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

WHY CUSTOMERS MIGRATE TO HYBRID CLOUDS

INNOVATION IS REQUIRED TO KEEP UP WITH THE COMPETITION

IMPROVE BUSINESS AGILITY\(^1\)

“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 OWNERSHIP\(^1\)

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

- Yui Onodera, C.A. Mobile\(^3\)

SUPPORT INNOVATION\(^1\)

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

- Paul Cutter, CTO, Betfair\(^4\)

GROW THE BUSINESS\(^1\)

“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


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
BUT THIS IS NOT JUST A SW STORY

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<thead>
<tr>
<th>CLOUD-NATIVE USE CASES</th>
<th>EVOLUTION</th>
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<td></td>
<td>Accelerate app delivery</td>
<td>Drive business innovation</td>
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<td>Optimize existing apps</td>
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<td>Develop new cloud-native apps</td>
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<td>Red Hat Open Innovation Labs</td>
<td>OpenShift Application Runtimes on OpenShift</td>
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<th>RED HAT CAPABILITIES</th>
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<td>Red Hat Consulting</td>
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<td>Red Hat Training</td>
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</table>

Red Hat Consulting container adoption program
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

HYBRID MANAGEMENT

- 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:

- DIY IT stack: 15%
- Container platforms: 16%
- Bare-metal: 18%
- Virtual machines: 21%

WHEN OFF-PREMISE:

12% Public cloud using CaaS/PaaS
11% Public cloud using container platforms
8% DIY cloud stack
CONSISTENCY ACROSS PLATFORMS

CONSISTENT DEV EXPERIENCE
CONSISTENT OPS EXPERIENCE

PRIVATE CLOUD
VMWARE

INCONSISTENT DEV EXPERIENCE
INCONSISTENT OPS EXPERIENCE

PRIVATE CLOUD
VMWARE

aws
Azure
Google Cloud
APPLICATION PORTABILITY WITH CONTAINERS

RHEL Containers + RHEL Host = Guaranteed Portability Across Any Infrastructure
Red Hat Hybrid Cloud and DevOps

**RED HAT CONTAINER STACK (OCP 3.x)**

---

**Red Hat Application Services (JBoss)**

- Business Automation
- Integration
- Data
- Web & Mobile
- 3rd party frameworks

**LIFECYCLE AUTOMATION**

- SELF-SERVICE
- SERVICE CATALOG
- IMAGE BUILD
- MONITORING
- POLICY MANAGEMENT
- CAPACITY MGMT
- SECURITY ANALYSIS

**CONTAINER MANAGEMENT**

- ORCHESTRATION (Kubernetes)
- CONTAINER ENGINE (Docker Engine)
- REGISTRY (Atomic Registry)
- STORAGE (Kubernetes)
- SECURITY (Docker Engine)
- NETWORKING (Open vSwitch)
- ENTERPRISE-GRADE CONTAINER OS

**CONTAINER INFRASTRUCTURE SERVICES**

- PHYSICAL
- VIRTUAL
- PRIVATE CLOUD
- PUBLIC CLOUD

---

**Red Hat OpenShift Container Platform**

- CI/CD (Jenkins)
- CI/CD

**Red Hat Enterprise Linux & Atomic Host**

- IMAGE BUILD
- CONTAINER ENGINE
- REGISTRY

**PaaS**

**CaaS**

**IaaS**

---

**ENTERPRISE REGISTRY (RH Quay)**

**PUBLIC REGISTRY (RH Registry)**

**OPS MANAGEMENT (CloudForms, Satellite)**

**OPS AUTOMATION (Ansible)**

**STORAGE (RH Storage)**

**DEV TOOLS ( Developer Studio, Container Dev Kit)**

---

Red Hat Application Services (JBoss)

Red Hat OpenShift Container Platform

Red Hat Enterprise Linux & Atomic Host

---

Red Hat Hybrid Cloud and DevOps

**18**
STORAGE CONSOLIDATION ON PREM

PERSISTENT VOLUMES PROVIDED BY OPENSHIFT CONTAINER STORAGE

- FIBRE-CHANNEL ARRAY
- ISCSI SAN
- SHARED SAS
STORAGE CONSOLIDATION IN THE CLOUD

RED HAT OPENSIGHT
Container Storage

EBS gp2
EBS st1
EBS io1
EBS sc1

VS.

RED HAT OPENSIGHT
Container Storage
What’s new in OCP 4
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)

Developer Preview: try.openshift.com
FULL STACK AUTOMATED INSTALL

What's new in OCP 4

**OPENSHIFT 3**
- OPENSHIFT PLATFORM
- OPERATING SYSTEM
- INFRASTRUCTURE

**OPENSHIFT 4**
- OPENSHIFT PLATFORM
- OPERATING SYSTEM
- 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
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
What's new in OCP 4

PROVIDER ROADMAP FOR RED HAT
OPENSHIFT 4

<table>
<thead>
<tr>
<th>Installer Provisioned Infrastructure (IPI)</th>
<th>User Provisioned Infrastructure (UPI)</th>
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<tr>
<td><img src="image" alt="OpenShift" /> DEV PREVIEW</td>
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<td><img src="image" alt="OpenShift" /> 4.1</td>
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<td><img src="image" alt="Red Hat Virtualization" /></td>
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*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
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

Build operators from Helm chart, without any coding

Build operators from Ansible playbooks and APBs

Build advanced operators for full lifecycle management

Helm Chart

Helm SDK

Ansible Playbooks APBs

Ansible SDK

Go SDK

Ansible SDK

APBs

Go SDK
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 OPENSHIFT SERVICE MESH

SERVICE MESH
- Load Balancing
- Fault Tolerance
- Traceability
- Observability
- Service Security
- Infra Security
- Chaos Engineering
- Traffic Control

OPENSFiTH
ENTERPRISE KUBERNETES
- Build Automation
- Logs
- Monitoring
- Infra Security
- CI/CD
- Load Balancing
- Deployment Resiliency
- Service Discovery
- Config
- Resource Management
- Elasticity

INFRA
- PHYSICAL
- VIRTUAL
- CLOUD

What's new in OCP 4
What's new in OCP 4

OPENSHIFT SERVERLESS

Functions      Apps      Microservices

Containers

Platform

Application

Infrastructure

Developer Preview
OPENSHIFT 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
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...
Overview of Container tooling

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
Overview of Container tooling

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
Overview of Container tooling

BUILDHAH

A tool that facilitates building OCI container images

- Buildah CLI
- OCP4 S2I
- podman build
- 3rd party tools

BUILDHAH library

- Base image
- rootfs
- User configs

BUILDHAH from

- buildah from
- buildah commit
- buildah push

BUILDHAH to

- buildah config
- Registry
- Container
Overview of Container tooling

BUILDAH

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

```
+ { ignition profile }
```

Applied at first boot
CLUSTER API OBJECTS

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

MachineDeployment
  type=worker

MachineSet
  Zone1

MachineSet
  Zone2

CoreOS

CoreOS
CLUSTER ARCHITECTURE

**Control Plane**
- m3.xlarge

**Logging & Monitoring**
- r5.2xlarge

**Workers**
- m5.large

**Internet Traffic**
- Load Balancer
- Routing
- m5.large
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.

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facebook.com/redhatinc
youtube.com/user/RedHatVideos
twitter.com/RedHat