

OpenShift Virtualization Technical Workshop

Alfred Bach
PSA
Field Partner and Learning Team

Step 1

Survive your
first meeting

The Virtualization
Opportunity

Step 2

Sales and
Technical Training

Skill up on OpenShift
Virtualization

Step 3

Architecture
Workshop

OpenShift
Virtualization

Step 4

Workshop-as-a-
Service (WaaS)

Sales and Technical Drop-in Session

OpenShift
Virtualization
Journey



Welcome to the OpenShift Virtualization Roadshow

09:30 - 10:00	Overview presentation
10:00 - 12:00	Virtualization lab
12:00 - 1:00	Lunch break
1:00 - 2:00	Continued lab
2:00 - 2:10	Break
2:10 - 3:30	Continued lab and wrap-up

OpenShift as an Application Platform should bring **developers** and **operations** teams **together** for both **Containers** and **Virtualization**.



OPEN SOURCE EVERYWHERE

100%

of airlines in the
Fortune Global 500
rely on Red Hat



100%

of telcos in the
Fortune Global 500
rely on Red Hat



100%

of healthcare
companies in the
Fortune Global 500
rely on Red Hat



100%

of commercial
banks in the
Fortune 500 rely
on Red Hat



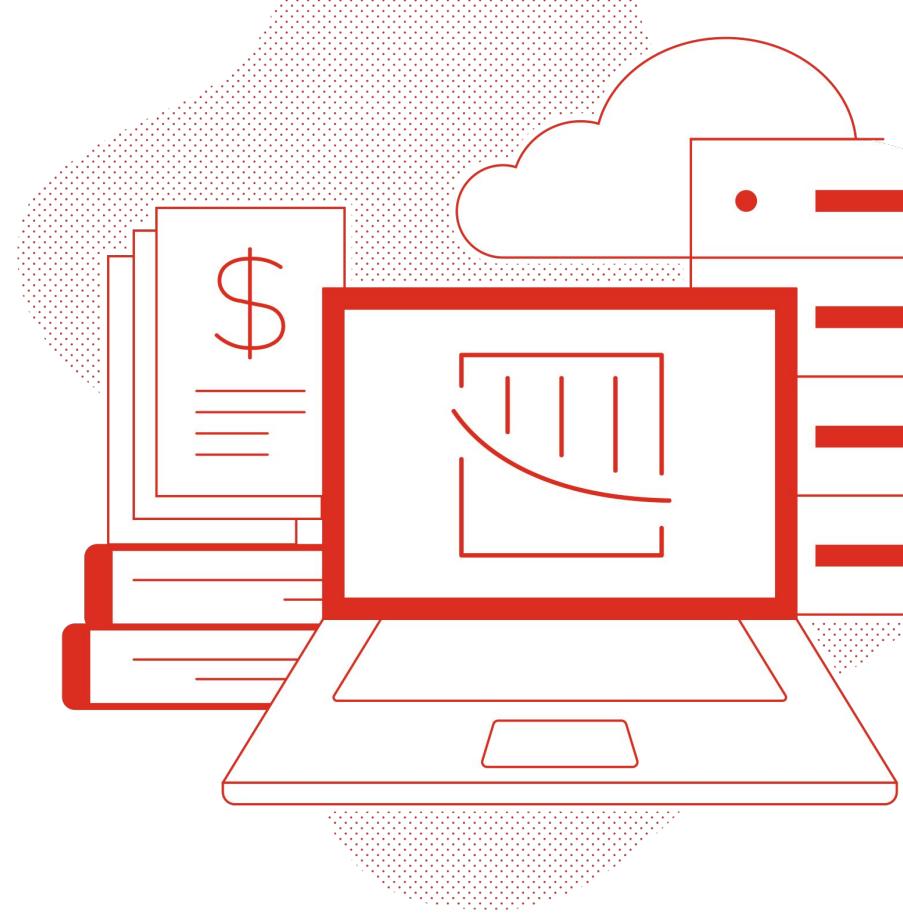
100%

of U.S. executive
departments rely
on Red Hat

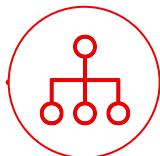


Why are you here today?
Server Virtualization industry is
changing dramatically

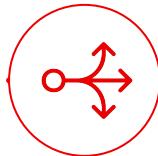
Consider your options.



By the end of the day....



Consider an alternative solution for your
virtual infrastructure



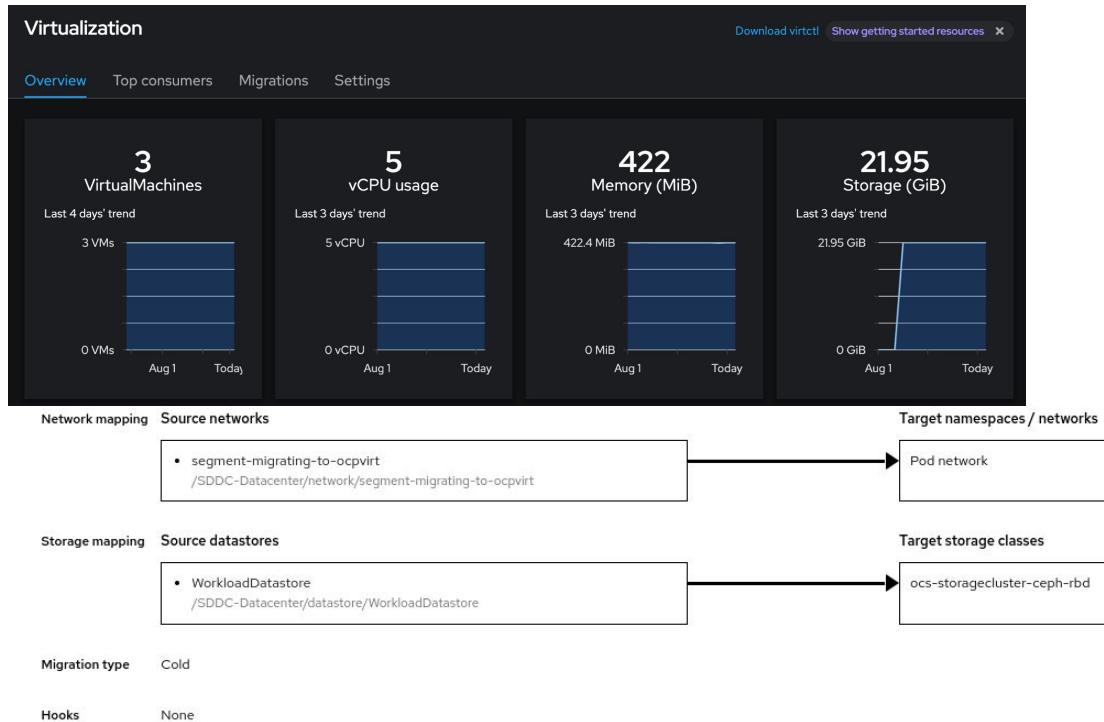
Become familiar with Red Hat OpenShift Virtualization



Understand that your journey to infrastructure
modernization starts here

What we will cover in the hands-on workshop

- Virtual machine
 - Provisioning
 - Management
 - Live migration
- Platform
 - Storage
 - Network
 - Load balancing
- Migration
 - vSphere -> OpenShift
- Backup and restore



Challenges of traditional Virtualization environment



Increasing cost



Slow Evolution



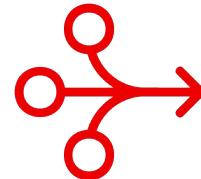
Supporting Growth



Risk



Developer Productivity



Modern environments solve these challenges



Cost reduction for operating infrastructure



Innovate at speed



Scalability



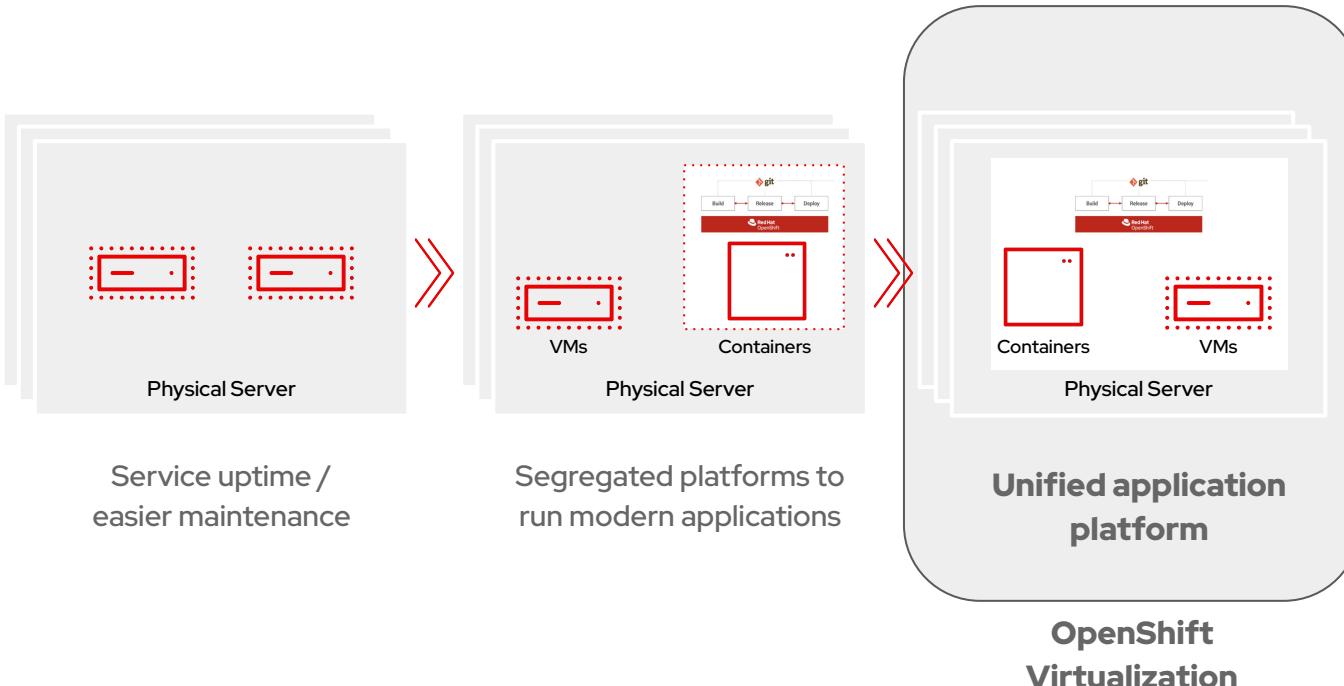
Security focused



Integrated development tools

Bring cloud-native functionality to virtual machines with Red Hat innovation

The benefits of k8s without containerizing



A single open platform for application innovation

A complete application platform that integrates with existing infrastructure, tools, and services



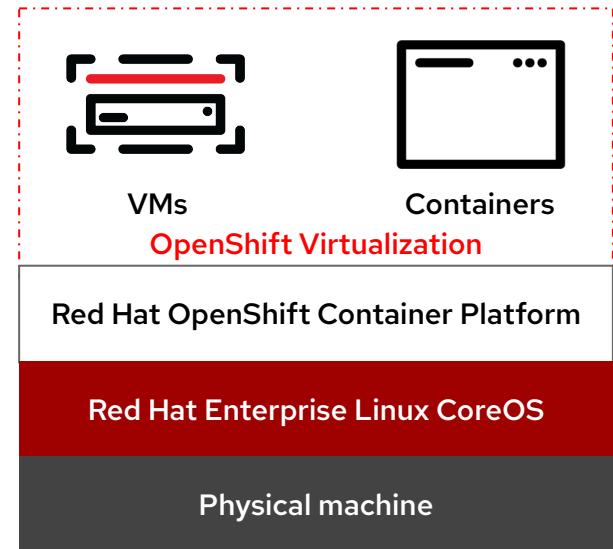
Empowering operations teams to innovate

A cloud-like experience, everywhere

Trusted enterprise open source platform

What is OpenShift Virtualization?

- Included feature of the OpenShift application platform
- Run VMs in OpenShift
- Performance, stability, scalability, and reliability of KVM, the Linux kernel-based hypervisor
- RHEL guest entitlements are included
- Supports Microsoft Windows guests – Microsoft Server Virtualization Validation Program (SVVP)
- Manageability and ecosystem of OpenShift
- Unified platform for running VMs and Containers



Bring traditional VMs into OpenShift

Traditional VM behavior in a modern platform

- ▶ Administrator concepts and actions
- ▶ Network connectivity
- ▶ Live migration

Leverage existing VM roles and responsibilities

- ▶ Maintain business critical application components
- ▶ Modernize skill sets over time

Migration Tooling

- ▶ **Migration Toolkit for Virtualization (MTV)**
- ▶ Warm migration of VMs at scale

Name	Migration analysis	VM name	Datacenter	Cluster	Host	Folder path
▶ <input type="checkbox"/>	⚠	VM1	datacenter1	cluster1	host1	folder1\folder2
▶ <input type="checkbox"/>	✓	VM2	datacenter1	cluster1	host1	folder1\folder2
▶ <input type="checkbox"/>	ℹ	VM3	datacenter1	cluster1	host1	folder1\folder2
▶ <input type="checkbox"/>	✓	VM4	datacenter1	cluster1	host1	folder1\folder2
▼ <input type="checkbox"/>	❗	VM5	datacenter1	cluster1	host1	folder1\folder2

This VM is a high risk for migration because it violates the following rules:
- VM shares a disk with other VMs
- VM uses remote device management
- VM was harvested during a month without an "r" in it

Creating a migration plan with MTV

Modernize at your own pace

Legacy Virtualization

Apps in VMs

Slow evolution


Increasing costs


Developer productivity


Infrastructure Modernization

Apps in VMs



Cloud Elasticity + Scalability



Reduce Operating Cost



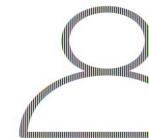
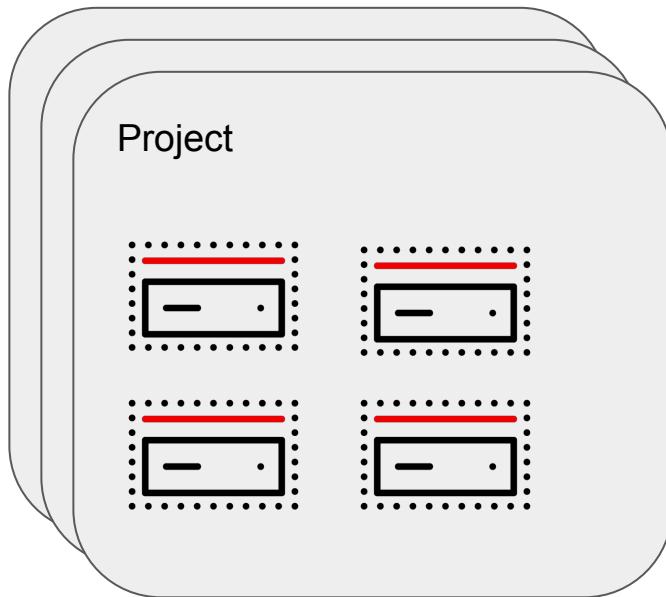
Increase IT efficiency +
reliability

MTV

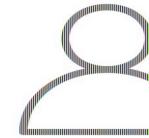
Speed of Infrastructure Deployment
Speed of Application Development

Self-service VM by Project

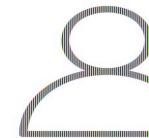
Assign roles and collaborate around Projects as you would in the cloud



Project owner



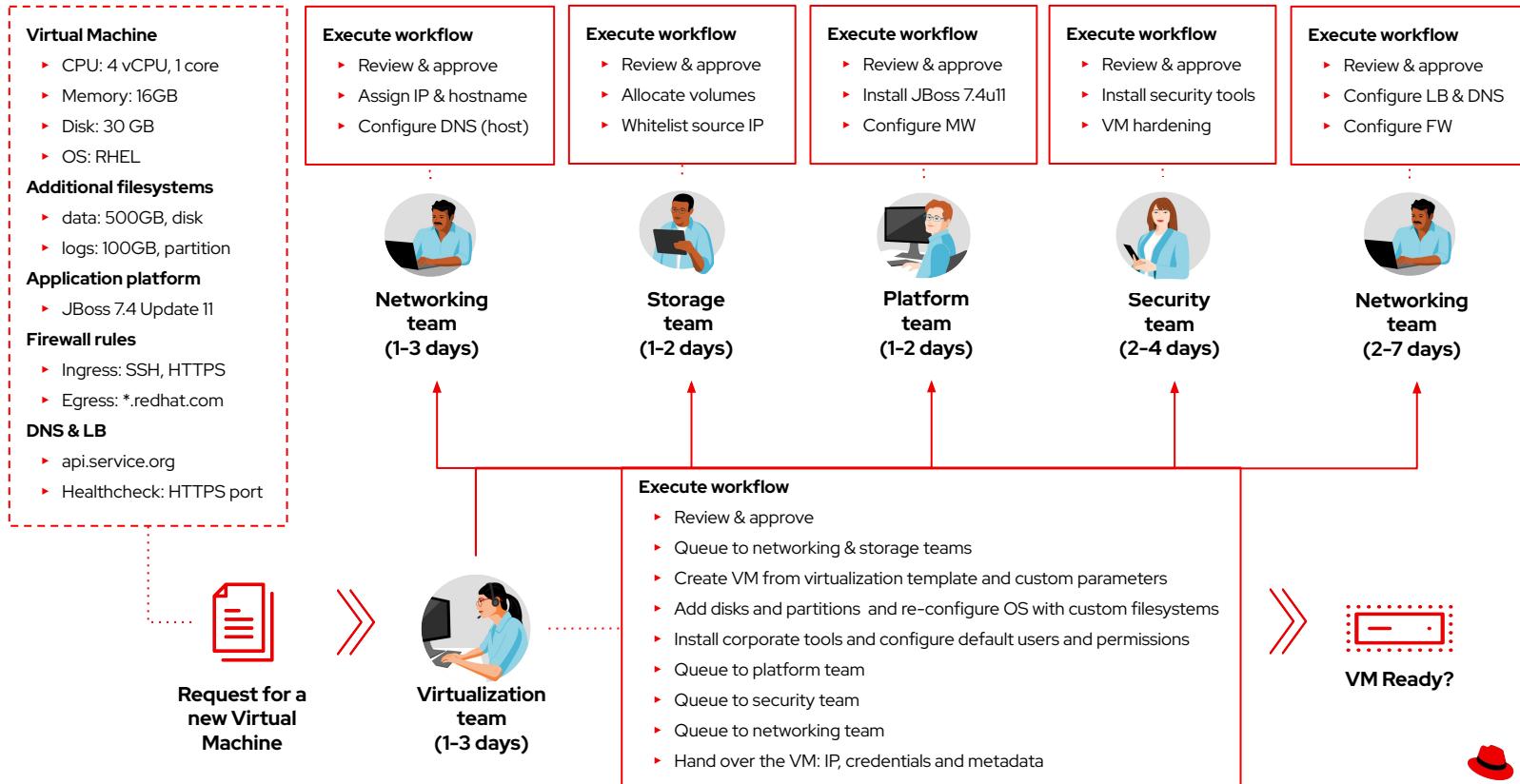
Project editor



Project viewer

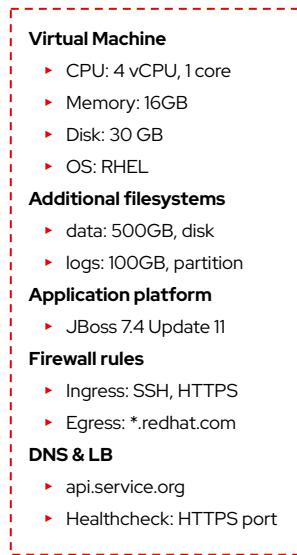
Fragmented 'approach' to VM provisioning

A process that can take weeks trapped in queues and iterations

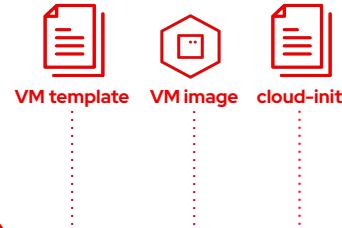


Next Gen approach to VM provisioning

Automated VM provisioning in minutes

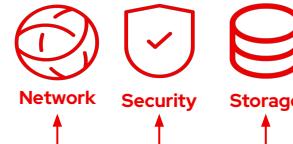


Request for a
new Virtual
Machine



OpenShift

Manage networks, storage, load balancers, etc.



VM Ready!

Execute workflow

- ▶ Validated network, storage, and security against policies and permissions
- ▶ Provisioning of VM with corporate tools from template and custom parameters
- ▶ Publish VM: IP, credentials and metadata

Modernize at your own pace

Legacy Virtualization

Apps in VMs

Slow evolution


Increasing costs


Developer productivity


MTV

Infrastructure Modernization

Apps in VMs

Cloud Elasticity + Scalability


Reduce Operating Cost


Increase IT efficiency + reliability


Cloud native

Direct path to cloud native

DevOps and Infrastructure Modernization

Apps in VMs or Containers

Innovate at speed

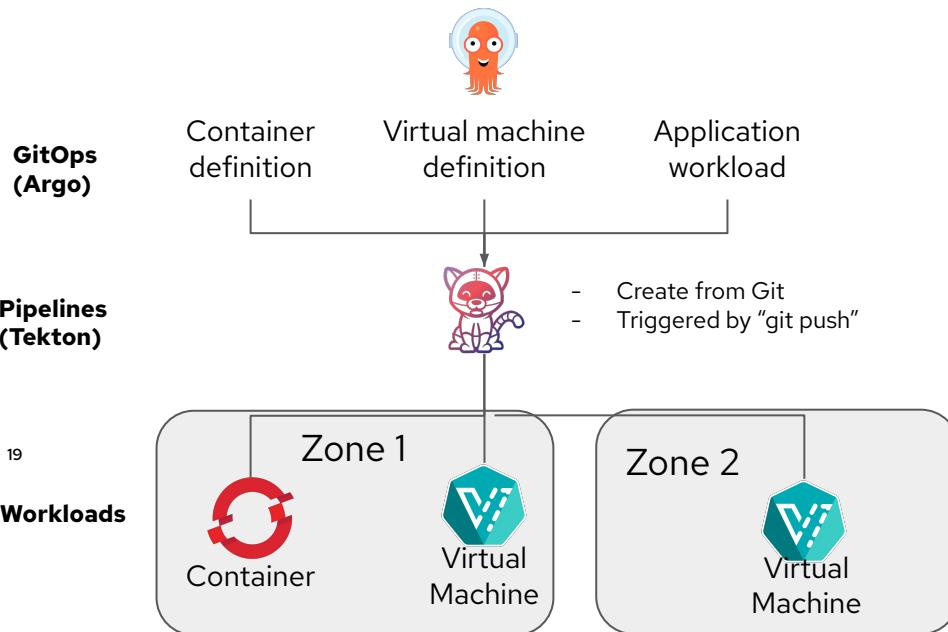

Higher Annual Revenue


Increased Developer Output


Speed of Infrastructure Deployment
Speed of Application Development

OpenShift Virtualization: Build Cloud-native VMs

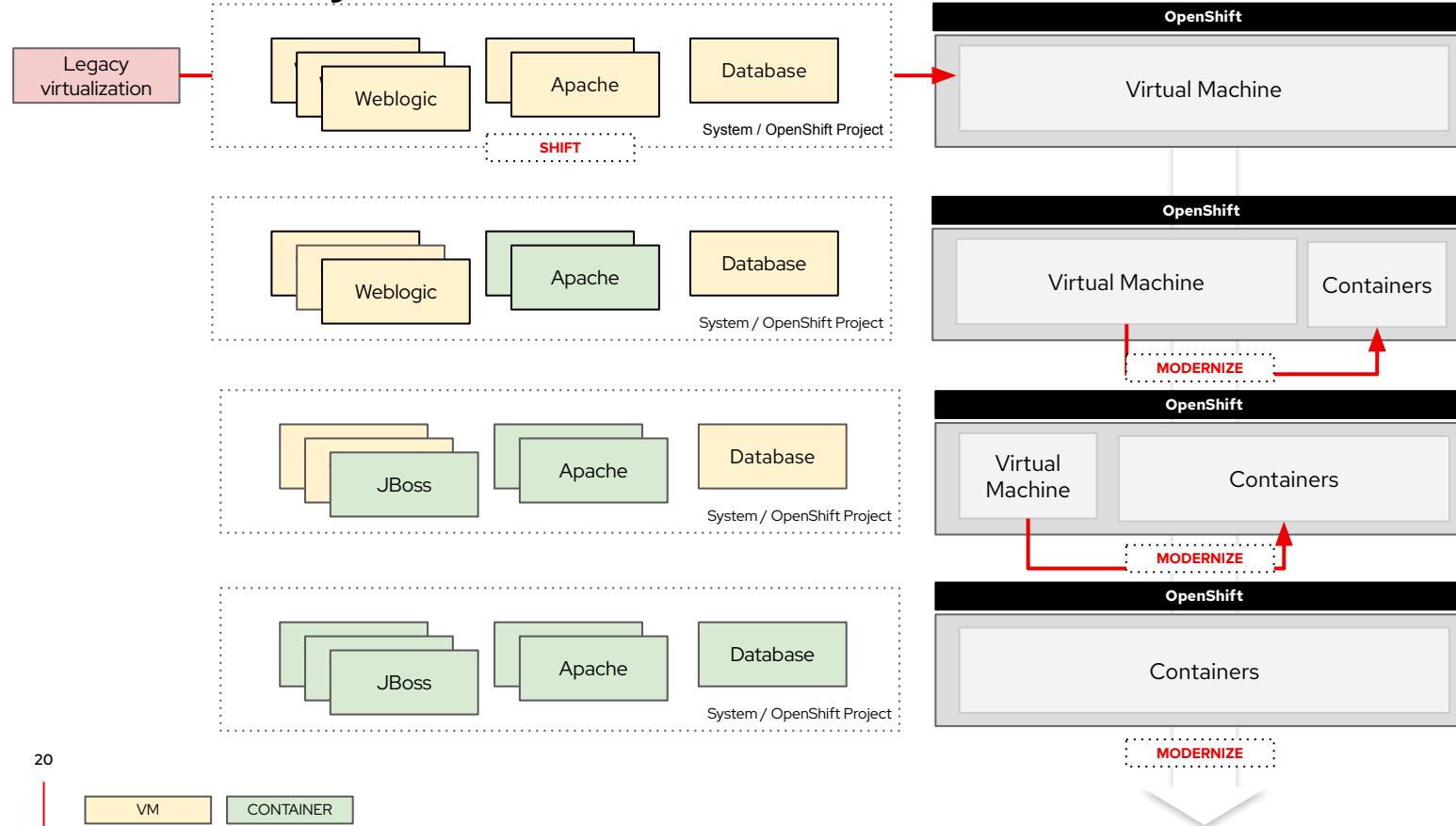
Deploy VMs as Code with CI/CD



Integrate legacy VMs with a modern GitOps framework

- ▶ Deploy different security zones to run both composite applications of pods/VMs as well as traditional VM workloads
- ▶ Deploy and automate Virtual Machines as Code with GitOps

OpenShift Virtualization: Modernize Applications Iteratively



Next Gen approach to VM orchestration & management

Automated VM provisioning in minutes

Virtual Machine

- ▶ CPU: 4 vCPU, 1 core
- ▶ Memory: 16GB
- ▶ Disk: 30 GB
- ▶ OS: RHEL

Additional filesystems

- ▶ data: 500GB, disk
- ▶ logs: 100GB, partition

Application platform

- ▶ JBoss 7.4 Update 11

Firewall rules

- ▶ Ingress: SSH, HTTPS
- ▶ Egress: *.redhat.com

DNS & LB

- ▶ api.service.org
- ▶ Healthcheck: HTTPS port



Request for a
new Virtual
Machine



VM template VM image cloud-init



OpenShift

Physical network infrastructure

DNS, load balancers, and firewalls

Public/private cloud services

Hosted database services, hypervisors, and serverless functions

Software as a Service (SaaS)

ServiceNow ITSM, service catalogs, and other hosted apps

Security

Audits, incident response, and remediation



Network Security Storage



Infrastructure
orchestration

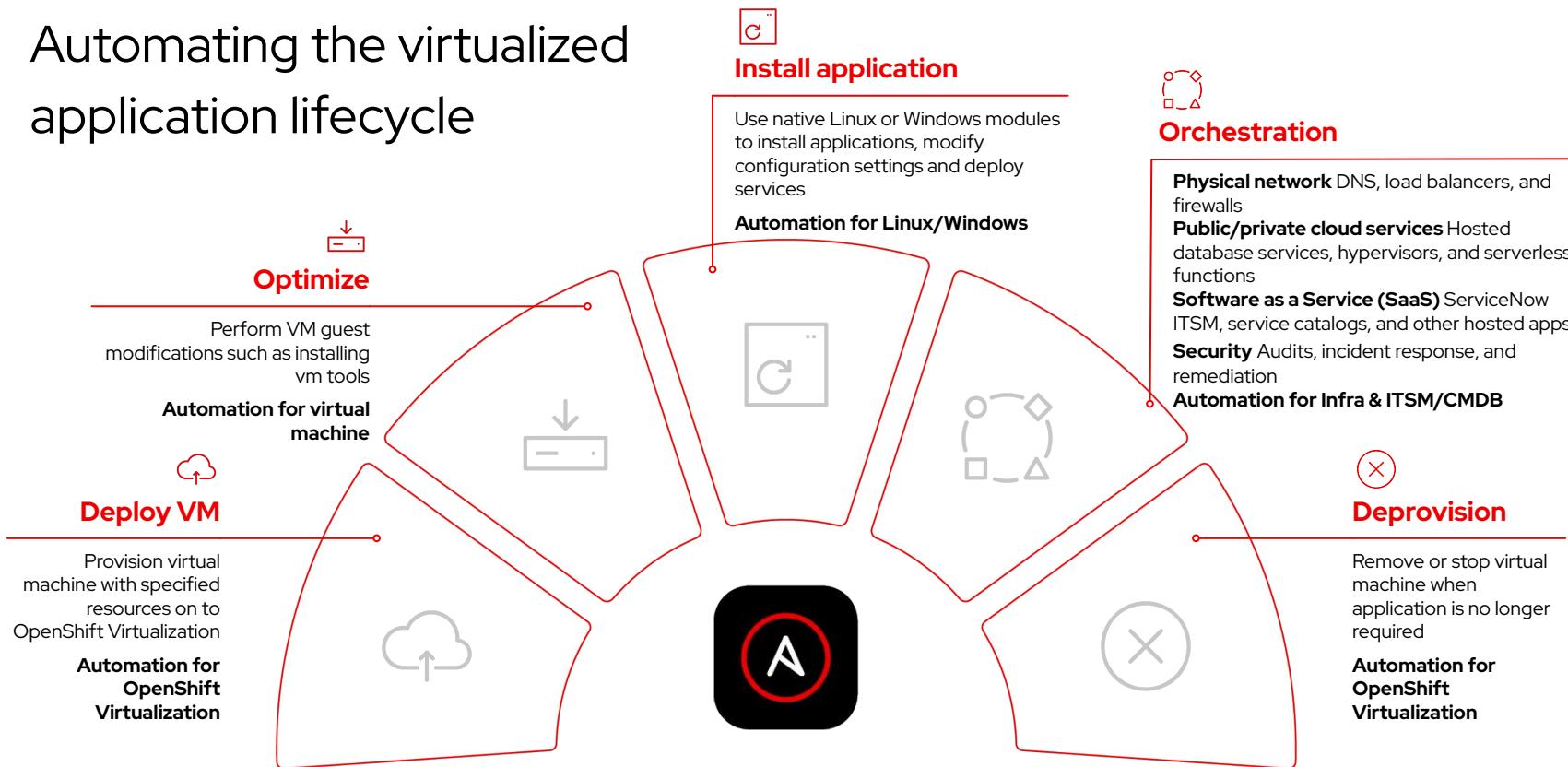


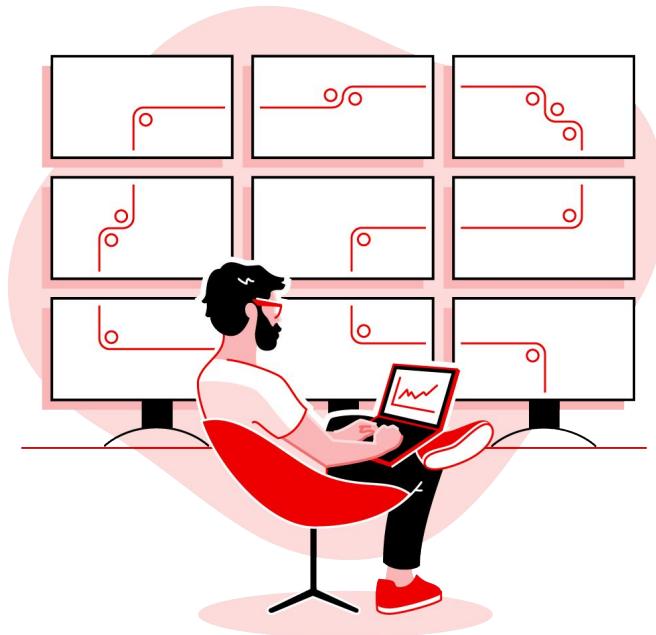
VM Ready!

Execute workflow

- ▶ Validated network, storage, and security against policies and permissions
- ▶ Provisioning of VM with corporate tools from template and custom parameters
- ▶ Publish VM: IP, credentials and metadata

Automating the virtualized application lifecycle





Let's get familiar with the product



OpenShift Virtualization Roadshow

Hands-on workshop companion slides

Accessing your lab instance

Browse to

https://demo.redhat.com/workshop/<id_here>

Password: xxxxxxxx

Importing virtual machines from vSphere: 50 minutes

End: 12:00

LunchBreak:
60 minutes

End: 13:00

OpenShift Virtualization basics: 50 minutes

End: 13:50

Break: 10 minutes

End: 14:00

Choose your own adventure: Modules for roles and interests

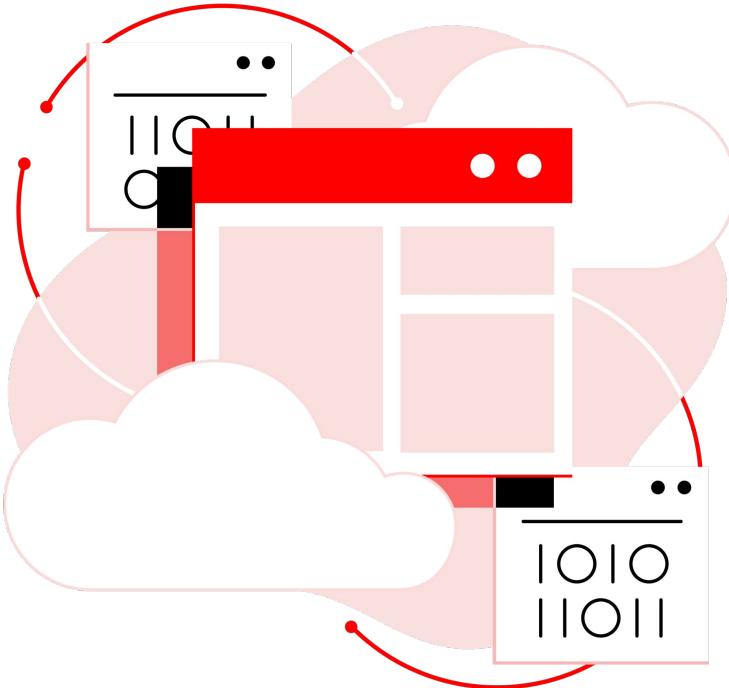
- Virtual machine administrators
 - Customize virtual machines
 - Windows virtual machines
- Virtual infrastructure administrator
 - Bare metal OpenShift
 - Network management; Storage management
 - Backup and restore
- Virtual machine users
 - Exposing apps using a Route; Exposing apps using MetalLB

Role specific modules:
60 minutes

End: 15:00

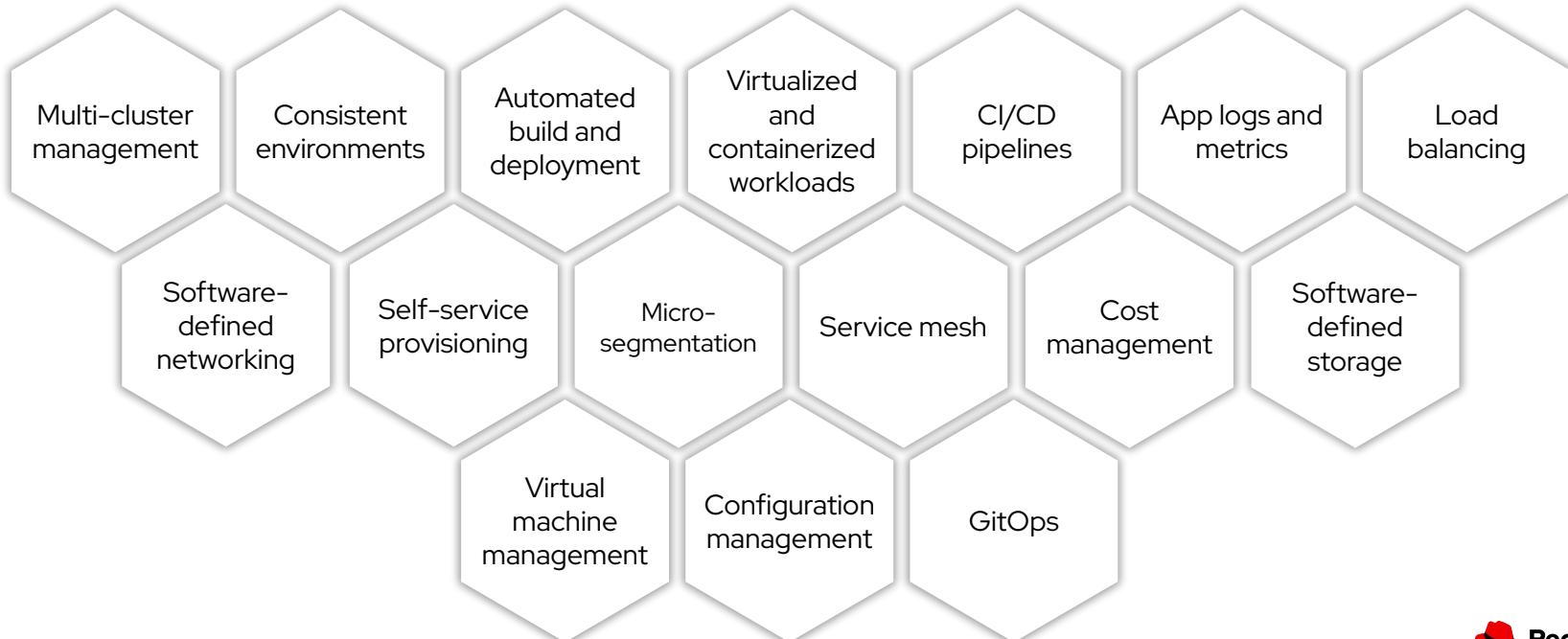
Break: 10 minutes

End: 15:10



Your journey with OpenShift Virtualization

A Modern application platform with comprehensive lifecycle and infrastructure management





A Growing Infrastructure Ecosystem



OpenShift Virtualization Red Hat OpenShift Service on AWS (ROSA) and AWS Bare Metal Offering

- Faster adoption of OpenShift and public clouds
 - Rehost and then refactor
 - Data Center Exit
 - Windows modernization
- Consistent VM deployment and management, on-prem and in the cloud
 - Consistent management
 - VM portability between cloud providers & on-prem
 - Disaster Recovery and bursting



OpenShift Data Foundation

- ▶ Allows customers to **scale storage and compute independently**
 - Storage - Scale **UP or OUT**
 - Compute - Scale number of VMs or expand VMs
- ▶ Disaster recovery
 - VMs can live-migrate within cluster
 - VMs can live migrate across data centers with Metro DR
- ▶ Networking
 - Multus - separate data networks and storage networks.
- ▶ Flexible deployment
 - Block, File, NFS, Object or just Block
- ▶ Data Transfer optimization using local read affinity
- ▶ Security - Encryption at rest and in-transit



VMs

Containers

OpenShift Data Foundation Block, File, NFS, Object



Bare metal

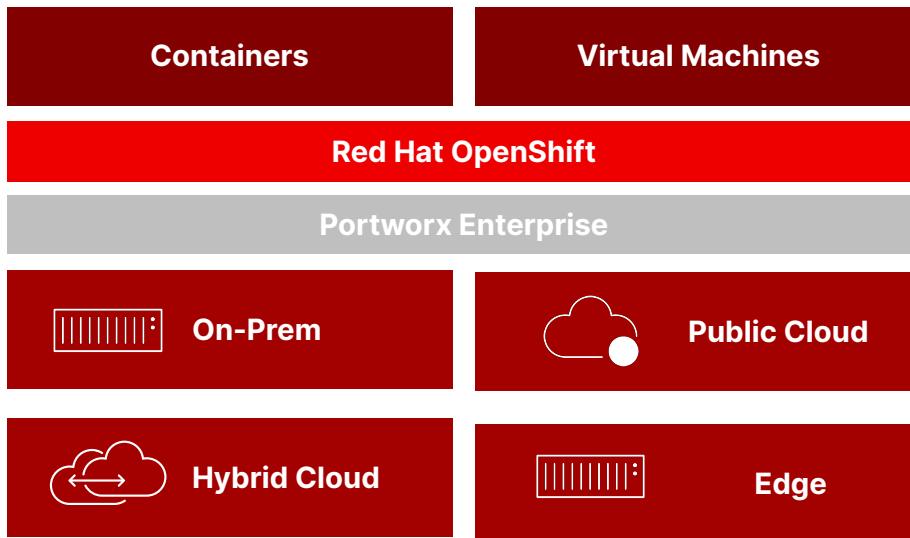
Virtual

Private
cloud

Public
cloud



Storage Automation for VMs and Containers



Storage for application layer for containers & VMs

Enables performance and HA for containers & VMs

Comprehensive DR for VMs and containers

Live migration of VMs and containers



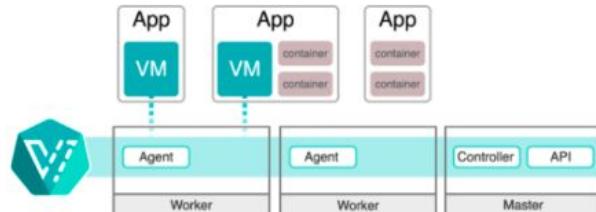
Protect OpenShift Virtualization VMs and Containers side by side

K10 5.5 launched in October 2022 with VM capabilities:

- Discover VMs: snapshot VM configuration and VM storage
- Freeze a VM before snapshot (optional annotation) w/ timeouts and unfreeze
- Restore VM snapshots with resource transforms and automatic orchestration

K10 enterprise features apply to VM workloads for automated data protection:

- Apply K10 policies to vms
- Export and import VMs for disaster recovery and VM mobility between clusters



Disaster and Recovery

- Operator based cloud native solution
- Trilio Treats VMs as K8S first class citizens
 - VMs are automatically backed up irrespective they are provisioned
 - Labels, Namespaces, Operators, Helm Release
- Disaster recovery through Trilio's Intelligent Recovery
- Quiesce and thaw hooks for application consistency backups
- Backups are QCOW2 images which are space efficient
- Full and forever incremental backups
- Wide range of recovery options to recover to multiple clouds



Storage Automation for VMs and Containers

Discover enterprise-grade data protection for the Red Hat ecosystem. Now with OpenShift Virtualization support.

- Automated and Scheduled Backups
- Policy-Driven Backup and Recovery
- Incremental Backups and Deduplication
- Backup Catalog and Metadata Management
- Granular Recovery Options
- Recovery Verification
- Encryption and Data Integrity
- Role-Based Access Control
- Wide range of backup destination options including file system/object storage, tape pools and legacy backup systems (IBM/Dell/Micro Focus and others)



Pair IBM Data Services with Red Hat OpenShift Virtualization

Manage VMs with operators and CRDs

- Windows and Linux VMs
- Common GitOps management tools
- Common Fusion container-native storage layer



Define application-aware backups with “recipes”

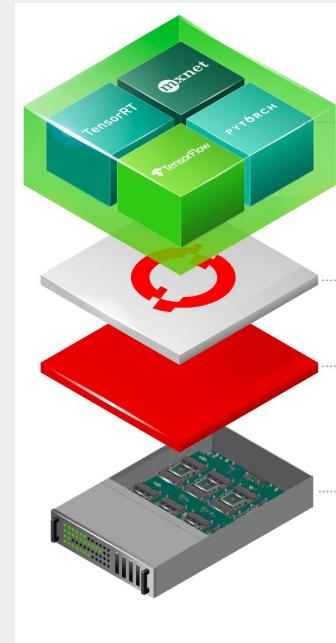
- A Fusion recipe defines workflow to backup and restore application state
- Enforce consistency to ensure recoverability (e.g., *database dump and restore*)
- Orchestrate Fusion backup policies from a central hub

Flexible deployment options

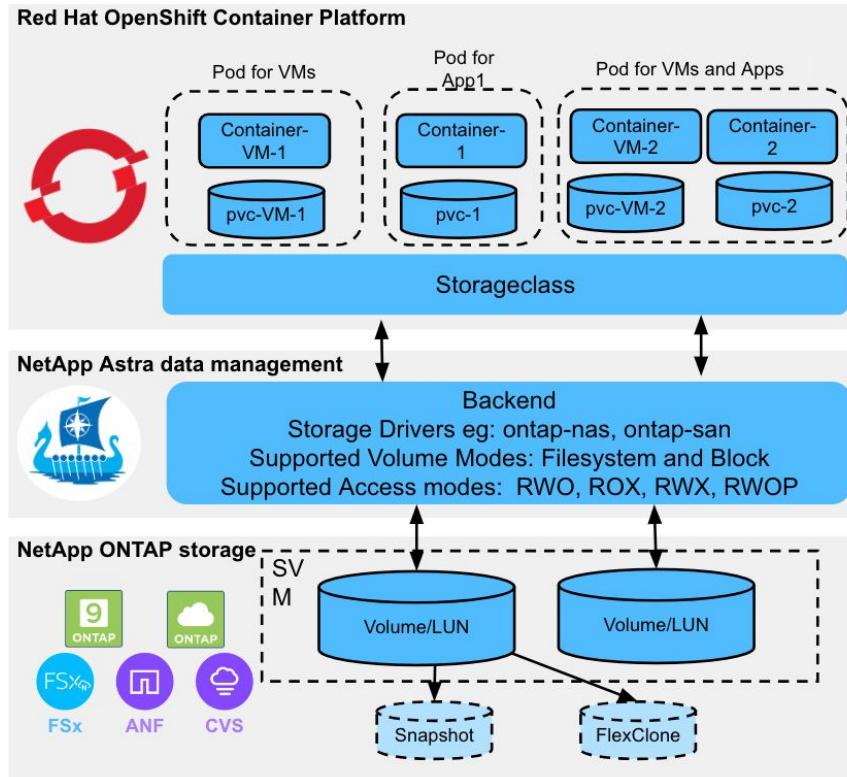
- Deploy Fusion data services in any OpenShift cluster
- IBM Storage Fusion HCI System – an integrated system purpose built for OpenShift applications
- Single point of contact for support

Orchestrating NVIDIA GPU accelerated Virtual Machines with OpenShift

- ▶ GPU-accelerated applications running in virtual machines can be orchestrated by OpenShift, just like ordinary enterprise applications, enabling unified management.
- ▶ In addition to AI, enabling OpenShift Graphics GPU use cases.
- ▶ The NVIDIA vGPU Manager allows multiple virtual machines to share access to a single physical GPU, enabling simultaneous utilization with Time-sliced vGPUs (no MIG support for now).
- ▶ The NVIDIA GPU Operator automates deployment, configuration, and lifecycle management of GPU-accelerated workloads.



Industry leading storage and data management functionality for modern workload deployments



20+ years of partnership and joint support between Red Hat and NetApp

Support both virtualized and containerized apps in a single infrastructure

VM live migration, CSI topology awareness and storage offload

Fast and efficient, best-in-class snapshots & clones

NetApp Astra provides functionality to protect, move, and store apps

Data protection for VMs is coming in Q4 2023



Dell CSI Storage Portfolio

The [CSI Drivers by Dell](#) implement an interface between OpenShift and Dell Storage Arrays

	PowerFlex	PowerScale	PowerStore	PowerMax	Unity
Static Provisioning	✓	✓	✓	✓	✓
Dynamic Provisioning	✓	✓	✓	✓	✓
Expand Persistent Volume	✓	✓	✓	✓	✓
Create/Delete Volume Snapshot	✓	✓	✓	✓	✓
Create Volume from Snapshot	✓	✓	✓	✓	✓
Volume Cloning	✓	✓	✓	✓	✓
Raw Block Volume	✓		✓	✓	✓
Ephemeral Volume	✓	✓	✓		✓

Dell Apex Cloud Platform

You are logged in as a temporary administrative user. Update the cluster OAuth configuration to allow others to log in.

Dell APEX Cloud Platform

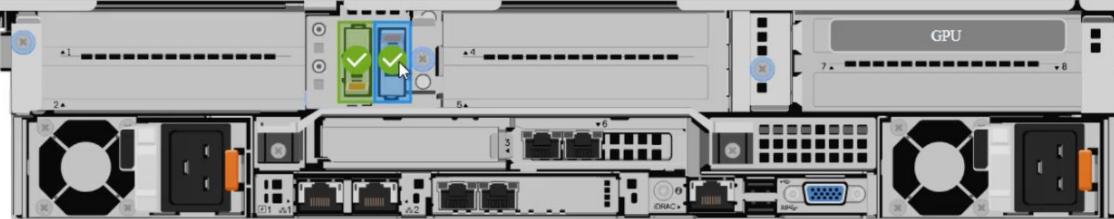
Overview Inventory Updates Security Settings Support

u23-appl-cl-raven.ravencse.local > 35RLCX3

Physical View

Actions ▾

Front View Back View



BOSS Information

Overview Alerts

Boss Controller

Device model	Status	Firmware version
BOSS-N1 Monolithic	HEALTHY	2.1.13.2021

Active Boot Device

Slot	Device model	Protocol	Capacity
0	Dell NVMe PE8010 R1 M.2 960GB	PCIe	894.25GB

DELL Technologies

Overview Boot Devices Alerts

Server health Warning

System LED Healthy

Power state On

Service tag 35RLCX3

Role node Control plane, Master, Worker

Manufacturer Dell Inc.

Server slot 1

Server model APEX MC-760

Management IP address 172.18.30.52

iDRAC IP address 192.168.10.19

Location

Rack name U23

Activate Windows

Rack position 2

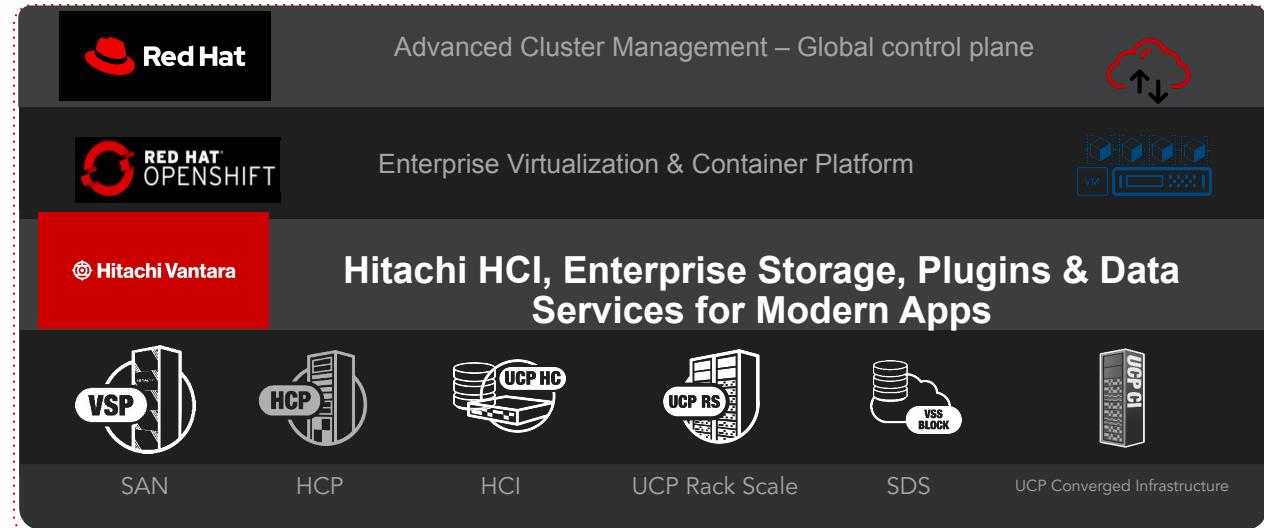
Go to Settings to activate Windows.

Firmware versions

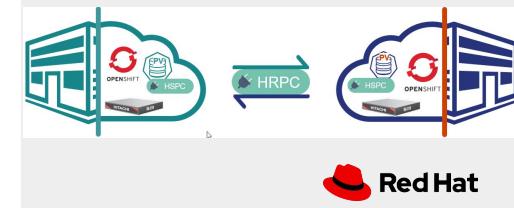
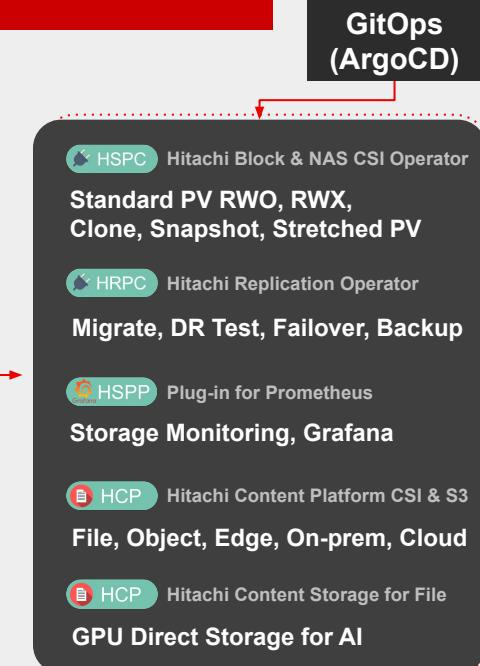
OpenShift Virtualization with Hitachi

Hyperconverged, Storage Operators & Data Services for Apps

Hitachi Vantara



- High Performance CSIs
- Reliable Hyperconverged
- Multi Site Replication and DR
- GitOps for Edge-Core automation





Product Journey

Utilizing OpenShift Virtualization to Consolidate OpenShift Clusters

Hosted Control Planes with KubeVirt provider



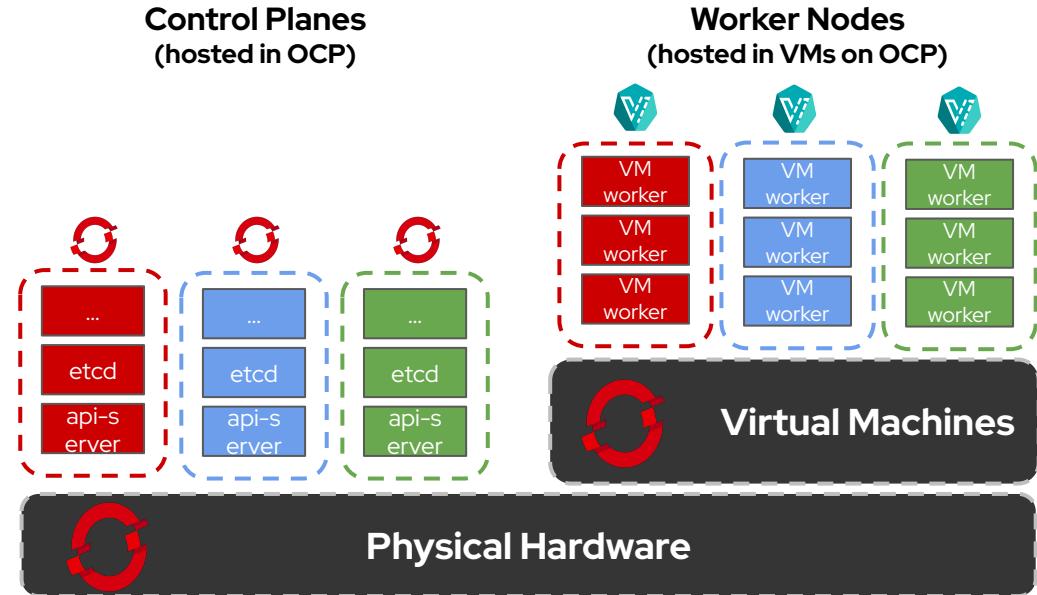
Increase Utilization of Infrastructure

- Consolidate multiple control planes to reduce unused and underutilized infrastructure
 - Increase bare metal node utilization by hosting virtual worker nodes for multiple clusters



Reduce Dependency on Legacy Virtualization

- Eliminate the need to have legacy hypervisor layer to host your containerized infrastructure
 - Underlying virtualization layer is included with hosted OpenShift cluster entitlements (no separate licensing needed)



Core Enterprise Capabilities



Currently Supported

Near

Future

Core Functionality

- Live Migration between nodes
- Microsoft SVVP certification, any currently supported Microsoft Windows, UEFI and Secure boot, Persistent vTPM
- Microsoft Windows Server Failover Cluster (WSFC)
- Infrastructure & Application fencing
- Performance and Limits Parity
- RHEL VMs
- Hot pluggable disks / VM disk resize
- DRS / CPU overcommit
- GPU passthrough / vGPU support
- Non-disruptive upgrades

- Network hotplug
- CPU Hotplug
- Memory hotplug (TP)

- Memory Hot Plug
- Higher density with safe memory overcommit
- Real-Time VMs

50

Hybrid Cloud and Managed Services



- X86 Intel and AMD based systems
- Single Node OpenShift
- 3-node compact cluster
- IBM Cloud (Tech Preview)
- ROSA, AWS (General Availability)

- ROSA secondary network

- Off-premises hosting (Equinix)
- Oracle Cloud
- ARM based systems

Storage and Networking



Currently Supported

Near

Future

Storage, Backup and DR

- Storage profiles for all major storage providers - ODF, Netapp, Pure/Portworx, Dell, Hitachi, HPE, IBM
- VM export
- Backup / restore with OADP
- Portworx support for Metro-DR and Async-DR
- Kasten K10 by Veeam
- Trilio TVK
- Storware vProtect

- NetApp Astra data protection for VMs
- Metro-DR (Sync) with ODF (GA)
- Regional-DR (Async) w/ ODF (TP)
- Storage migration (TP)

- Regional-DR (Async) w/ ODF
- OADP to support data mover for block volume
- Storage Migration (GA)

Networking

- DPDK (TP)
- SR-IOV
- Dual-stack IPv4 & IPv6
- Flat L2 Overlay network without the need to configure host networking

- DPDK (GA)
- Secondary network ipBlock policies and microsegmentation
- OVN Kubernetes localnet as an alternative to the Bridge CNI

- Single-stack IPv6
- Hardware offload
- IPAM
- Port mirroring
- Services over a secondary OVN Kubernetes
- Localnet QinQ

Management

Currently Supported

Near

Future



DevOps and Platform Engineering

- Deploy and Configure virtual machines using Tekton pipelines
- Multi-cluster management using ACM and ArgoCD
- Self-service and users roles
- Deploy hosted OpenShift Clusters with Hosted Control Planes

- Example Git repo w/ best practices
- Tekton pipeline to upload customised VMs to Git Repositories

- Developer Hub / Backstage

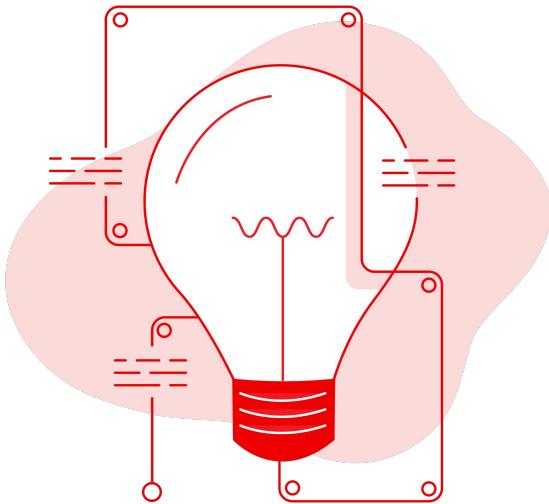


VM Management and Observability

- Migration at scale from VMware, RHV (Warm) from OpenStack, inter-cluster (Cold) (MTV)
- Overview dashboards for VMs and Cluster
- Individual VM ops & detailed dashboards
- Prometheus metrics can be integrated with external monitoring
- Templates for VM deployment

- Cloud-like experience to create VMs
- Consistent set of APIs
- Integrations with provisioning and management tools
- VM guest boot and application logging
- Integrate infra logs with Loki
- Virtualization Overall Health Metric
- Actionable Telemetry
- Historical trending & identify anomalies
- OpenShift Virtualization Insight rules

- User-defined instance types
- Additional Ansible collections
- Multi-cluster VM management (ACM)
- Multi-cluster virtualization monitoring (with ACM)



Next Steps

Services: OpenShift Virtualization Pilot

Plan and implement lift-and-shift migration of virtual machines to OpenShift Virtualization platform

Consulting

New skills

Learn how to architect, deploy, and manage OpenShift on bare metal with OpenShift Virtualization

Bare metal

Automate the provisioning and validation of OpenShift bare metal nodes

OpenShift Data Foundation

How to incorporate (architect, deploy, operate) OpenShift Data Foundation in OpenShift bare metal environments

OpenShift Virtualization

Learn how to use virtual machines within Kubernetes, as a user and operator. Using templates and automation tooling.

Training

Managing Virtual Machines with Red Hat OpenShift Virtualization | DO316

Learn More: [Portfolio Hub – Services Map: Container Platform Acceleration](#)



Key takeaways

1. OpenShift Virtualization provides you with a mature, stable, scalable solution and it's easy to get started
2. Full automation including: declarative, self-healing and secure
3. Integration with a broad ecosystem of partners
4. Part of an application platform that allows you to add features and capabilities while being "batteries included", but replaceable if necessary



Follow up with your account executive to continue using the environment.

What else can we answer for you?

Thank You !



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



[youtube.com/user/RedHatVideos](https://www.youtube.com/user/RedHatVideos)



[facebook.com/redhatinc](https://www.facebook.com/redhatinc)



twitter.com/RedHat