OpenShift Virtualisation

vILT VMA Workshop


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Agenda

Day One

09:00 - 10:35

- Welcome and Introductions
- Sales Motion and Getting the Technical Win (GTM Strategy)
- OpenShift Virt Overview / Storage / Networking

10:35 - 10:45 BREAK

10:45 - 12:00

- VMware vSphere Overview Presentation
- VMware to OpenShift Presentation

12:00 - 13:00 LUNCH BREAK

13:00 - 14:45

12:00 - 13:00 BREAK

13:00 - 14:45

- Citrix VDI
- Migration Factory

15:00 - 17:00

- Access to the Hands-On Lab
- LAB - OpenShift Virtualization Basics / Networking / Storage
- LAB - Migration from VMware to OpenShift

Day Two

09:00 - 10:15

- Discussion on migration risks
- Estimating a project

10:15 - 10:30 BREAK

10:30 - 12:00

- Showcase the VMA Analysis

12:00 - 13:00 Lunch

13:00 - 14:45

- Risk Analysis and Project Planning

14:45 - 15:00 BREAK

15:00 - 15:30

- Choosing the right Subscription
- Advanced Cluster Management-V

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https://github.com/RHEPDS/VMA-Partner-vlL
T

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Red Hat OpenShift Virtualization

VMA vILT WorkShop Day One

Alfred Bach
Principal Learning and Development Instructor

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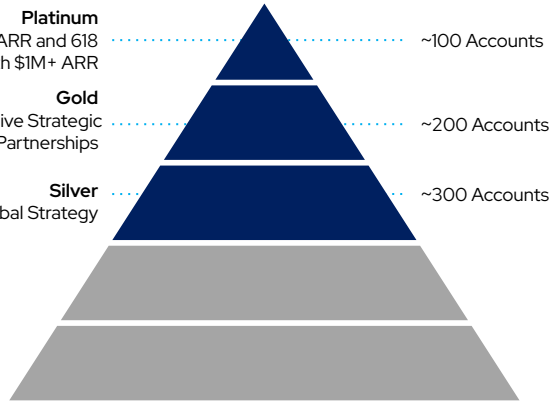
The announcement of Broadcom to Acquire VMware has sparked concerns in the industry.

Technology Risk

With the announcement of the new Go-to-Market Model by Broadcom to focus on the **top 600 accounts** globally leaves many enterprises in open.



Increase of cost of virtualization software and subscription[#]

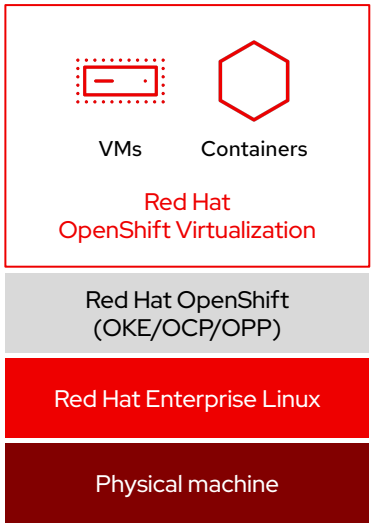
Reduction of enterprise support for non-focus accounts

Reference

[#] VMware announcement of 10% increase in software price by 10% <link>

Red Hat OpenShift Virtualization

The modern option for general purpose virtualization



- **Unified platform**
  for virtual machines and containers
- **Consistent management**
  tools, interfaces, and APIs incl. ACM and AAP integrations
- **Performance and stability**
  of Linux, KVM, and qemu
- **Healthy open source community**
  the KubeVirt project is a top 10 CNCF active project, with 200+ contributing companies
- **Supports Microsoft Windows**
  guests through Microsoft SVVP
- **Inbound guest migration**
  using Ansible Automation Platform + Migration Toolkit for Virtualization, Training and Consulting
- **Diverse ecosystem**
  of Red Hat & partner operators

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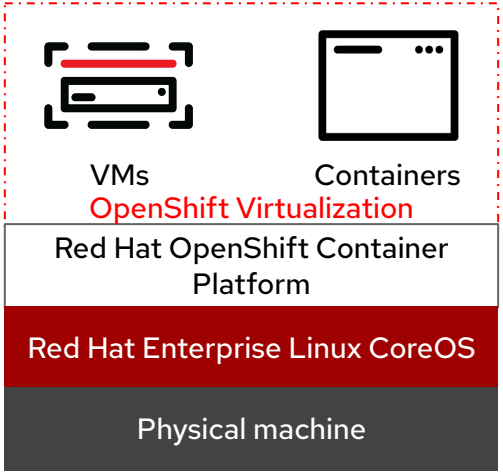
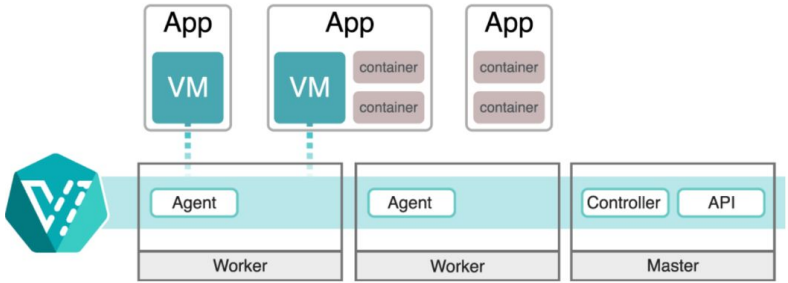
What is OpenShift Virtualization?

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





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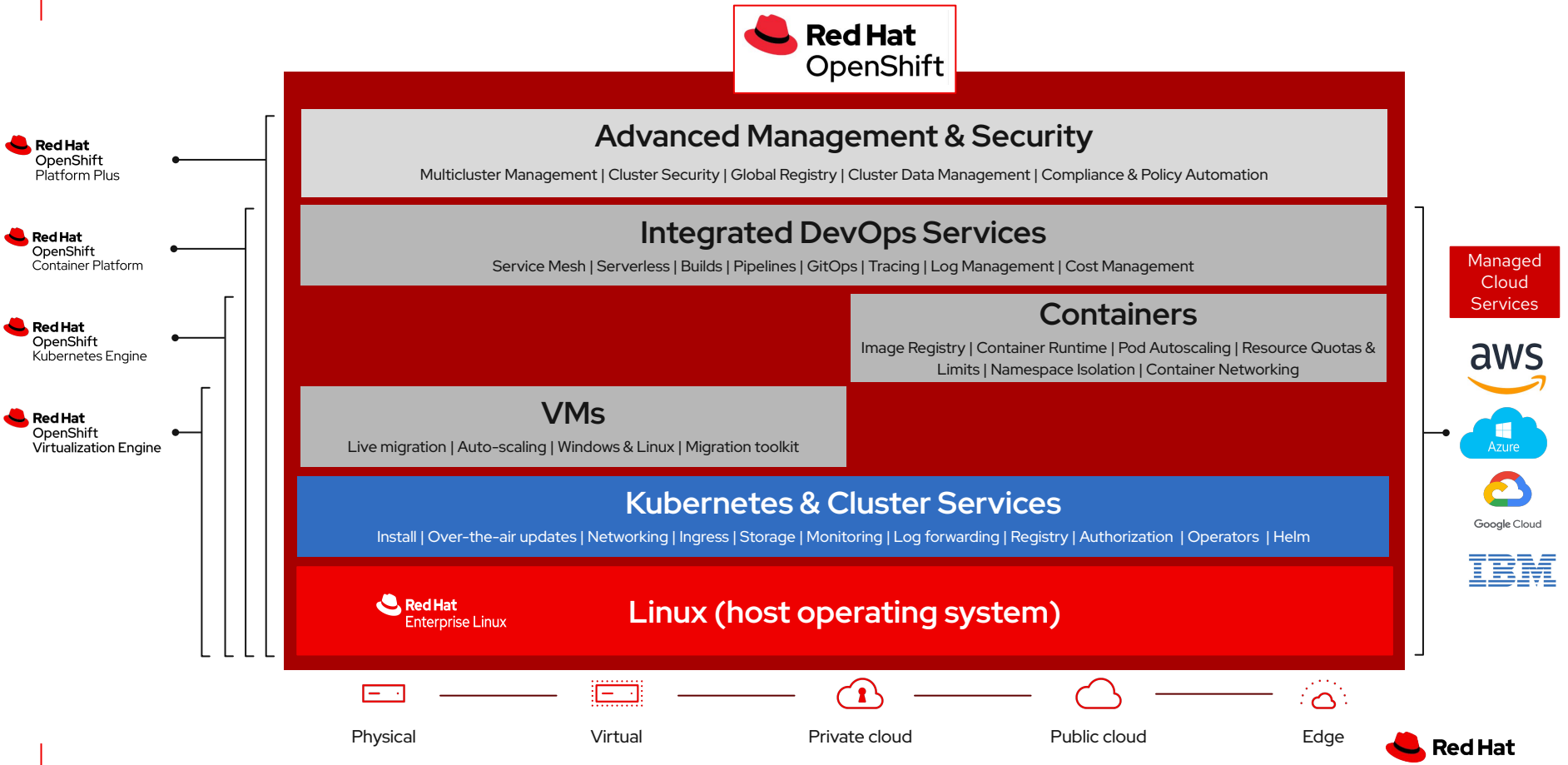
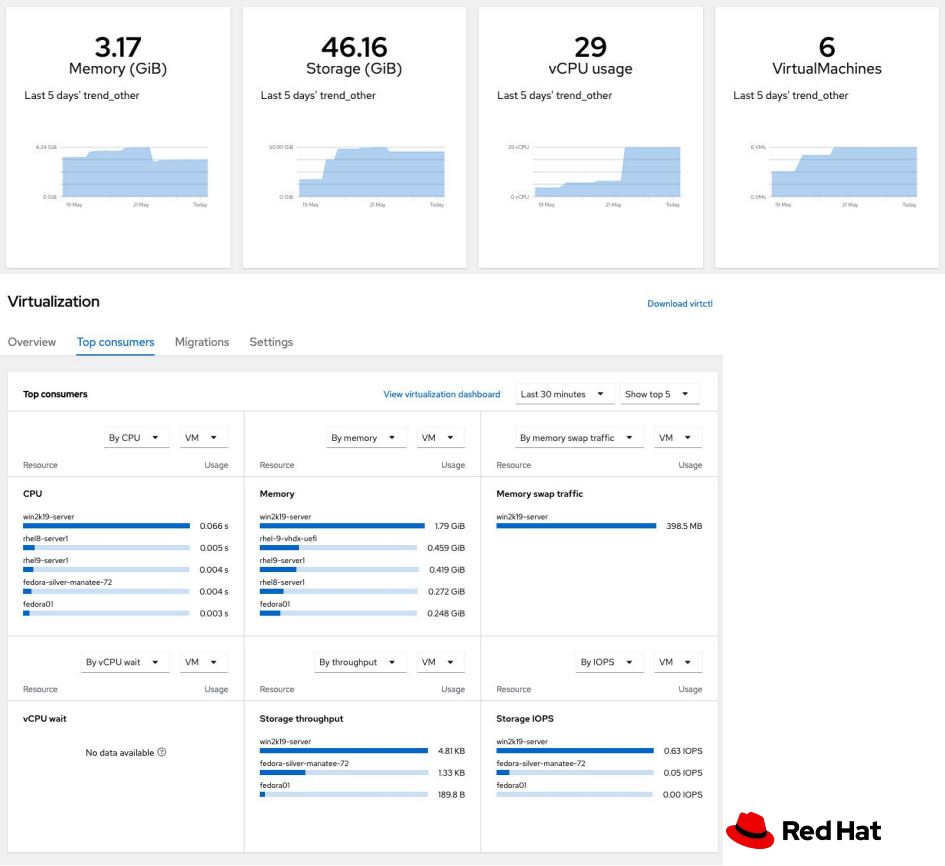
Hybrid cloud application platform



OpenShift Virtualization Overview

- Virtual Machine
  - Provisioning, Deprovisioning
  - Life Cycle Management
  - Live Migration (vMotion equivalent)
- Platform
  - Storage
    - Software Defined (Block, File, NFS, Object Storage)
    - Traditional Storage with Container Storage Interface
      - Dell, EMC, HPE, Hitachi, IBM, Pure etc
  - Network
    - Software Defined (OpenShift OVN)
    - Multiple Networks with VLANs segregation (Multus)
  - Load Balancing
    - MetalLB, F5 etc
- Backup and Restore
  - OADP (Valero), Kasten, Portworx, NetApp, Veritas etc
- Migration to OpenShift
  - vSphere, ESXi, OVA
  - Red Hat Virtualization, OpenStack
  - Hyper-V and other KVM variants (Automate with Ansible)



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De-Risking Your Virtualisation Technology Investment

Future-Proof Your Virtualization Strategy

New and modern applications will be built on containers. They provide new levels of agility and empowers organisations to accelerate their digital capabilities.

However, **not all applications** can or are **ready** to be containerized and operate in microservices.

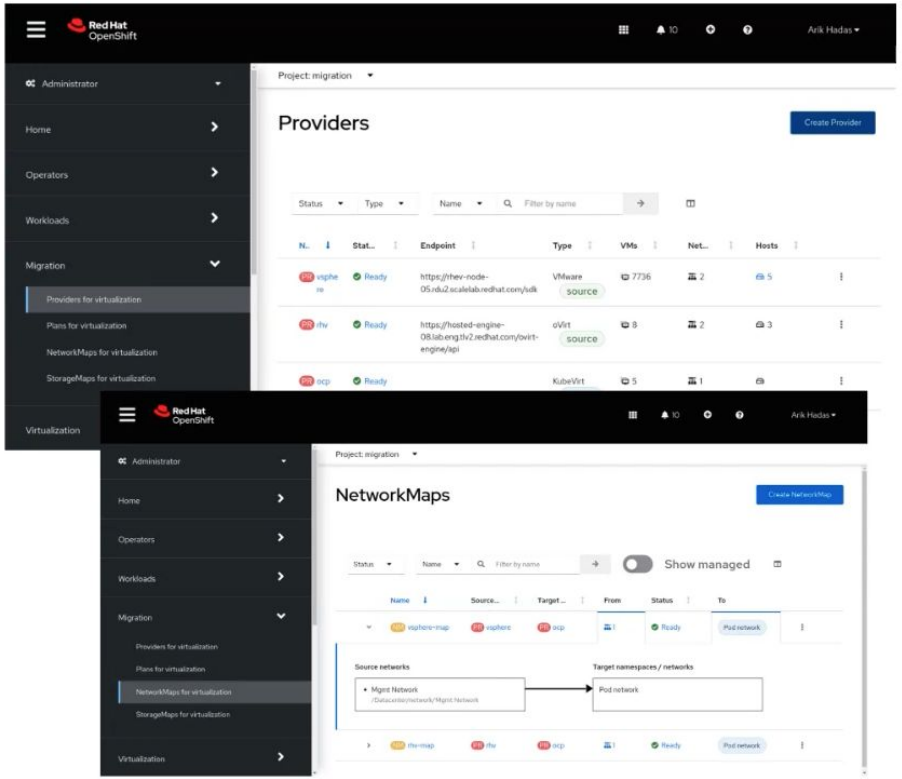
In most organizations, the **journey** will be a **multi-phased approach**, requiring IT operations to maintain and **coexist** workloads with both virtual machines and containers in their IT landscape.

1. **Rehosting** by "shifting" virtual machine workloads into the OpenShift platform
2. **Replatform** by "upgrading" the application into a container-based architecture
3. **Refactor** applications from monolithic to microservices

Migration Toolkit for Virtualization (MTV)

Main Features:

- Easy to use UI
- Mass migration of VMs from VMware, Red Hat Virtualization, OpenStack to OpenShift and between OpenShift Clusters
- VM data pre-copied before shutdown (Warm Migration) for VMware and Red Hat Virtualization migrations
- VM validation service:
  - Runs checks on VM configuration to avoid migration issues
- Parallelized VM Conversion
  - Maximize Throughput
- Migration Network Selection
  - Avoid impact on other running workloads



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Modernize at your own pace

Legacy Virtualization
Apps in VMs

Slow evolution

Increasing costs

Developer toil

Migration Toolkit for VMs

Infrastructure Modernization
Apps in VMs

Cloud elasticity + scalability

Reduced cost

Increase IT efficiency + reliability

Cloud Native

DevOps & Infrastructure Modernization
Apps in VMs or Containers

Innovate at speed

Higher annual revenue

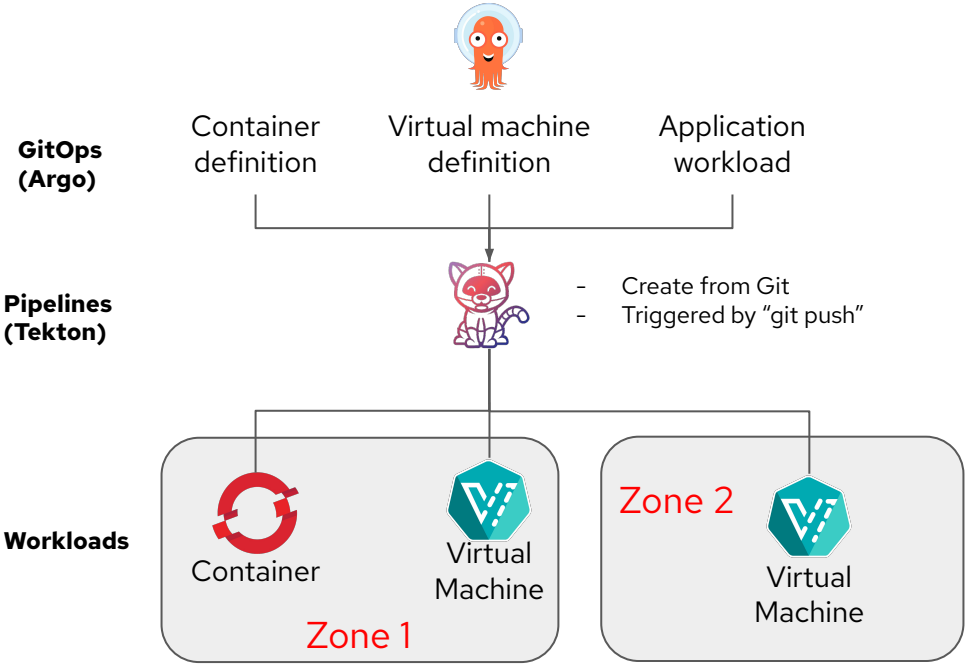
Increased developer output

Direct path to cloud native

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

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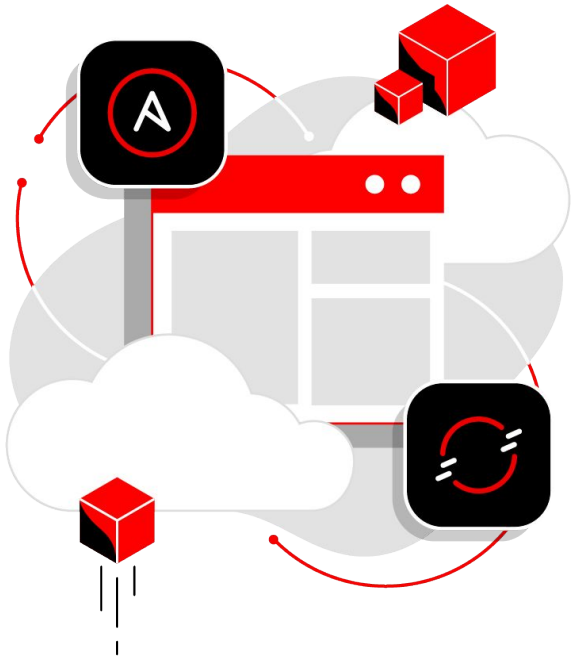
Creating Mission Critical Virtualization with AAP



Virtualization Operations

Automate daily activities (remediation)

- Application deployments and CI/CD pipelines
- Life cycle management and enforcement
- OS patching (Windows and Linux) and maintenance
- Event Driven Remediation

Deployment and retirement

Provision, configure and teardown virtual instances

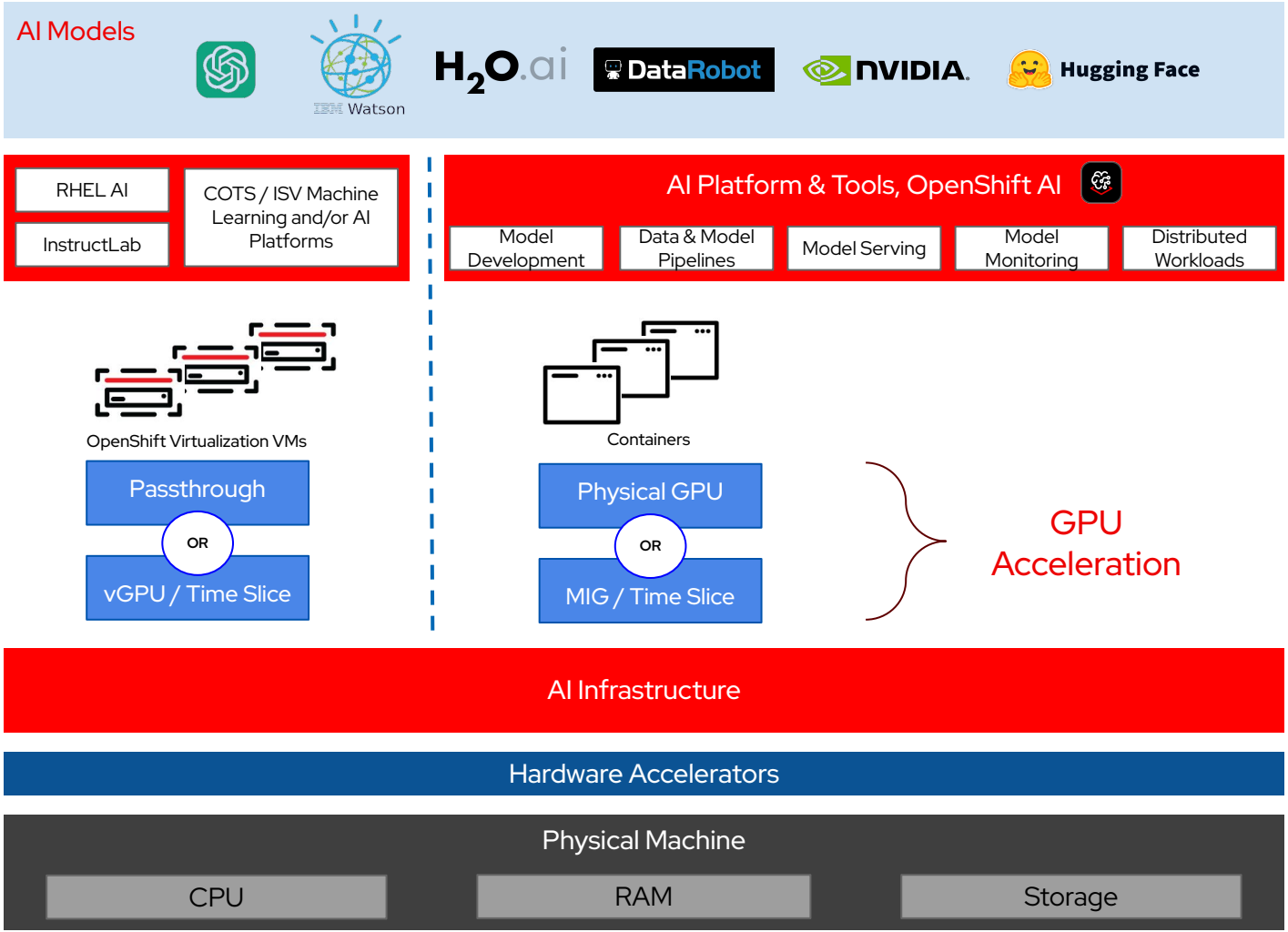
- Create turn key deployments for infrastructure teams
- Govern instance creation and enforce retirements
- Create service catalog items for ordering environments

Virtual Machine migration

Move workloads to OpenShift safely

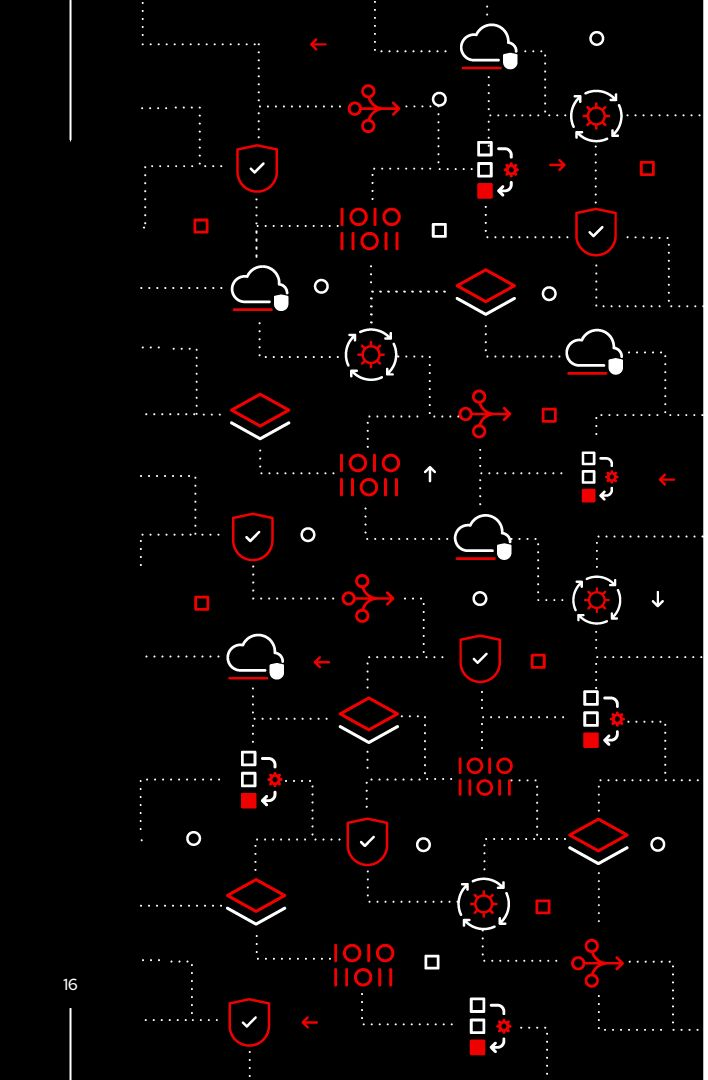
- Pre and Post processing for VM Migration from vSphere
- Last mile configuration checks

OpenShift Virtualization for AI



RED HAT OPENSHIFT

NVIDIA AMD intel



Deeper Dive into the Technology

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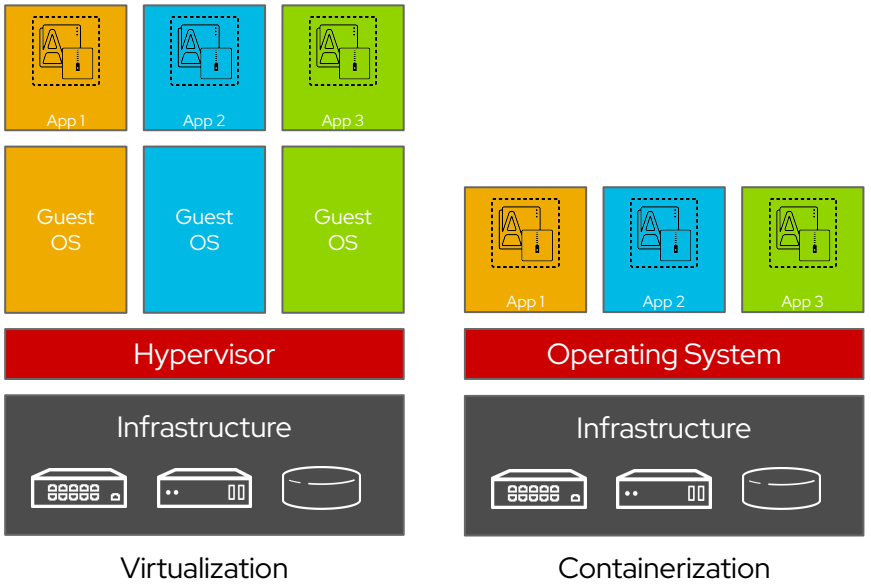
Containers are not Virtual Machines

- Containers are process isolation
- Kernel namespaces provide isolation and cgroups provide resource controls
- No hypervisor needed for containers
- Contain only binaries, libraries, and tools which are needed by the application
- Ephemeral



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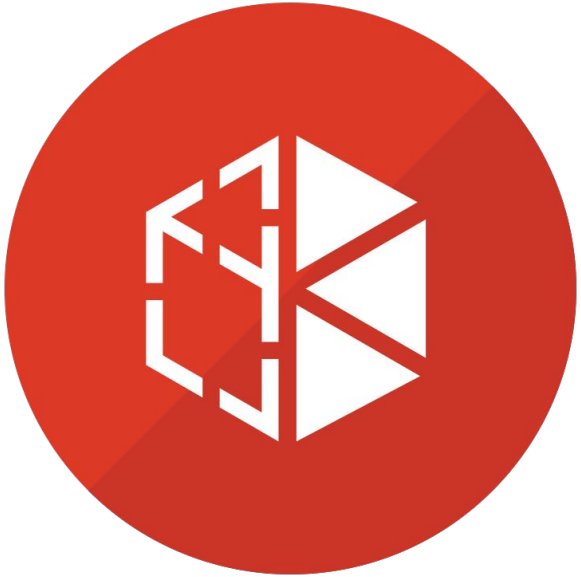
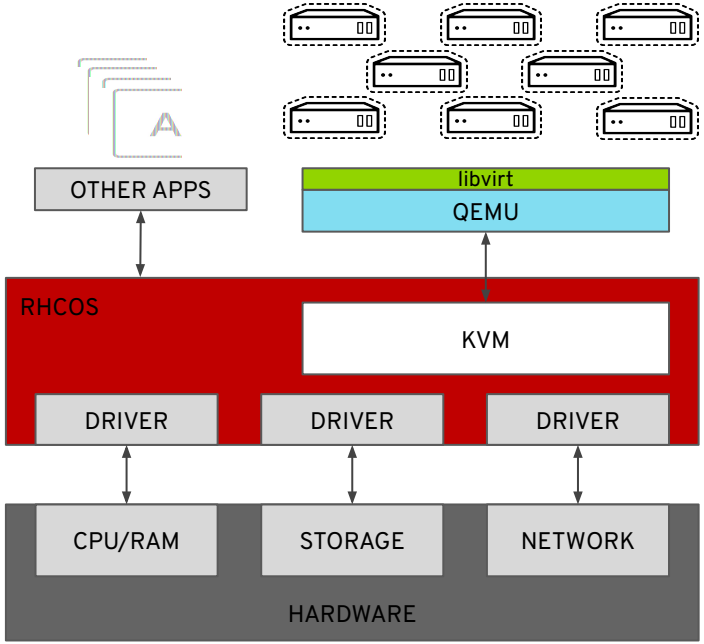
OpenShift Virtualization

- Virtual machines
  - Running in containers, managed as Pods
  - Using the KVM hypervisor
- Scheduled, deployed, and managed by Kubernetes
- Integrated with container orchestrator resources and services
  - Traditional Pod-like SDN connectivity and/or connectivity to external VLAN and other networks via multus
  - Persistent storage paradigm (PVC, PV, StorageClass)



OpenShift Virtualization uses KVM

- OpenShift Virtualization uses KVM, the Linux kernel hypervisor
- KVM is a core component of the Red Hat Enterprise Linux kernel
  - KVM has 10+ years of production use: Red Hat Virtualization, Red Hat OpenStack Platform, and RHEL all leverage KVM, QEMU, and libvirt
- QEMU uses KVM to execute virtual machines
- `libvirt` provides a management abstraction layer
- Currently supported on x86 bare metal
- For other platforms contact Product Management for roadmap



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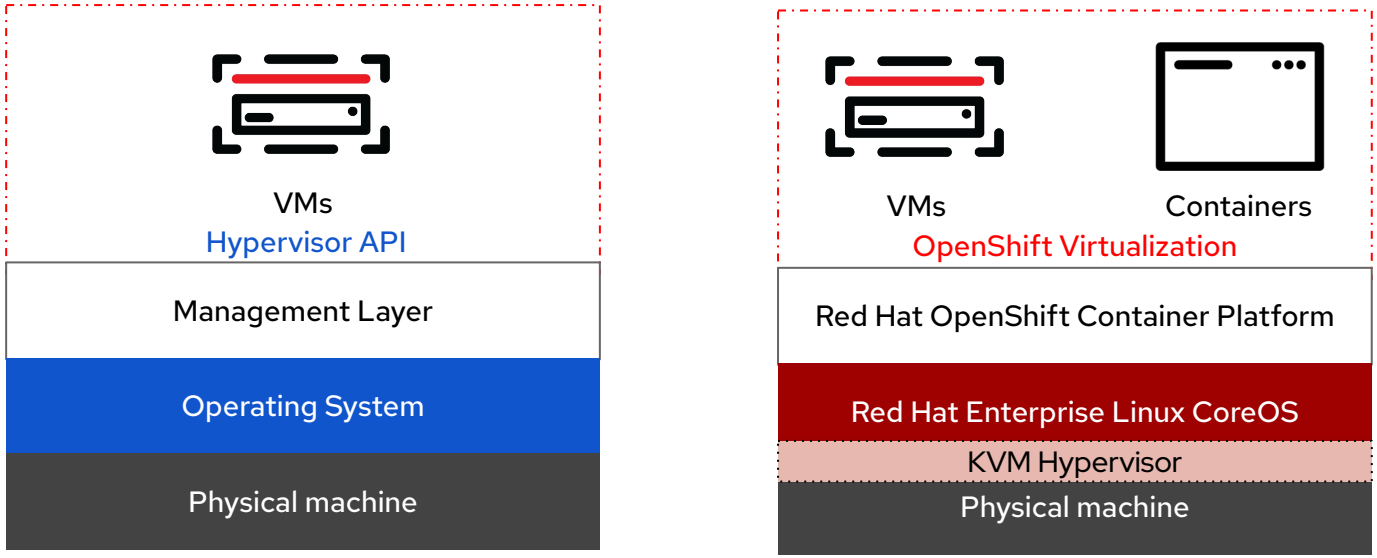
Traditional Type 1 Hypervisor vs OpenShift Virtualization



Red Hat OpenShift

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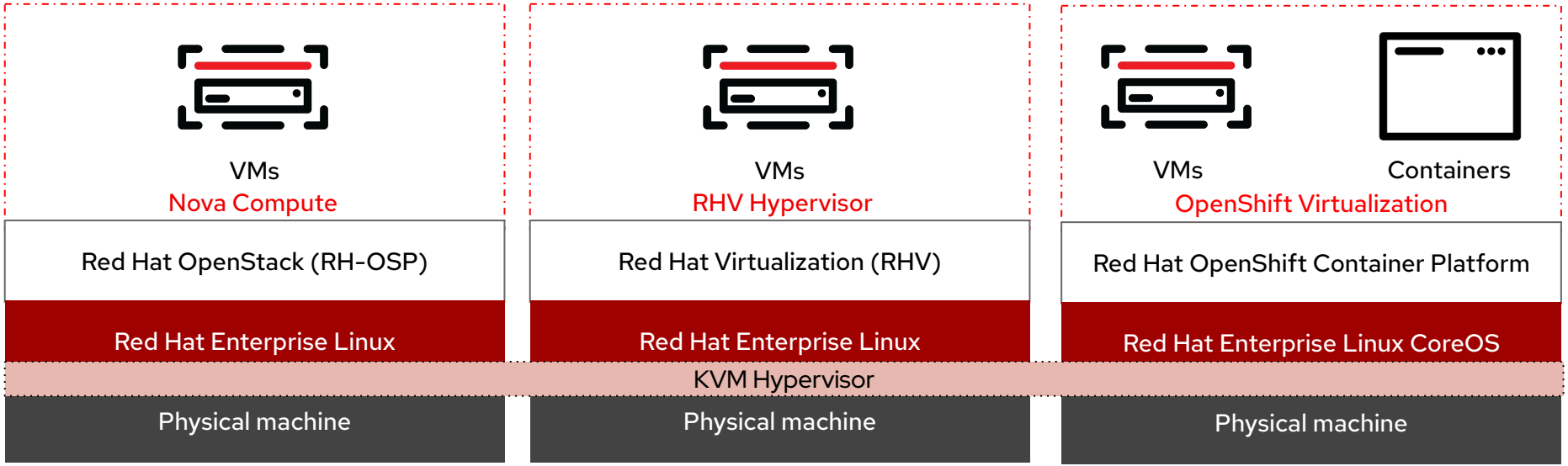
OpenStack vs RHV vs OpenShift Virtualization



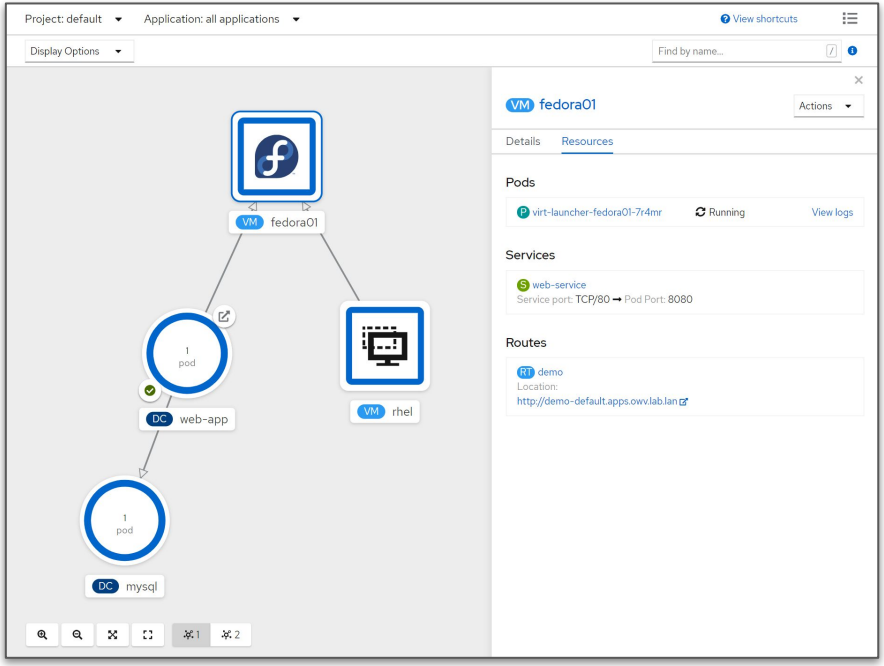
Red Hat OpenStack Platform

Red Hat Virtualization

Red Hat OpenShift

Using VMs and Containers Together

- Virtual machines connected to pod networks are accessible using standard Kubernetes methods:
  - Service
  - Route
  - Ingress
- Network policies apply to VM pods the same as application pods
- VM-to-pod, and vice-versa, communication happens over SDN or ingress depending on network connectivity



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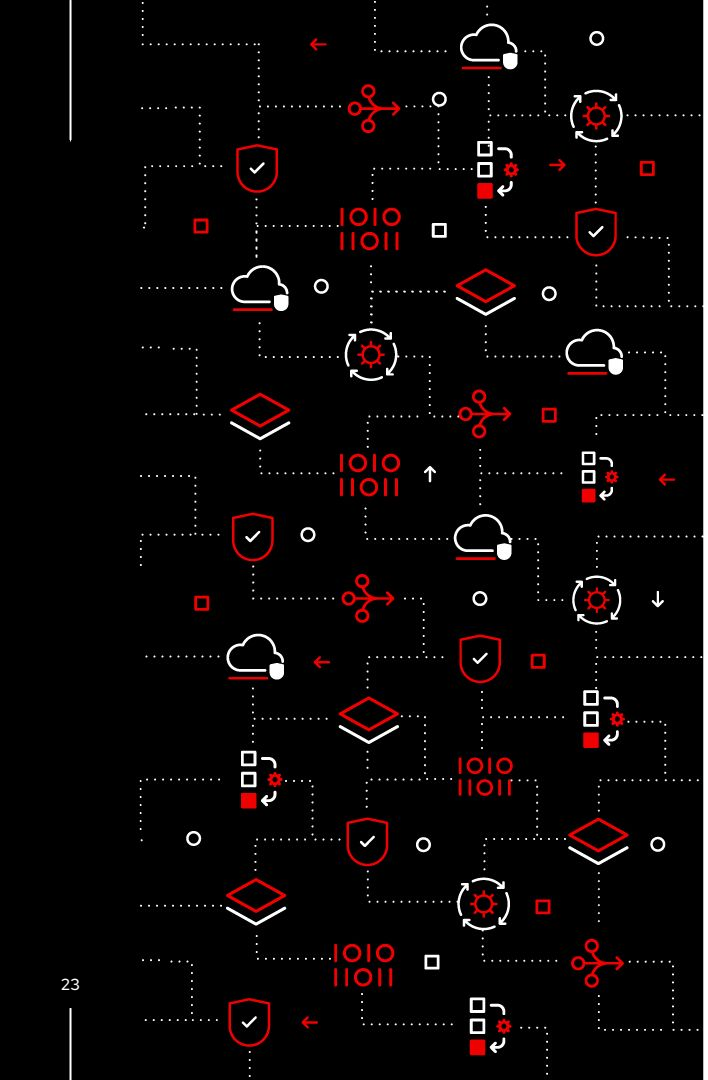

Networking

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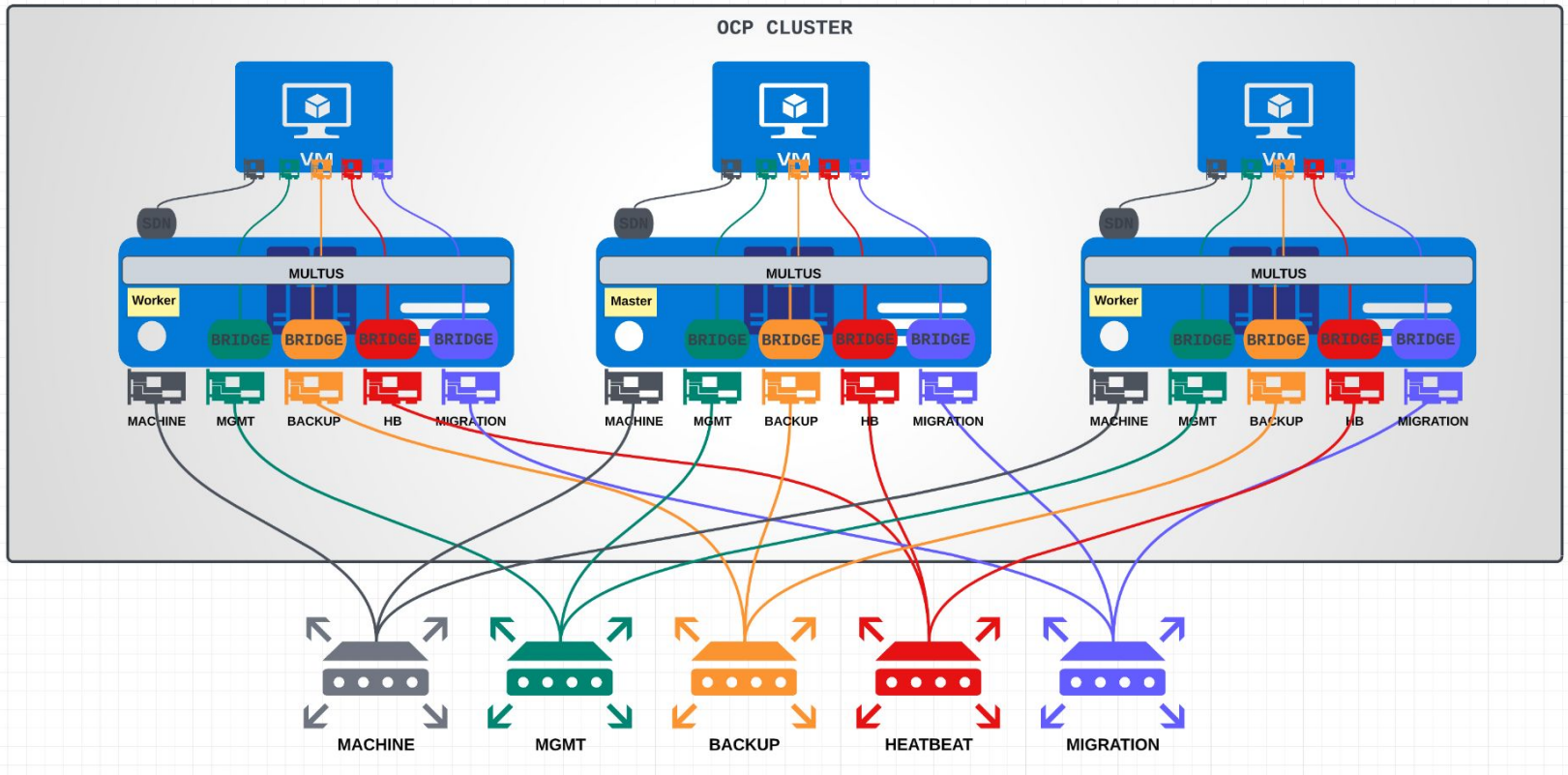
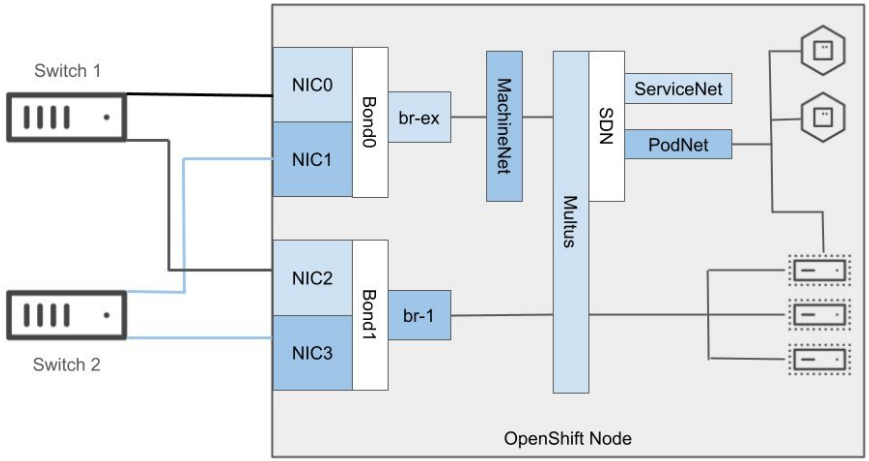
VM Multi-NIC High Level Architecture



Red Hat

Physical Host Configuration, VM Connectivity

- Virtual machines optionally connect to the standard pod network
  - OVN-Kubernetes or partners (Tigera Calico/F5)
- Additional network interfaces accessible via Multus:
  - Bridge, SR-IOV, OVN secondary networks
  - VLAN and other networks
- NMstate applies declarative host network configuration to all machines which match the selector
  - Bond, bridge, OVS
- Node firewall and ingress/egress rules apply



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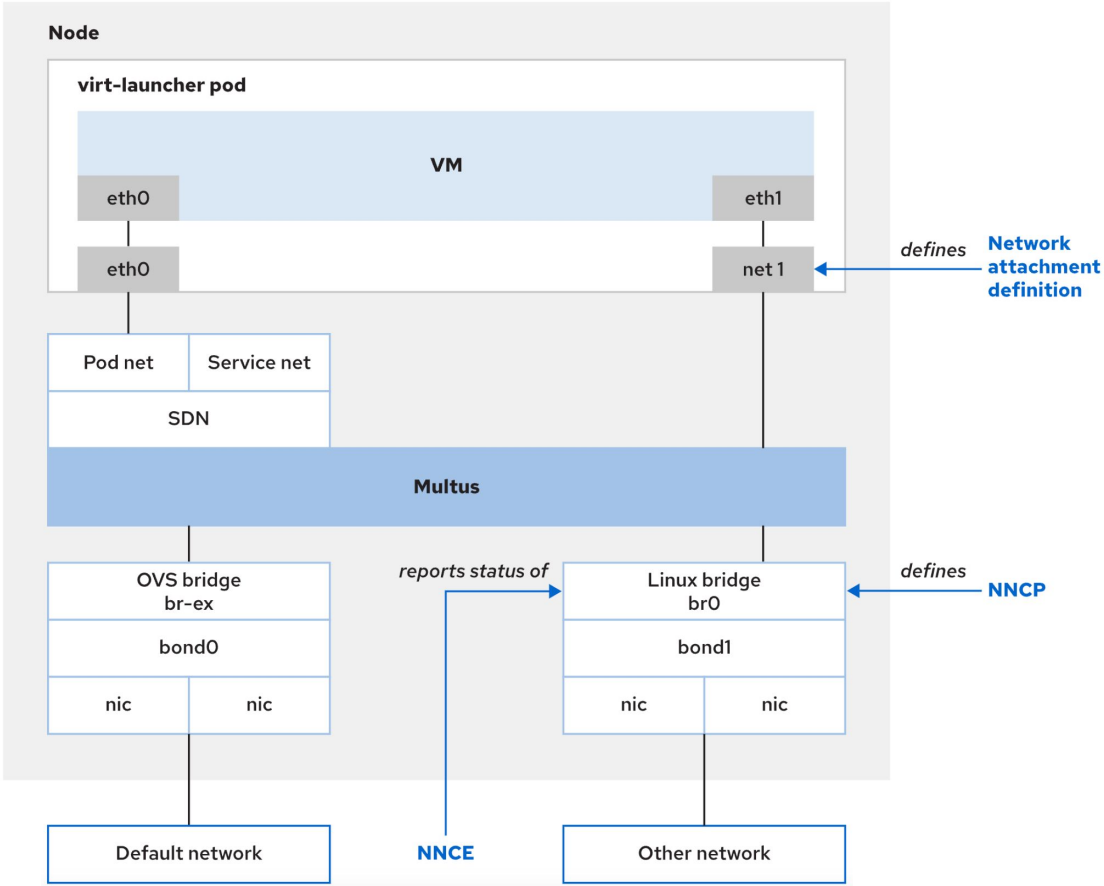
Linux Bridge Node Networking with Multus and Kubernetes NMState



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VM Networking in OpenShift Virtualization

- VMs connected to the SDN have the same functionality as Pods
  - Service-based discoverability and (internal) load balancing
  - Route-based external access
  - Ingress/egress throughput control
  - MetalLB for externally accessible load balanced connections
  - NetworkPolicy for microsegmentation
  - Service Mesh features and functions

- VMs connected to an OVN-K secondary network inherit functionality of OVN/OVS
  - MultiNetworkPolicy for microsegmentation
  - L2 topology for east-west isolated networks
  - Localnet topology for external access, including VLANs

OpenShift Virtualization Prior to 4.17+

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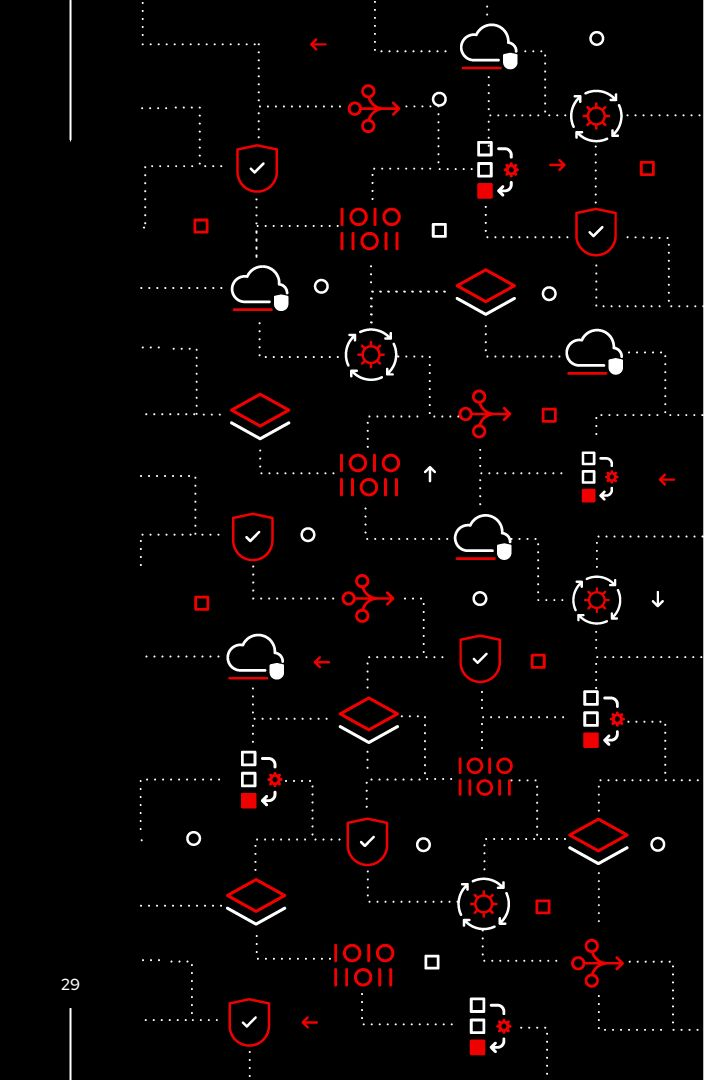


Storage

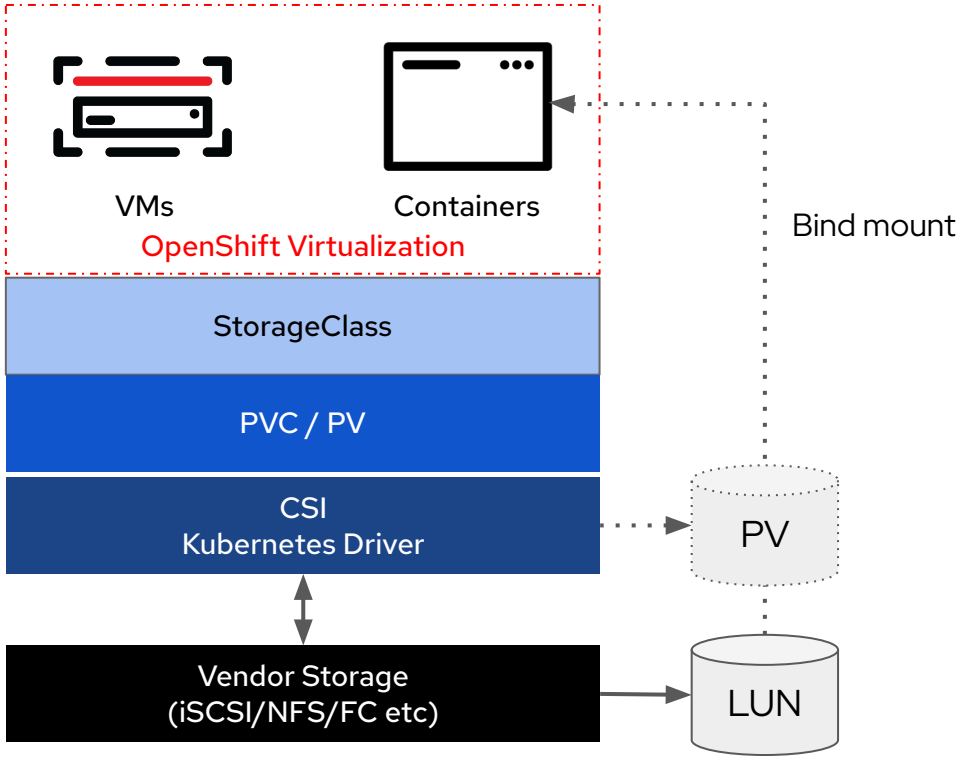
Red Hat

Policy Based Storage

Red Hat OpenShift

Type: Block, File or Object
Gold, Silver or Bronze

Request: Block, 10GB
Read-Write Many



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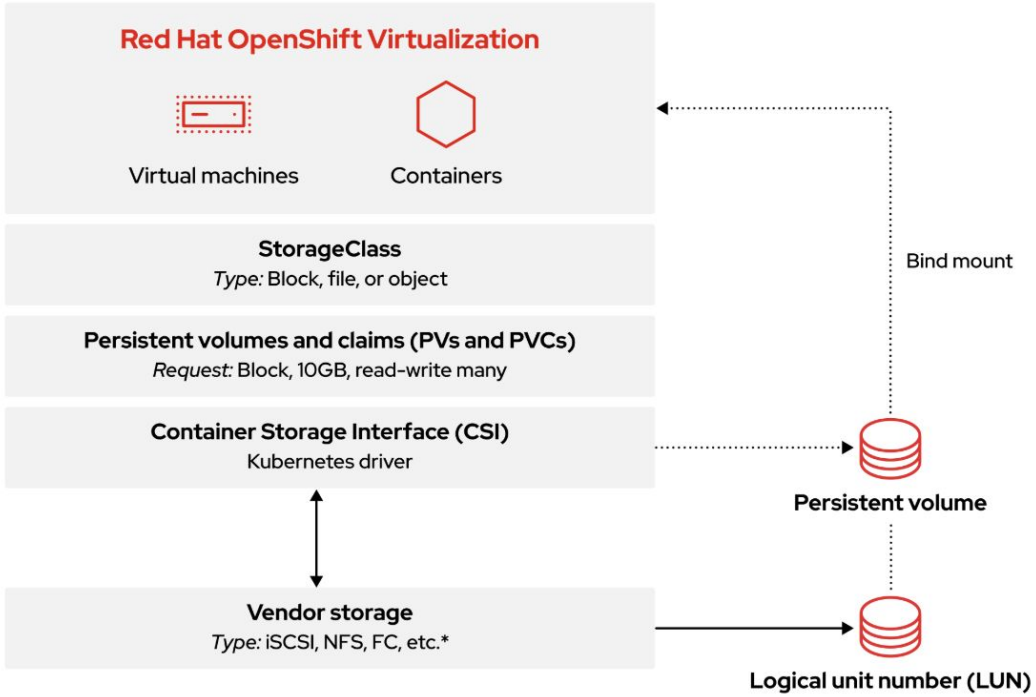
Policy Based Storage

Red Hat OpenShift



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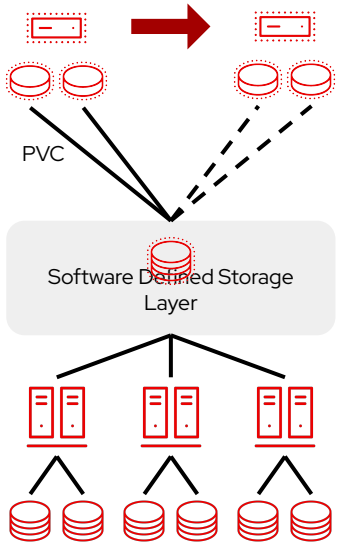
OpenShift Virtualization Storage Requirements

Functionality Required for Feature & Capabilities

Feature	Storage Requirement	Comments
Live Migration	RWX Volumes	Works with File & Block volumes RWX on Block volumes is harder
Quick Machine Provisioning	Volume Cloning	If not available, higher latency to VM provisioning
VM Backups VM Templates	Volume Snapshots	-
Backups at Scale	Change Block Tracking (CBT)	Now part of CSI driver, being implemented by storage & data protection vendors
Storage Live Migration	Ability to alter storage class of a volume, without turning off VM	In TP as of OpenShift 4.17
Disaster Recovery Support	Volume Based Replication	Different vendors have different implementation
Stretched Cluster Support	Stretched Storage SANs	Vendor implementation & CSI support varies

Storage 101

Software Defined Storage



Architecture

- SDS layer runs internal or external to the OpenShift cluster

Configuration

- PVs by SDS layer, internal or external to OpenShift cluster
- Supports any number of nodes & VMs

Performance

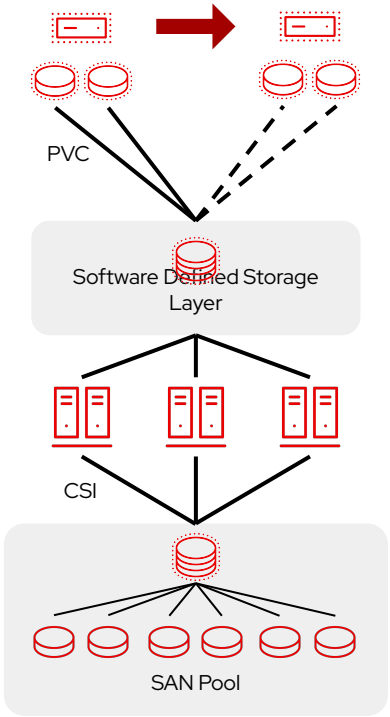
- Capacity/Performance/Latency: As per design
- Recommended: Separate storage network + use DCB (Data Center Bridging)

Considerations/Risk

- Existing storage not used - phase out or use otherwise
- Slightly higher latency than traditional storage (YMW)
- Servers must provide slots for media or external chassis required +
- CPU/RAM needed for data layer

Storage 101

Software Defined Storage (SDS) over SAN



Architecture

- CSI driver by SDS vendor
- SDS layer runs internal or external to the OpenShift cluster

Configuration

- Only SDS nodes must have SAN access + SAN zoing
- PVs by SDS layer; Consumes larger virtual volumes from existing storage
- Security abstraction for sensitive environments

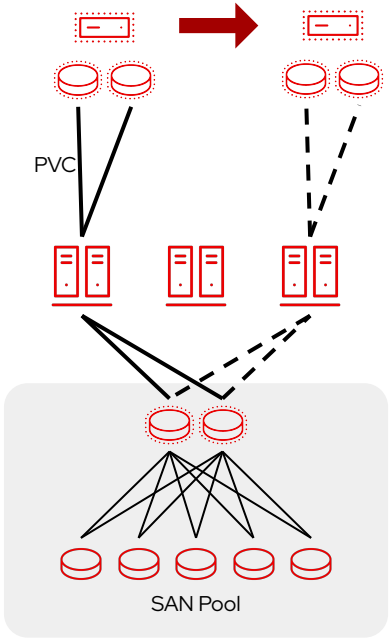
Performance

- SDS **adds latency**: Consumes capacity/performance/latency from underlying storage
- Load on array procs - IO structure changed - Reduced performance for some workloads

Considerations/Risk

- **High footprint**: In most cases, additional replication layer may **reduce usable capacity**
- Recommended: Separate storage network + DCB (Data Center Bridging)
- OpenShift cluster might need admin access for de-/provisioning to existing storage
- **Higher latency** than existing storage
- **Costs**

Storage 101



Direct Storage Consumption over SAN/NAS

Architecture

- **Direct use of existing storage through CSI driver by vendor**
- SAN / Dedicated storage network can be leveraged

Configuration

- 1:1 use of virtual volumes by existing storage
- All nodes must have SAN access + Fiber Channel SAN zoning must include all worker nodes

Performance

- Leverage & direct full use of capacity/performance/latency from storage pool

Considerations/Risk

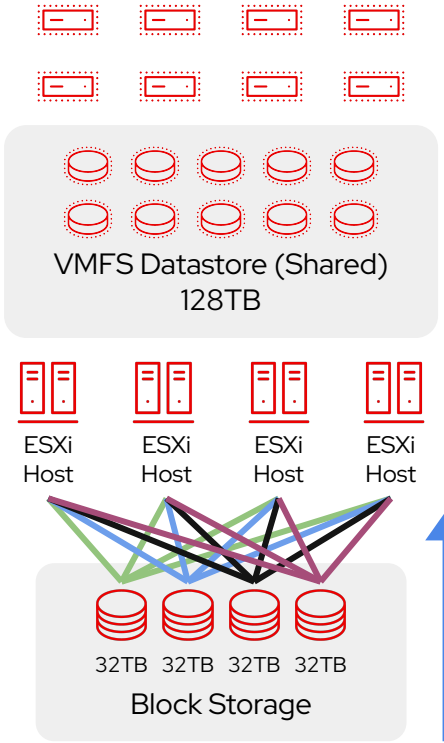
- Potential **high number of LUNs per node** and multi-pathing challenges
- Frequent changes of volume mappings - latency due to rescans and multipathing management
- Speed of **de-/provisioning & mapping/parallelism of changes** => VM migration & provisioning
- **Possible limitations of snapshot & cloning**
- OpenShift cluster needs permissions on the storage system to (de)provision and possibly other operations.

Storage Option Matrix

Considerations for VM/Container workloads

Workload Profile	Existing Storage	SDS Internal	SDS External
Large VMs	Best Match Easy to manage	Possible size constraints	Suitable
Low Latency Required (VMs/Containers)	Best Match Direct interface to storage	Higher Latency due to SDS layer	Higher Latency due to SDS layer
Many Small VMs	Operationally Challenging & Complex	Best Match	Suitable
Highly Dynamic Deployments; Lots of (De)provisioning	Operational Challenge; Speed & Frequency of Changes	Best Match	Suitable
Containers	Operational Challenge; Speed & Frequency of Changes	Best Match	Suitable
High Capacity/Volume Required	Expensive over time/lifecycle	Limits to capacity	Best Match Easy to expand capacity
Other Storage Used	Potential Limitations	Best Match	Suitable

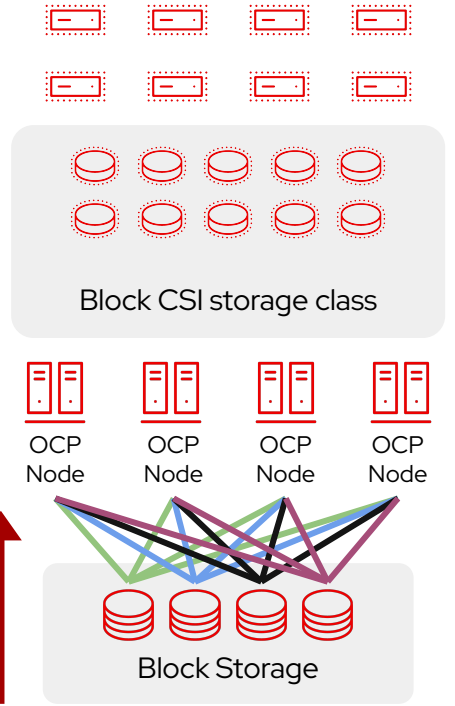
VMware VMFS



- vmdks of varying sizes
- Live Migration
- Disaster Recovery
- Raw Disk Maps

- SAN attached
- Shared fixed size few to 1 large LUNs per ESXi host
- Multi-path

OpenShift Virtualization with Block CSI



- PVCs of varying sizes
- Live Migration
- Disaster Recovery
- Raw Disk Maps

- SAN attached
- Block Storage CSI driver
- Multi-path
- 1:1 Multiple LUNs of varying sizes based on VMs requiring PVCs

- Older array does not expect to have LUN CRUDs driven by VM activity
- Hosts expect storage to be segmented to the Fiber Channel network with nothing going over TCP/IP
- Storage admin is exposed to all the activity instead of throwing single large LUNs over to the Virtualization admin. OpenShift admins need

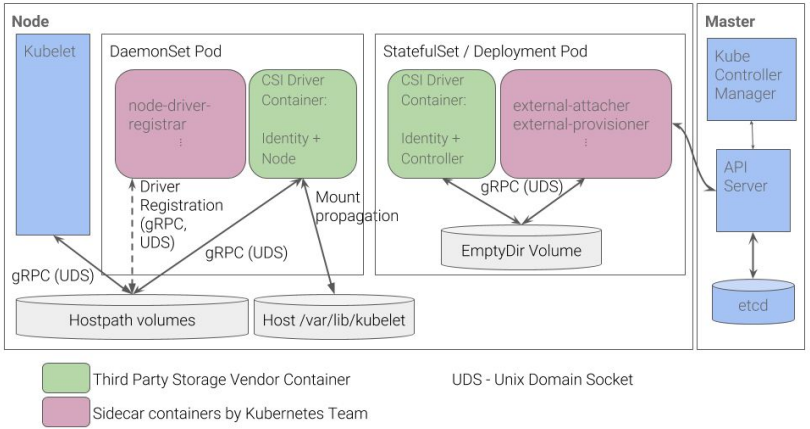
Red Hat

Container Storage Interface (CSI)

- Container Storage Interface (CSI) was proposed as a solution to problems faced by in-tree volume plugins

- CSI Specification defined APIs (RPCs) to enable:
  - Dynamic provisioning and deprovisioning of a volume
  - Attaching/detaching a volume from a node
  - Mounting/unmounting a volume from a node
  - Consumption of both block and mountable volumes
  - Creating and deleting a snapshot
  - Provisioning a new volume from a snapshot

- Storage vendors now had to develop only a single CSI Driver and it would work across a number of container orchestration (CO) systems.



CONTAINER STORAGE INTERFACE

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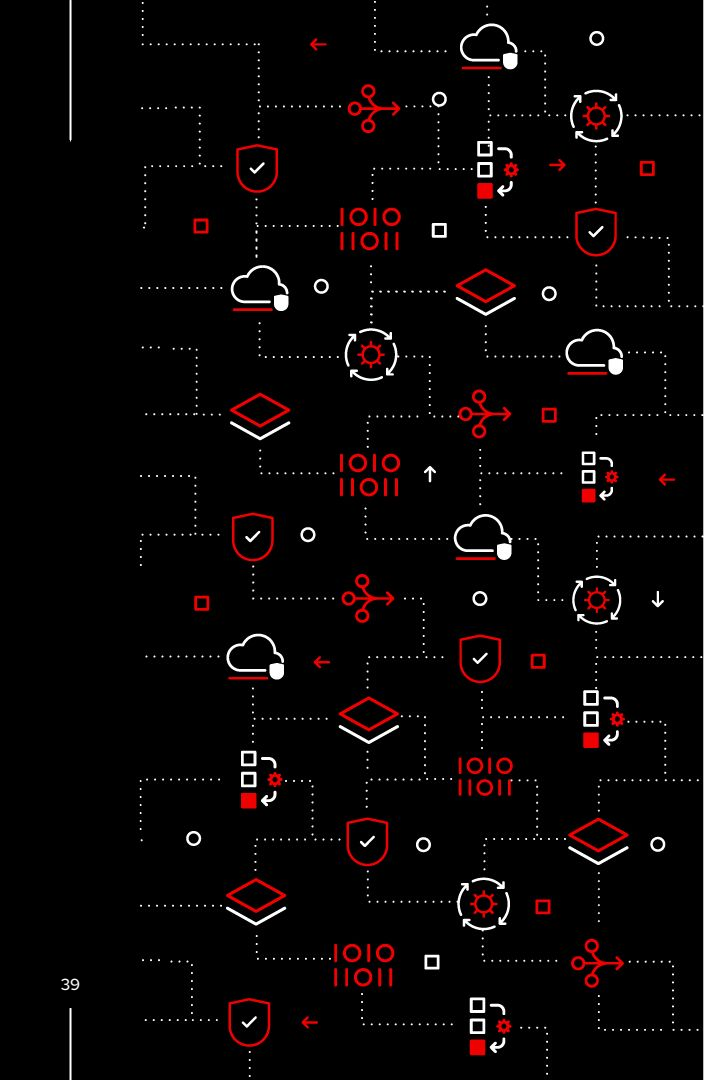
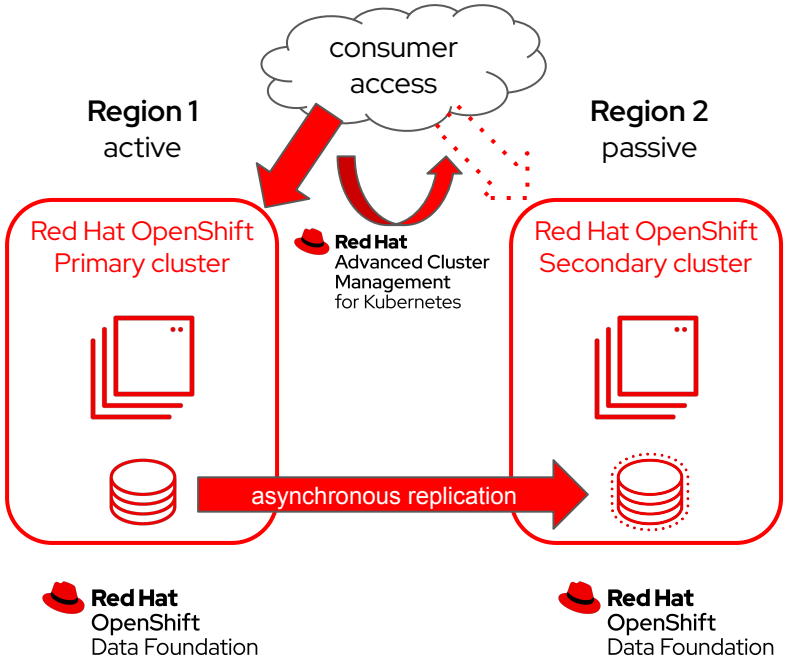


DR / HA

Red Hat

Red Hat OpenShift-Regional Disaster Recovery

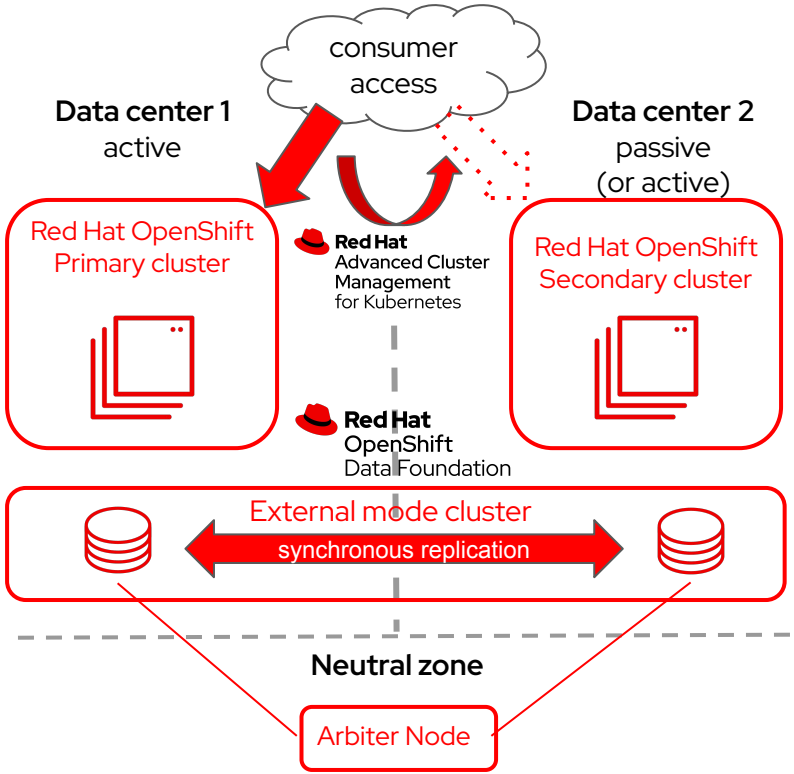


Protection against geographic scale disasters

- OpenShift Data Foundation enables cross cluster replication of data volumes
- Storage operators synchronize both volume persistent data and kubernetes metadata
- Enables failover and failback automation at application granularity, orchestrated by Red Hat Advanced Cluster Management

Red Hat

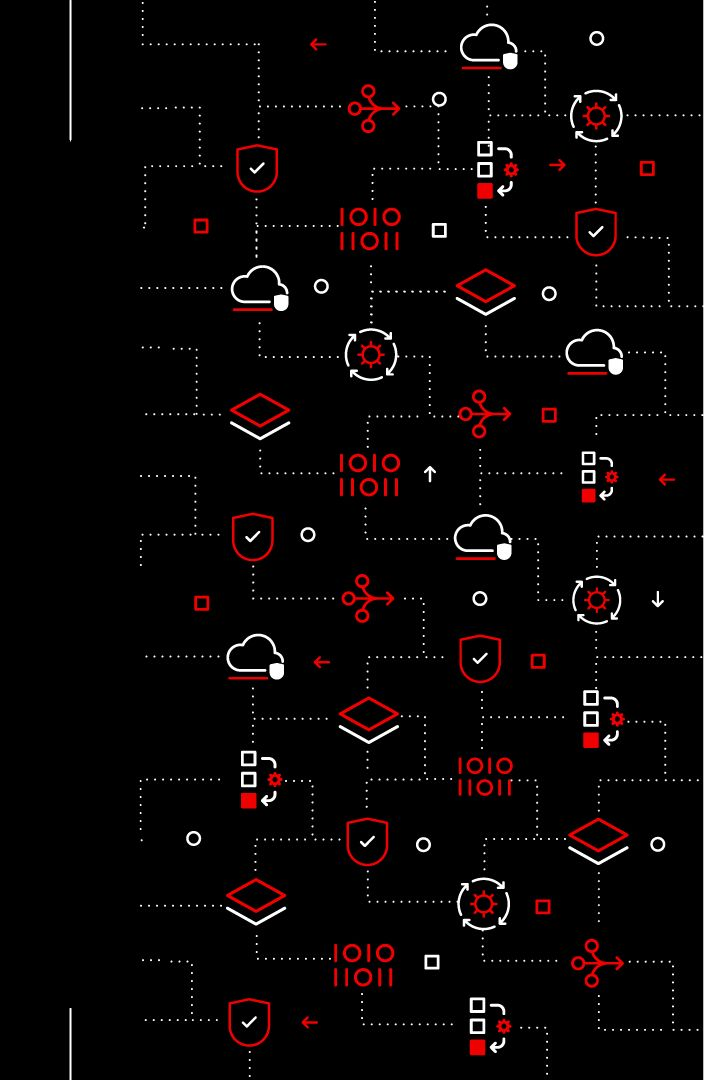
Red Hat OpenShift-Metropolitan Disaster Recovery



Protection against data loss across multiple clusters with Metropolitan disaster recovery

- Clusters deployed in different datacenters provide a fault isolated configuration
- External mode OpenShift Data Foundation cluster provides synchronous replicated volumes across the datacenters
- Enables failover and failback automation at application granularity, orchestrated by Red Hat Advanced Cluster Management

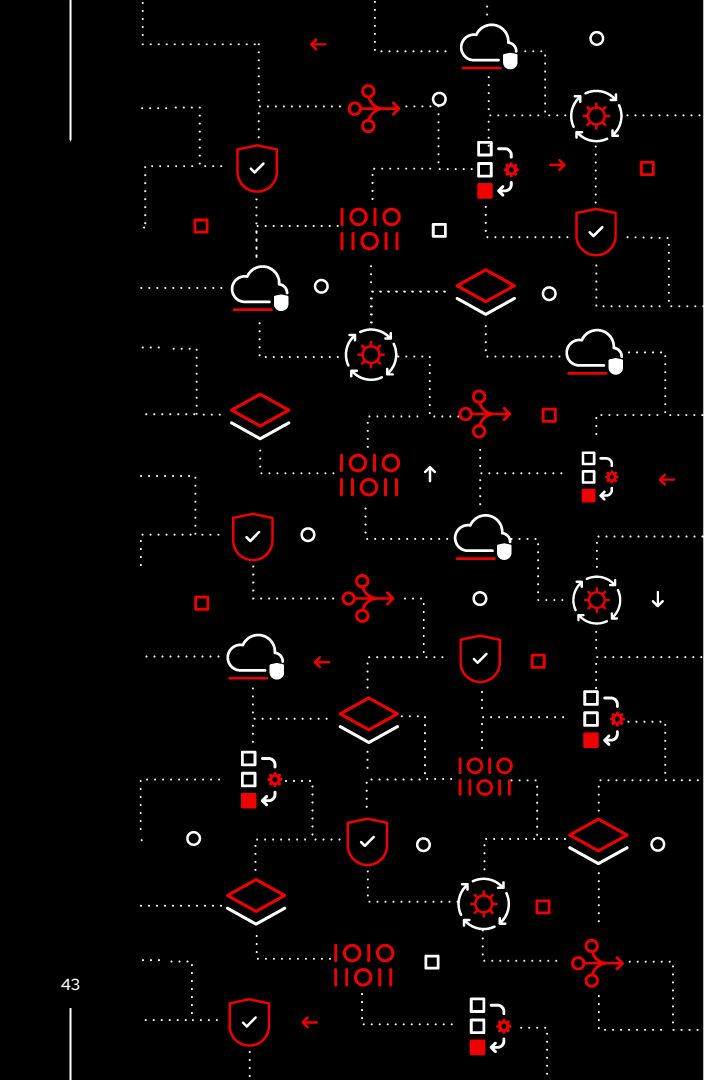
Red Hat



Break

10:35 - 10:45

Red Hat



Migration from VMware

Red Hat

Terminology Comparison

Feature	OpenShift Virtualization	vSphere
Where VM disks are stored	PVC / PV (Persistent Volume/Persistent Volume Claim)	Datastore
Policy based storage	StorageClass	Storage Policy Based Management (SPBM)
Non-disruptive VM migration	Live migration	vMotion
Non-disruptive VM storage migration	N/A	Storage vMotion
Active resource balancing	Pod eviction policy, descheduler	Dynamic Resource Scheduling (DRS)
Physical network configuration	NMstate Operator, Multus	vSwitch / DvSwitch
Overlay network configuration	OVN-Kubernetes, CNI partners, Multus	NSX-T
Host / VM metrics	OpenShift Metrics and Monitoring	vCenter, vRealize Operations

How do I manage virtual machines?

VMware

- vCenter provides GUI-based VM management for both devs/app teams and virtualization admins
- Multiple ways to access vCenter API: Ansible/SaltStack/etc., PowerCLI, Python/Java/etc. SDKs

OpenShift Virtualization

- The OpenShift console for GUI-based access for creating and managing VMs
- The developer and admin consoles both provide access to VM-centric management features
- The OpenShift/Kubernetes API includes the ability to create and manage VMs using standard methodologies. This includes any scripting language or SDK which can use a REST API
- In addition to `kubectl` and `oc` CLI tools, the `virtctl` command simplifies VM management

How do I manage the virtualization environment?

VMware

- Install ESXi to hypervisor nodes and configure basic network connectivity, then use vCenter to join the nodes and configure additional properties
- Configuration can be done manually, semi-automated using DvSwitches and host profiles, and otherwise automated using traditional tools (Ansible, PowerCLI, etc.)

OpenShift Virtualization Getting Started

- Deploying OpenShift to physical servers using full stack automation (IPI), Assisted Installer, or UPI
- Install OpenShift Virtualization Operator
- Configure with standard OpenShift methodologies
    - Machine Config, NMstate, Low Latency tuning, Node Tuning Operator, etc.

Alternate View: How do I connect VMs and containers/k8s?

VMware

- Kubernetes is deployed in VMs to the vSphere environment
- When using standard networking, e.g. (D)vSwitches, for VM connectivity, Pod-to-VM traffic traverses the k8s ingress/egress stack
- When using NSX-T as the SDN, VMs and containers can be connected to the same logical network
- Additional functionality, e.g. microsegmentation, for Pods relies on NSX-T

OpenShift Virtualization

- OpenShift Virtualization uses the same SDN for both Pods and VMs, they are native peers.
- VMs access the same SDN features as Pods, including network policies, Service Mesh, Service and Route abstractions, etc.
- VMs can also connect directly to external L2 network, e.g. VLAN, or other networks defined using Multus

Capability Mapping

Leverage the document repositories

Summary

	OpenShift Virtualization	VMware
Infrastructure Automation	RHACM, Ansible, and GitOps	Aria Automation Config (SaltStack) and PowerShell
Application Automation	RHACM, Ansible, Pipelines, and GitOps	Aria Automation Orchestrator (vRealize Orchestrator) and Aria Automation (vRealize Automation)
Networking	Multus / OVN-Kubernetes / Third party CNI	NSX
Storage	ODF, Optimizing Storage and partner ecosystem for CSI	vSAN, Partner Ecosystem
Observability	RHACM, OpenShift Logging & Metrics, Service Mesh, Distributed Tracing	Wavefront
Data Protection	OpenShift API for Data Protection (OADP) Partner ecosystem	vSphere Replication, partner ecosystem

Automation

	OpenShift	VMware
Declarative infrastructure (platform)	OpenShift supports infrastructure as code for both OpenShift-hosted workloads **and** OpenShift infrastructure itself.	Third party solutions
Declarative configuration	OpenShift GitOps (Argo CD) included. Governance enforcement using RHACM	Terraform and other ecosystem partners
CI/CD	Automate build and configuration of VMs with included OpenShift pipelines (Tekton)	Aria Automation (vRealize Automation)
Multi-cluster management	Red Hat ACM (includes Submariner)	Aria Automation & Aria Automation Orchestrator (vRealize Orchestrator)

Storage - the bigger story

- OpenShift Virtualization uses Kubernetes CSI abstractions for VM storage
  - In vSphere, static pools of capacity are given to the hypervisor (datastore), each VM disk is one or more file(s). Each datastore holds one or many VM disks. The virtualization admin is responsible for storage capacity management.
  - OpenShift / k8s uses dynamic PV/PVC provisioning of a CSI compliant storage provider. Each PV holds one VM disk. The storage admin is responsible for storage capacity management
- Local storage - maximize host resource utilization via LocalStorageOperator, TopoLVM to provide PVs to VMs, Pods, or hosted storage solutions
- Both vSphere and OpenShift have converged hypervisor and storage offerings
  - Use OpenShift Data Foundation, or a partner offering with a CSI provider, e.g. Portworx, to host VMs in a converged storage + OpenShift deployment
  - VMware has VSAN and multiple ecosystem partners offering hyperconverged features, e.g. Nutanix

Storage - Core feature/capability matrix

	OpenShift	VMware
Accessing legacy storage arrays	All major storage vendors have a CSI compliant driver	Compatible with all major storage vendors
Storage accelerated cloning	Yes, depending on CSI driver	Yes, via VAAI
Disk resizing	Yes	Yes
Policy based storage management	Implicit to the platform (StorageClasses)	vVols, SPBM
Disk / VM snapshots	Yes	Yes
Non-disruptive storage migration	*[see speaker notes]	Storage vMotion

Data Protection and Disaster Recovery

	OpenShift	VMware
Backup / restore	OpenShift API for Data Protection (OADP) EX: **Kasten K10 by** Veeam supports VMs. Additionally working with Dell, IBM, Veritas, Trilio, Storware to support. • Kasten K10 by VEEAM • Trilio for Kubernetes • Storware Backup and Recovery • Portworx PX-Backup and Metro-DR Search for additional venders here https://marketplace.redhat.com/en-us	Strong ecosystem of backup partners.
Disaster Recovery - Regional (async)	GitOps, Infrastructure-as-Code, RHACM + ODF Future - other storage providers	Site Recovery Manager (SRM) vSphere Replication
Disaster Recovery - Metro (sync)	RHACM + ODF - Tech Preview OCP 4.15 Future - other storage providers	Stretched clusters Fault Tolerance

Networking

	OpenShift	VMware
Host network configuration and management	Kubernetes-native configuration management using the NMstate Operator and Multus	Per-host configuration via vSwitch or single point management via Distributed Virtual Switch (DvSwitch)
Software-defined networking: protect/limit/control VM-to-VM communication	Network policies using any SDN provide {Pod|VM}-to-{Pod|VM} traffic control. Multiple distinct SDNs are possible using the partner ecosystem, e.g. the Tigera Calico Operator.	Multiple capabilities here, e.g. QinQ, but this is most often referring to NSX's microsegmentation, a.k.a. distributed firewall
Disaster Recovery - Metro (sync)	VMs are connected to one or more L2 (VLAN) networks using Multus and/or connected to the cluster SDN	VMs are connected to one or more L2 (VLAN) networks using (D)vSwitches and/or NSX

Networking

	OpenShift	VMware
Pod-to-VM and VM-to-Pod connectivity	VMs and Pods are native peers when connected to the SDN, with all of the features and capabilities equally available to both	Traffic between Pods and VMs must traverse through the Kubernetes ingress or similar mechanism, e.g. NodePort unless NST-T is being used for the SDN
Application observability	Service Mesh provides robust abilities to ingest and analyze network flows and application level data to assist with debugging, performance troubleshooting, and more for both containerized and virtualized application components in the same cluster	NSX traffic analysis for security purposes, no - or little - native visibility without NSX

VM Administration

	OpenShift	VMware
Template Management	Can use OVAs and VM (template) Library with performance tuned VM templates. Two-click VM creation wizard flow	Template VMs, OVA/OVF deployment, and content libraries offer the ability to provision VMs using a simplified process
VM lifecycle management	Utilize sysprep and cloud-init	Guest OS customization is an abstraction for sysprep/cloud-init
VM Export/Import	Import OVA using Migration Toolkit for Virtualization	Import and export VMs using the OVF and OVA formats

VM Optimization

	OpenShift	VMware
High Performance VMs	NUMA aware node scheduling for best performance, huge pages for data warehousing and in-memory databases, reserve/protect resources using standard Kubernetes mechanisms	NUMA awareness, large/huge pages, latency sensitivity, resource reservations, SIOC, NIOC, and shares mechanism for fairness during contention
Compute Acceleration	GPU passthrough supported, (NVIDIA) vGPU supported	PCI passthrough for GPUs, vGPU supported
Dynamic reconfiguration	Supports storage, SR-IOV and Bridge Network hot-plug CPU hot-plug became available in 4.16, and memory in 4.17	CPU, memory, disk, network adapter, and some additional hardware is supported for hot add/remove and reconfiguration

High Availability

	OpenShift	VMware
Infrastructure HA Node Failure	Supported through fencing agents for IPI and non-IPI environments. See KCS for HA configuration.	Node failure detection and VM rescheduling happens within 15-30 seconds, even without vCenter
Application level HA	RHEL HA (pacemaker) and Windows Server Failover Clustering (WSFC) are supported.	RHEL HA (pacemaker) and Windows Server Failover Clustering (WSFC) are supported.

Resource Management and Optimization

	OpenShift	VMware
Compute live migration	Yes, "Live Migration"	Yes, "vMotion"
Adaptive resource scheduling / resource rebalancing	Descheduler and eviction policies, (anti)affinity rules for VMs, Pods, and hosts	Dynamic Resource Scheduling (DRS), (anti)affinity rules for VMs to VMs and VMs to hosts
Memory overcommitment	KSM and free page reporting supported 4.15, CPU & Memory hot swap as of 4.16 & 4.17	Ballooning and Transparent Page Sharing (TPS)
CPU overcommitment	Yes	Yes

Hosted Kubernetes Integration

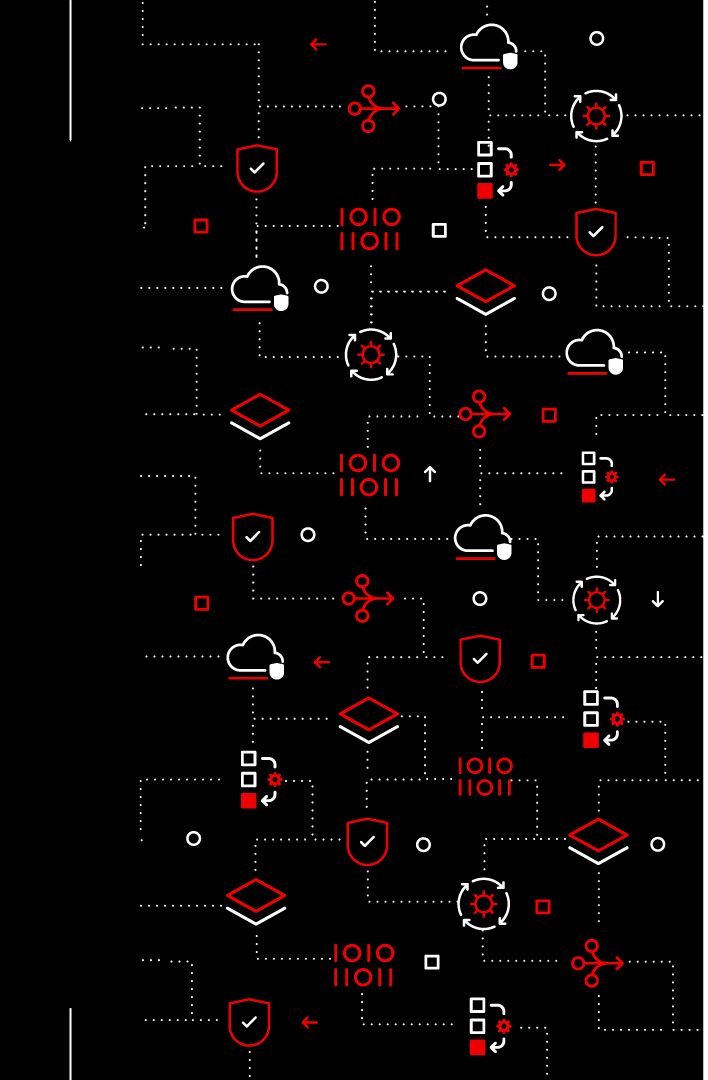
	OpenShift	VMware
Hosting pods on hypervisor nodes	Pods and VMs are native peers, there is no difference between them with OpenShift Virtualization	vSphere with Kubernetes allows “native” Pods to be deployed against the cluster, however they are still running using a VM shim
Efficient cluster provisioning	Hosted Control Planes enable rapid creation of tenant OpenShift clusters with cloud provider integration using the KubeVirt provider.	Tanzu Kubernetes Grid abstracts provisioning Kubernetes clusters using Cluster API

Access Control

	OpenShift	VMware
Resource Scoping	Top-level organization starts at the cluster level. Organizing VMs in folders can be represented by namespaces. Resources such as network, storage, VM templates are stored within namespaces and can be isolated via network policies.	Scoped access to resources: datacenters, clusters, folders, networks, storage, templates, content.
Action Permissions	Provides three default roles: cluster admin, admin by namespace, and view. Custom RBAC can be mimic any existing roles or permissions down to the Kubernetes object level.	Roles and Permissions structure for different user/group archetypes.

Monitoring, Alerts/Events, Logs

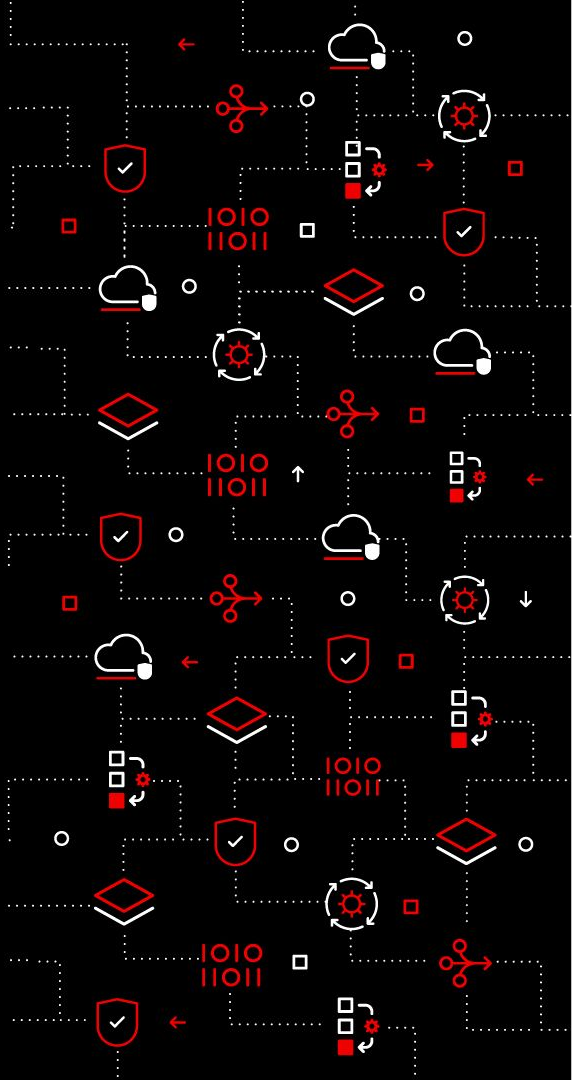
	OpenShift	VMware
Notification/Alarm on Triggers	Prometheus and Alertmanager provide rules definition on all cluster objects including VMs. Severity levels can be set and have discrete actions for each level.	Custom Alarm provides rules definition on event, condition, or state triggers. Severity levels can be set.
Variety of Notification Targets	Alertmanager provides default handlers for email, webhook, and several 3rd party apps including Slack, PagerDuty, and MSTeams (See Notes for full list)	Custom Alarm provides for emails and SNMP traps configuration as well as script execution
VM Event Logging	Vector/Loki/Logging Console plugin has replaced the traditional Elasticsearch/Fluentd/Kibana stack to provide greater insights and better observability	Provides a per-VM advanced option to Enable logging to a log file called vmware-n.log
Log Shipping	Vector multi log forwarder feature supports multiple Red Hat and 3rd party logging applications	Host logs can be shipped from vCenter to alternate locations/3rd party logging apps



Lunch Break

12:00 – 01:00 PM

Red Hat

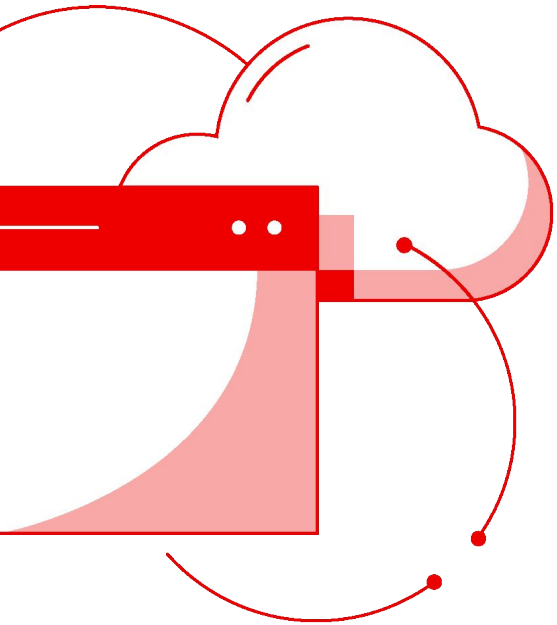


OpenShift Virtualization and virtual desktop infrastructure

Red Hat and Citrix

Red Hat

Why move VDI to Red Hat OpenShift Virtualization?



Exposure management

Diversify your virtualization to avoid costly legacy hypervisor lock-in.

Tool reduction and consolidation

Run virtual machines and containers together on one platform with Red Hat OpenShift Container Platform.

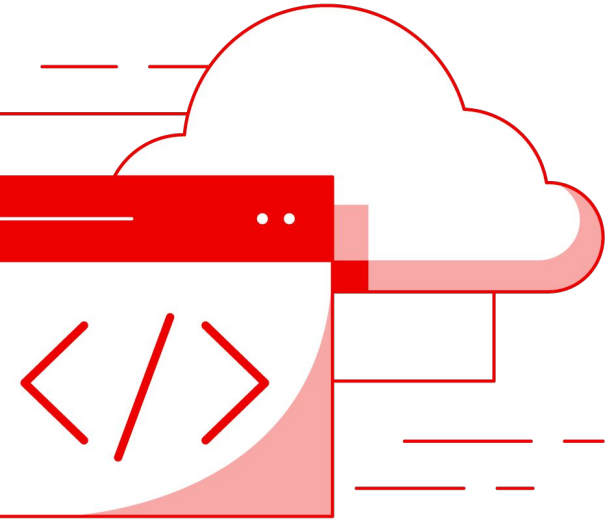
Modernization

Bridge the gap from monolithic applications to containers and microservices.

Machine Creation Services

Citrix full provisioning overview

Image management



01
Virtualize
Capturing operating system and apps into a virtual image

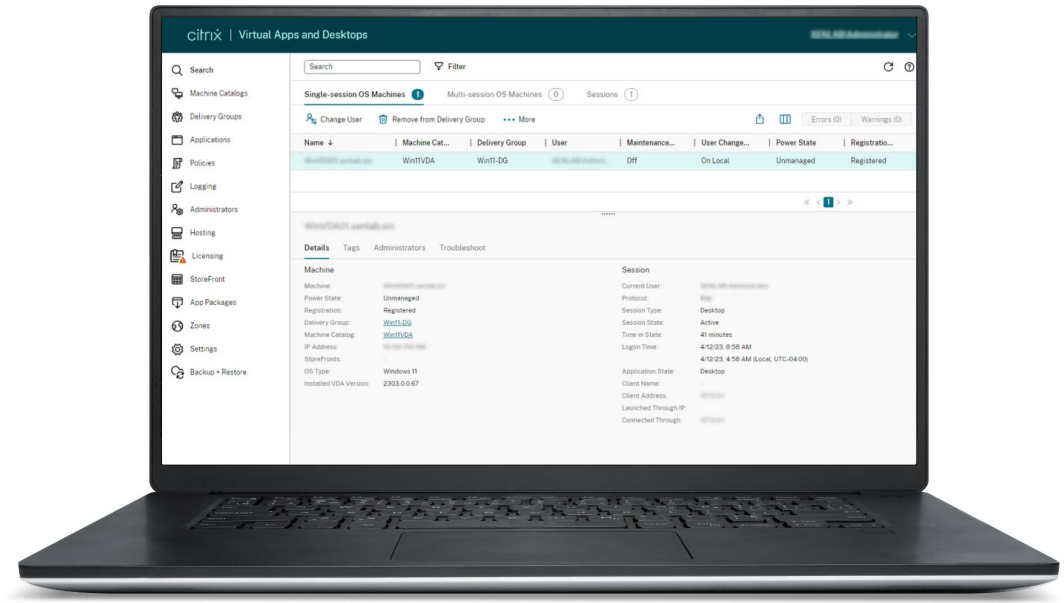
02
Store
Store the virtual image

03
Deliver
Deliver the virtual image to multiple target devices

04
Monitor
Review usage of current image and/or contents

Citrix Virtual Apps and Desktops

Web Studio



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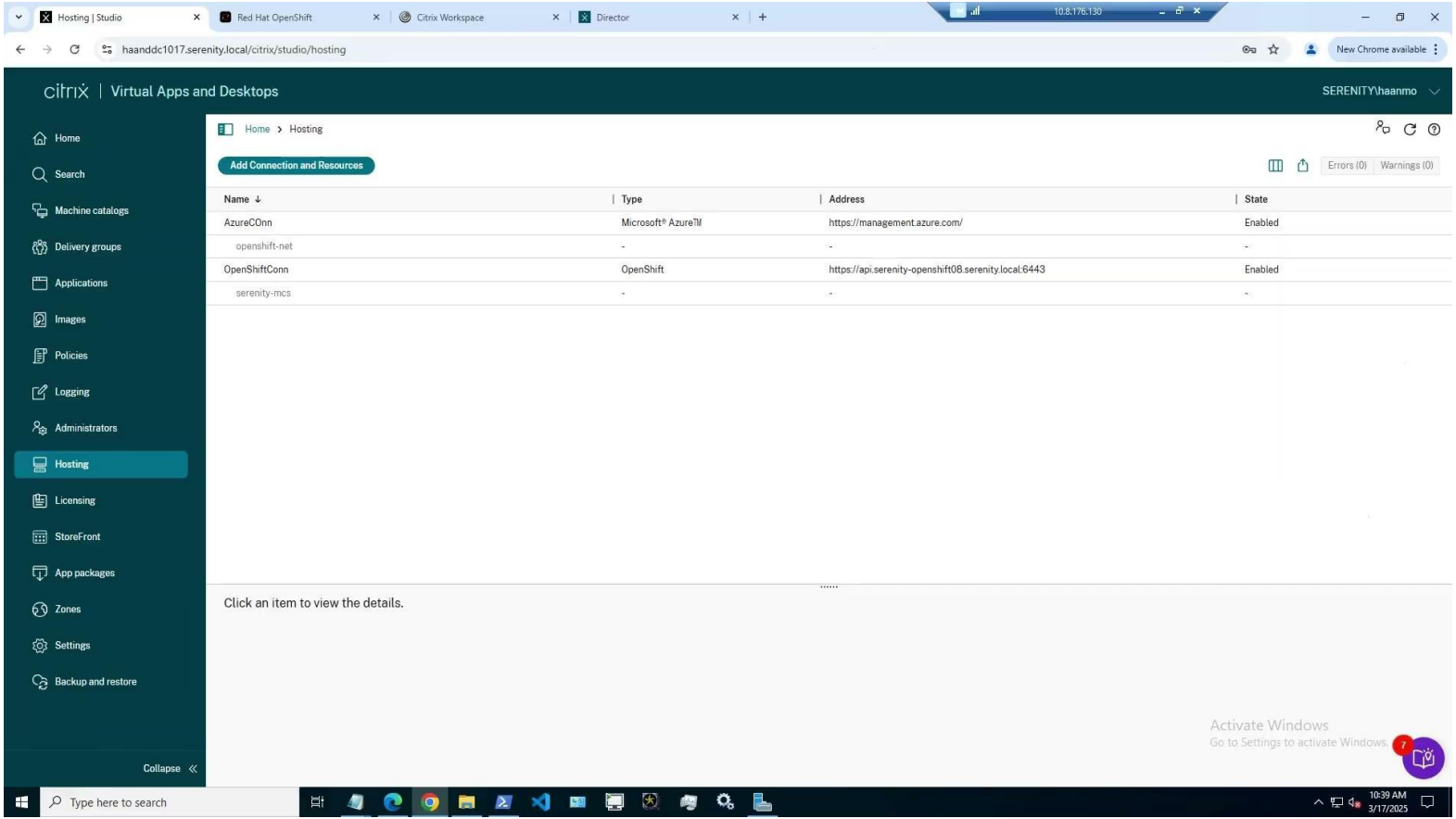


Joint value

Red Hat OpenShift Virtualization

Unified user experience

Operate your virtual desktops on-premises with the same user experience.

- No additional upgrade from Citrix, but would require OVE or OCP for OpenShift Virtualization access

Virtual desktops at scale

Citrix VDI delivers virtual desktops at scale across all these environments regardless of where your data and applications live.

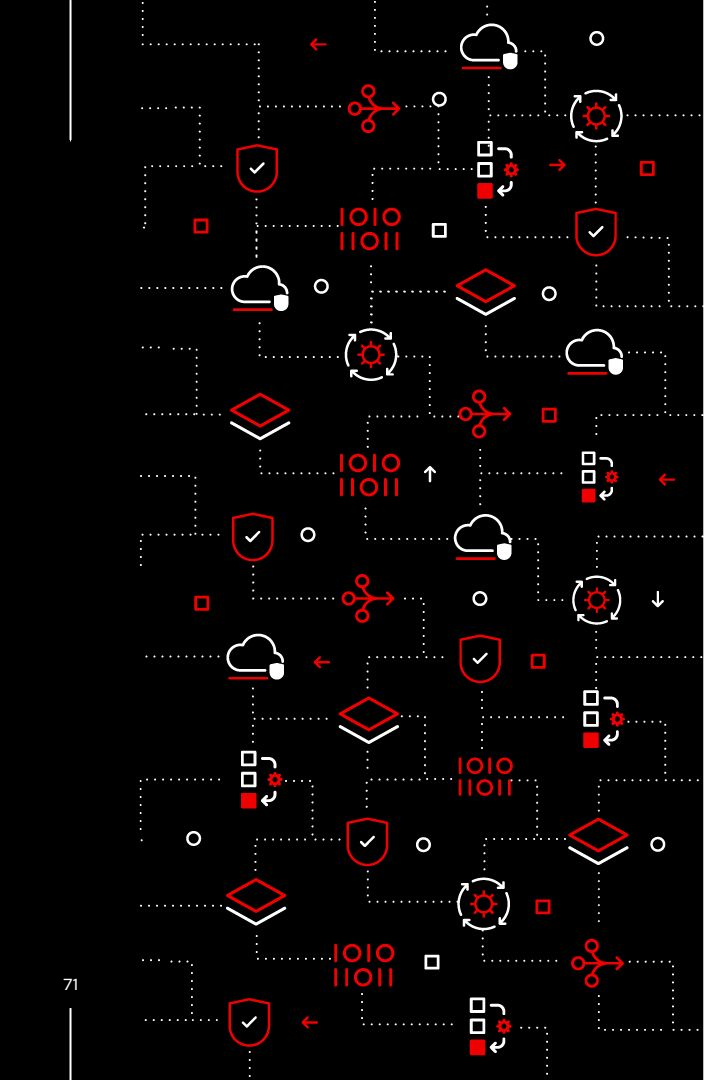
- On premise, Azure, AWS as a resource location for Citrix
- On premise and ROSA as an option for running OpenShift Virtualization

Flexible use cases

Red Hat delivers OpenShift platform in disconnected or air-gapped environments that allow for Citrix VDI capabilities.

- Citrix on premise (for air-gapped only)
- Hosted, shared desktops
- Persistent desktops
- Linux and Windows machines

Red Hat | citrix



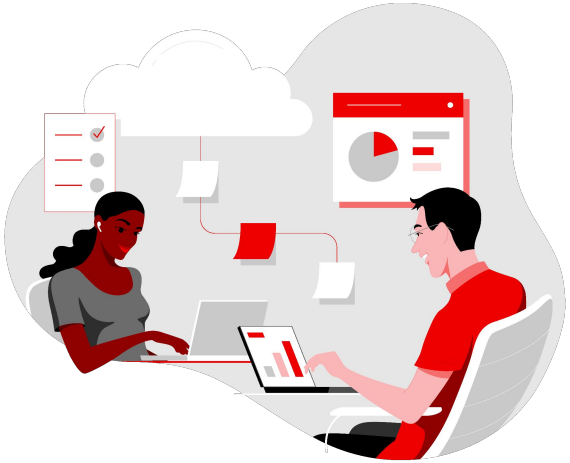
Migration Factory

Red Hat

Virtualization Migration Factory

Migrate virtual machines at scale

Strategy | Foundation | **Expand** | Evolve



- **Evaluate** your workload portfolio, **plan and prioritize** to **migrate and modernize at scale**
- **Create** iterative migration of batches of workloads
- **Reduce** IT management effort to increase productivity
- **Prepare teams** for scaled app operations and production readiness

Red Hat Learning

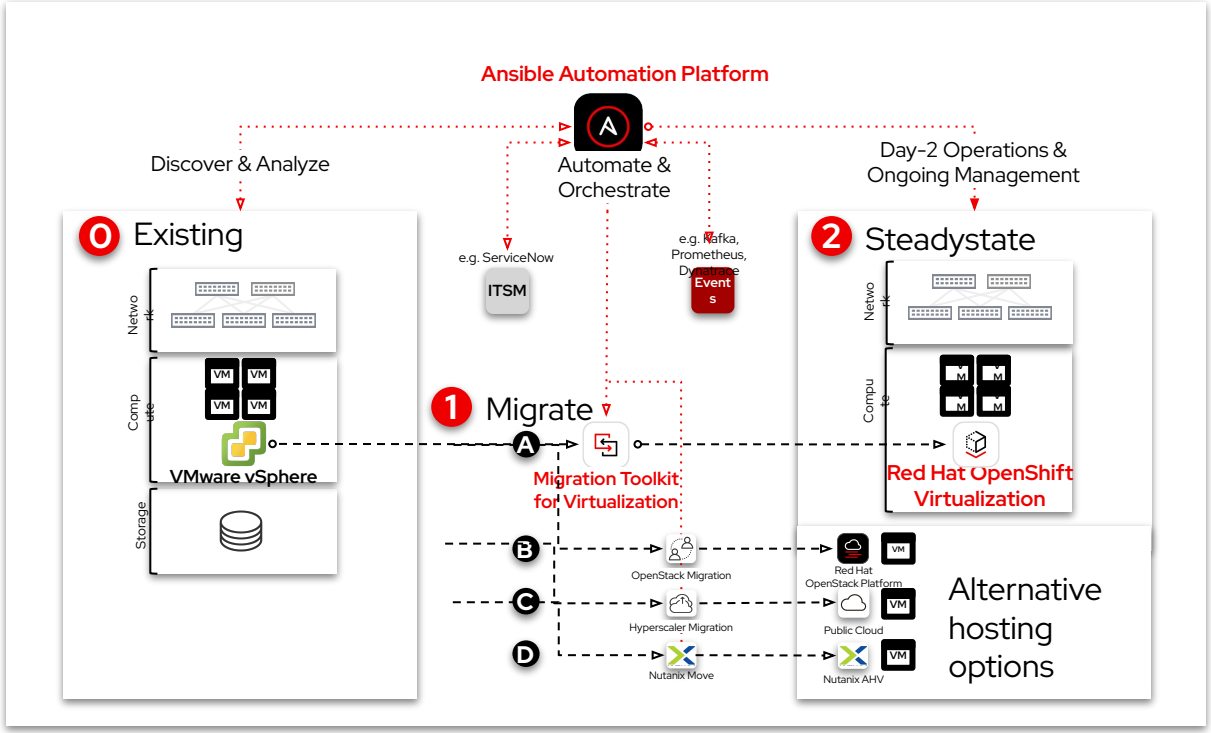
Accelerating Migrations at Scale with AAP

A Migration factory from Day-0 to Day-2 with Ansible automation

0 Evaluate and scope
Evaluate the existing data center setup

1 Migrate
Use MTV to migrate virtual machines to Openshift VIrtualization. Ansible helps automate orchestrate as needed.

2 Red Hat Steadystate
VMs are now hosted on OpenShift Virtualization alongside container workloads. Ansible Automation Platform handle day two operations.



Red Hat Learning

Maximizing Value with the Ansible for OpenShift Virtualization Migration

0

Pre-Migration Configuration - Made Easy!

Accelerate your migration journey with streamlined, automated pre-configuration. Our solution simplifies the discovery and setup process, ensuring your infrastructure is ready for seamless transformation.

Bootstrapping Environments.

Whether you're starting from scratch or building on existing infrastructure, our Environment Bootstrap process sets the foundation for a successful migration.

- AAP Deployment on OpenShift
- Deploy and configure OpenShift Virtualization and the Migration Toolkit for Virtualization (MTV) to power your migration efforts
- Accelerate your migration factory setup with a fully configured, operator-driven OpenShift environment—designed for automation, scalability, and ease of use.

1

Migration & Inventory: Smarter, Faster, Scalable

*** Quickly assess the existing environment.** Gather information about the VM inventory to create recommendations on what and how to migrate—fast and without missing anything.

*** Automate at-scale migrations.** Migrate multiple VMs in one playbook run. Streamline tasks like VM migration, network or load balancer connection, and security tool enrollment.

*** Streamline post-migration operations,** with automated management for provisioning new VMs, patching, drift remediation, security, and decommissioning unused VMs.

2

Steadystate Day 2 Operations: Take the control Beyond Migration.

The journey doesn't stop at migration—and neither does our automation. With a full suite of Day 2 Operations, manage and optimize virtual machines with confidence, flexibility, and ease.

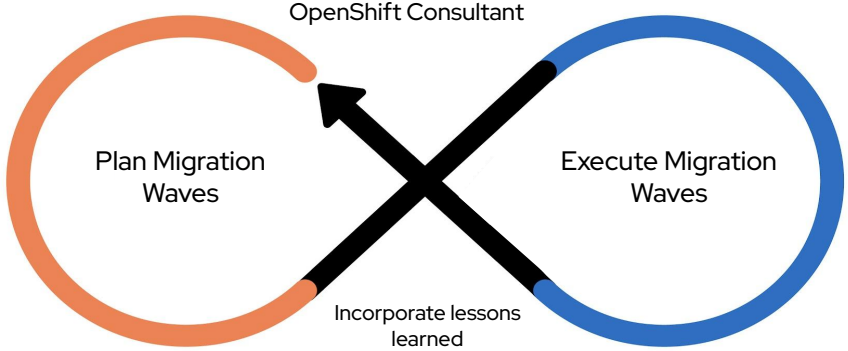
Squad Model

Red Hat Consulting, Training, and TAM
Advise on patterns, architecture, and enablement

- Design reference architectures
- Enable teams with OpenShift Virtualization
- Deploy automation
- Evolve process

Migration Squad

VM Batch Customer Stakeholders + OpenShift Consultant



Customer Infrastructure teams and VM owners
Advise on requirements, processes, and challenges

- Define requirements
- Support migration wave
- Navigate internal processes
- Validate migration

Build the knowledge base
Minimize downtime and failover

Evolve a repeatable approach to migration waves

Accelerate migration rate
Complete migration

Core Migration Team

Customer Infrastructure Lead +
TAM, Architect, and Automation Consultant

Red Hat Learning

Red Hat Training for VMware Migration

What training does Red Hat recommend for customers who are migrating from VMware?

Essentials

- OpenShift Virtualization Technical Overview
- OpenShift Technical Overview
- Ansible Technical Overview D007 (Update Coming **Q1** CY25)
- ACM Technical Overview (Coming **Q2** CY25)

Day 1

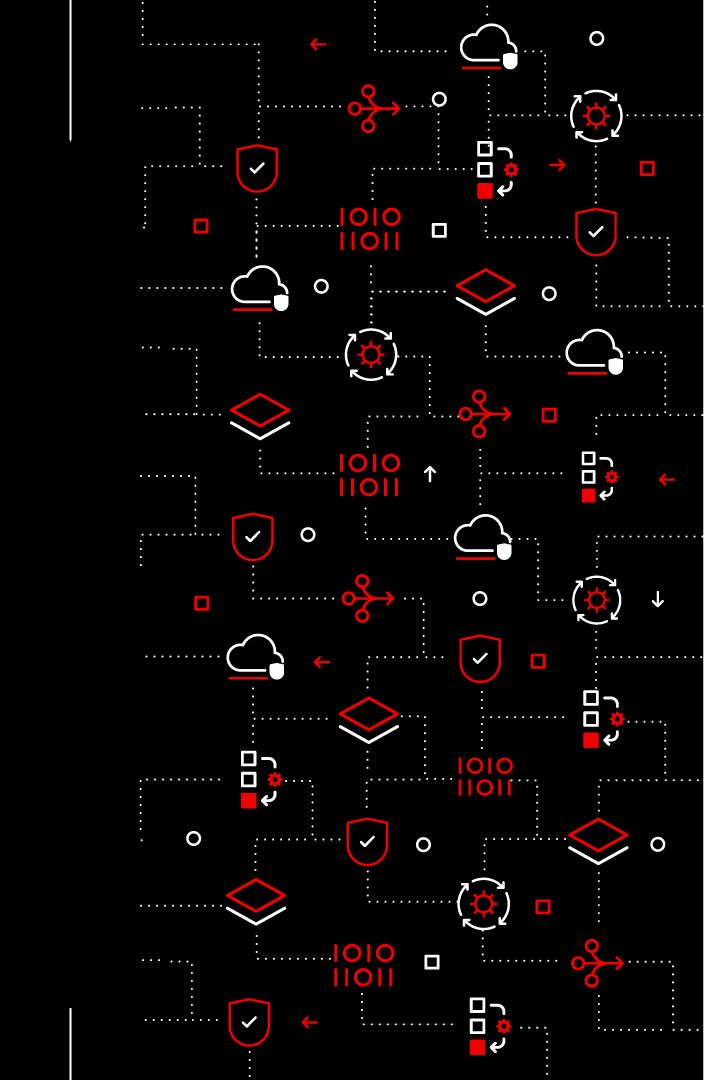
- DO346: Migrating Virtual Machines to Red Hat OpenShift Virtualization with Ansible Automation Platform (Coming **Q2** CY25)
- DO316: Managing Virtual Machines with Red Hat OpenShift Virtualization

Day 2

- DO336: Automate and Manage Red Hat OpenShift Virtualization with Ansible (Coming **Q2** CY25)
- DO432: Red Hat Advanced Cluster Management for Kubernetes (Update Coming **Q1** CY25)

Prerequisites for Day 1

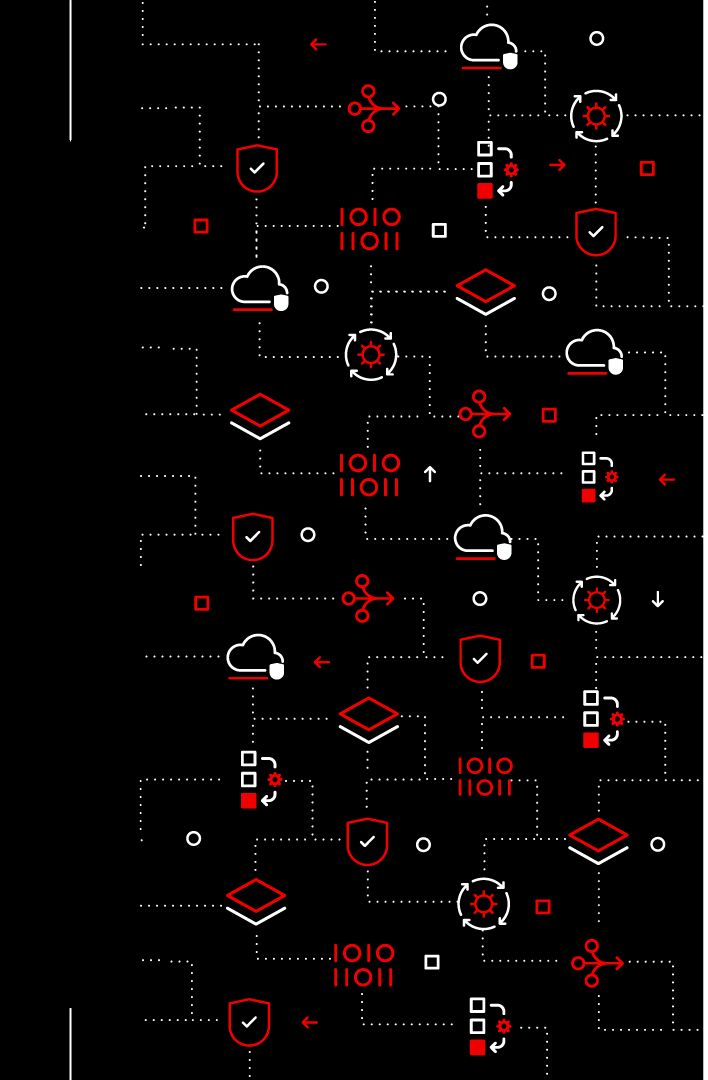
- DO180: Red Hat OpenShift Administration I: Operating a Production Cluster
- DO280: Red Hat OpenShift Administration II: Configuring a Production Cluster



BREAK

02:45 – 03:00 PM

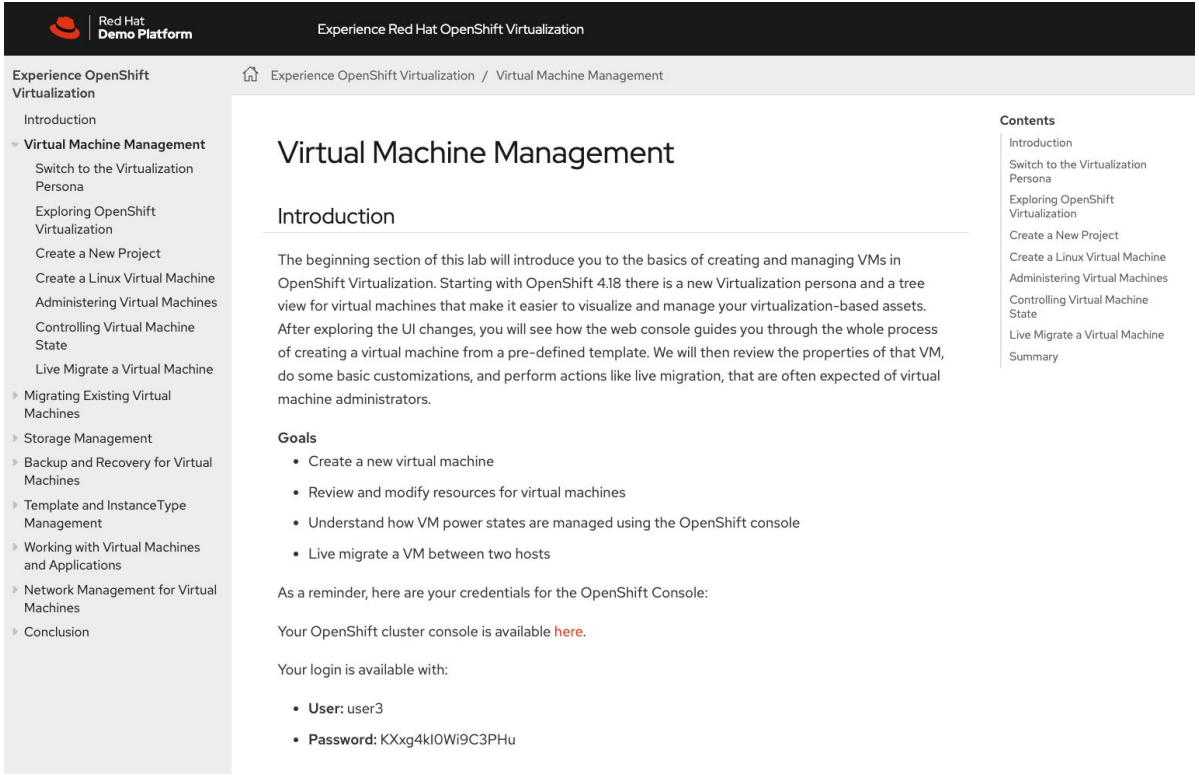
Red Hat



Hands-On Labs

3:00 – 5:00 PM

Red Hat


Red Hat
Demo Platform
Experience Red Hat OpenShift Virtualization
Experience OpenShift Virtualization
Introduction
Virtual Machine Management
Switch to the Virtualization Persona
Exploring OpenShift Virtualization
Create a New Project
Create a Linux Virtual Machine
Administering Virtual Machines
Controlling Virtual Machine State
Live Migrate a Virtual Machine
Migrating Existing Virtual Machines
Storage Management
Backup and Recovery for Virtual Machines
Template and InstanceType Management
Working with Virtual Machines and Applications
Network Management for Virtual Machines
Conclusion
Experience OpenShift Virtualization / Virtual Machine Management
Virtual Machine Management
Introduction
The beginning section of this lab will introduce you to the basics of creating and managing VMs in OpenShift Virtualization. Starting with OpenShift 4.18 there is a new Virtualization persona and a tree view for virtual machines that make it easier to visualize and manage your virtualization-based assets. After exploring the UI changes, you will see how the web console guides you through the whole process of creating a virtual machine from a pre-defined template. We will then review the properties of that VM, do some basic customizations, and perform actions like live migration, that are often expected of virtual machine administrators.
Goals
Create a new virtual machine
Review and modify resources for virtual machines
Understand how VM power states are managed using the OpenShift console
Live migrate a VM between two hosts
As a reminder, here are your credentials for the OpenShift Console:
Your OpenShift cluster console is available here.
Your login is available with:
User: user3
Password: KXxg4kI0Wi9C3PHu
Contents
Introduction
Switch to the Virtualization Persona
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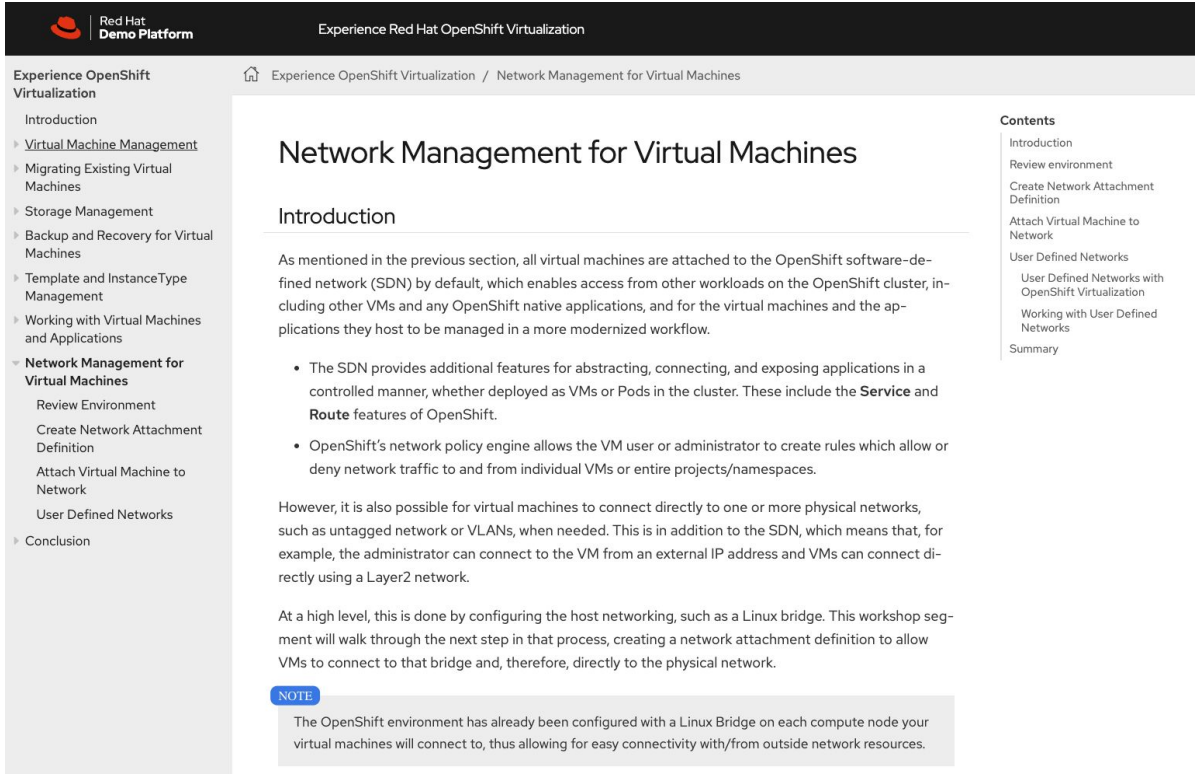
Create a New Project
Create a Linux Virtual Machine
Administering Virtual Machines
Controlling Virtual Machine State
Live Migrate a Virtual Machine
Summary

Red Hat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Working with Virtual Machines and Applications
Network Management for Virtual Machines
Review Environment
Create Network Attachment Definition
Attach Virtual Machine to Network
User Defined Networks
Conclusion
Experience OpenShift Virtualization / Network Management for Virtual Machines
Network Management for Virtual Machines
Introduction
As mentioned in the previous section, all virtual machines are attached to the OpenShift software-defined network (SDN) by default, which enables access from other workloads on the OpenShift cluster, including other VMs and any OpenShift native applications, and for the virtual machines and the applications they host to be managed in a more modernized workflow.
The SDN provides additional features for abstracting, connecting, and exposing applications in a controlled manner, whether deployed as VMs or Pods in the cluster. These include the Service and Route features of OpenShift.
OpenShift's network policy engine allows the VM user or administrator to create rules which allow or deny network traffic to and from individual VMs or entire projects/namespaces.
However, it is also possible for virtual machines to connect directly to one or more physical networks, such as untagged network or VLANs, when needed. This is in addition to the SDN, which means that, for example, the administrator can connect to the VM from an external IP address and VMs can connect directly using a Layer2 network.
At a high level, this is done by configuring the host networking, such as a Linux bridge. This workshop segment will walk through the next step in that process, creating a network attachment definition to allow VMs to connect to that bridge and, therefore, directly to the physical network.
NOTE
The OpenShift environment has already been configured with a Linux Bridge on each compute node your virtual machines will connect to, thus allowing for easy connectivity with/from outside network resources.
Contents
Introduction
Review environment
Create Network Attachment Definition
Attach Virtual Machine to Network
User Defined Networks
User Defined Networks with OpenShift Virtualization
Working with User Defined Networks
Summary

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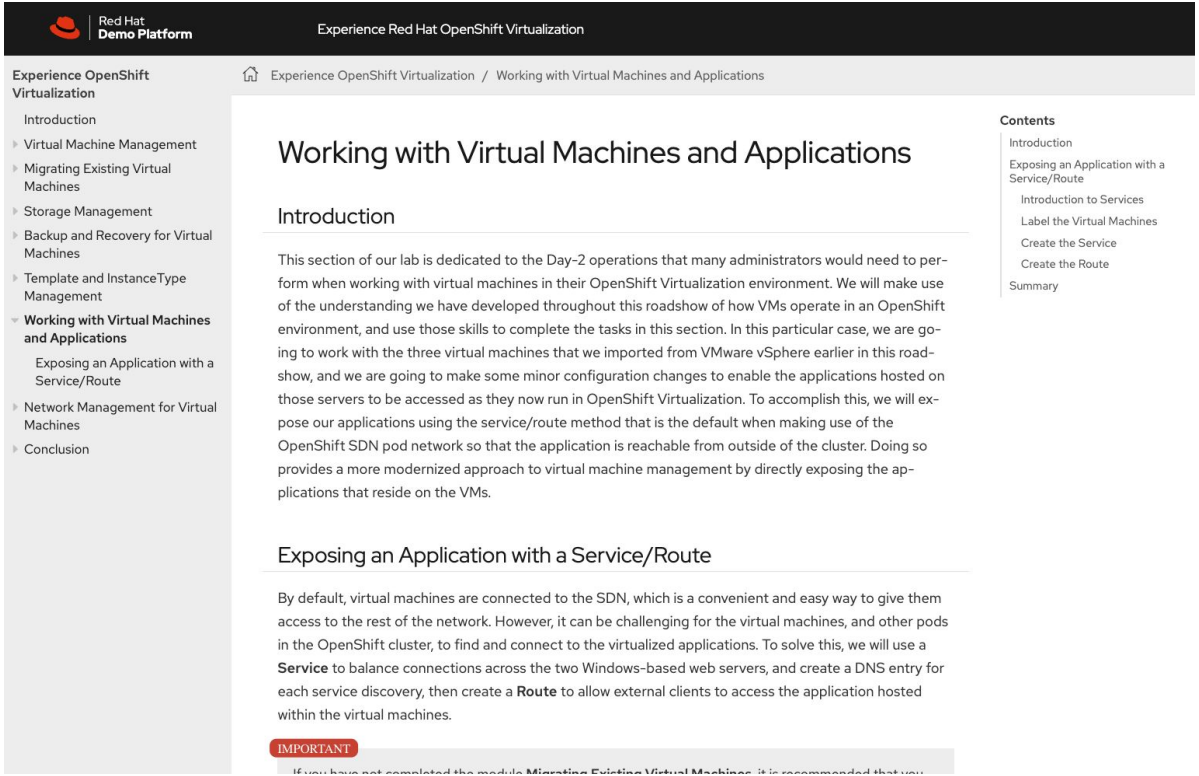
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Working with Virtual Machines and Applications
Introduction
This section of our lab is dedicated to the Day-2 operations that many administrators would need to perform when working with virtual machines in their OpenShift Virtualization environment. We will make use of the understanding we have developed throughout this roadshow of how VMs operate in an OpenShift environment, and use those skills to complete the tasks in this section. In this particular case, we are going to work with the three virtual machines that we imported from VMware vSphere earlier in this roadshow, and we are going to make some minor configuration changes to enable the applications hosted on those servers to be accessed as they now run in OpenShift Virtualization. To accomplish this, we will expose our applications using the service/route method that is the default when making use of the OpenShift SDN pod network so that the application is reachable from outside of the cluster. Doing so provides a more modernized approach to virtual machine management by directly exposing the applications that reside on the VMs.
Exposing an Application with a Service/Route
By default, virtual machines are connected to the SDN, which is a convenient and easy way to give them access to the rest of the network. However, it can be challenging for the virtual machines, and other pods in the OpenShift cluster, to find and connect to the virtualized applications. To solve this, we will use a Service to balance connections across the two Windows-based web servers, and create a DNS entry for each service discovery, then create a Route to allow external clients to access the application hosted within the virtual machines.
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Introduction to Services
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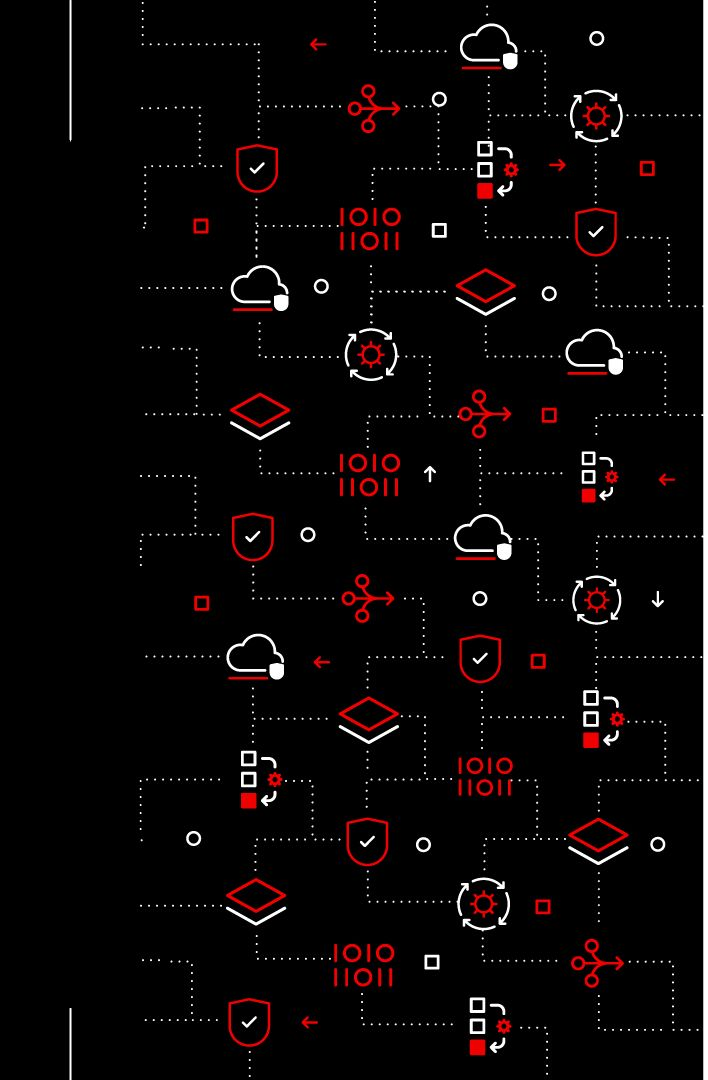

Hands-On Lab 2 Migration from VMware

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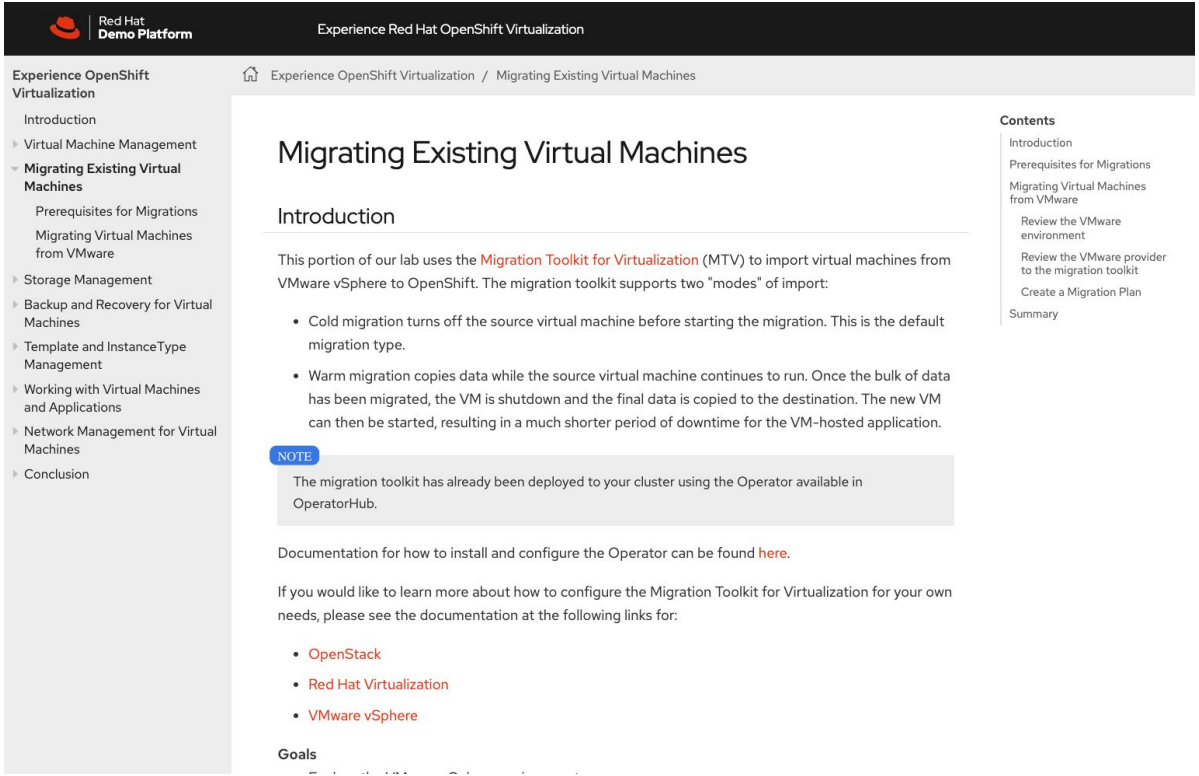
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Migrating Existing Virtual Machines
Introduction
This portion of our lab uses the Migration Toolkit for Virtualization (MTV) to import virtual machines from VMware vSphere to OpenShift. The migration toolkit supports two "modes" of import:
Cold migration turns off the source virtual machine before starting the migration. This is the default migration type.
Warm migration copies data while the source virtual machine continues to run. Once the bulk of data has been migrated, the VM is shutdown and the final data is copied to the destination. The new VM can then be started, resulting in a much shorter period of downtime for the VM-hosted application.
NOTE
The migration toolkit has already been deployed to your cluster using the Operator available in OperatorHub.
Documentation for how to install and configure the Operator can be found here.
If you would like to learn more about how to configure the Migration Toolkit for Virtualization for your own needs, please see the documentation at the following links for:
OpenStack
Red Hat Virtualization
VMware vSphere
Goals
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Prerequisites for Migrations
Migrating Virtual Machines from VMware
Review the VMware environment
Review the VMware provider to the migration toolkit
Create a Migration Plan
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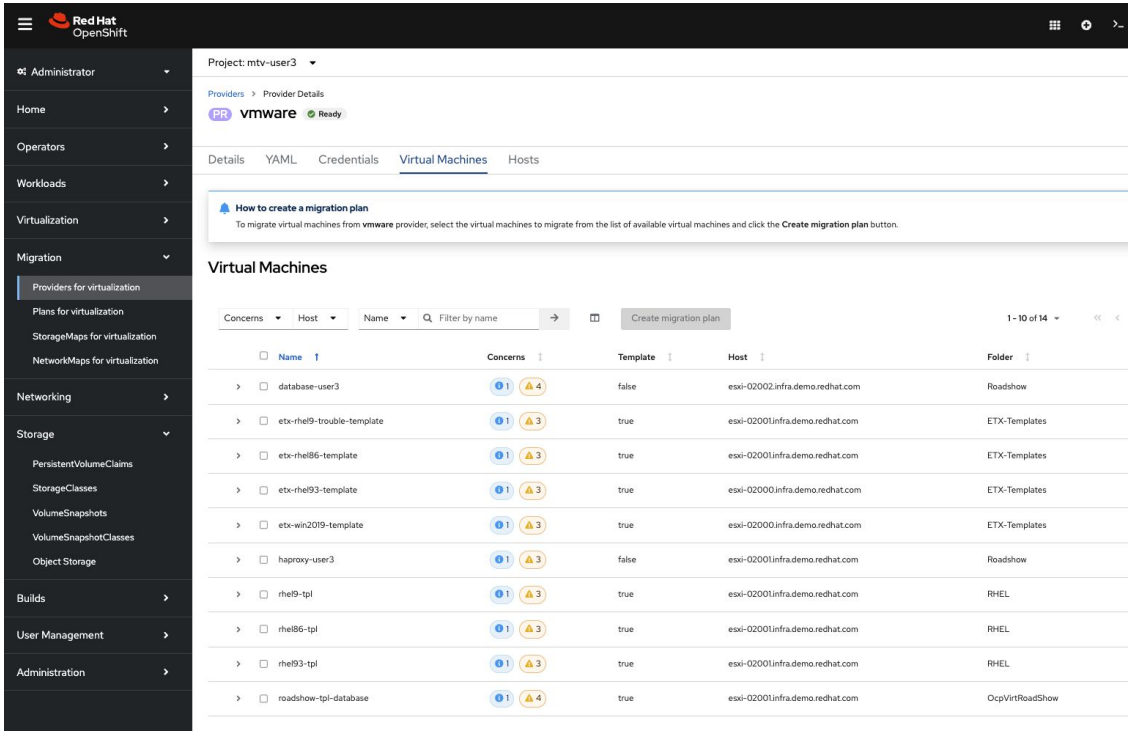
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StorageMaps for virtualization
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Storage
PersistentVolumeClaims
StorageClasses
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VolumeSnapshotClasses
Object Storage
Builds
User Management
Administration
Project: mtv-user3
Providers > Provider Details
PR vmware Ready
Details YAML Credentials Virtual Machines Hosts
How to create a migration plan
To migrate virtual machines from vmware provider, select the virtual machines to migrate from the list of available virtual machines and click the Create migration plan button.
Virtual Machines
Concerns Host Name Filter by name Create migration plan 1 - 10 of 14
Name Concerns Template Host Folder
database-user3 1 4 false esxi-02002.infra.demo.redhat.com Roadshow
etx-rhel9-trouble-template 1 3 true esxi-02001.infra.demo.redhat.com ETX-Templates
etx-rhel86-template 1 3 true esxi-02001.infra.demo.redhat.com ETX-Templates
etx-rhel93-template 1 3 true esxi-02000.infra.demo.redhat.com ETX-Templates
etx-win2019-template 1 3 true esxi-02000.infra.demo.redhat.com ETX-Templates
haproxy-user3 1 3 false esxi-02001.infra.demo.redhat.com Roadshow
rhel9-tpl 1 3 true esxi-02001.infra.demo.redhat.com RHEL
rhel86-tpl 1 3 true esxi-02001.infra.demo.redhat.com RHEL
rhel93-tpl 1 3 true esxi-02001.infra.demo.redhat.com RHEL
roadshow-tpl-database 1 4 true esxi-02001.infra.demo.redhat.com OcpVirtRoadShow

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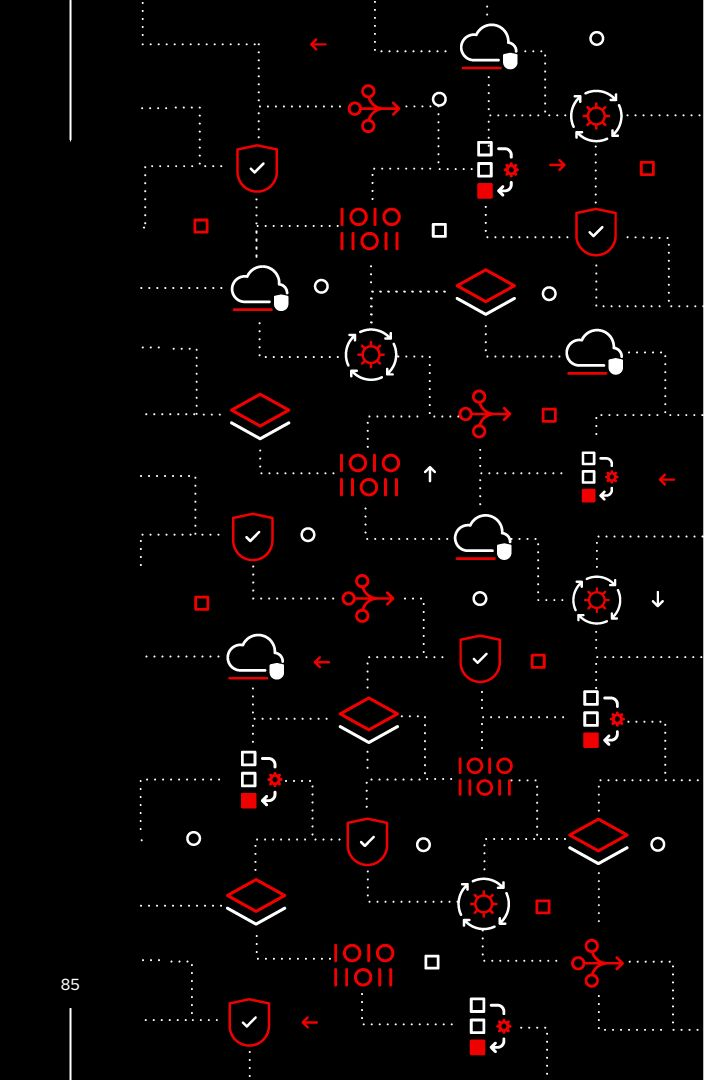

End of Day One

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Thank you

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