null
      labels:
        robszumski-0100-worker-us-east-2a: "true"
    spec:
      containers:
        - image: openshift/node:v3.11.0-20180710-1454-0
        - image: openshift/etcd:v3.1.1-20180710-1454-0
        - image: openshift/pause:v3.1.0-20180710-1454-0
      dnsPolicy: ClusterFirst
      hostNetwork: true
      nodeSelector:
        robszumski-0100-worker-us-east-2a: "true"
      restartPolicy: Always
      terminationGracePeriodSeconds: 30
      tolerations:
        - effect: NoSchedule
          key: node-role.kubernetes.io/master
        - effect: PreferNoSchedule
          key: node-role.kubernetes.io/worker
        - effect: NoExecute
          key: node.kubernetes.io/unreachable
      volumes:
        - name: worker-user-data
          persistentVolumeClaim:
            claimName: robszumski-0100-worker-us-east-2a-worker-pvc
      providerConfig:
        type: AWSMachineProviderConfig
        awsMachineProviderConfig:
          availabilityZone: us-east-2a
          region: us-east-2
          keyName: null
          credentialsSecret: null
          instanceType: M4.large
          metadata:
            creationTimestamp: null
            publicIp: null
            securityGroups:
              - id: null
                filters:
                  - name: tag:Name
                    values:
                      - robszumski-0100_worker_sg
              - id: null
                kind: AWSMachineProviderConfig
                loadBalancers: null
                tags:
                  - name: openshiftClusterID
                    value: openshiftClusterID
```

# OVER-THE-AIR UPDATES

- OpenShift retrieves list of available updates
- Admin selects the target version
- OpenShift is updated over the air
- Auto-update support

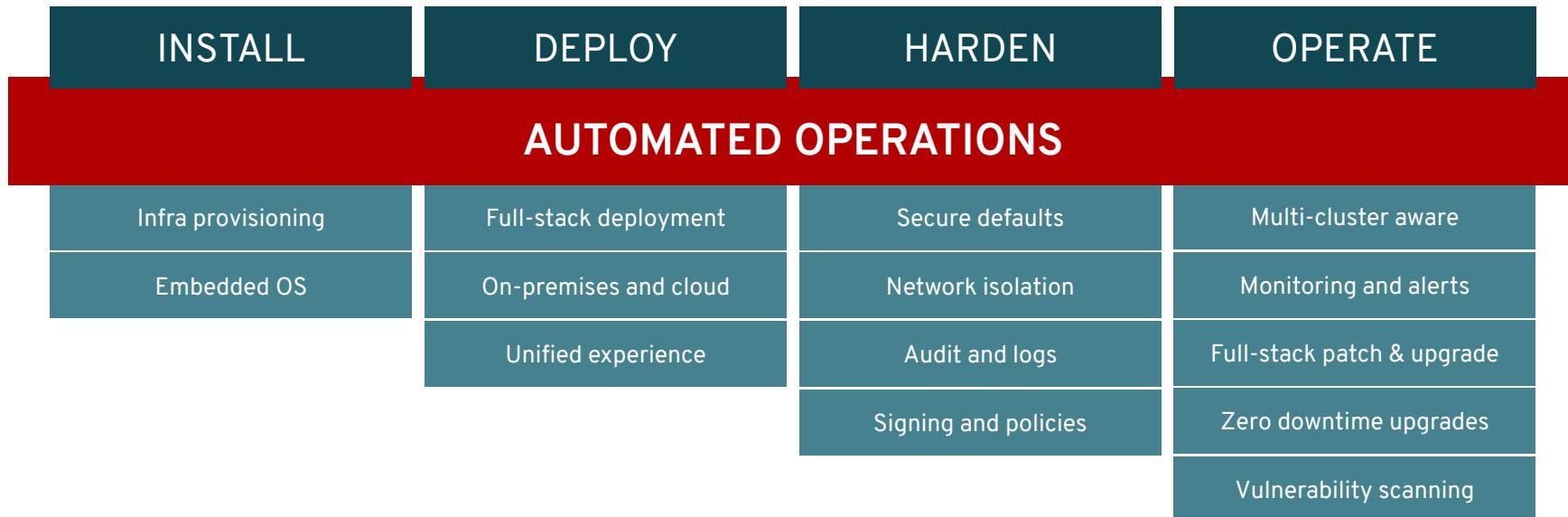
The screenshot shows the Red Hat OpenShift web interface. On the left is a dark sidebar with navigation links: Home, Catalog, Workloads, Networking, Storage, Builds, Monitoring, Administration (with sub-links for Cluster Settings, Namespaces, and Nodes), and a user dropdown for 'kube:admin'. The main content area is titled 'Cluster Settings' and has tabs for Overview, Global Configuration, and Cluster Operators. Under 'Overview', there's a table with three columns: CHANNEL (set to 'fast'), UPDATE STATUS (4.1.0-0.2), and CURRENT VERSION (4.0.0-0.2). Below the table, it says 'CLUSTER ID' followed by a long hex string. It also shows 'CURRENT PAYLOAD' with a small arrow icon. At the bottom right of the main area is a blue 'Update' button.

# PROVIDER ROADMAP FOR RED HAT OPENSHIFT 4



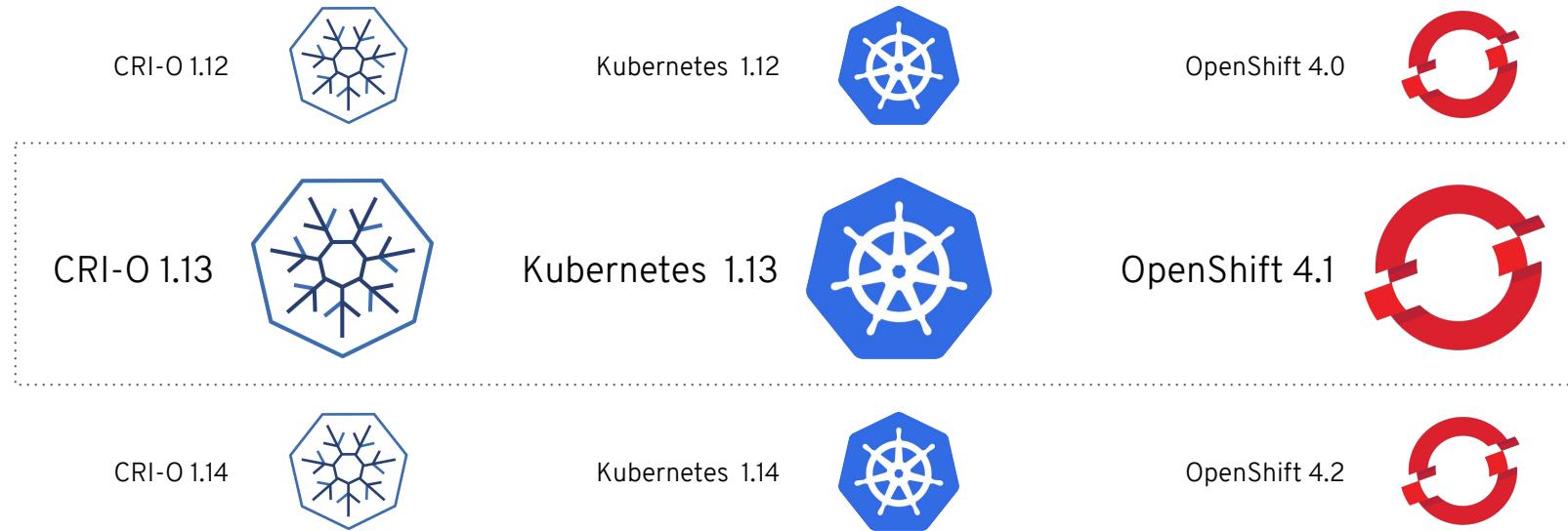
# AUTOMATED CONTAINER OPERATIONS

Fully automated day-1 and day-2 operations



# CRI-O Support in OpenShift

CRI-O tracks and versions identical to Kubernetes, simplifying support permutations





[try.openshift.com](http://try.openshift.com)

## Trusted enterprise Kubernetes

- Trusted Host, Content, Platform
- Full Stack Automated Install
- Over the Air Updates & Day 2 Mgt

## A cloud-like experience, everywhere

- Hybrid, Multi-Cluster Management
- Operator Framework
- Operator Hub & Certified ISVs

## Empowering developers to innovate

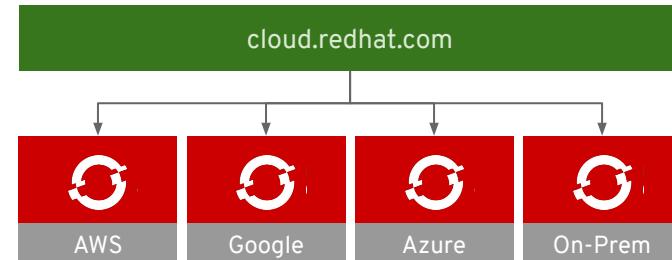
- OpenShift Service Mesh (Istio)
- OpenShift Serverless (Knative)
- CodeReady Workspaces (Che)

# UNIFIED HYBRID CLOUD

- [cloud.redhat.com](https://cloud.redhat.com)
- Multi-cluster management
  - New clusters on AWS, Azure, Google, vSphere, OpenStack, and bare metal
  - Register existing clusters
  - Including OpenShift Dedicated
- Management operations
  - Install new clusters
  - View all registered clusters
  - Update clusters

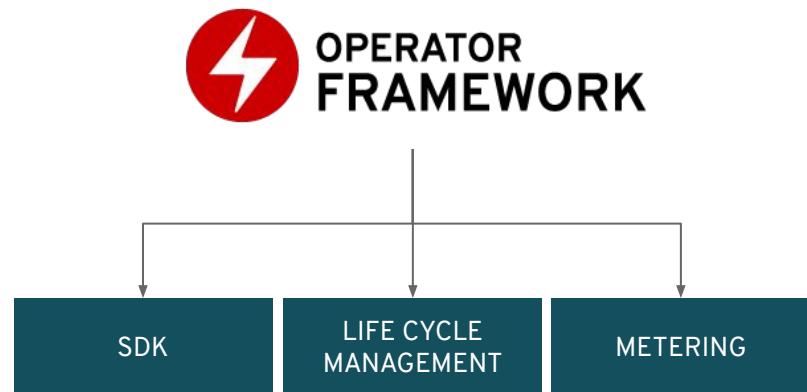
The screenshot shows the OpenShift Cluster Manager interface. On the left, there's a sidebar with 'Clusters', 'Subscriptions', 'Membership', and 'Administration' sections. The main area is titled 'Clusters' and has a 'Create' button. It lists several clusters with their names and provider information. A modal window titled 'OpenShift Clusters' is open, showing two tabs: 'Register cluster' and 'Download Installer'. Below the tabs, it lists 'Production' and 'Cloud Staging' clusters, each with their platform (AWS), version (4.0.158 and 4.0.163 respectively), and a message indicating a security upgrade available for Production.

CLUSTER NAME	PLATFORM	VERSION	MESSAGE
Production	AWS	4.0.158	⚠️ Security upgrade available
Cloud Staging	AWS	4.0.163	Up to date



# OPERATOR FRAMEWORK

Operators codify operational knowledge and workflows to automate life cycle management of containerized applications with Kubernetes



# KUBERNETES OPERATOR FRAMEWORK

AN INNOVATIVE, MORE EFFICIENT WAY TO MANAGE CONTAINERIZED APPLICATIONS AT SCALE

## AUTOMATED LIFECYCLE MANAGEMENT



Operators codify operational knowledge and workflows to automate lifecycle management of containerized applications with Kubernetes

# OPERATORHUB IN OPENShift 4

## For Cluster Admins:

The screenshot shows the OperatorHub interface. On the left, there's a sidebar with categories like All Items, AI/Machine Learning, Big Data, Database, Integration & Delivery, Logging & Tracing, and Monitoring. In the center, the AMQ Streams operator is displayed with its icon, name, version (1.1.0), provider (Red Hat, Inc.), and a brief description: "based on the Apache Kafka™ open source project, designed for mission-critical real-time data processing at scale". Below this, there are sections for Languages, Middleware, and Other, and a search bar for "Kafka". At the bottom, it says "Red Hat AMQ Streams is a Red Hat product".

- Discovery/install/upgrade of Operators
- Community, Red Hat products, Certified ISVs
- Granular access via specific Projects

## For Developers:

The screenshot shows the Developer Catalog interface. It has tabs for Overview, YAML, and Resources, with Resources selected. Under the Resources tab, there are tabs for Route, Service, StatefulSet, Deployment, and ReplicaSet. The main area shows a table of resources under the heading "my-cluster". The table includes columns for NAME, TYPE, and STATUS. It lists several resources: my-cluster-entity-operator (Deployment, Created), my-cluster-entity-operator-5778f899cc-lddz (Pod, Running), my-cluster-kafka (StatefulSet, Created), and my-cluster-hafka-0 (Pod, Running). Below the table, there's a section for "Kafka" with its description: "Represents a Kafka cluster".

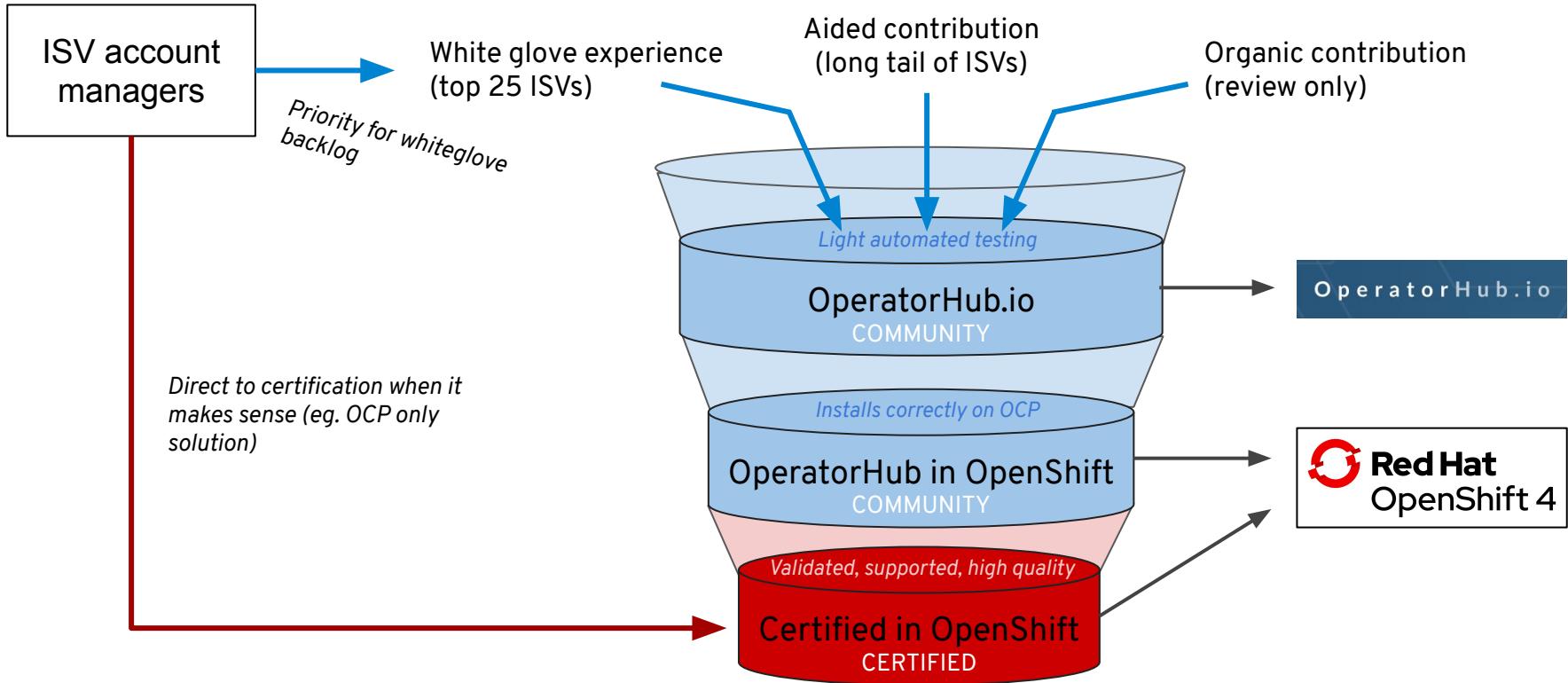
- Developers can't see admin screens
- Operator capabilities are exposed in Catalog
- Self-service management

# THE INDUSTRY IS ALIGNING BEHIND THE KUBERNETES OPERATOR FRAMEWORK



60+ Certified ISV Operators in Red Hat Early Access Program

# OPERATOR CERTIFICATION FUNNEL



# OPERATOR CERTIFICATION

## Customer Benefits

- Enabling desired customer workloads
- Support from the experts: the ISVs
- First line of support from Red Hat
- Testing to ensure quality and verified to install on OpenShift
- Services released on partner schedule
- Container updates through CFC

## ISV Benefits

- Access to our enterprise install base
- Out-of-the-box experience
- Use OCP for their hybrid story
- Consistent foundation to build and support for their apps
- SaaS-like experience with a partner that won't compete with them



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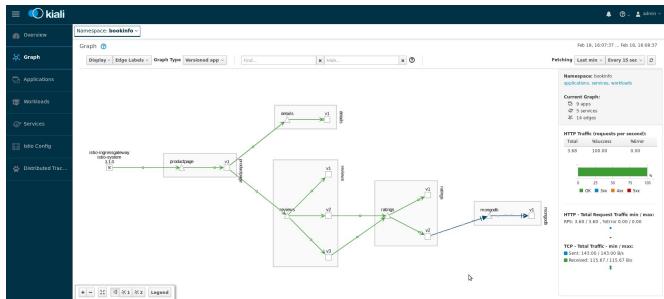
- OpenShift Service Mesh (Istio)
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# OpenShift Service Mesh

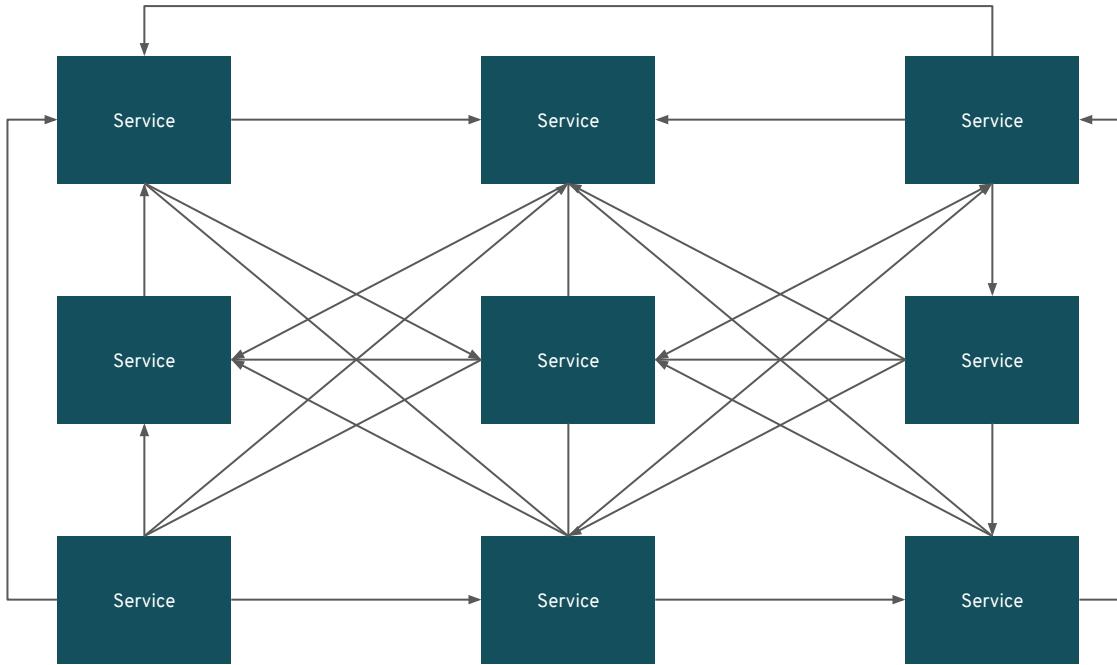
"A dedicated network for service-to-service communications"

## Customer Benefits

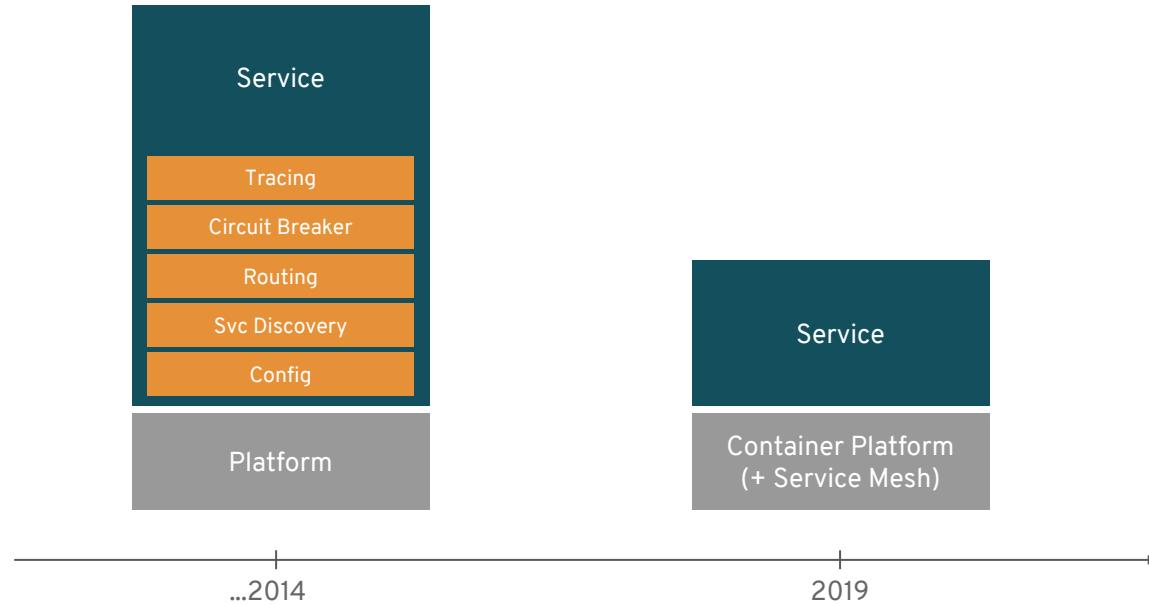
- Reduced need for developers to have operational knowledge
- Service observability and discovery with distributed tracing
- Enable transparent policy-driven security
- From routing rules to chaos engineering
- Powerful visualization & monitoring



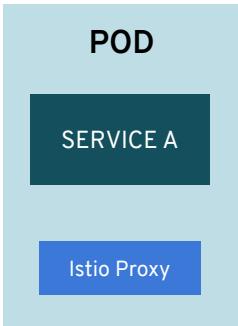
# DISTRIBUTED ARCHITECTURE



# MICROSERVICES EVOLUTION



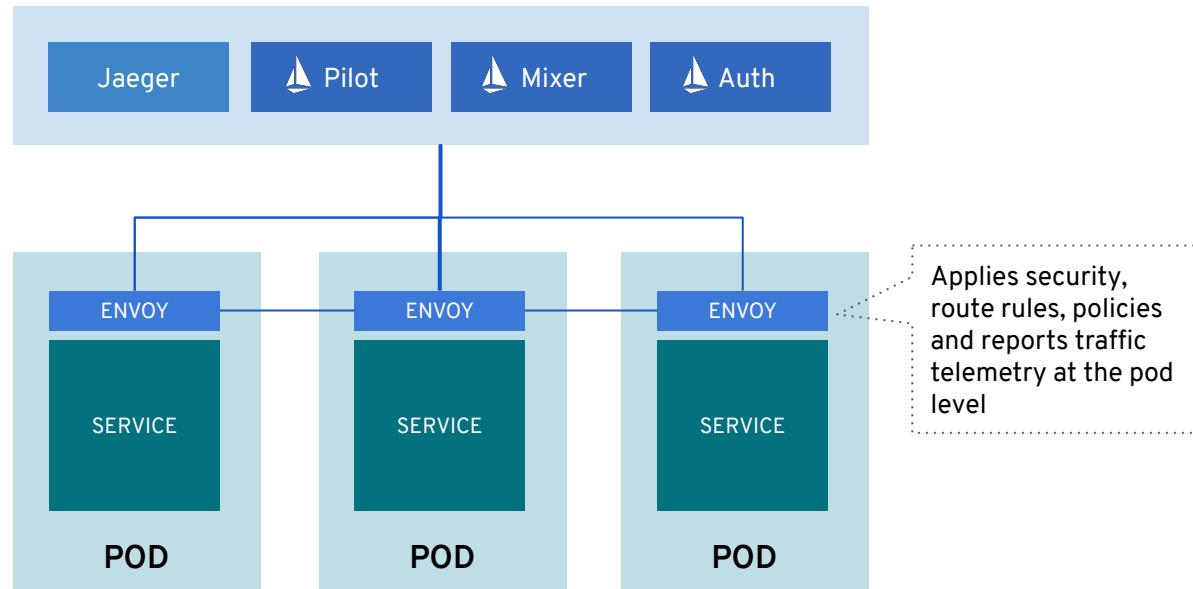
# SIDECARS



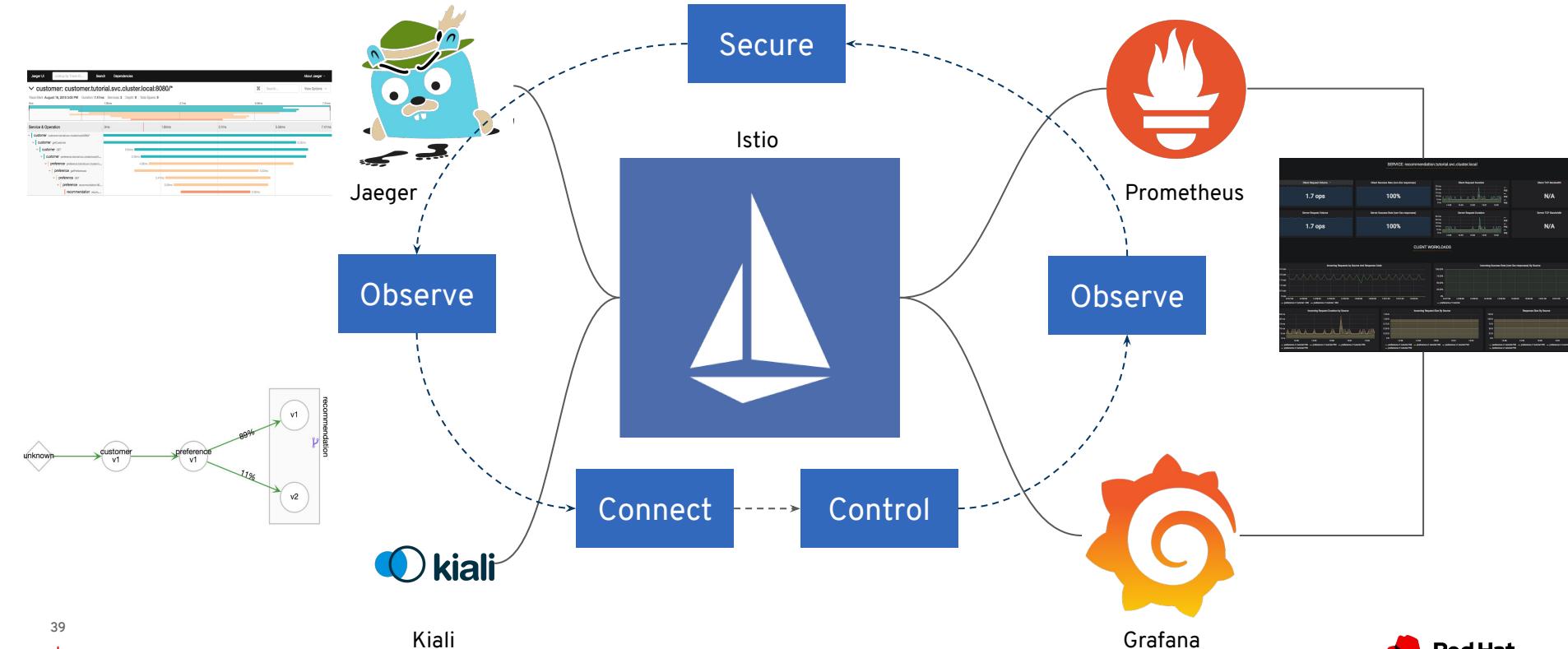
- Two or more containers deployed to same pod
- Share
  - Same
    - Namespace
    - Pod IP
  - Shared lifecycle
- Used to enhance the co-located containers
- Istio Proxy (L7 Proxy)
  - Proxy all network traffic in and out of the app container

Source: <http://blog.kubernetes.io/2015/06/the-distributed-system-toolkit-patterns.html>

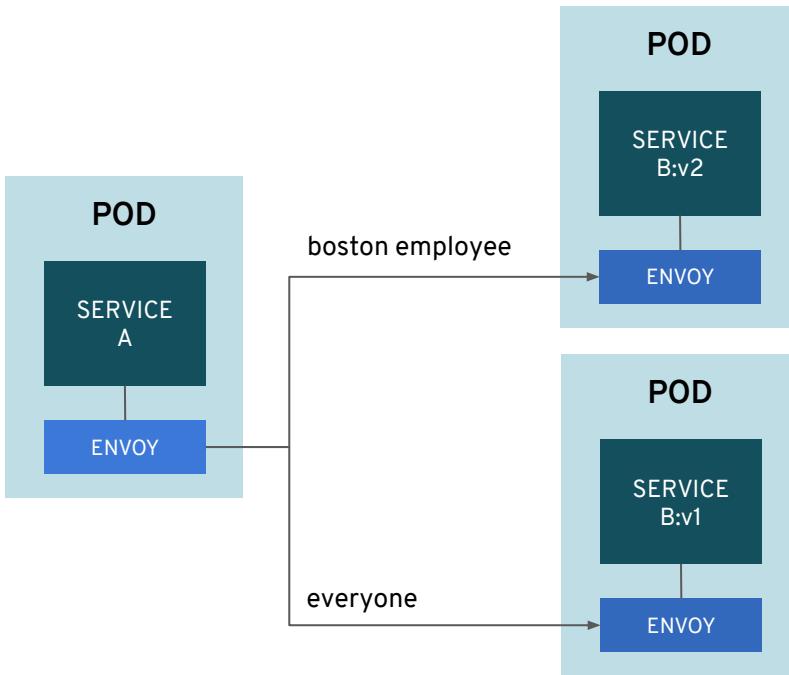
# SERVICE MESH ARCHITECTURE



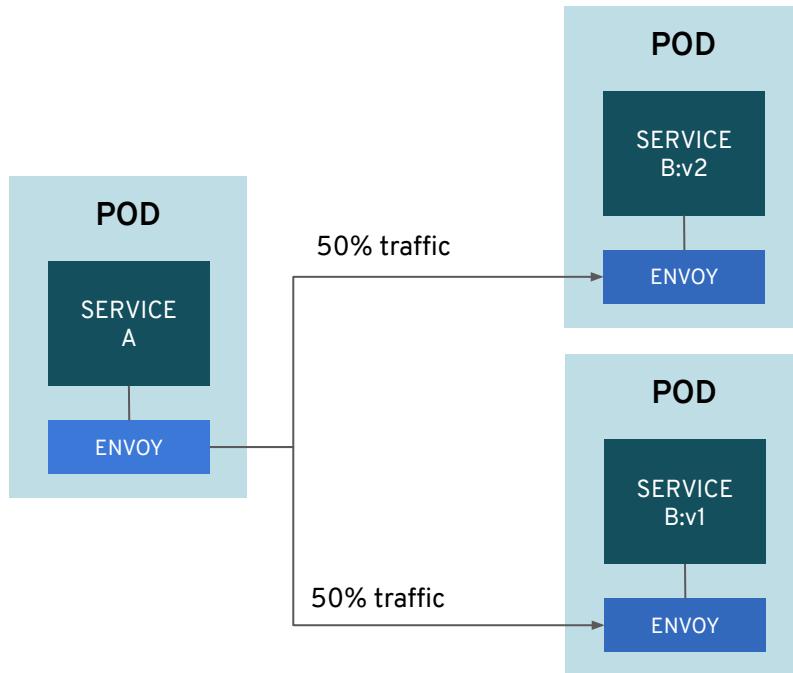
# OPENSHIFT SERVICE MESH ECOSYSTEM



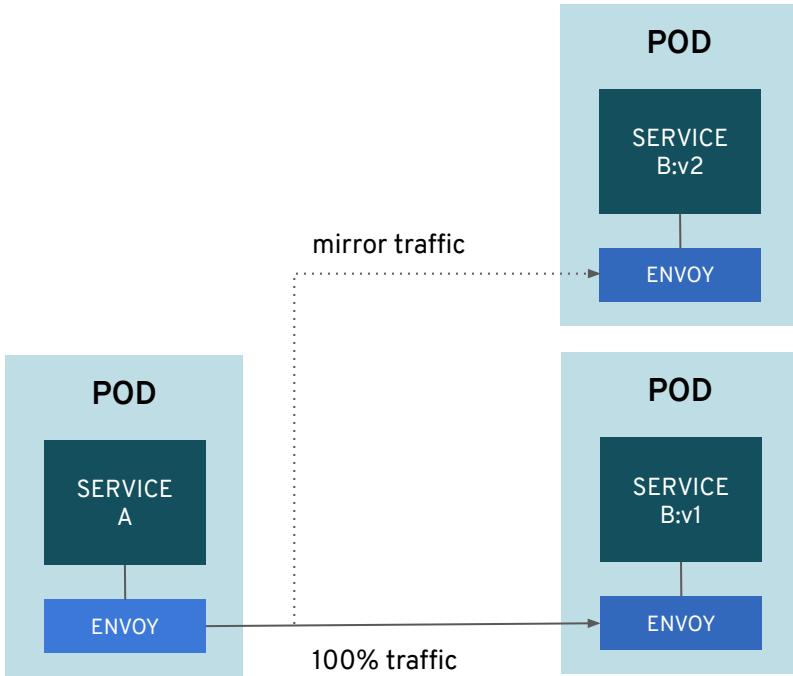
# CANARY DEPLOYMENT WITH SERVICE MESH



# A/B DEPLOYMENT WITH SERVICE MESH



# DARK LAUNCHES WITH SERVICE MESH



**kiali**

- Overview
- Graph**
- Applications
- Workloads
- Services
- Istio Config
- Distributed Trac...

Namespace: **bookinfo** ▾

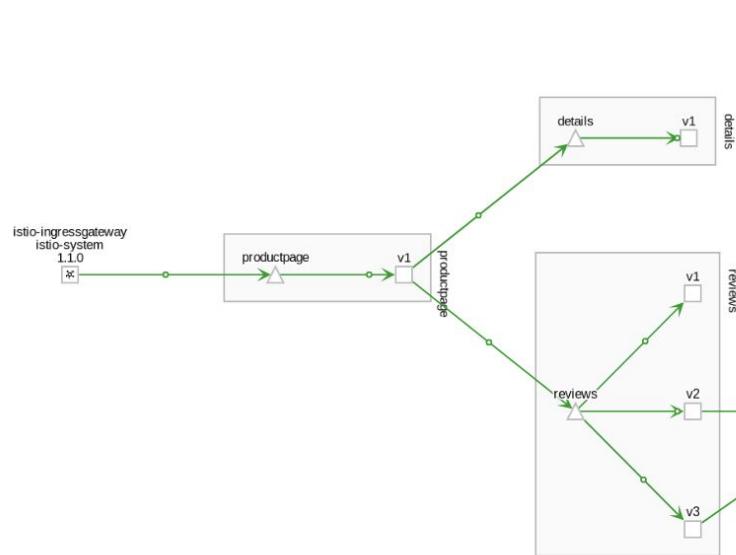
Graph ⓘ

Display ⓘ Edge Labels ⓘ Graph Type Versioned app ⓘ

Find... x Hide... x ⓘ

Feb 18, 16:07:37 ... Feb 18, 16:08:37

Fetching Last min ⓘ Every 15 sec ⓘ



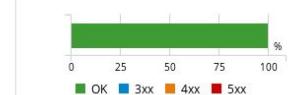
Namespace: bookinfo  
applications, services, workloads

Current Graph:

9 apps  
5 services  
14 edges

HTTP Traffic (requests per second):

Total	%Success	%Error
3.68	100.00	0.00



HTTP - Total Request Traffic min / max:  
RPS: 3.60 / 3.60 , %Error 0.00 / 0.00

TCP - Total Traffic - min / max:  
Sent: 143.00 / 143.00 B/s  
Received: 115.67 / 115.67 B/s

# OpenShift serverless

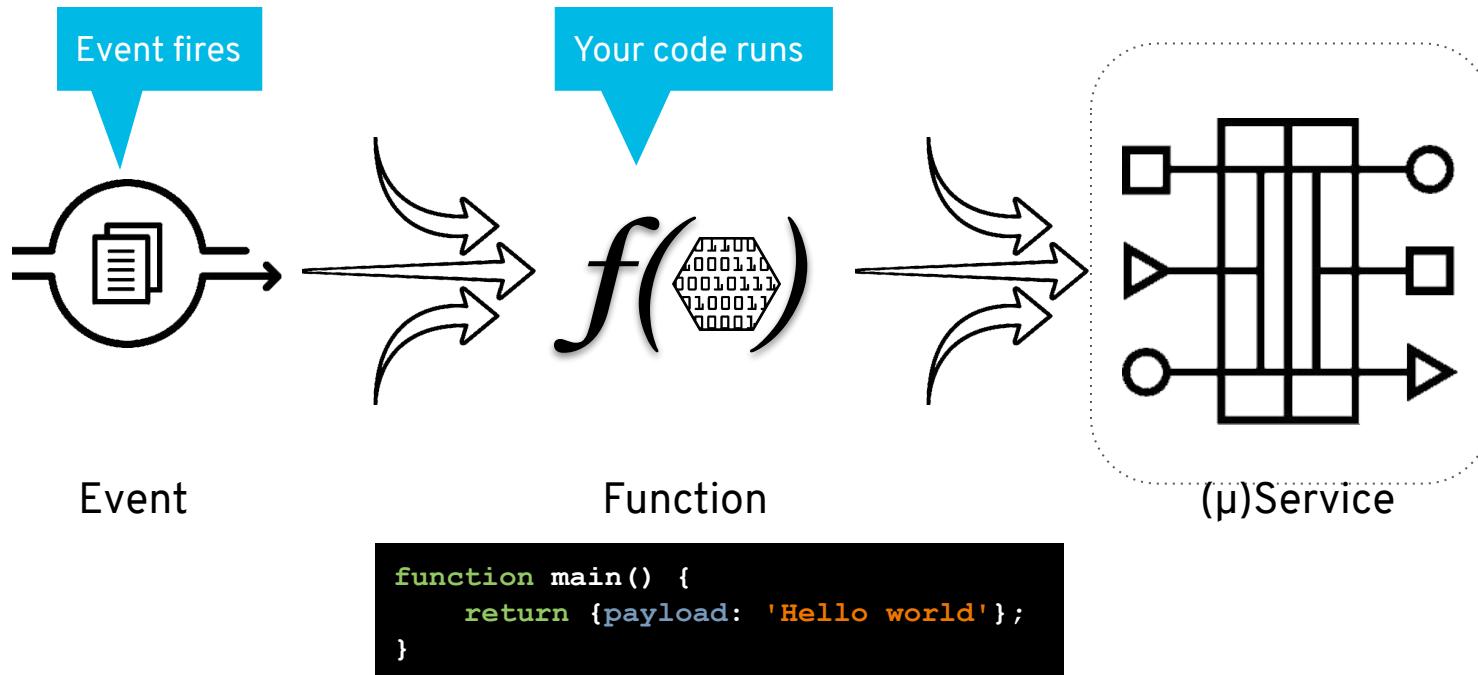
"Serverless building blocks for any container workload"



## Customer Benefits

- Familiar to Kubernetes users. Native.
- Scale to 0 and autoscale to N based on demand
- Applications and functions. Any container workload.
- Powerful eventing model with multiple event sources.
- No vendor lock in

# How does it work ?



# Knative Overview - Components

*"...an extension to Kubernetes exposing building blocks to build modern, source-centric, and container-based applications that can run anywhere".*

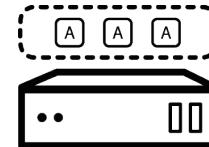
## Build

A pluggable model for building artifacts, like jar files, zips or containers from source code.



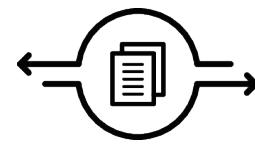
## Serving

An event-driven model that serves the container with your application and can "scale to zero".



## Events

Common infrastructure for consuming and producing events that will stimulate applications.



# Common use cases...

- Processing web hooks
- Scheduled tasks (a la cron)
- Data transformation
- Mobile image manipulation  
(compression, conversion, and so on)
- Voice packet to JSON transformation  
(Alexa, Cortana, and so on)
- Mobile video analysis  
(frame-grabbing)
- PDF generation
- Mobile/MBaaS /single-page apps
- Chat bots

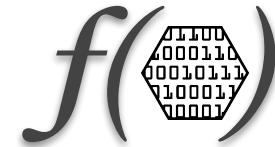
Web

Mobile

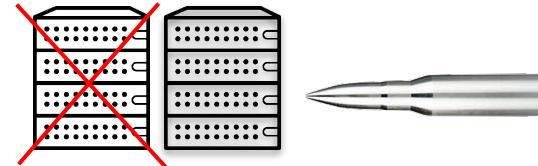
IoT

DevOps Automation

Focus on convenience and  
business value, no distractions.



# When not to use serverless



- *Real-time, ultra-low latency applications*
- *Long running tasks that can't be split into steps*
- *Advanced or complex observability and monitoring requirements*
- *Memory or CPU requirements are very demanding and specific*
- *Can't deal with cold-start...*

# CODEREADY WORKSPACES



Eclipse Che

- Browser-based Web IDE + Dev Environment in pods
- Red Hat supported Eclipse Che
- Bundled with OCP/OSD SKU
- Available on OCP and OSD
- Enabled via an operator
- RHEL 8-based stacks (tools and runtimes)

The screenshot shows the Eclipse Che IDE interface. The top bar includes tabs for Workspace, Project, Edit, Assistant, Run, Git, Profile, EXEC, and a status bar showing '#24 01:12'. The main area has a dark theme. On the left is the Projects Explorer showing a project named 'web-java-spring-petclinic [spring-petclinic]' with a 'src' folder containing 'main' and 'java' subfolders, and a 'org.springframework.samples.petclinic.model' package with files like BaseEntity.java, NamedEntity.java, Owner.java, Person.java, Pet.java, PetType.java, Specialty.java, and Vet.java. The right side shows the code editor with Pet.java open, displaying methods like getOwner() and setVisitsInternal(). A code completion dropdown is open over the 'Pet' class definition, listing proposals such as birthDate, id, owner, type, visits, addVisit, clone, equals, and finalize. Below the code editor is a terminal window titled 'ws-machine' showing a root shell prompt.

<https://www.youtube.com/watch?v=VwKEVeDy9TA>

# 2019 Roadmap

Q2 CY2019 OpenShift 4.1		Q3 CY2019 OpenShift 4.2		Q4 CY19/Q1 CY20 OpenShift 4.3	
HOSTED	HOSTED	PLATFORM	APP	DEV	HOSTED
<ul style="list-style-type: none"><li>• OpenShift Serverless (Knative) - DP</li><li>• OpenShift Pipelines (Tekton) Dev Preview</li><li>• CodeReady Workspaces</li><li>• CodeReady Containers Alpha</li><li>• Developer CLI (odo) Beta</li></ul> <ul style="list-style-type: none"><li>• OperatorHub</li><li>• Operator Lifecycle Manager</li><li>• Service Mesh (~2 month after)</li></ul> <ul style="list-style-type: none"><li>• Kubernetes 1.13 with CRI-O runtime</li><li>• RHEL CoreOS, RHEL7</li><li>• Automated Installer for AWS</li><li>• Pre-existing Infra Installer for Bare Metal, VMware, AWS</li><li>• Automated, one-click updates</li><li>• Multus (Kubernetes multi-network)</li><li>• Quay v3</li></ul> <ul style="list-style-type: none"><li>• <a href="http://cloud.redhat.com">cloud.redhat.com</a> - Multi-Cluster Mgmt</li><li>• OCP Cluster Subscription Management</li><li>• Azure Red Hat OpenShift</li><li>• OpenShift Dedicated consumption pricing</li></ul>	<ul style="list-style-type: none"><li>• OpenShift Serverless (Knative) - GA</li><li>• OpenShift Pipelines (Tekton) Tech Preview</li><li>• CodeReady Containers GA</li><li>• Developer CLI (odo) GA</li></ul> <ul style="list-style-type: none"><li>• GPU metering</li><li>• OperatorHub Enhancements</li><li>• Operator Deployment Field Forms</li><li>• Application Binding with Operators</li><li>• Application Migration Console</li></ul> <ul style="list-style-type: none"><li>• Kubernetes 1.14 w/ CRI-O runtime</li><li>• Disconnected Install and Update</li><li>• Automated Installer for Azure, OSP, GCP</li><li>• OVN Tech Preview</li><li>• FIPS</li><li>• Federation Workload API</li><li>• Automated App cert rotation</li><li>• OpenShift Container Storage 4.2</li></ul> <ul style="list-style-type: none"><li>• <a href="http://cloud.redhat.com">cloud.redhat.com</a> - Multi-Cluster Deployment</li><li>• Proactive Support Operator</li></ul>	<ul style="list-style-type: none"><li>• OpenShift Serverless (Knative) - GA</li><li>• OpenShift Pipelines (Tekton) GA</li></ul> <ul style="list-style-type: none"><li>• Metering for Services</li><li>• Windows Containers</li></ul> <ul style="list-style-type: none"><li>• Kubernetes 1.15 w/ CRI-O runtime</li><li>• Automated Installer for IBM Cloud, Alibaba, RHV, Bare Metal Hardware Appliance</li><li>• Pre-existing Infra Installer for Azure, OSP, GCP</li><li>• OVN GA w/ Windows Networking Integration</li></ul> <ul style="list-style-type: none"><li>• <a href="http://cloud.redhat.com">cloud.redhat.com</a> - Subscription Mgmt Consumption Improvements</li></ul>			



# Thank you

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