

RHUG

THE PLATFORM FOR AGILE BUSINESS

August 2019

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AGENDA

1. Red Hat Hybrid Cloud and DevOps
2. What's new in OCP 4
3. Overview of Container tooling: CRI-O, Podman, Buildah...
4. Demo: Elastic Infrastructure
5. Open Discussion



Red Hat Hybrid Cloud and DevOps

WHAT IS YOUR TOP PRIORITY?

1. Building a cloud strategy
2. Using public cloud
3. Building new private cloud
4. Maintaining or improving existing private cloud
5. Using containers on cloud
6. Managing hybrid or multi cloud resources
7. Security across hybrid cloud environments

THE REALITY OF CLOUD INFRASTRUCTURE

THERE ARE MANY WAYS TO GET TO DEPLOY A CLOUD

PUBLIC CLOUD

20% of enterprises plan to more than double public cloud spend in 2018.¹

Red Hat Enterprise Linux is the top commercial Linux distribution in the public cloud.²

PRIVATE CLOUD

26% of organizations have **already deployed a private cloud** while 20% are **researching private cloud adoption.**³

CONTAINERS

Containers support interoperability between different cloud environments, a situation that a third of organizations face today and 45% will face in 2 years.⁴

HYBRID CLOUD

38% of organizations are planning for hybrid cloud adoption while **33% are implementing them.**⁴

Sources: [1] RightScale, [2018 State of the Cloud Report](#), January 2018. [2] (n=372) Management Insight Technologies, sponsored by Red Hat, [State of Linux Kernel Development](#), 2017. [3] (n=205) Gary Chen, sponsored by Red Hat, [Preparing for Private Cloud and Hybrid IT with Red Hat Cloud Infrastructure](#), September 2017. [4] (n=1,057) Red Hat, Cloud Technology Research, May 2018

WHY CUSTOMERS MIGRATE TO HYBRID CLOUDS

INNOVATION IS REQUIRED TO KEEP UP WITH THE COMPETITION



IMPROVE BUSINESS AGILITY¹

“Red Hat technology has helped us to work in a more efficient way, with speed and agility as the biggest outcomes.”

- *Luis Uguina, Macquarie*²



REDUCE TOTAL COST OF OWNERSHIP¹

“...our operating costs have significantly decreased.”

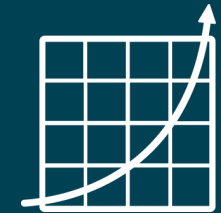
- *Yui Onodera, C.A. Mobile*³



SUPPORT INNOVATION¹

“We can deliver products to market more quickly than our competitors. It’s a game-changer.”

- *Paul Cutter, CTO, Betfair*⁴



GROW THE BUSINESS¹

“We are keen to spearhead development for technology platforms that can power our future networks, like OpenStack...”

- *Christian Gacon, Orange*⁵

Sources: [1] (n=1,057) Red Hat, Cloud Technologies Research Survey, May 2018

[2] Red Hat case study, [Macquarie transforms its digital banking experience for customers](#), May, 2017. [3] Red Hat case study, [C.A. Mobile meets traffic demands with a modern infrastructure](#), April 2016. [4] Red Hat case study, [Paddy Power Betfair upgrades systems to improve online betting](#), June 2016. [5] Red Hat press release, [Orange and Red Hat join forces to spearhead network virtualization innovation](#), November 2017.

BALANCING INNOVATION AND OPTIMIZATION

FOCUS ON OUTCOMES THAT IMPACT THE BUSINESS



Optimize the IT
you have



Integrate apps, data,
& processes



**Add & manage cloud
infrastructure**



Build more modern
applications



Automate &
manage IT

WHAT IS AN OPEN HYBRID CLOUD PLATFORM?

A MODERN PLATFORM THAT TAKES BEST ADVANTAGE OF ALL ENVIRONMENTS

- ✓ Uses both private and public cloud infrastructure
- ✓ Unifies management across all environments
- ✓ Provides seamless experience and interoperability across all environments
- ✓ Provides a container environment with orchestration
- ✓ Adheres to open, common industry standards and APIs

BUILD WITH THE FUTURE IN MIND

INVESTMENTS YOU MAKE TODAY WILL AFFECT THE NEXT 5-10 YEARS



- Build on open standards to ensure **interoperability** across current & future infrastructure investments
- Modern cloud infrastructure must support workload **portability** so you can move or run business functions across environments, as needed
- Choose infrastructure that will **scale and grow** at the speed your business & users demand
- Establish a unified **management strategy** so you can maintain policies & keep control
- Free resources for innovation by controlling **costs**

OPEN SOURCE IS KEY

BY AN OVERWHELMING MARGIN

“The vast majority of public cloud infrastructure in the market depends on open source software for basic enablement, and especially for delivery of full functionality. We also see the use of open source software as being fundamental to a substantial portion of private cloud infrastructure in use, and certainly for supporting the run-time environment.”

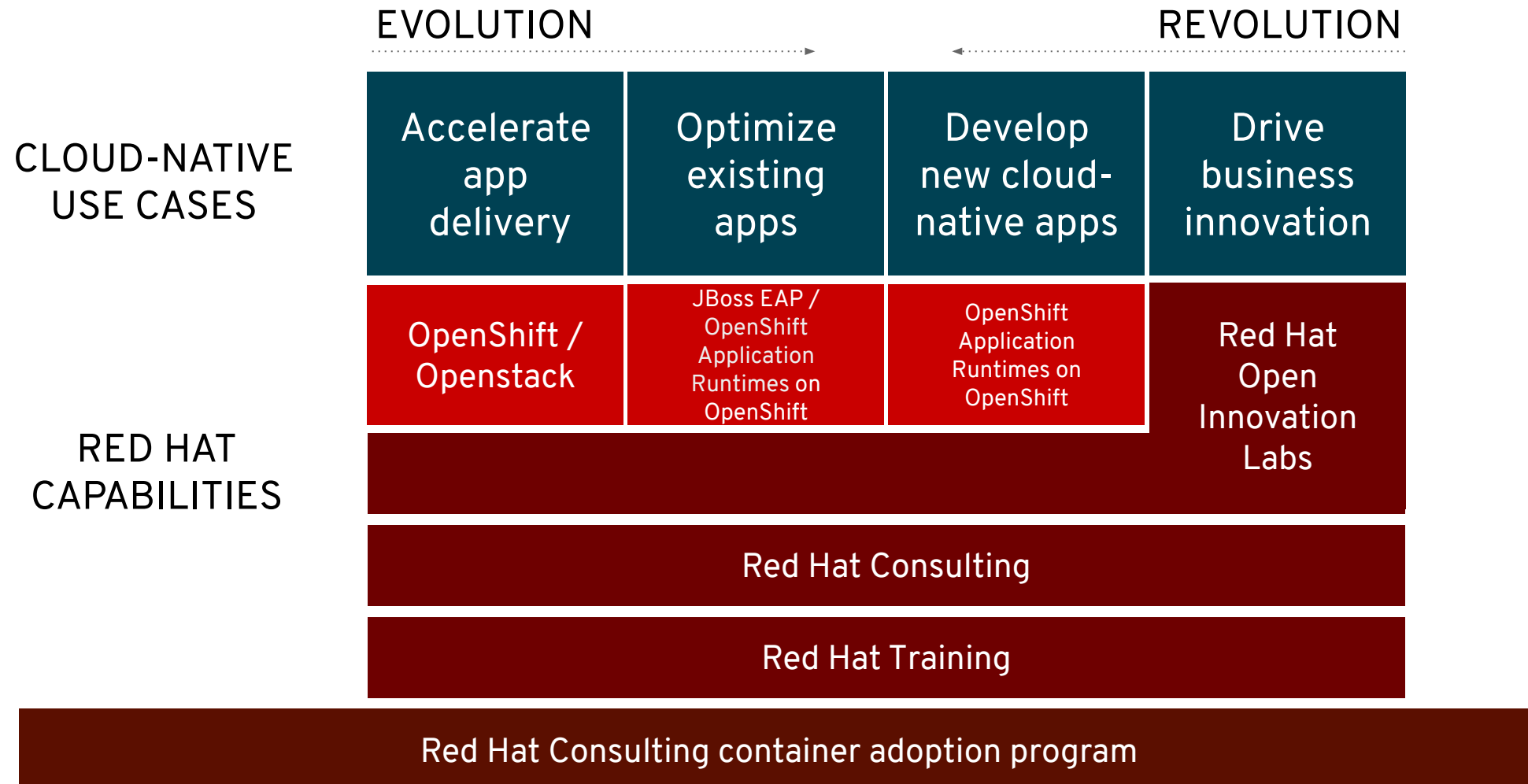
AL GILLEN

Group Vice President, Software Development & Open Source, IDC,
September 2017

RED HAT PORTFOLIO



BUT THIS IS NOT JUST A SW STORY



RED HAT CONSULTING



Hybrid cloud infrastructure



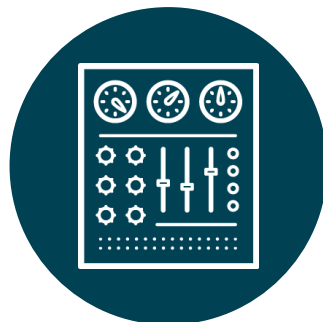
Cloud migration



Containers on cloud



NFV adoption



Virtualization management



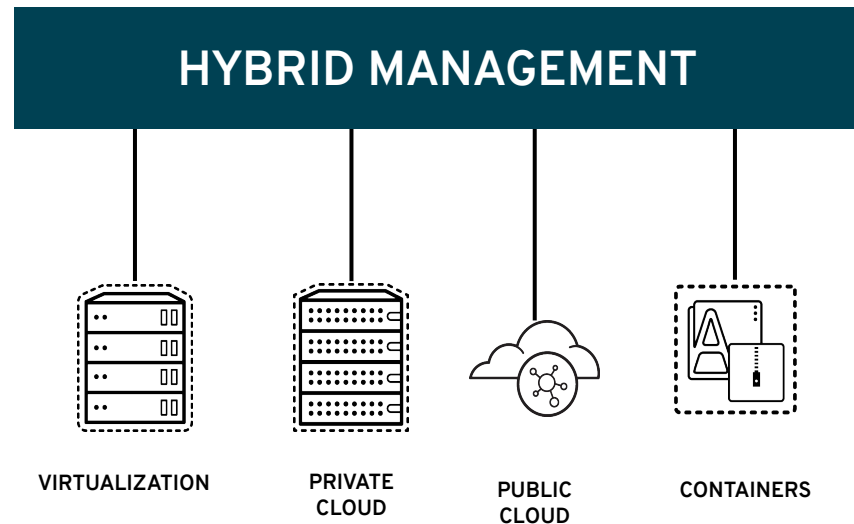
Cloud storage

UNIFIED HYBRID MANAGEMENT

DEFINE AND IMPLEMENT POLICY CONSISTENTLY



- One management system
- Consistent automation & policies



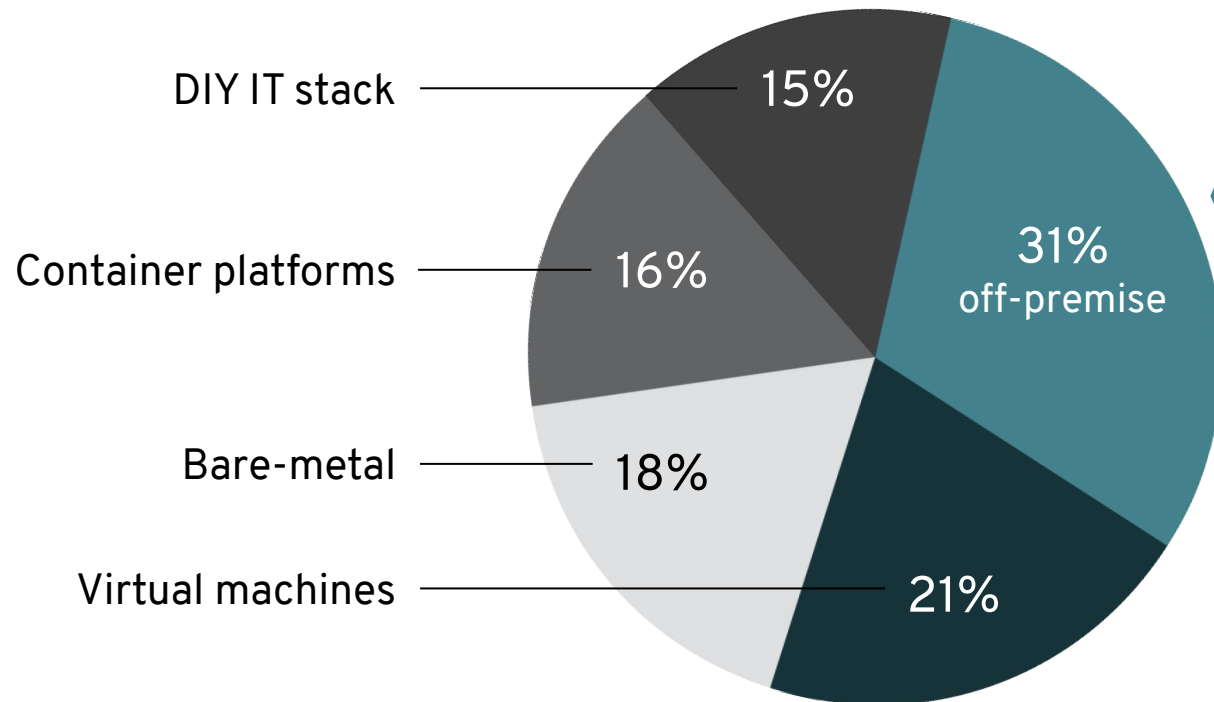
- Deliver services faster and reduce operational costs through self-service capabilities and life-cycle management
- Improve operational visibility and control, which helps reduce risk
- Ensure compliance and governance through automated policy control
- Deploy composite applications to your choice of infrastructure in the same way, every time

WHERE CONTAINERS ARE BEING USED

ORGANIZATIONS START ON-PREMISE, THEN MOVE TO THE CLOUD

Question: How much of your organization's containers are built and run in the following environments?

WHEN ON-PREMISE:

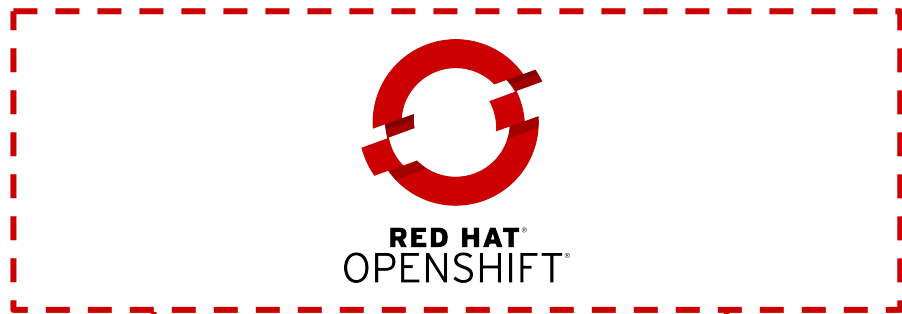


WHEN OFF-PREMISE:



CONSISTENCY ACROSS PLATFORMS

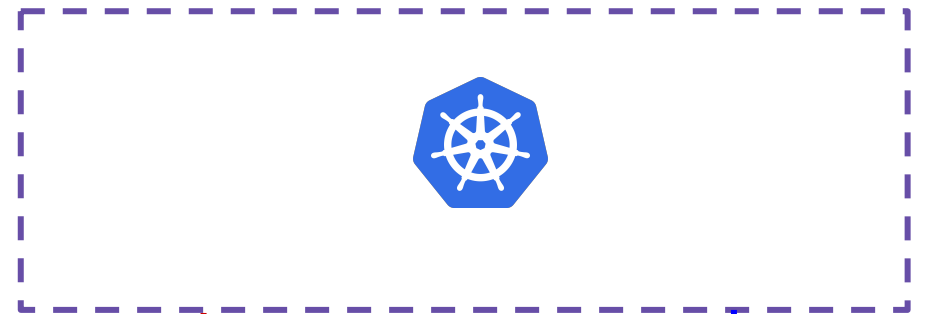
CONSISTENT DEV EXPERIENCE
CONSISTENT OPS EXPERIENCE



PRIVATE
CLOUD
VMWARE



INCONSISTENT DEV EXPERIENCE
INCONSISTENT OPS EXPERIENCE

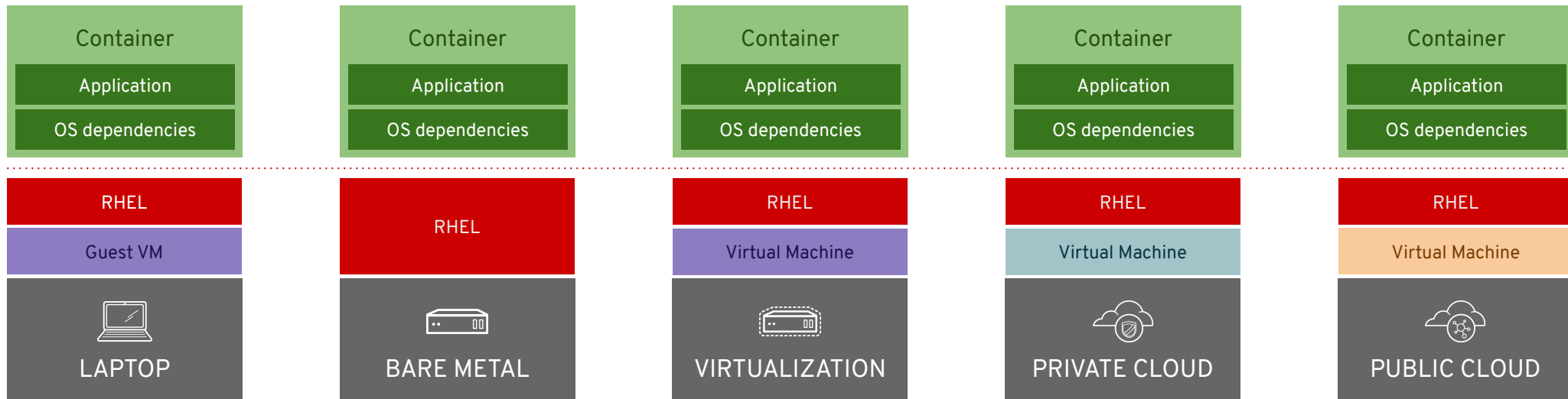


PRIVATE
CLOUD
VMWARE

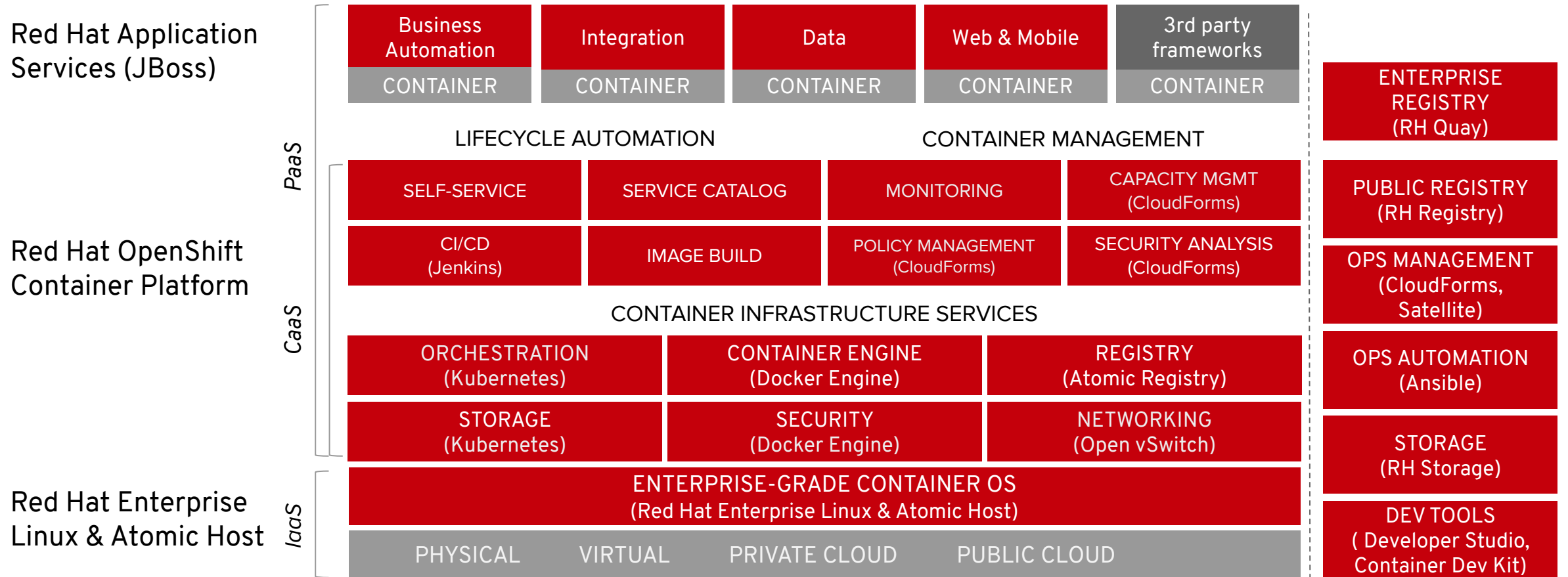


APPLICATION PORTABILITY WITH CONTAINERS

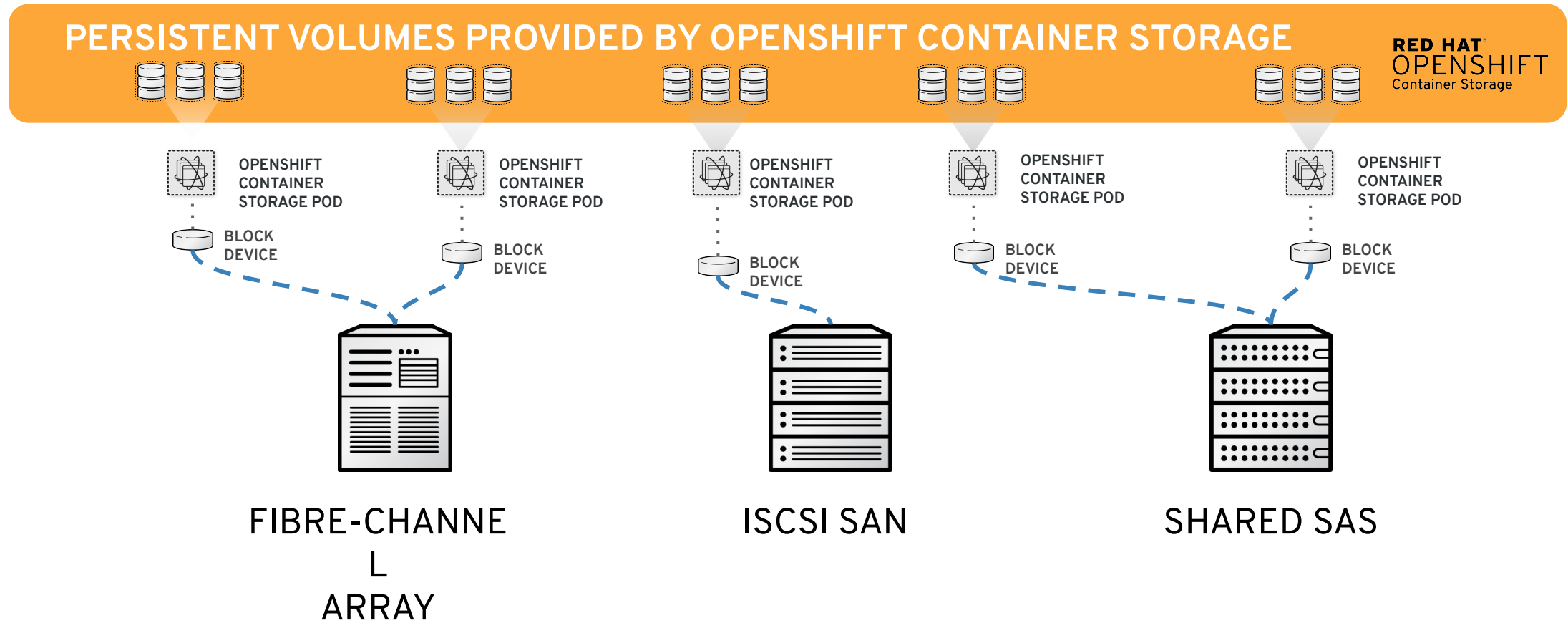
RHEL Containers + RHEL Host = Guaranteed Portability
Across Any Infrastructure



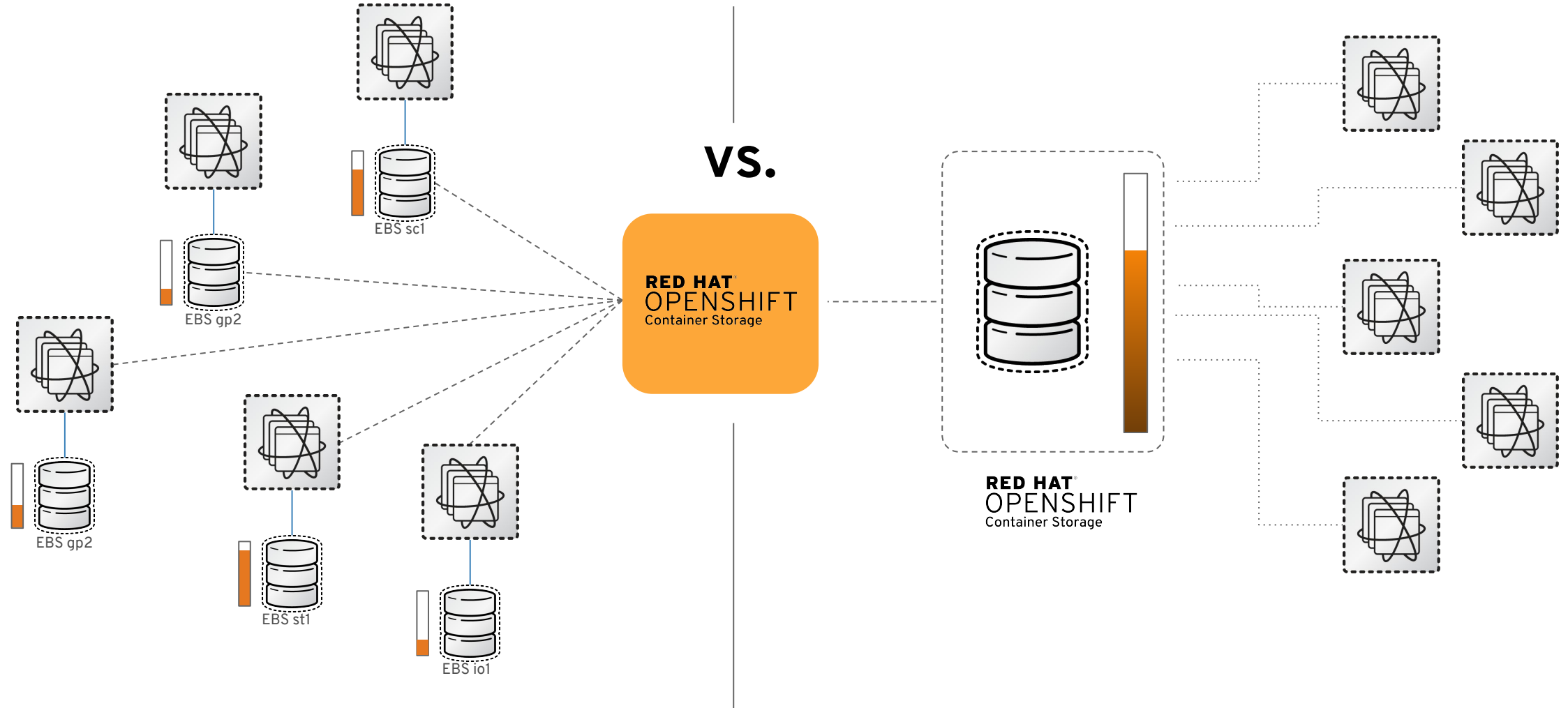
RED HAT CONTAINER STACK (OCP 3.x)



STORAGE CONSOLIDATION ON PREM



STORAGE CONSOLIDATION IN THE CLOUD





What's new in OCP 4



Trusted enterprise Kubernetes

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

A cloud-like experience, everywhere

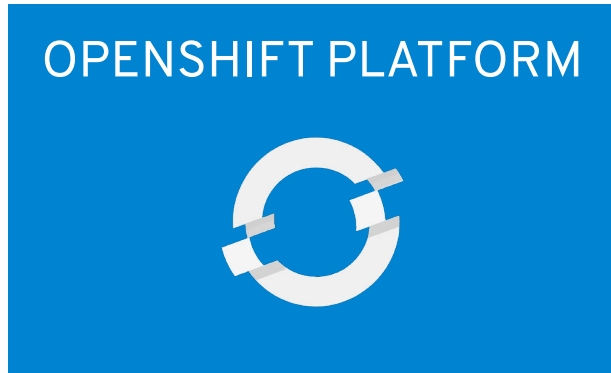
- Hybrid, Multi-Cluster Management
- Operator Framework
- Operator Hub & Certified ISVs

Empowering developers to innovate

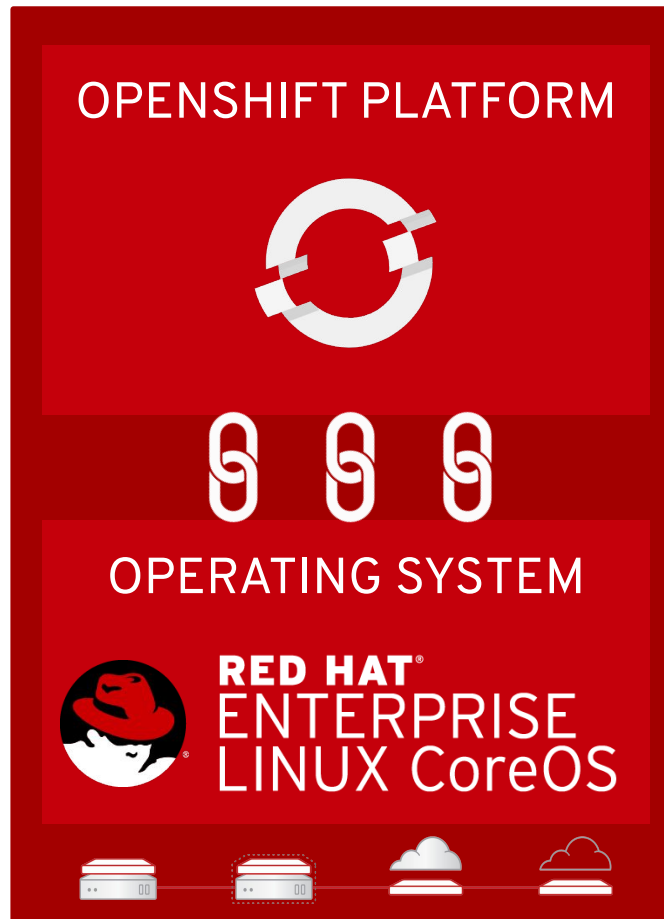
- OpenShift Service Mesh (Istio)
- OpenShift Serverless (Knative)
- CodeReady Workspaces (Che)

FULL STACK AUTOMATED INSTALL

OPENSIFT 3



OPENSIFT 4



Minimal Linux distribution

Optimized for running containers

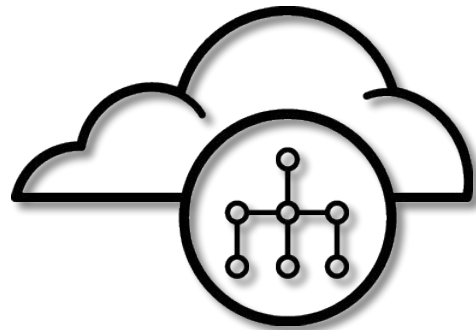
Decreased attack surface

Over-the-air automated updates

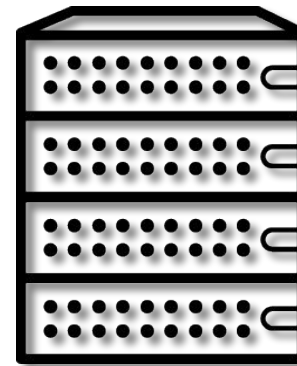
Immutable foundation for OpenShift clusters

Ignition-based Metal and Cloud host configuration

TWO INSTALLATION EXPERIENCES IN OCP 4



**Installer Provisioned
Infrastructure (IPI)**
Simplified opinionated
“Best Practices”
single cluster provisioning







**User Provisioned
Infrastructure (UPI)**
Customer managed
resources & infrastructure
single cluster provisioning

PROVIDER ROADMAP FOR RED HAT OPENS SHIFT 4

Installer Provisioned Infrastructure (IPI)

User Provisioned Infrastructure (UPI)

	Installer Provisioned Infrastructure (IPI)	User Provisioned Infrastructure (UPI)
 OPENS SHIFT by Red Hat® DEV PREVIEW		—
 OPENS SHIFT by Red Hat® 4.1		   Baremetal
 OPENS SHIFT by Red Hat® 4.2	  	—
 OPENS SHIFT by Red Hat® 4.3*	   Baremetal	   RED HAT VIRTUALIZATION

*Still TBD

UNIFIED HYBRID CLOUD

- 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 is a navigation sidebar with 'Clusters' selected. The main area displays a table of clusters. A modal window titled 'OpenShift Clusters' is open, showing a 'Register cluster' button and a 'Download Installer' button. Below these buttons is a table with columns for 'CLUSTER NAME', 'PLATFORM', 'VERSION', and 'MESSAGE'. The table contains two entries: 'Production' on AWS with version 4.0.158 and a 'Security upgrade available' message, and 'Cloud Staging' on AWS with version 4.0.163 and an 'Up to date' message.

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

Below the screenshot is a diagram showing a green bar labeled 'cloud.redhat.com' at the top. Four arrows point down from this bar to four red boxes, each containing a white circular refresh icon and a label: 'AWS', 'Google', 'Azure', and 'On-Prem'.

KUBERNETES OPERATOR FRAMEWORK

Operator Framework is an open source toolkit to manage application instances on Kubernetes in an effective, automated and scalable way.

AUTOMATED LIFECYCLE MANAGEMENT



Installation

Upgrade

Backup

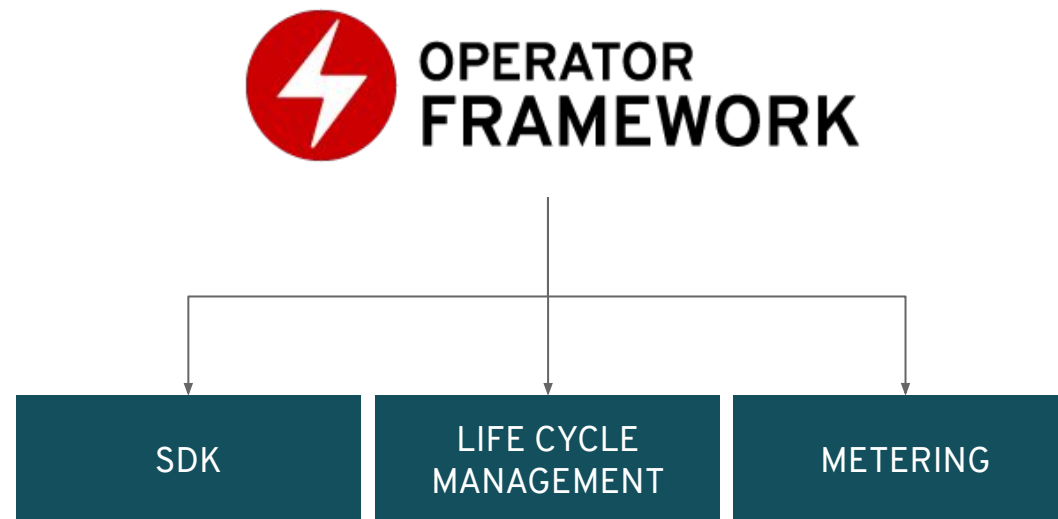
Failure
recovery

Metrics
& insights

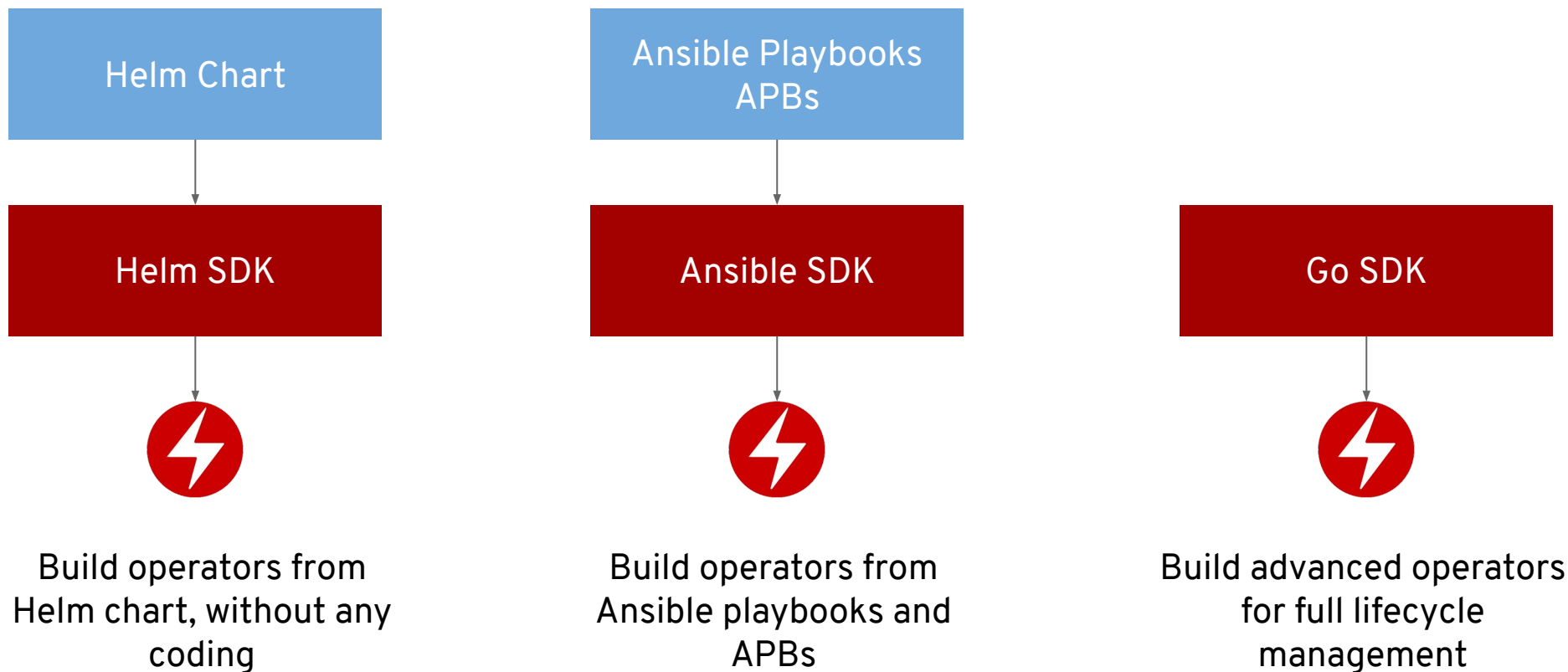
Tuning

OPERATOR FRAMEWORK

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



BUILD OPERATORS FOR YOUR APPS

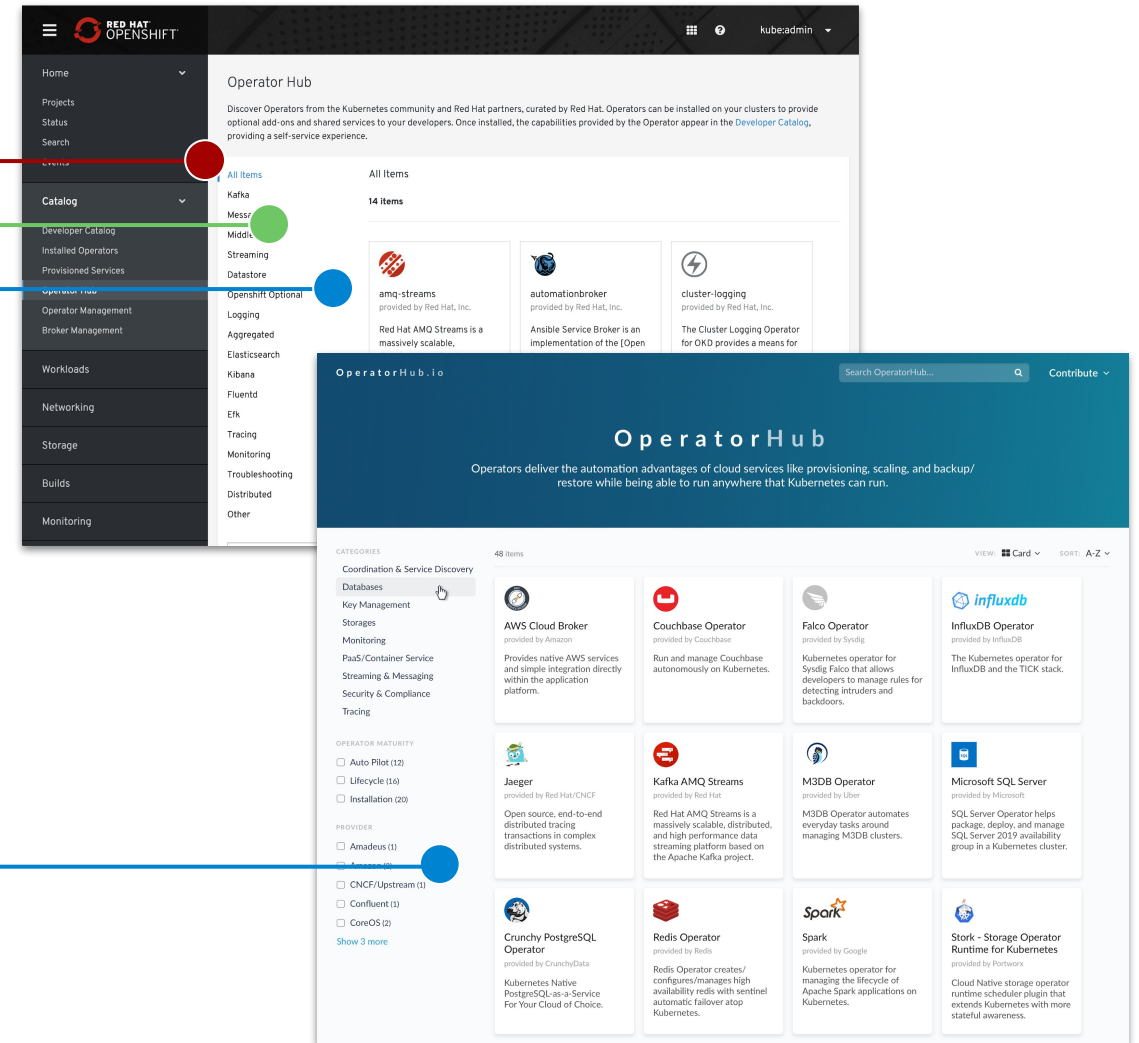


OPERATOR HUB

Accessible to admins only
Discovery/install of all optional components and apps
Upstream and downstream content
ISV partners will support their Operators

TYPES OF OPERATORS

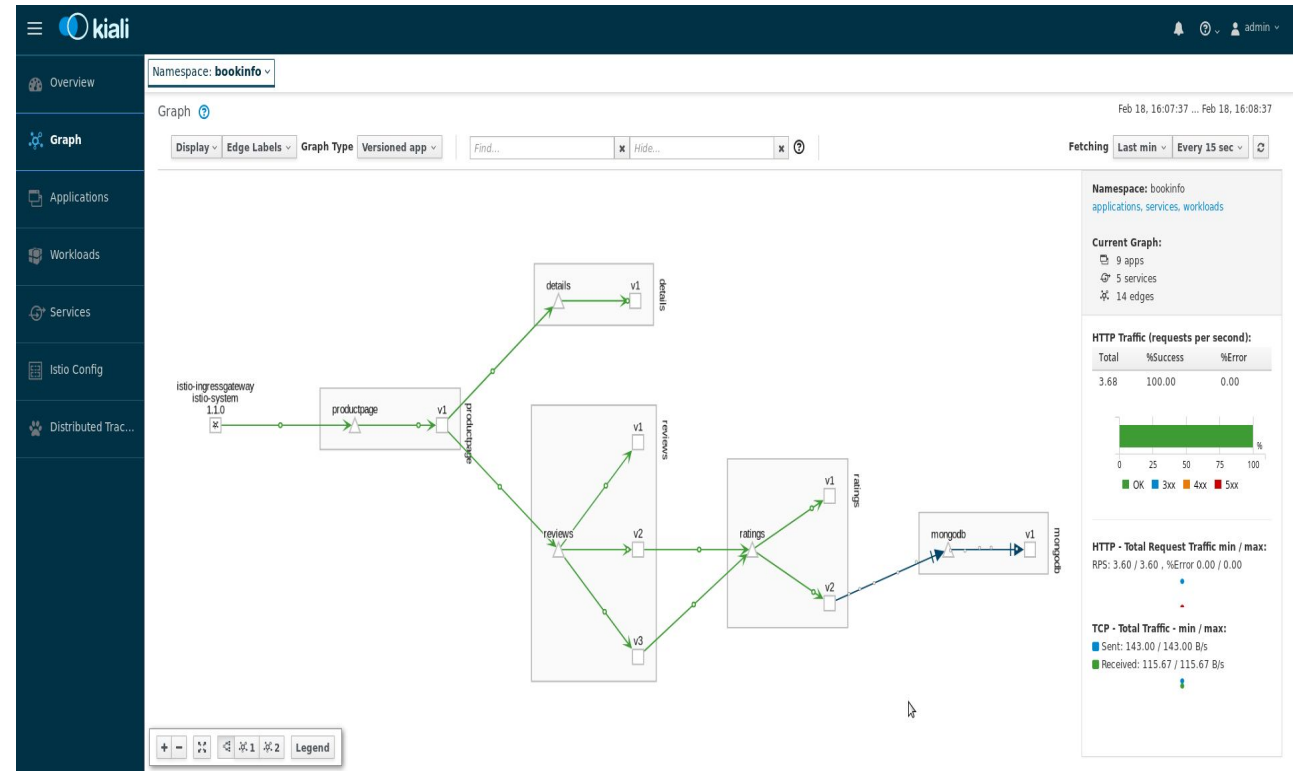
Red Hat Products
ISV Partners
Community



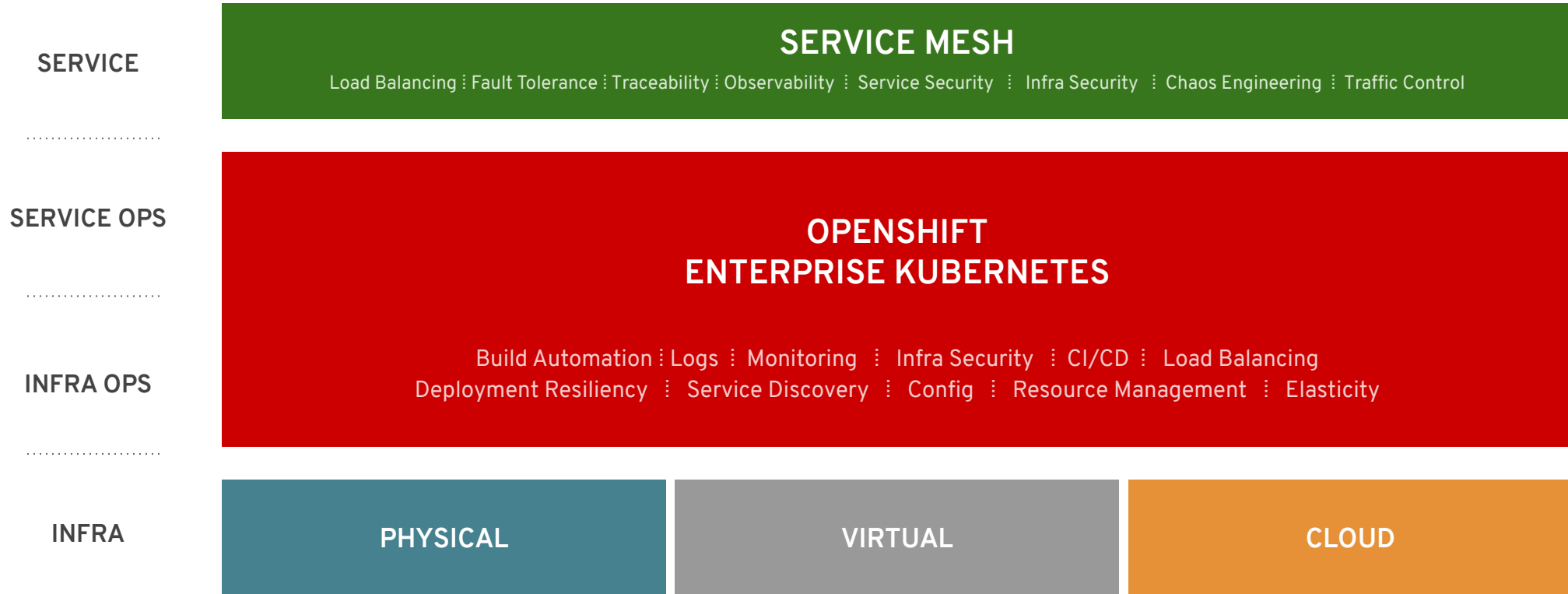
RED HAT SERVICE MESH

Key Features

- A dedicated network for service to service communications
- Observability and distributed tracing
- Policy-driven security
- Routing rules & chaos engineering
- Powerful visualization & monitoring
- Will be available via OperatorHub



DISTRIBUTED SERVICES WITH OPENSIFT SERVICE MESH



OPENSIFT SERVERLESS



Functions Apps Microservices

Containers

Platform

Application

Infrastructure



OPENSIFT SERVERLESS

Key Features

- 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.
- Operator available via OperatorHub
- Knative v0.6 (v1beta1 APIs)
- No vendor lock in

Learn more

<https://openshift.com/learn/topics/knative>

<http://bit.ly/knative-tutorial>

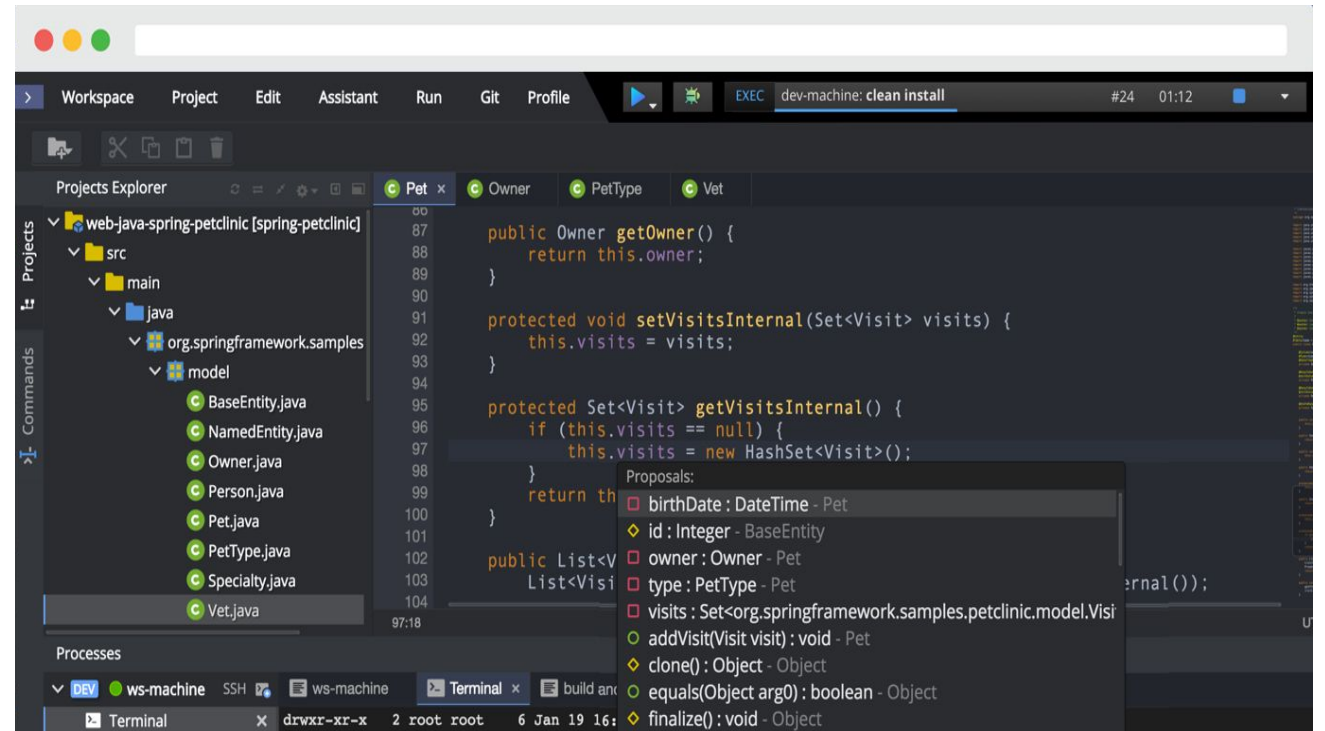
The screenshot displays the Red Hat OpenShift Container Platform dashboard. On the left, the 'OperatorHub' menu is expanded, showing 'Operator Management' and 'Workloads'. The main content area shows a list of installed operators. The 'Knative Serving Operator' is highlighted with a red box, indicating it is installed. Below the operator list, there is a diagram of the Knative architecture showing components like 'knative-ingressgateway', 'helloworld-go-00001', 'autoscaler', 'knative-serving', 'activator', and 'dummy-00001'. To the right of the diagram, there are performance metrics for 'Incoming Request Traffic' and 'Outgoing Request Traffic'.

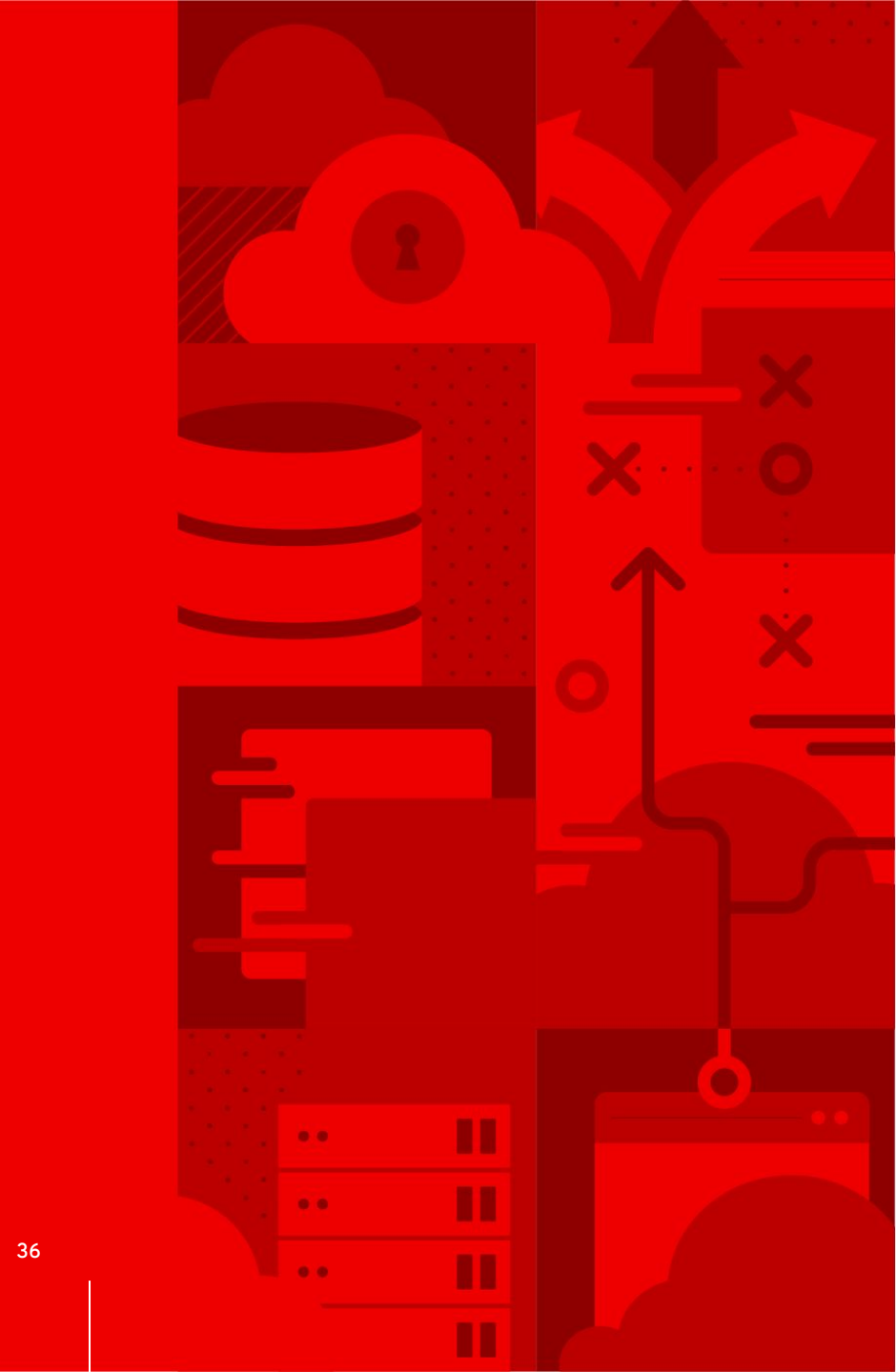
Developer Preview



CodeReady Workspaces

- 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)





Overview of Container tooling: CRI-O, Podman, Buildah...



cri-o

A lightweight, OCI-compliant container runtime

Minimal and Secure
Architecture

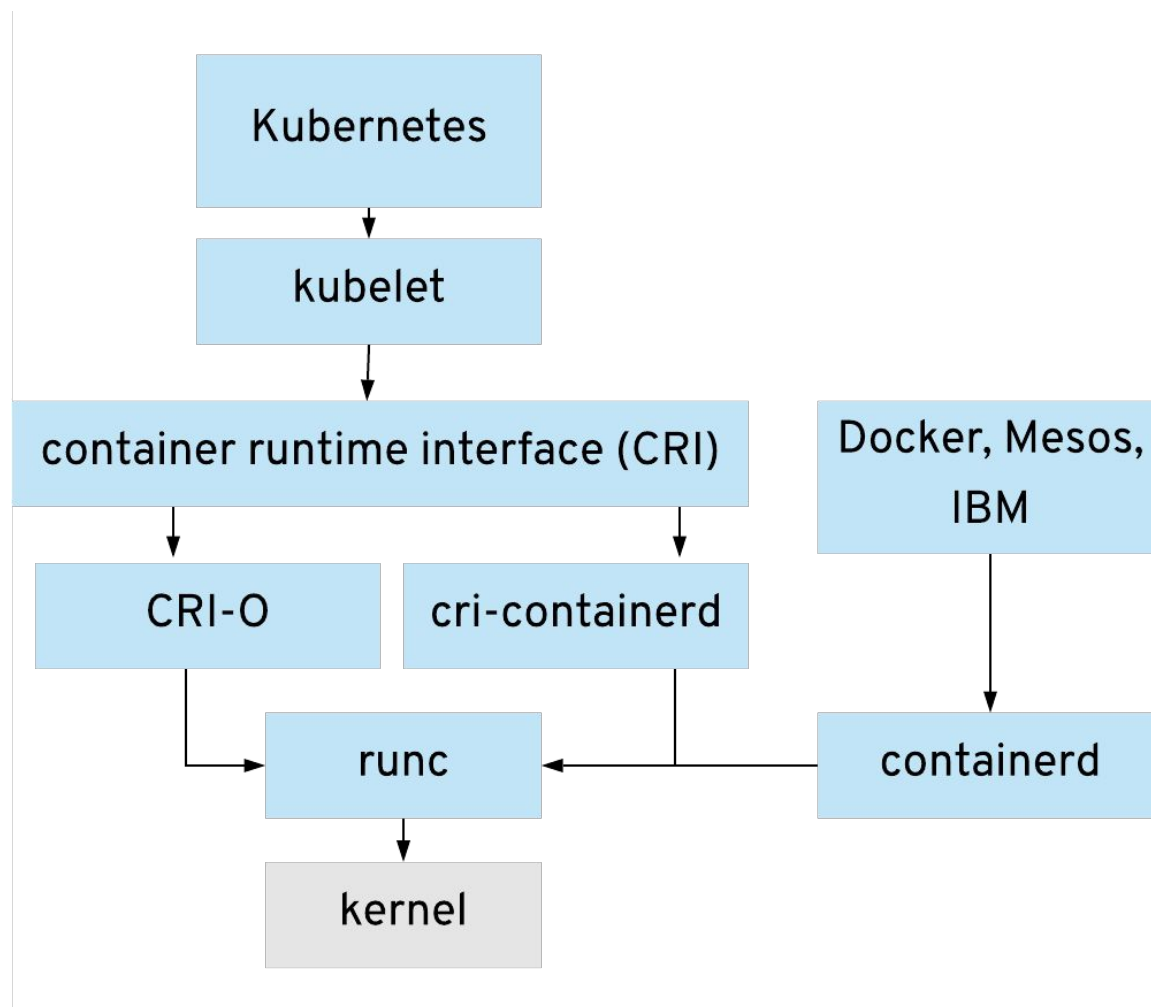
Optimized for
Kubernetes

Runs any
OCI-compliant image
(including docker)

Optional runtime in OCP 3.10, default OCP 3.11+

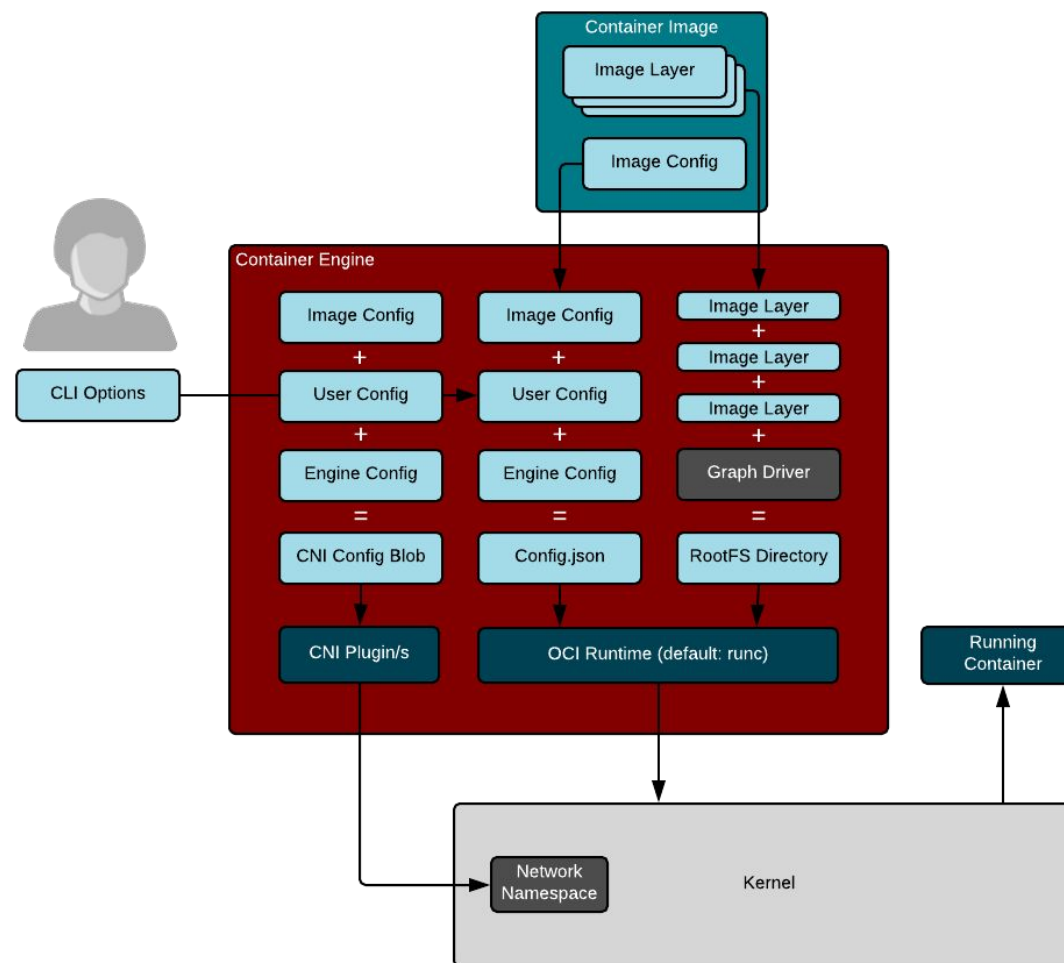
CONTAINER RUNTIMES

- Tools for spawning and running containers per OCI specification (runtime-spec)
- Interfaces with and sets up kernel resource constraints, security settings, and namespaces
- runc, kata, systemd-nspawn, rkt
- Yes, systemd is a container runtime!
- rkt is dead, sadly (no, RH didn't kill it)



CONTAINER ENGINES

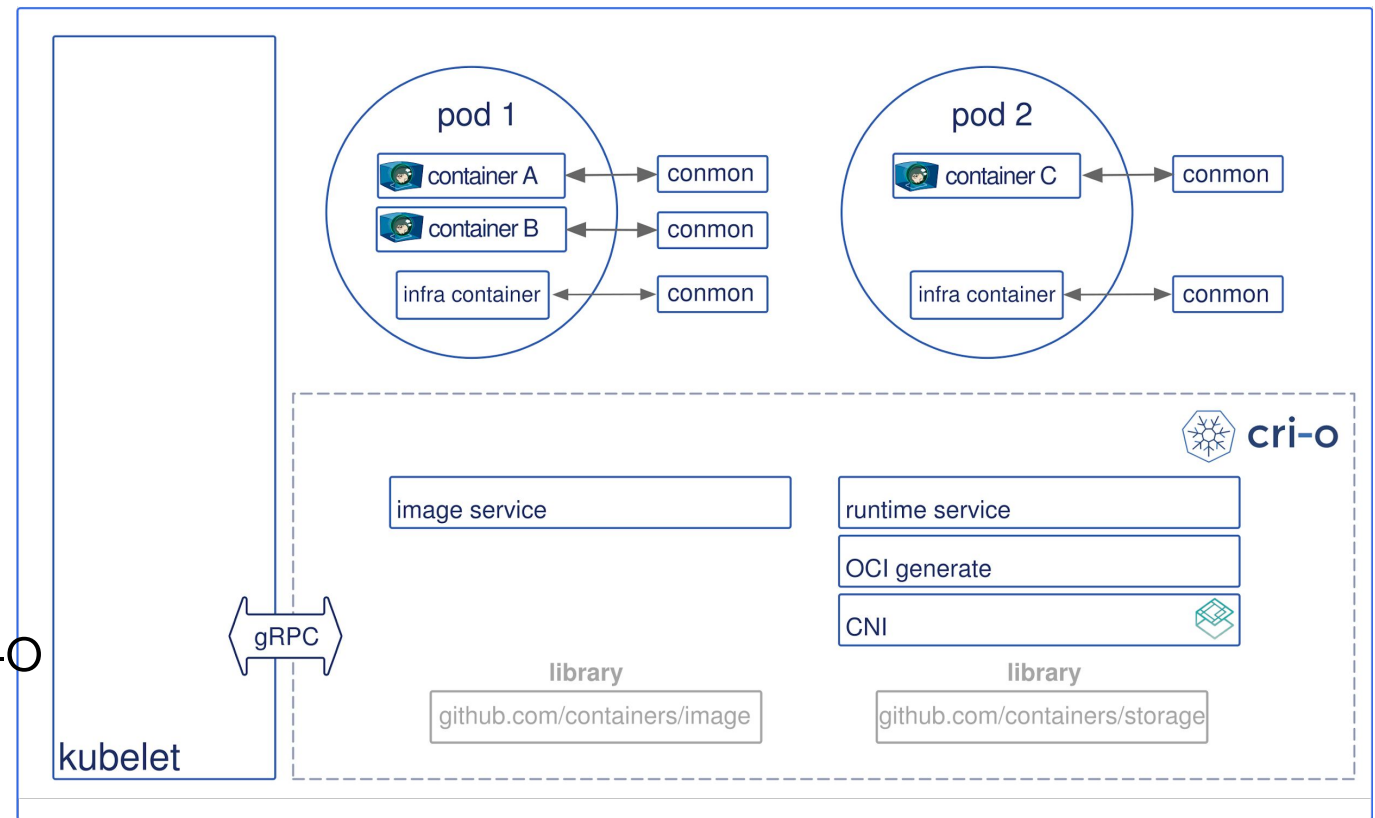
- Tells container runtimes to run container via OCI runtime specification (json format file)
- Managing container images as per OCI spec (image-spec)
- Tells CNI to setup the container networking
- Pull container images from container registries like docker.io
- Creates container rootfs



CRI-O

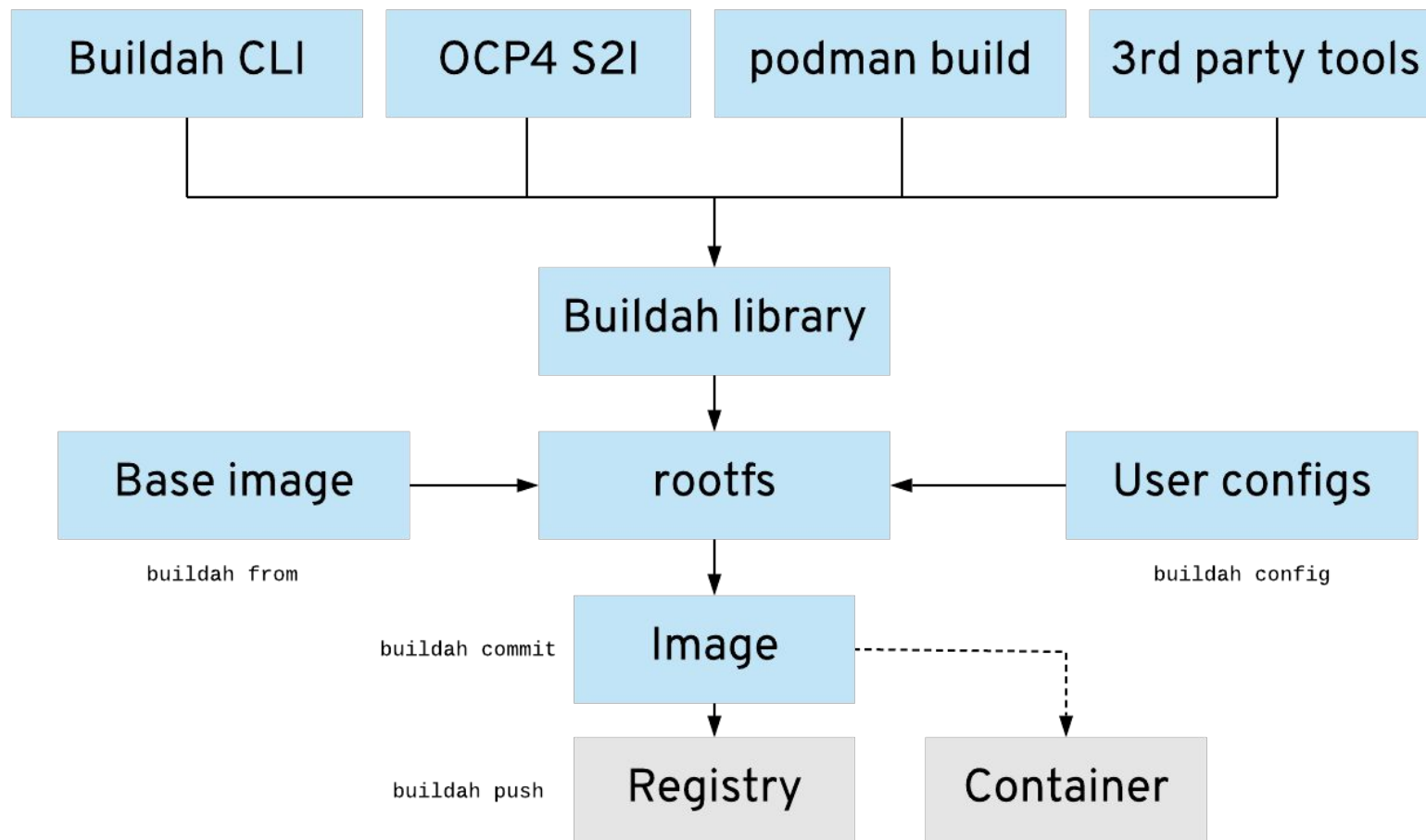
Lightweight Container Runtime Engine for Kubernetes

- Implementation of the Kubernetes CRI (Container Runtime Interface)
- Allows Kubernetes to use any OCI-compliant runtime
- Part of K8s project (SIG) and developed in lockstep with it
- Generates the OCI Runtime Specification for runc
- Kubernetes Master > Kubelet > CRI-O > runc > Linux kernel



BUILDDAH

A tool that facilitates building OCI container images



BUILDDAH

A tool that facilitates building OCI container images

- Container image is a rootfs directory containing code and JSON OCI image-spec explaining the image
- Create a rootfs directory on disk and allow other tools to populate the directory
- Create the JSON spec file
- Buildah also supports Dockerfile
 - `docker build == podman build`
- Can be run without root!
- Buildah has a special command, **buildah unshare**, that allows you to enter the user namespace!



PODMAN

alias docker == podman

- Based on the Docker CLI
- Any time you do a `podman build`, you are executing Buildah code to build your container images
- Work going into RHEL8 Beta to enable running containers in user namespace
- Doesn't require a daemon/service to run!
- Can be integrated with systemd service units to run a container as a service

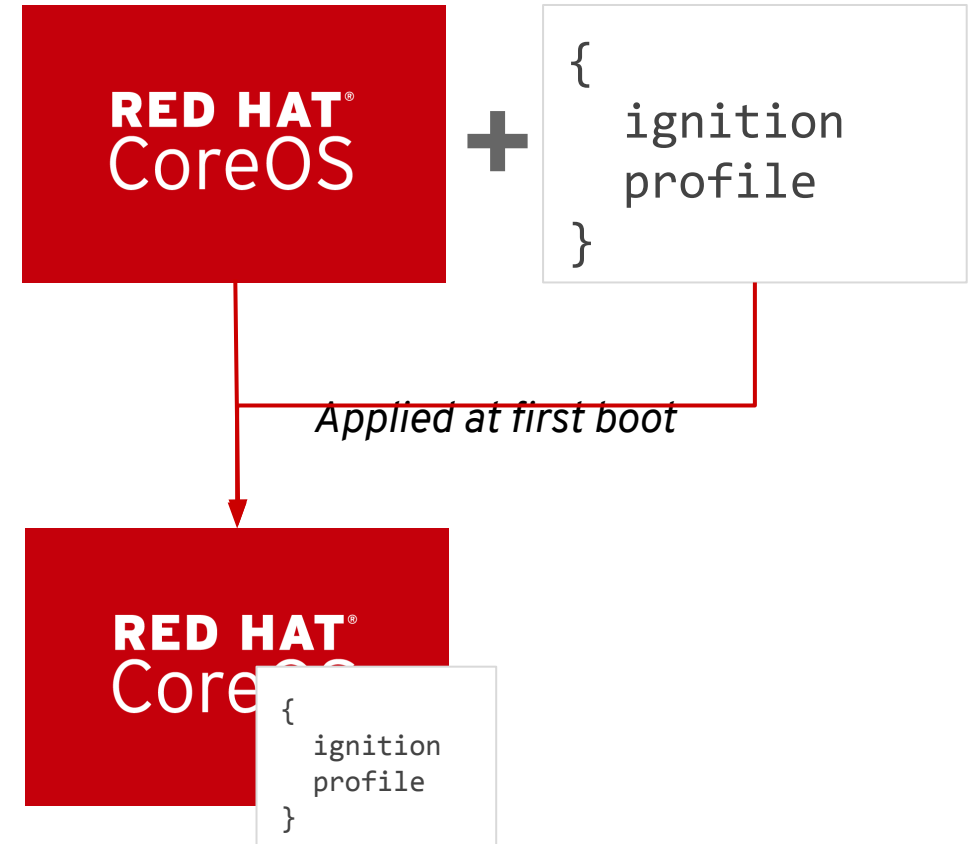




Demo: Elastic Infrastructure

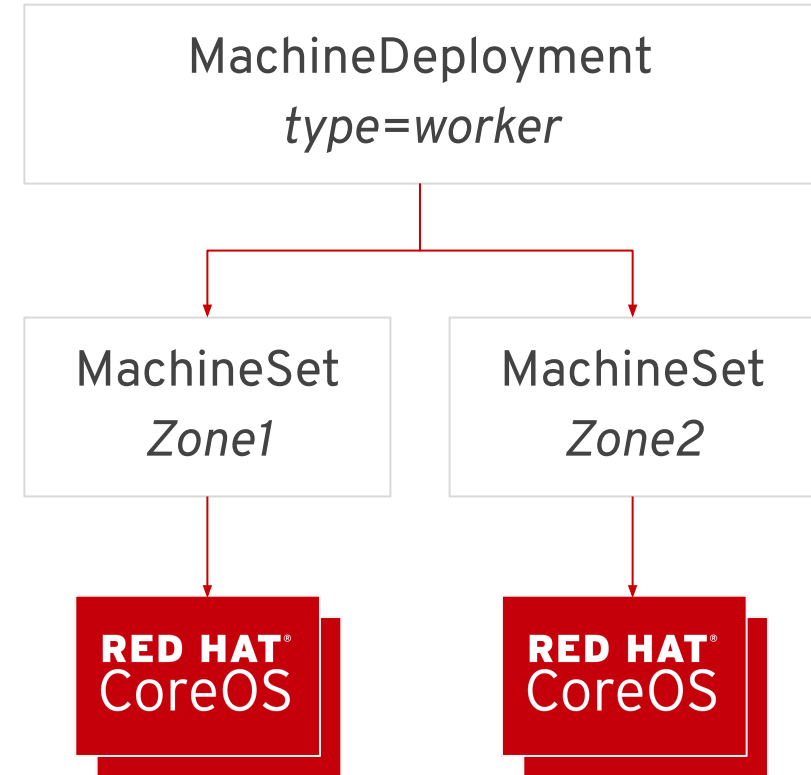
MACHINE CONFIGURATION

- Red Hat CoreOS uses Ignition for configuration
- Ignition only runs once, on the first boot
- Ignition runs before systemd starts
 - Configure networking
 - Provision disks/RAID

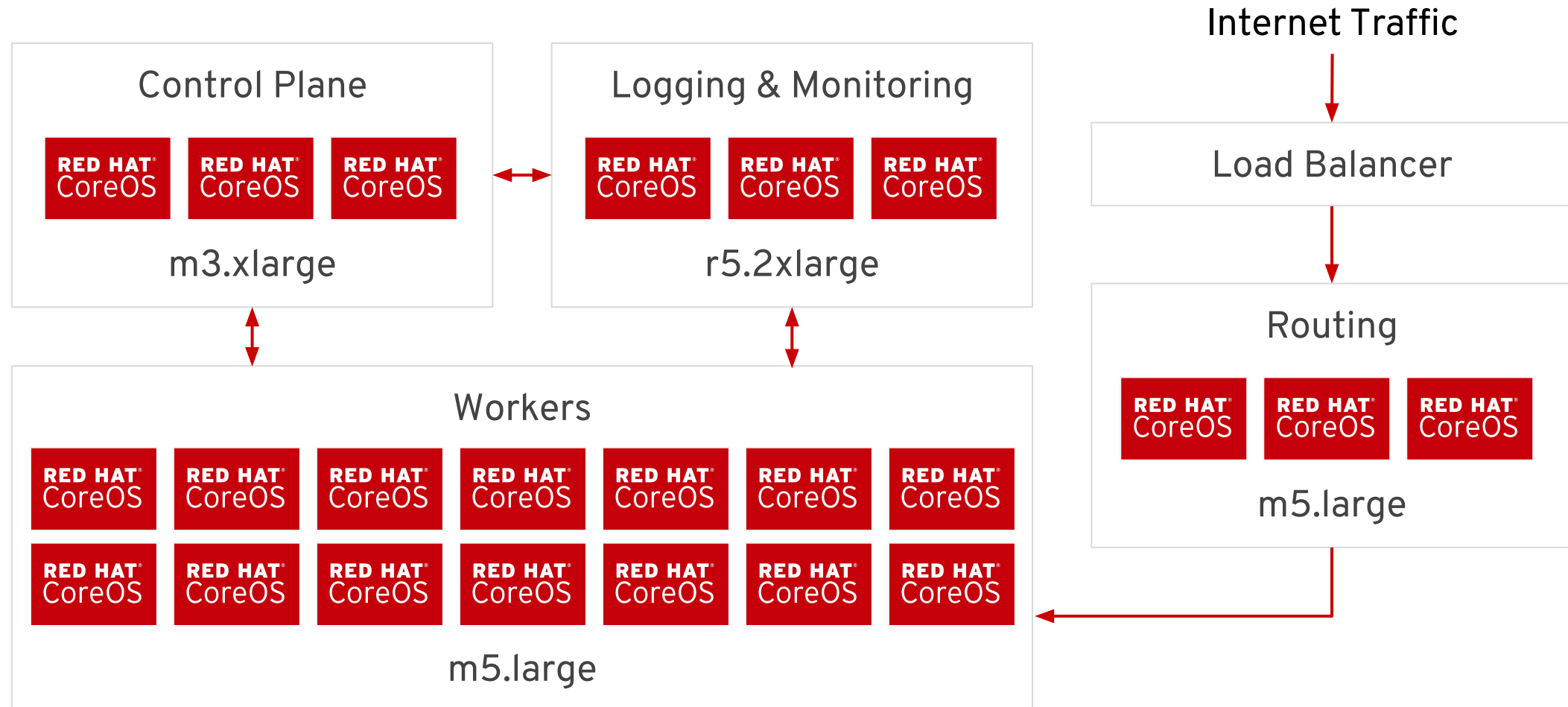


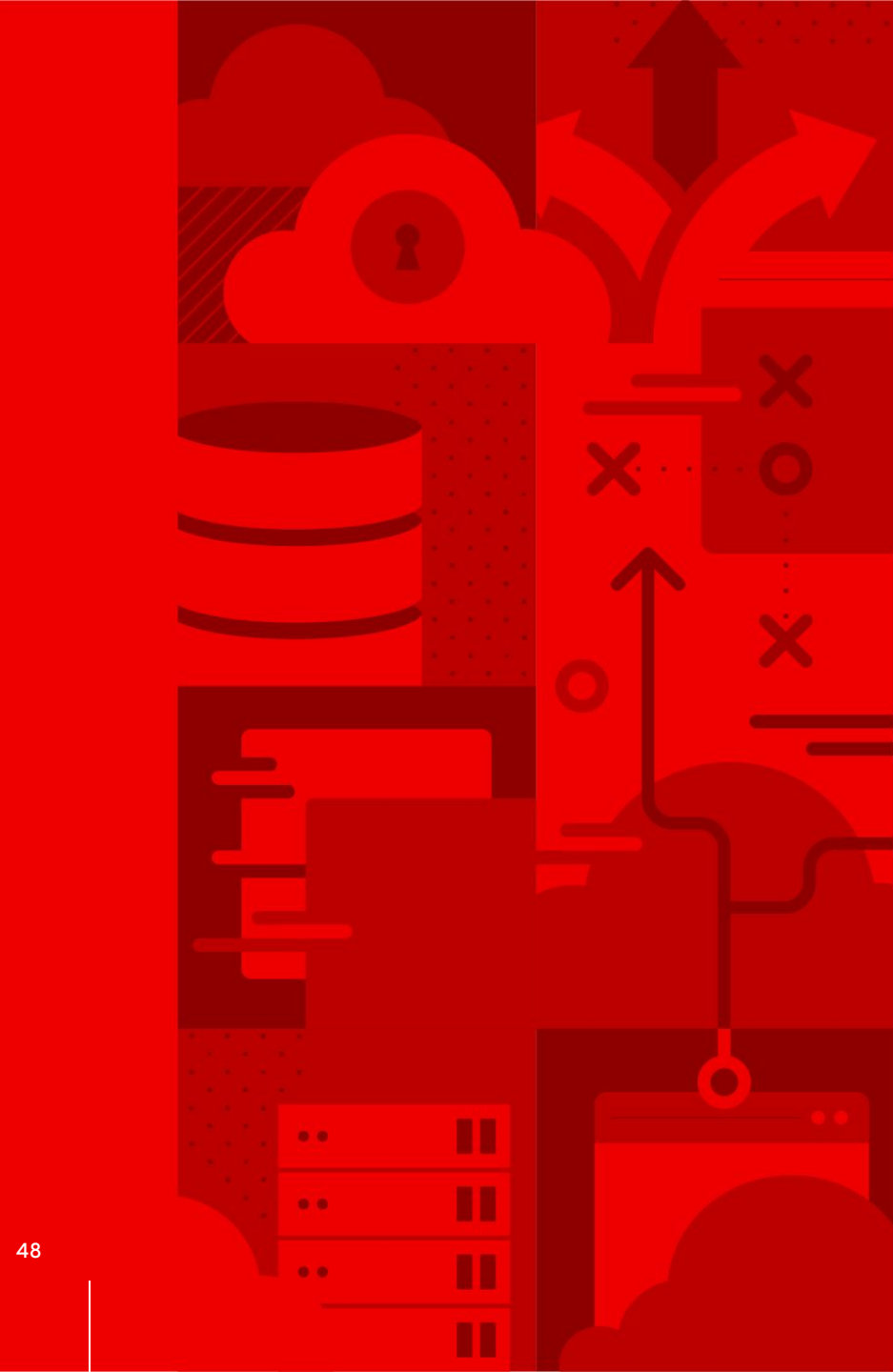
CLUSTER API OBJECTS

- New API objects to declaratively manage the cluster
 - MachineDeployment
 - MachineSet
 - Machine



CLUSTER ARCHITECTURE






Open Discussion

Thank you

Red Hat is the world's leading provider of enterprise open source software solutions. Award-winning support, training, and consulting services make Red Hat a trusted adviser to the Fortune 500.

 [linkedin.com/company/red-hat](https://www.linkedin.com/company/red-hat)

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