Red Hat OpenShift Virtualization

DeepDive

Alfred Bach
Principal Learning and Development Instructor

Red Hat

Agenda Day 1

09:00 - 10:15

- Welcome and Introductions
- Sales Motion and Getting the Technical Win (GTM Strategy)
- ISV Overview

10:30 - 12:00

- All the Labs were presented and explained by the facilitator, with no hands-on for the attendees
- LAB - OpenShift Virtualization Basics
- LAB - Network Management
- LAB - Storage Management Lab

12:00 - 13:00 Lunch

13:00 - 14:45

- LAB - Introduction to virtual machine customization
- LAB - GitOps

14:45 - 15:00 BREAK

15:00 - 16:00

- VMware vSphere Overview Presentation
- VMware to OpenShift Presentation

16:00 - 17:00

- Migration Factory
- Deep Dive on the Migration Factory offering
- OpenShift Virtualization Ansible Migration Factory Demo

Red Hat

Agenda Day 2

09:00 - 10:00

- Showcase of the VMA Analysis

10:00 - 12:00

- Migration discussion based on a real-world scenario
- Discussion on migration risks
- Estimating a project

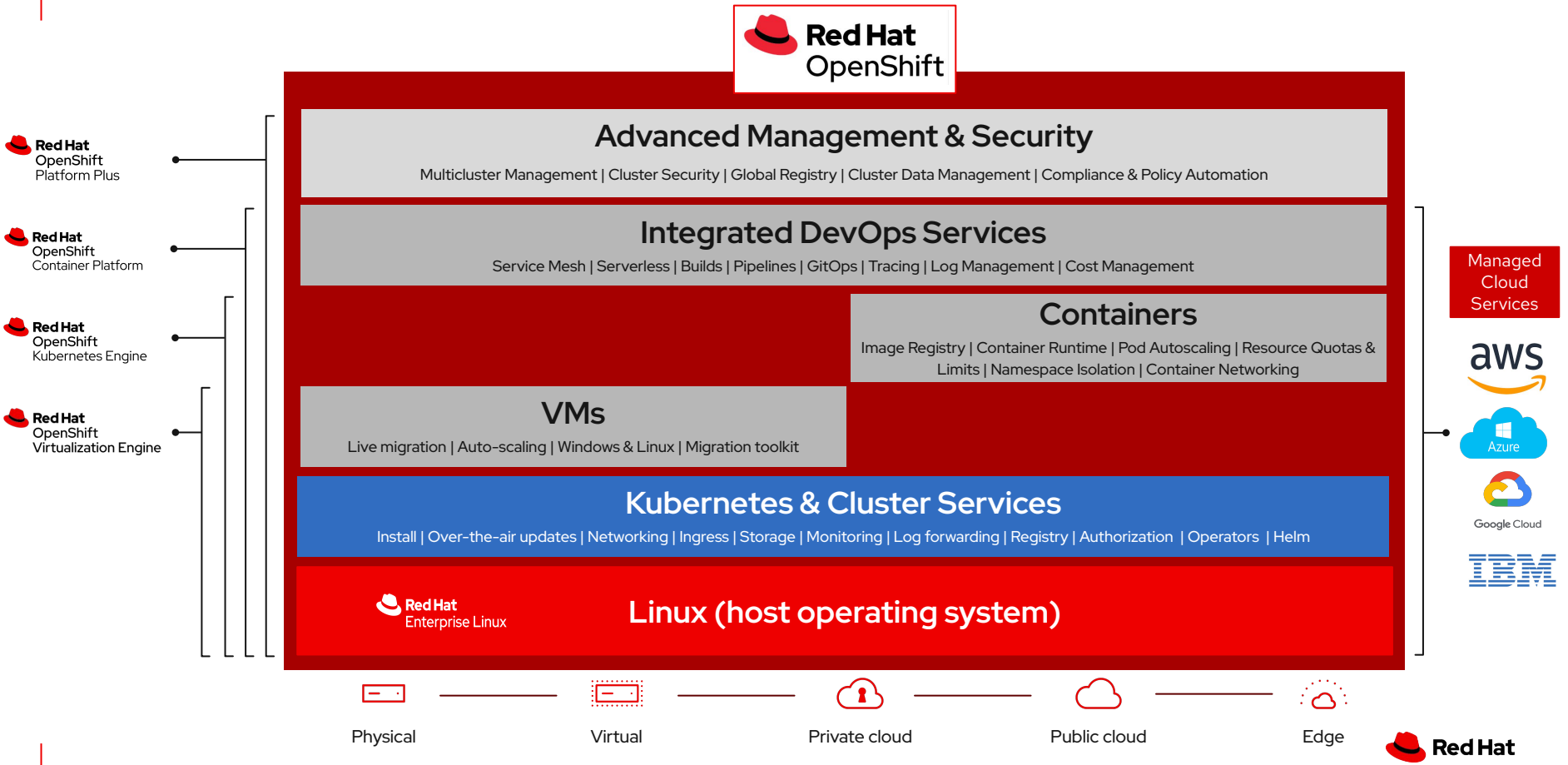
12:00 - 13:00 Lunch

13:00 - 16:45

- Advanced Cluster Management for Virtualization (ACM-V)
- Subscription offerings
- Creating a Lab/Demo environment
- Demos available on demo.partner.redhat.com
- Questions and recap

Red Hat

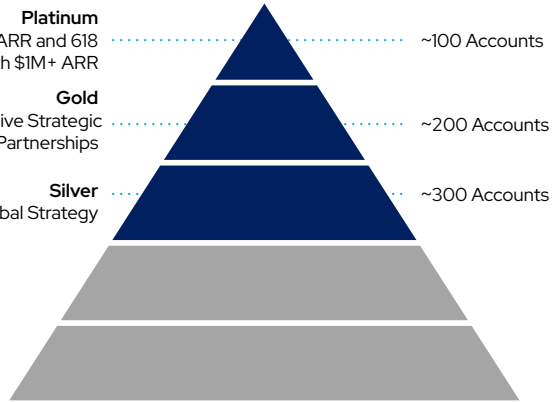
Hybrid cloud application platform



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>

Disruptions to VMware Partners...

vmware by Broadcom

Partner Connect | Your Profile | Promotions | Support Center

VMware Partner Programs Termination Notice

For more than two years, VMware has outlined its plan to transition from a perpetual to a subscription-based business model. This is consistent with the overall market trend toward cloud operating models and was reinforced with the launch and evolution of VMware's Partner Connect Program.

On December 11, 2023, VMware by Broadcom announced its simplified licensing model and solution portfolio. Broadcom and VMware are driven by technology and innovation and have a shared passion for, and commitment to, partner profitability and success. You are now well positioned to capture substantial growth opportunities for delivering advanced, innovative cloud infrastructure and associated services wherever your customers need.

Broadcom Takes Top VMware Accounts Direct 'Effective Immediately'

BY O'RYAN JOHNSON

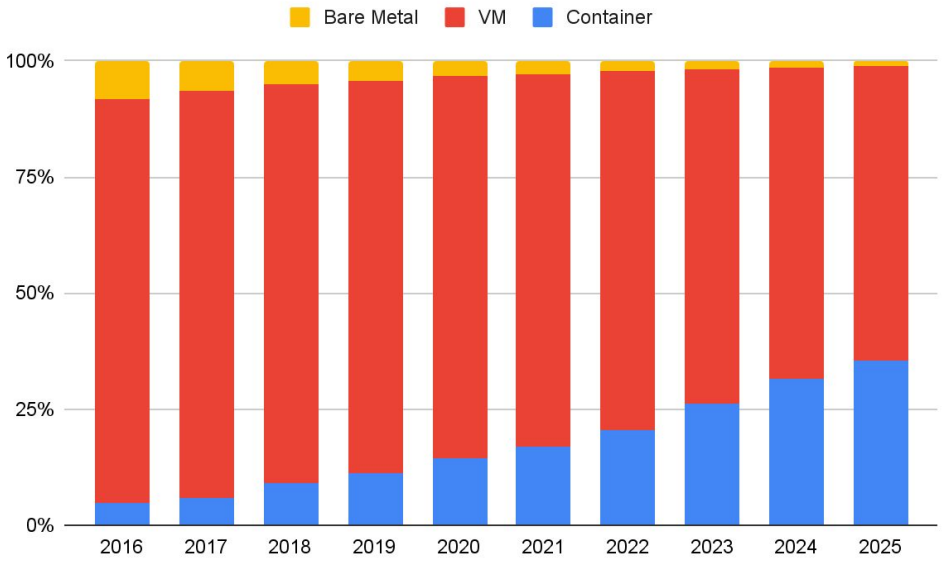
JANUARY 8, 2024, 8:42 AM EST

'Effective Immediately: Strategic customer segments are no longer eligible for Opportunity Registration,' Broadcom wrote to partners in a newly issued Opportunity Registration Policies, according to material obtained by CRN.

Red Hat

Virtualization is here to stay

But not as we know it today



Source: IDC Container Infrastructure Software Market Assessment: Container Deployment Forecast, 2022–2025 (IDC #US48670722, January 2022)

Red Hat

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.

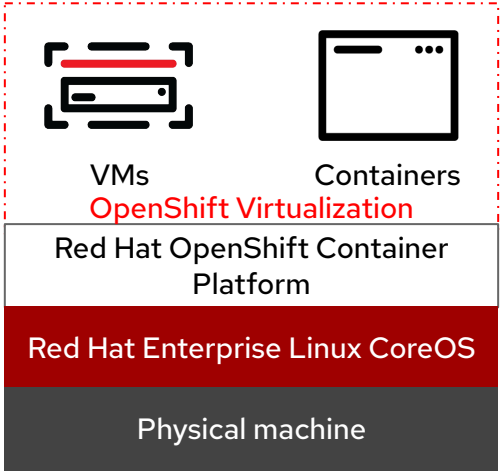
However, **not all applications** can or are **ready** to be containerized and operate in microservices.

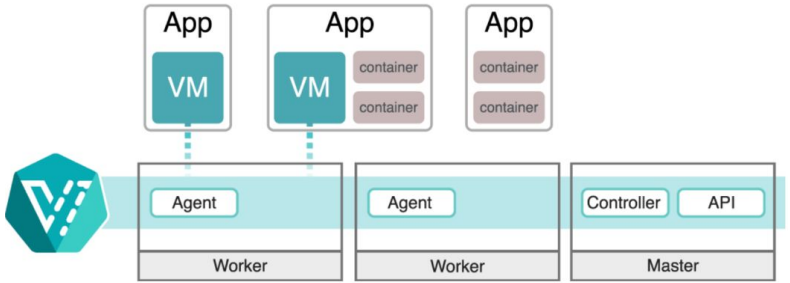
In most organizations, the **journey** will be a **multi-phased approach**, requiring IT operations to maintain and **coexist** workloads with both virtual machines and containers in their IT landscape.

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

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)

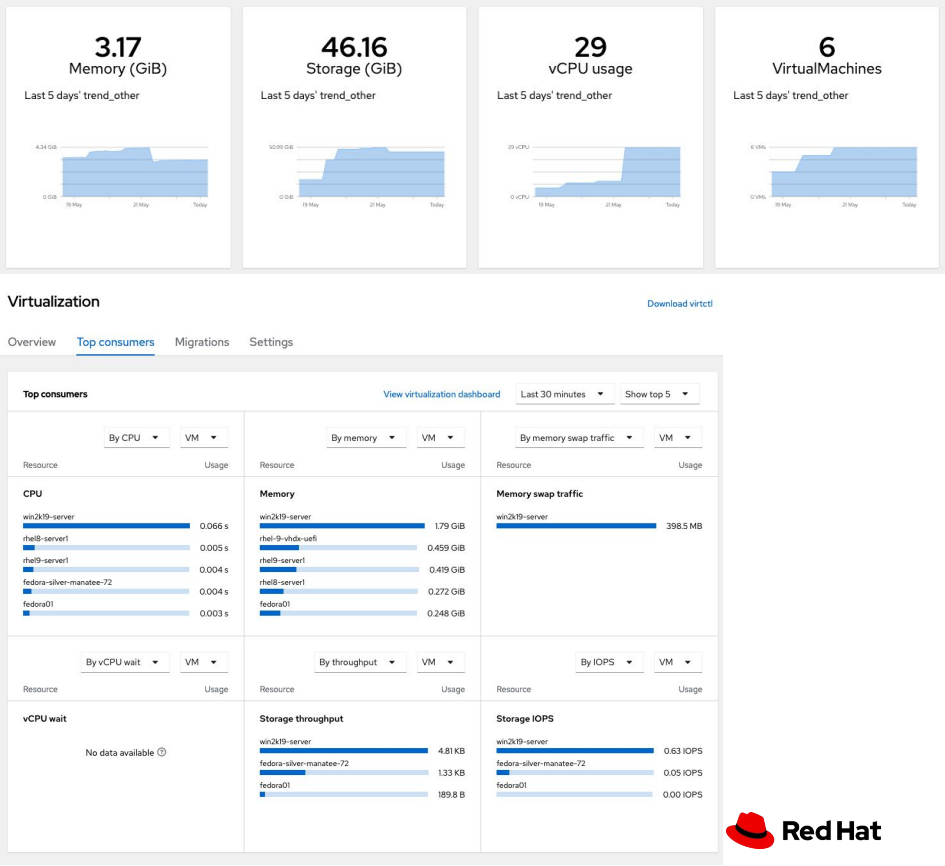




Red Hat

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)

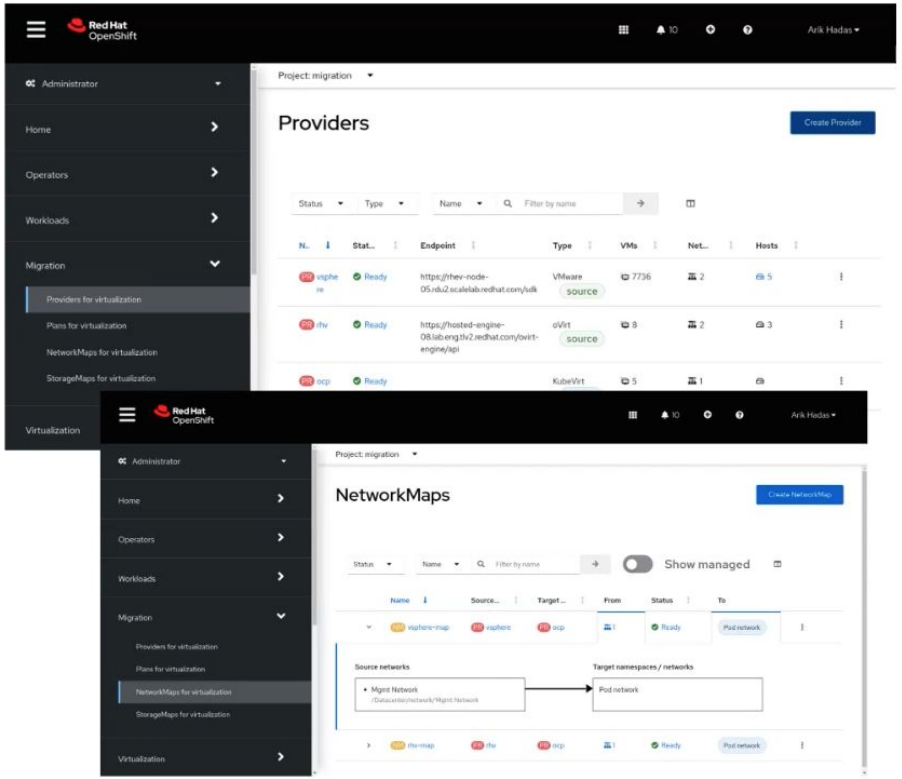


Red Hat

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



Red Hat

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

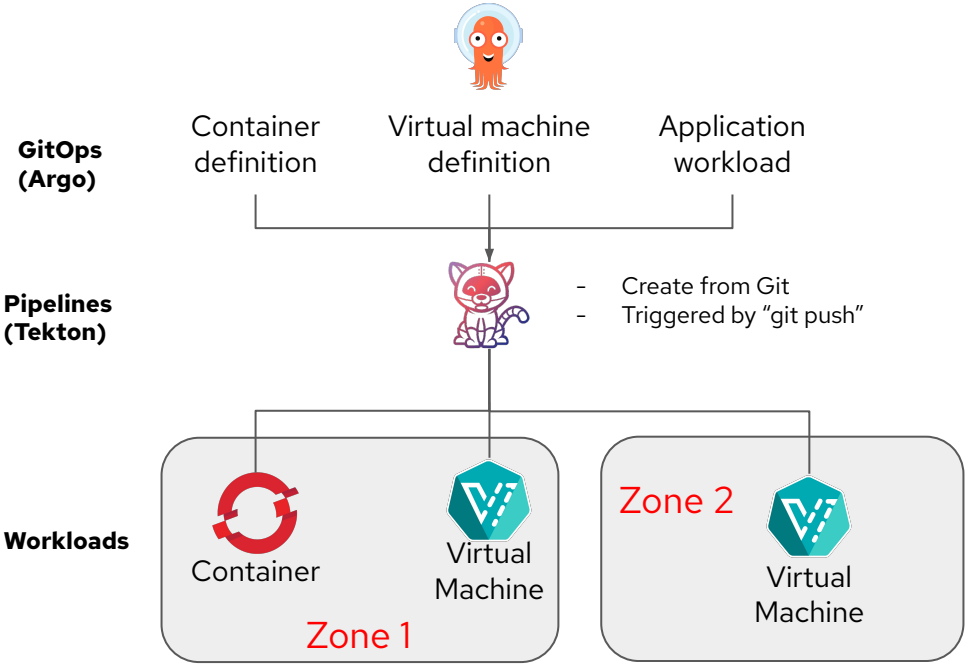
Increased developer output

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

Red Hat

Next-generation approach to virtual machine provisioning

A process that can be optimized down to a few minutes

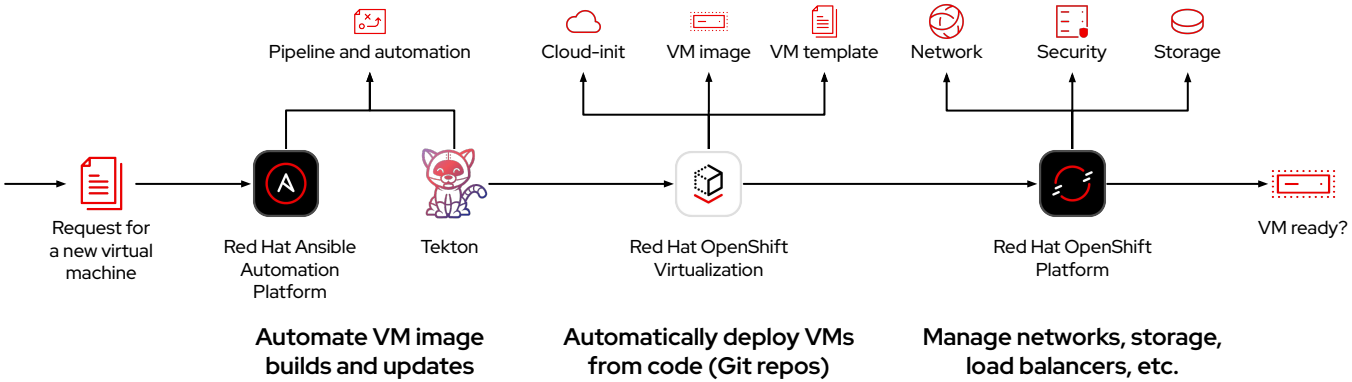
Virtual machine
- CPU: 4 vCPU, 1 core
- Memory: 16GB
- Disk: 30 GB
- OS: RHEL

Additional file systems
- Data: 500GB, disk
- Logs: 100GB, partition

Application platform
- JBoss 7.4 update 11

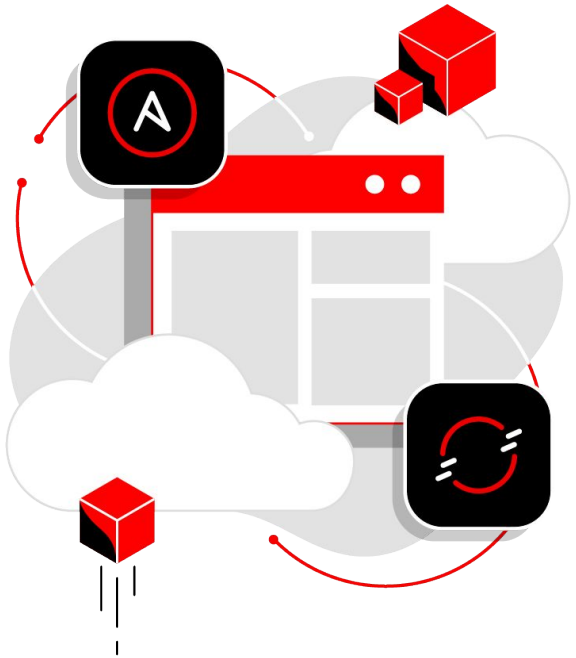
Firewall rules
- Ingress: SSH, HTTPS
- Egress: *.redhat.com

DNS and LB
- api.service.org
- Healthcheck: HTTPS port



Red Hat

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

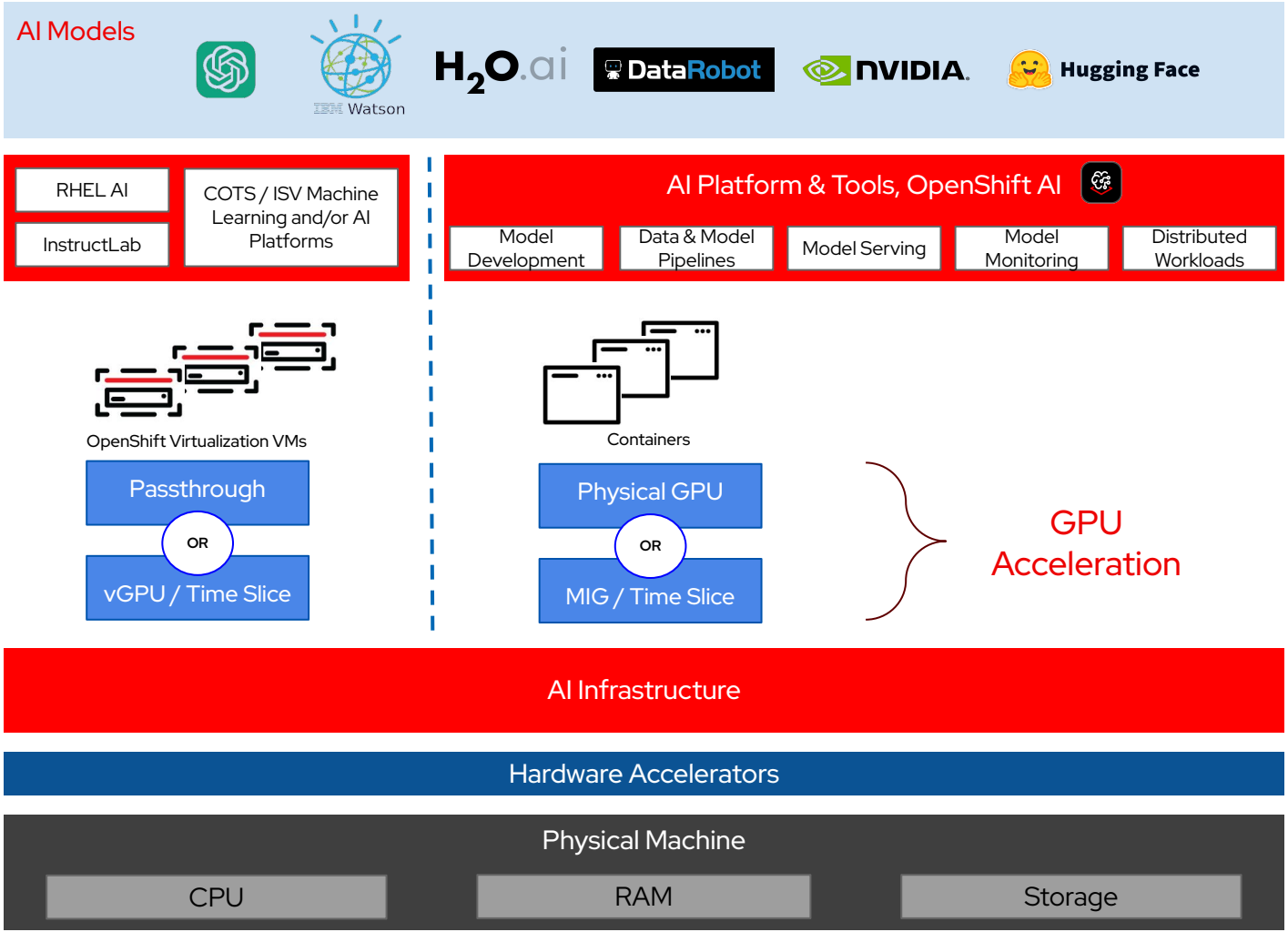
- Create turn key deployments for infrastructure teams
- Govern instance creation and enforce retirements
- Create service catalog items for ordering environments

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

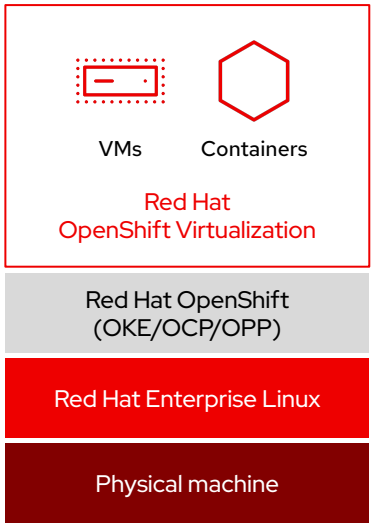


RED HAT OPENSHIFT

NVIDIA AMD intel

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

Red Hat

OpenShift Virtualization Unlocks Tangible Value

COST EFFECTIVENESS

Lower TCO

Cloud-native approach to VM manageability minus the cost of proprietary SW

RISK MANAGEMENT

Highly resilient and scalable

Manage VM fleet with single-pane of glass with modern dashboard technology

ITERATIVE MODERNIZATION

Flexibility of approach

Traditional VM behavior while VMs participate in modern DevSecOps and GitOps pipelines via Infrastructure as Code

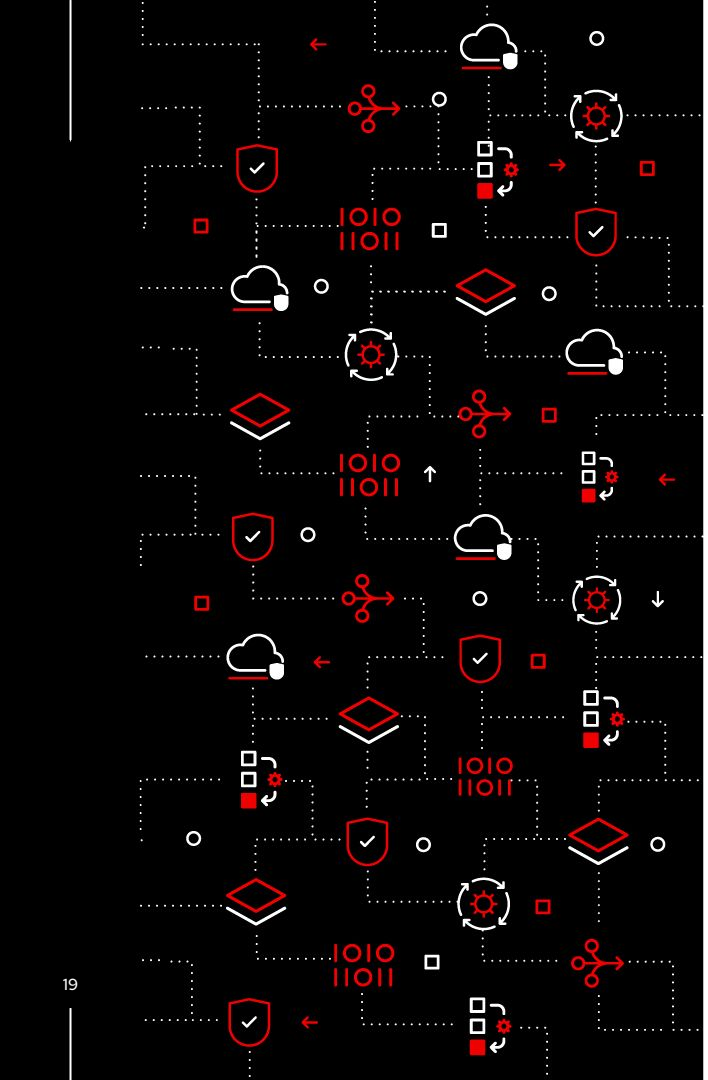
Up to 21% Higher Operational Infrastructure Efficiency*

Consistency of Management

Up to 42% reduction of Unplanned Outages*

Red Hat

*Forrester "Total Economic Impact of OpenShift Platform Plus 2023

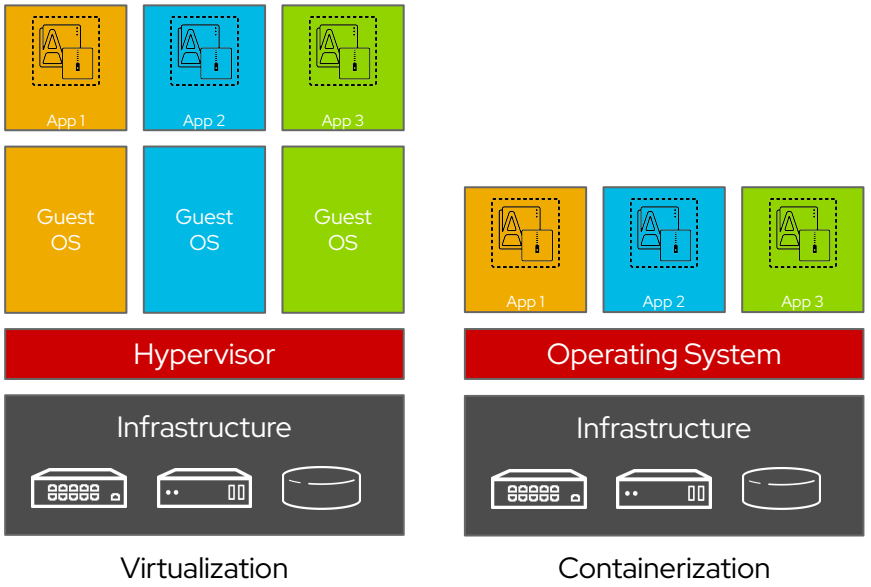


Deeper Dive into the Technology

Red Hat

Containers are not Virtual Machines

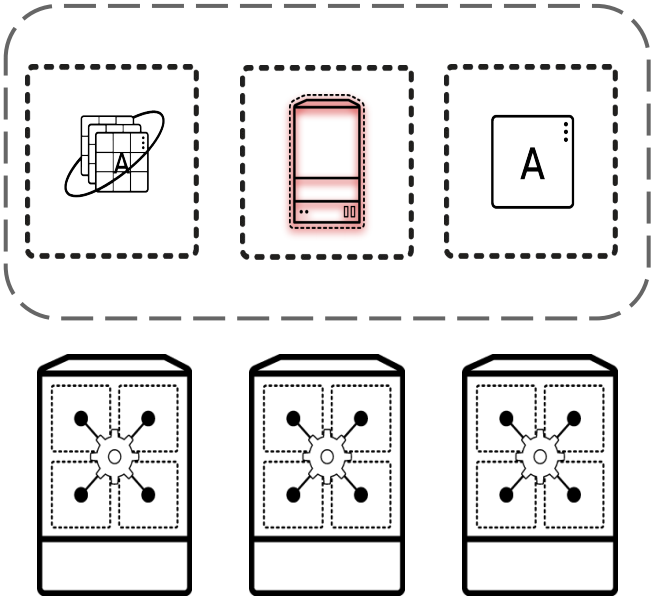
- Containers are process isolation
- Kernel namespaces provide isolation and cgroups provide resource controls
- No hypervisor needed for containers
- Contain only binaries, libraries, and tools which are needed by the application
- Ephemeral



Red Hat

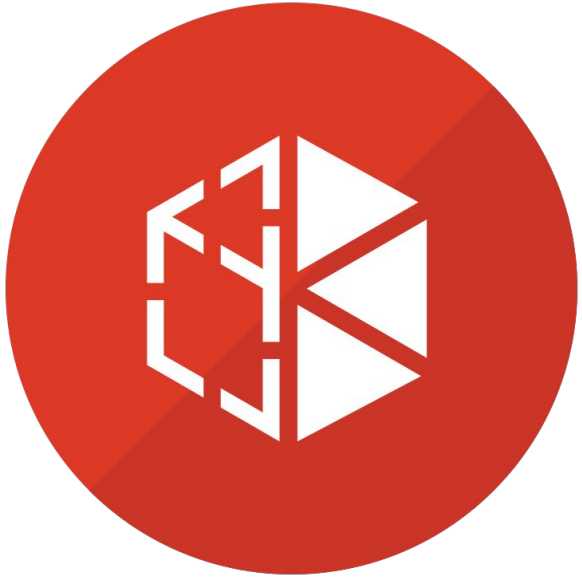
Virtual Machines can be put into Containers

- A KVM virtual machine is a process
- Containers encapsulate processes
- Both have the same underlying resource needs:
  - Compute
  - Network
  - (sometimes) Storage



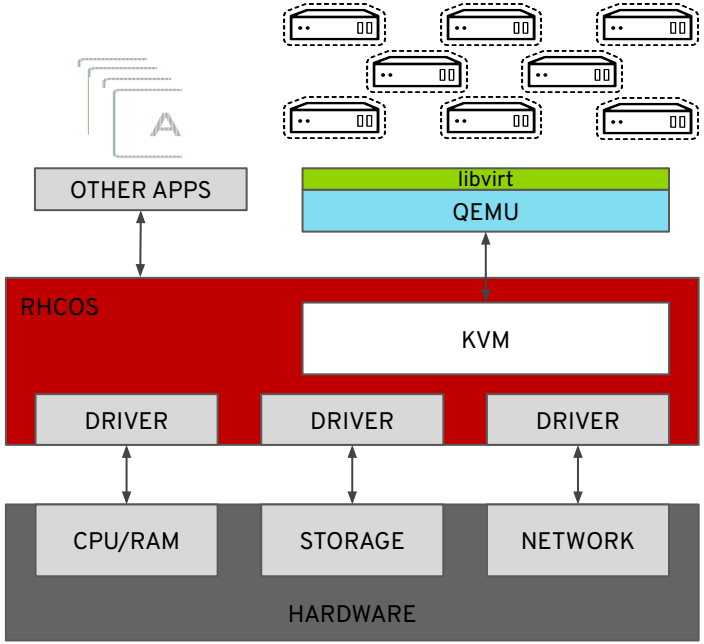
OpenShift Virtualization

- 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)



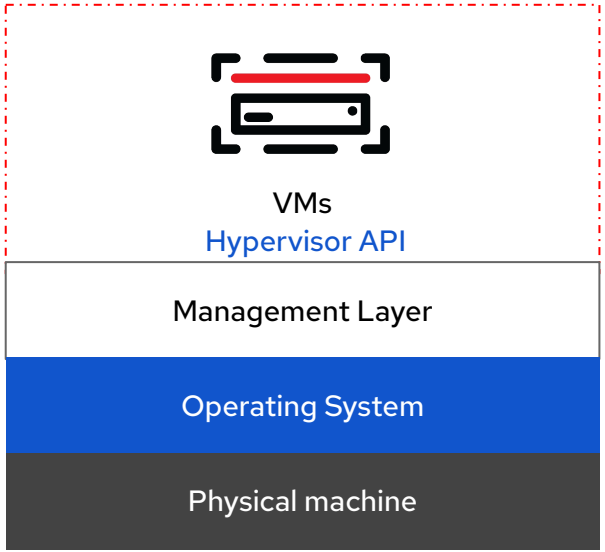
OpenShift Virtualization uses KVM

- 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



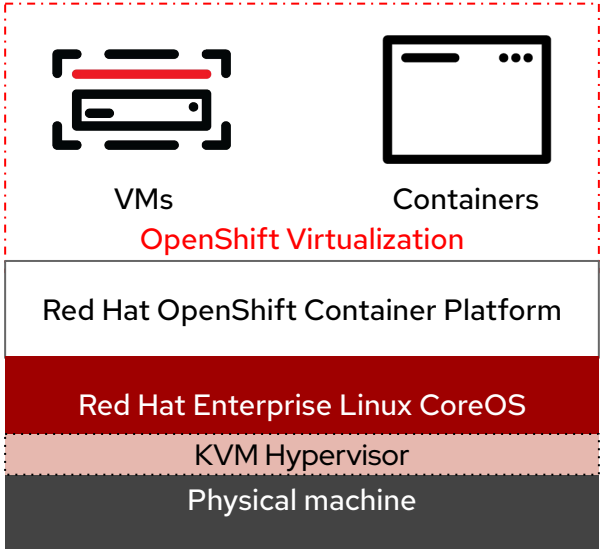
Red Hat

Traditional Type 1 Hypervisor



Red Hat

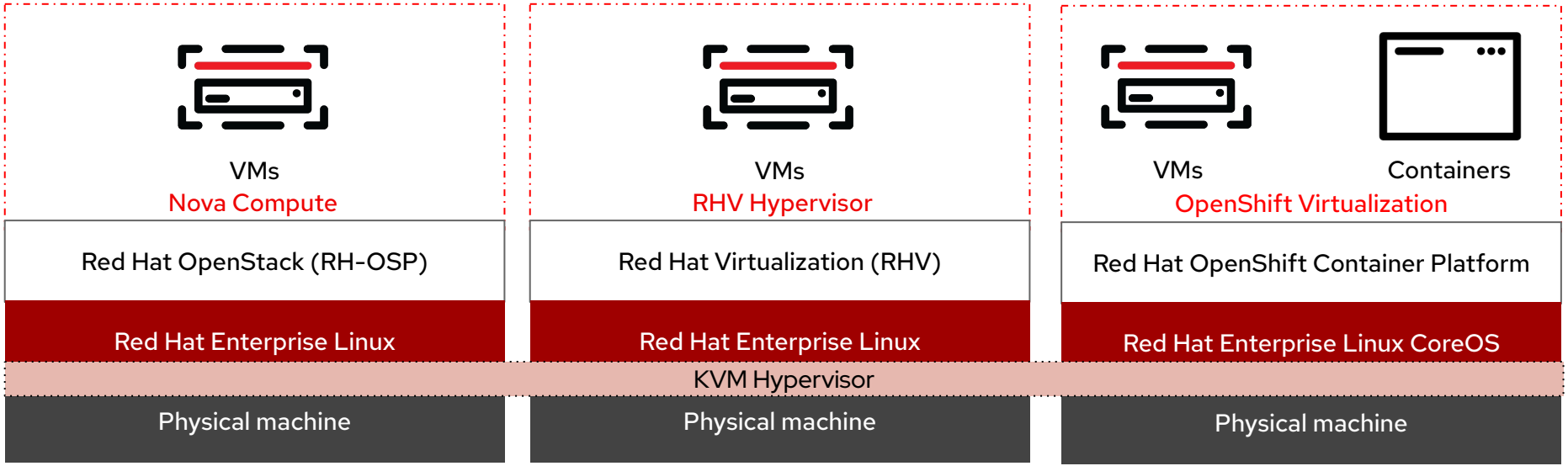
vs OpenShift Virtualization



Red Hat OpenShift

Red Hat

OpenStack vs RHV vs OpenShift Virtualization



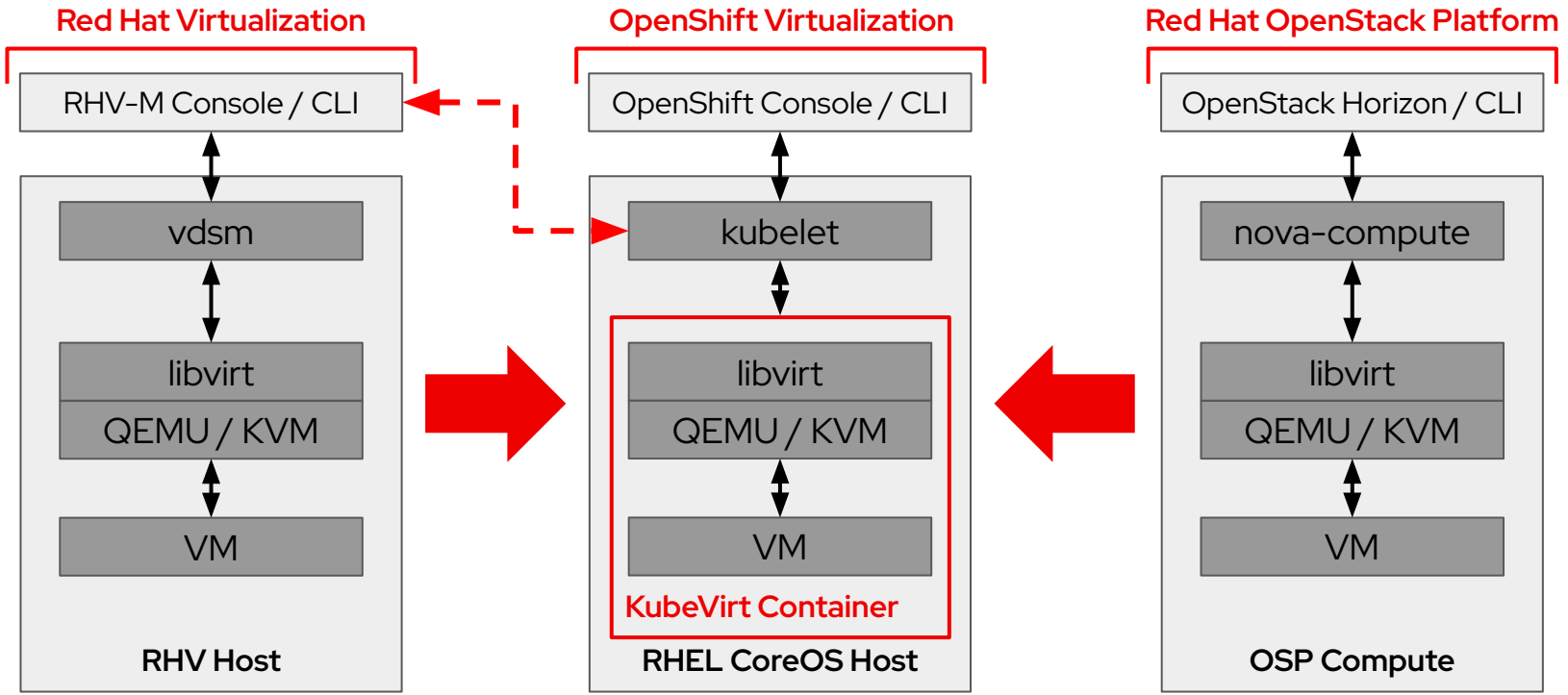
Red Hat OpenStack Platform

Red Hat Virtualization

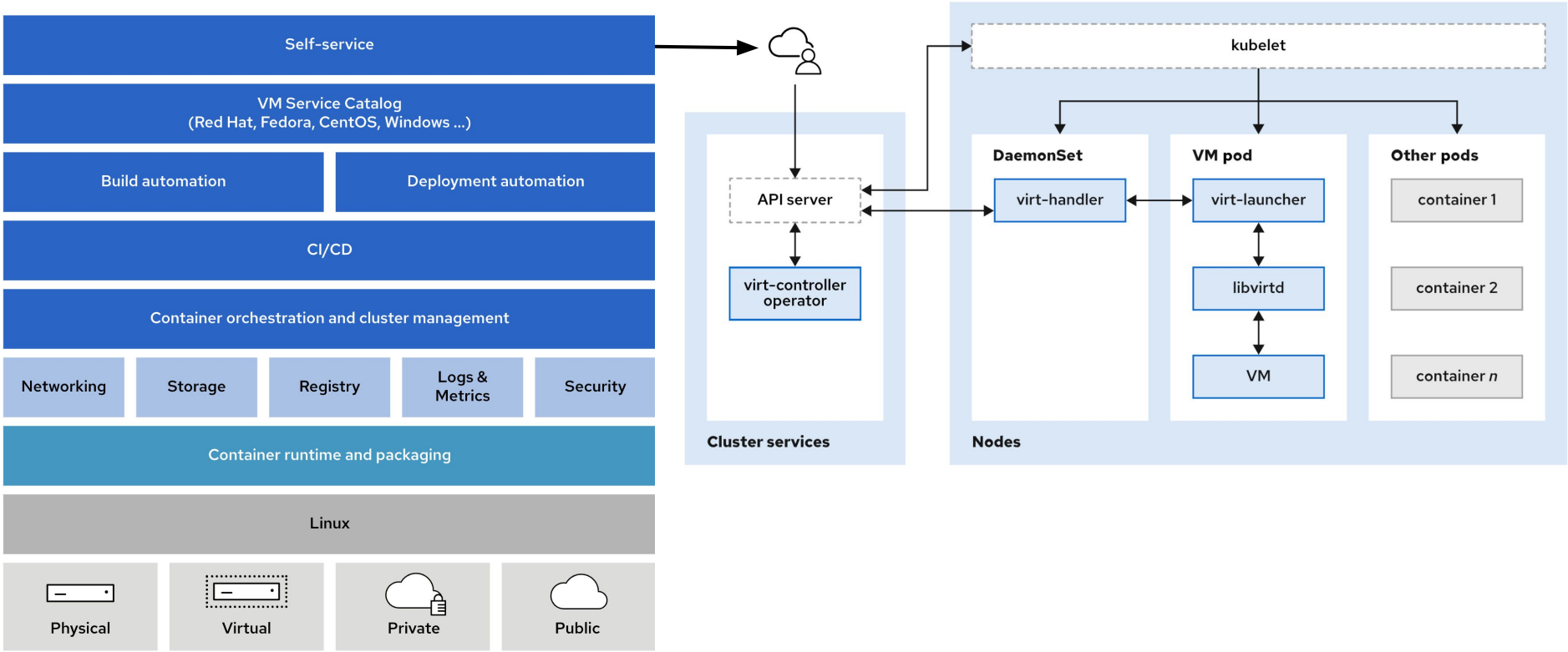
Red Hat OpenShift

Containerizing KVM

Trusted, mature KVM wrapped in modern management and automation

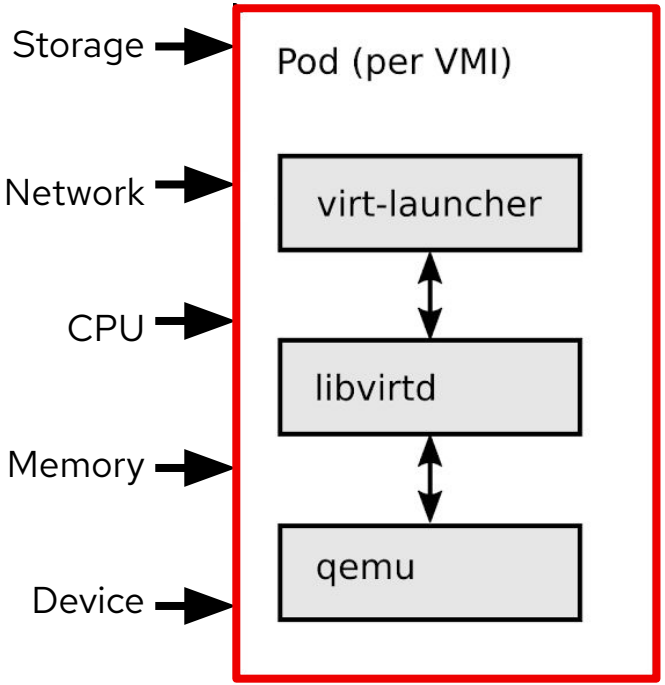


Red Hat



Architecture of the OpenShift Virtualization Operator

Containerized Virtual Machines



Kubernetes resources

- Every VM runs in a launcher pod. The launcher process will supervise, using libvirt, and provide pod integration.

Red Hat Enterprise Linux

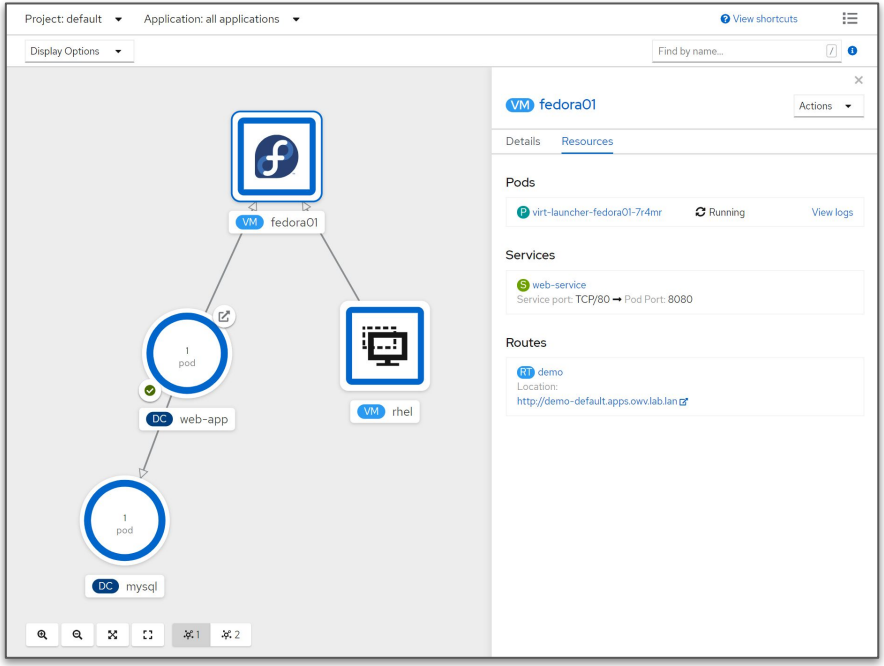
- libvirt and qemu from RHEL are mature, have high performance, provide stable abstractions, and have a minimal overhead.

Security - Defense in depth

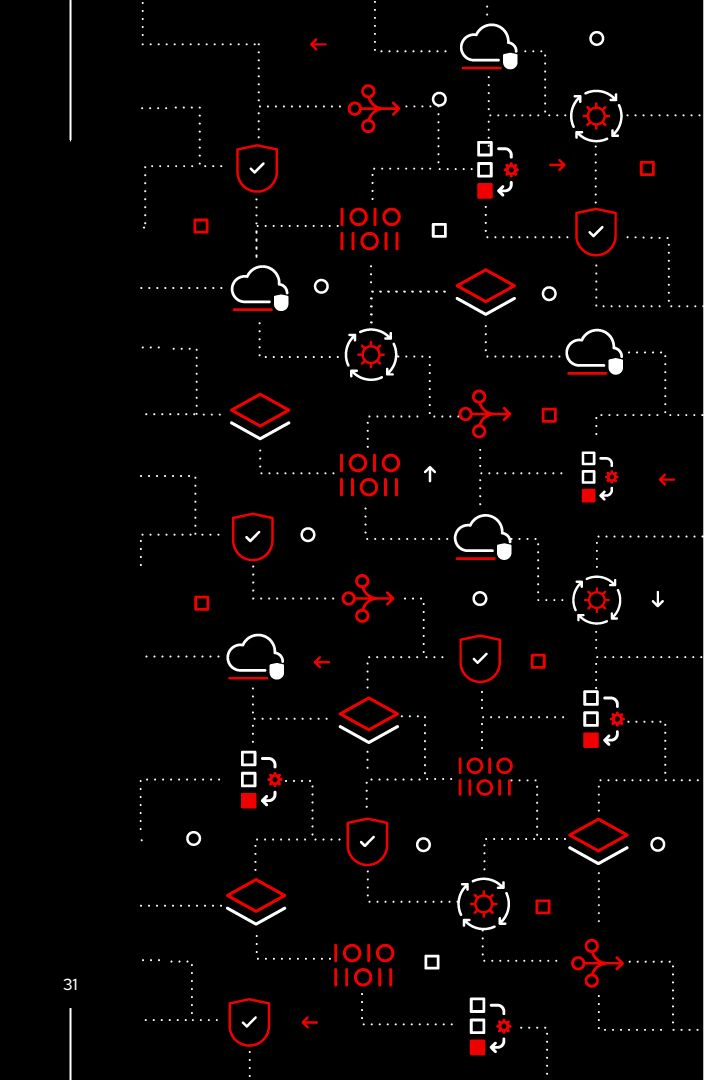
- Immutable RHCOS by default, SELinux MCS, plus KVM isolation - inherited from the Red Hat Portfolio stack

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



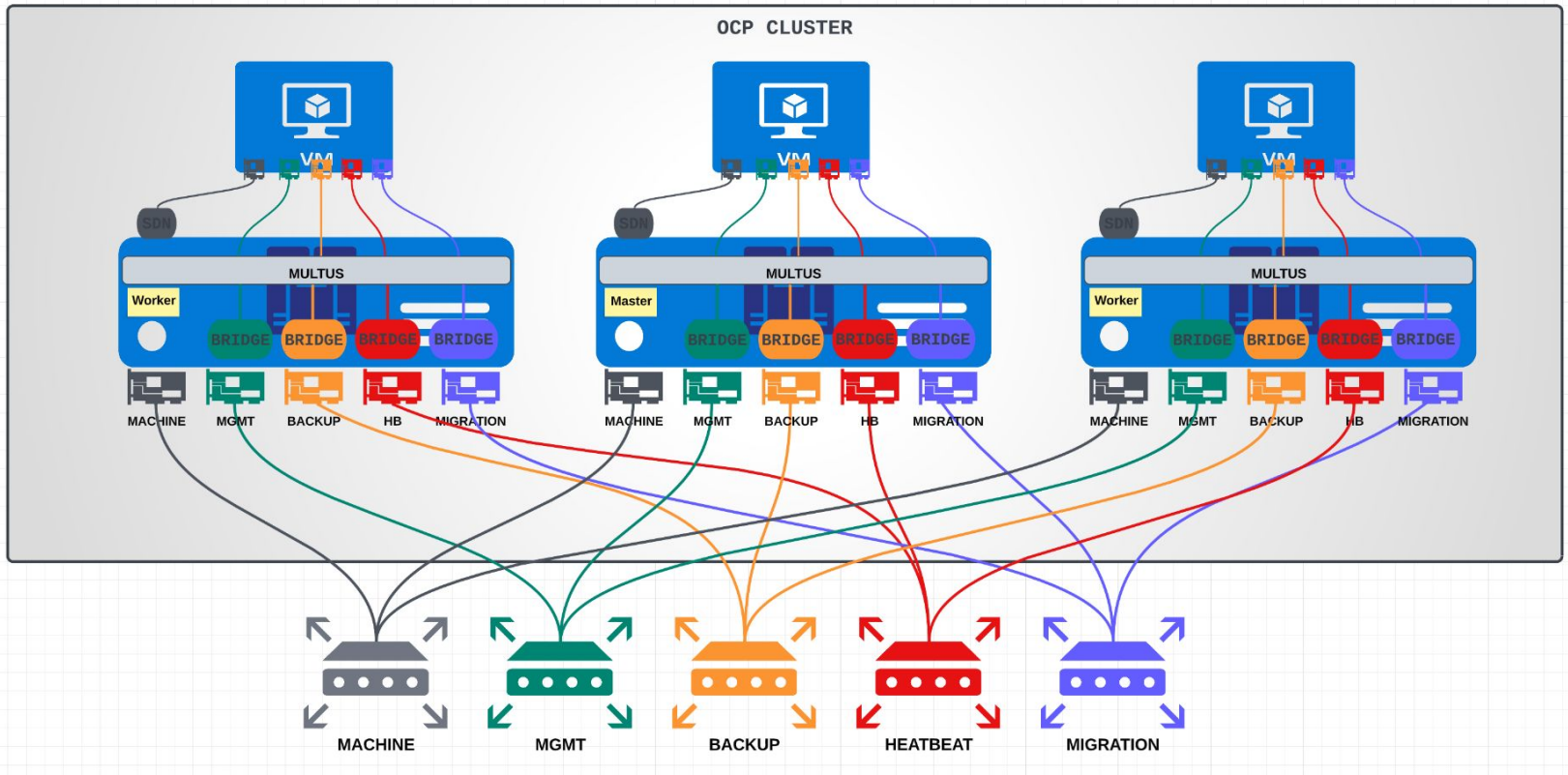
Red Hat



Networking

Red Hat

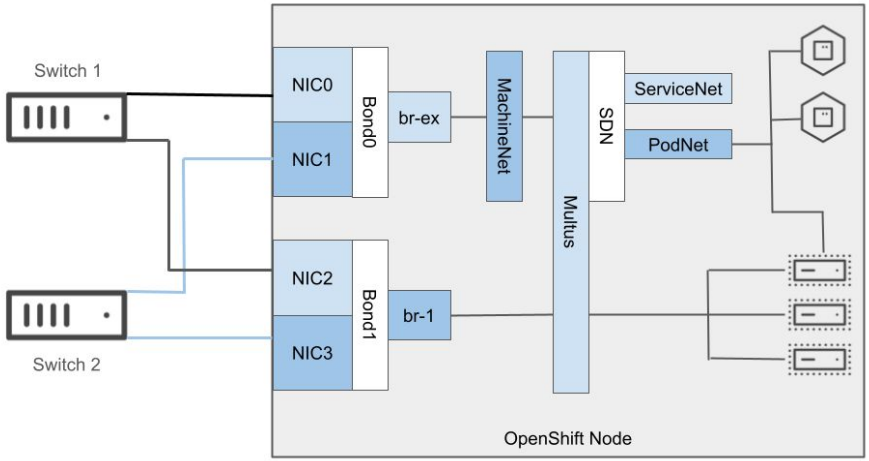
VM Multi-NIC High Level Architecture



Red Hat

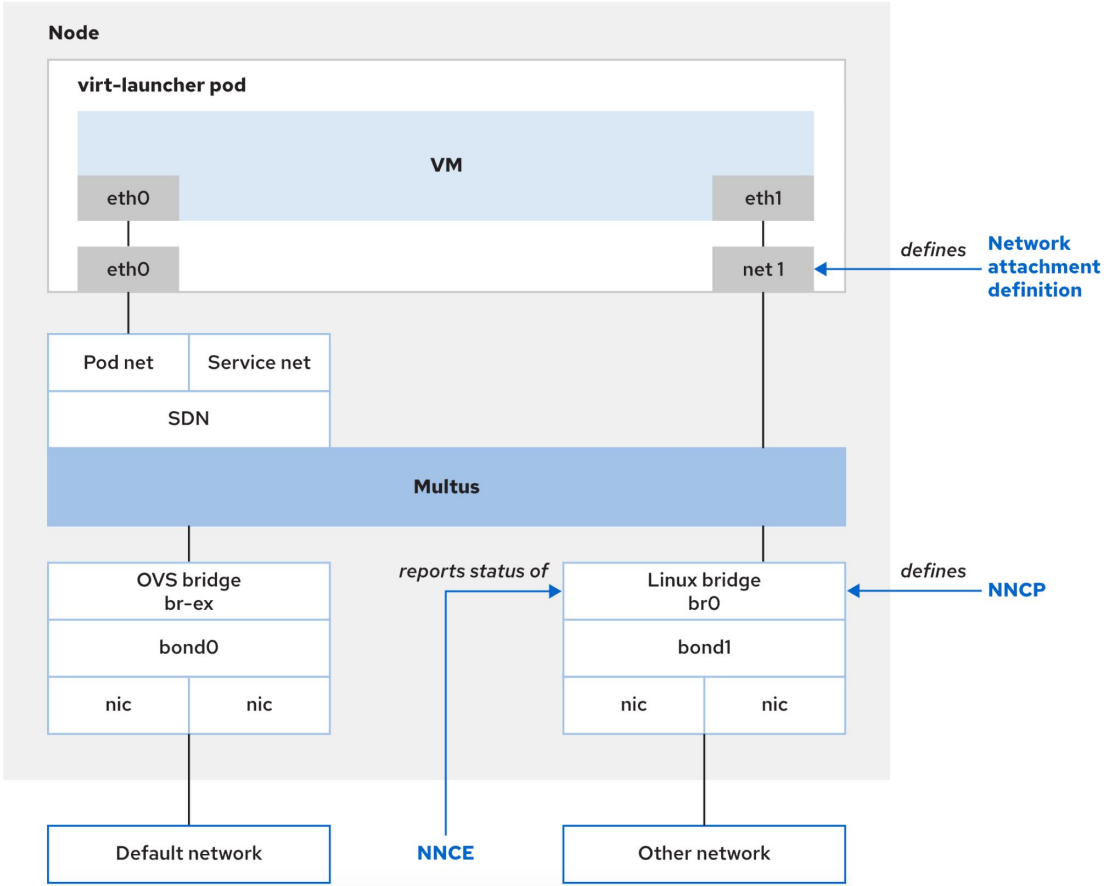
Physical Host Configuration, VM Connectivity

- 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



Red Hat

Linux Bridge Node Networking with Multus and Kubernetes NMState



Red Hat

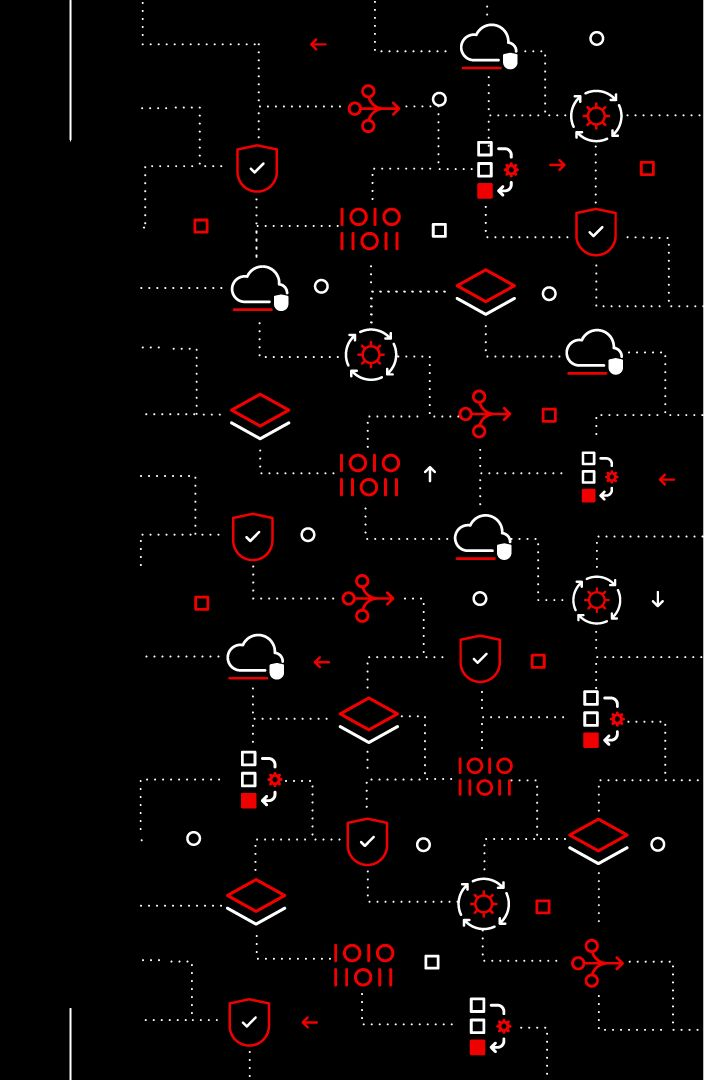
VM Networking in OpenShift Virtualization

- 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

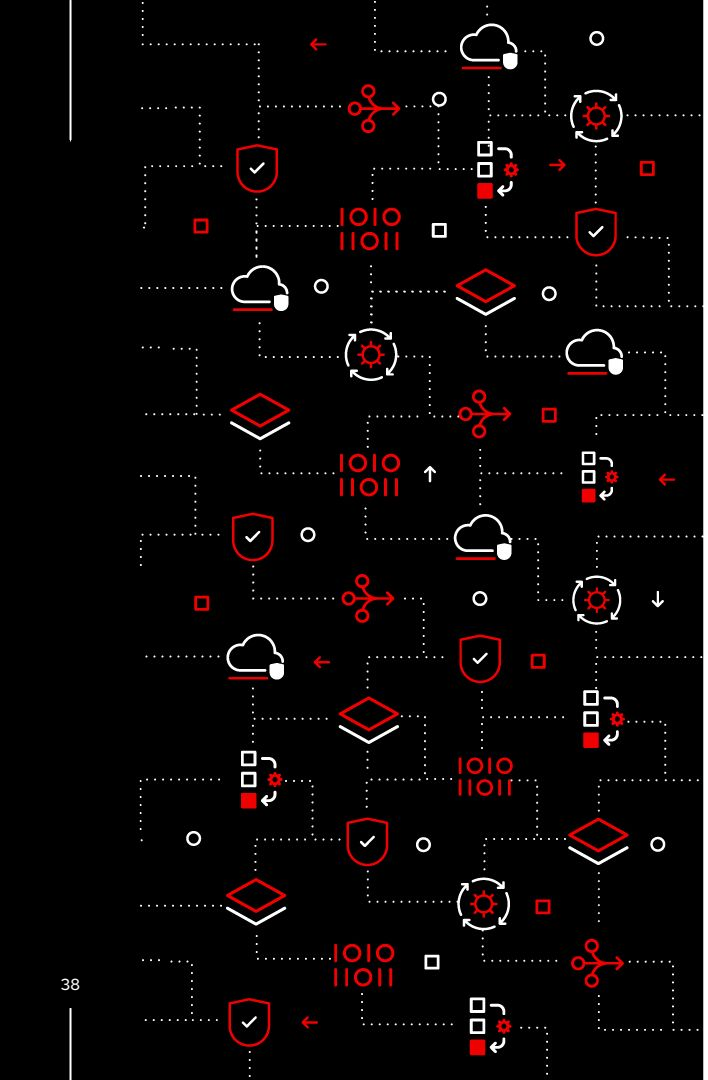
OpenShift Virtualization Prior to 4.17+

- 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



Lunch Break

Red Hat



Storage

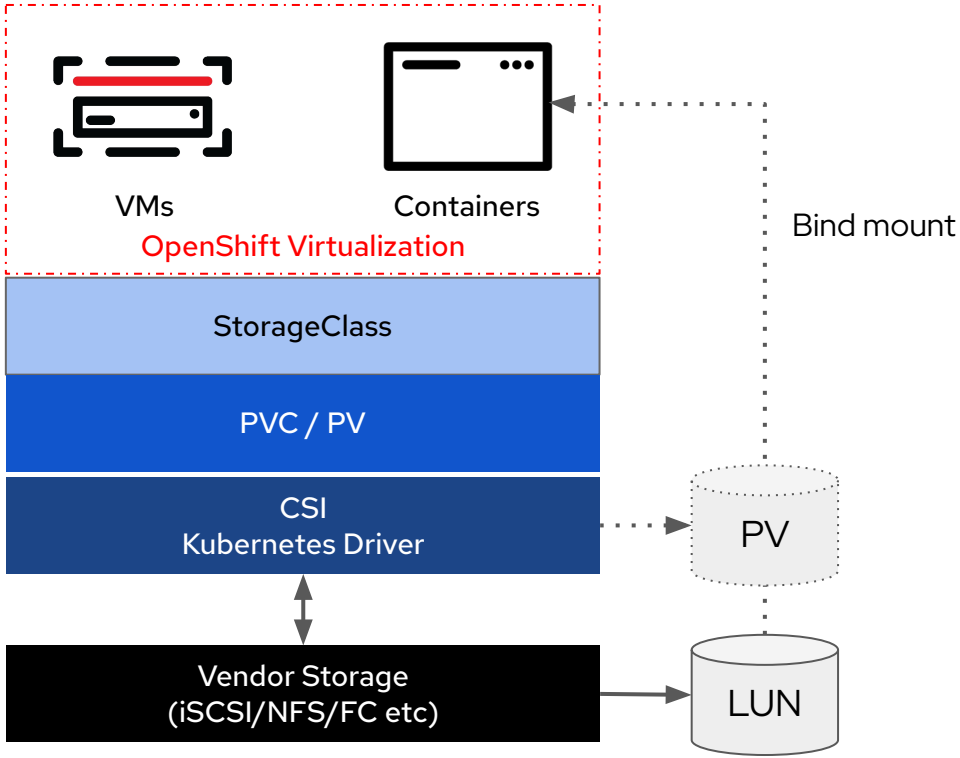
Red Hat

Policy Based Storage

Red Hat OpenShift

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

Request: Block, 10GB
Read-Write Many



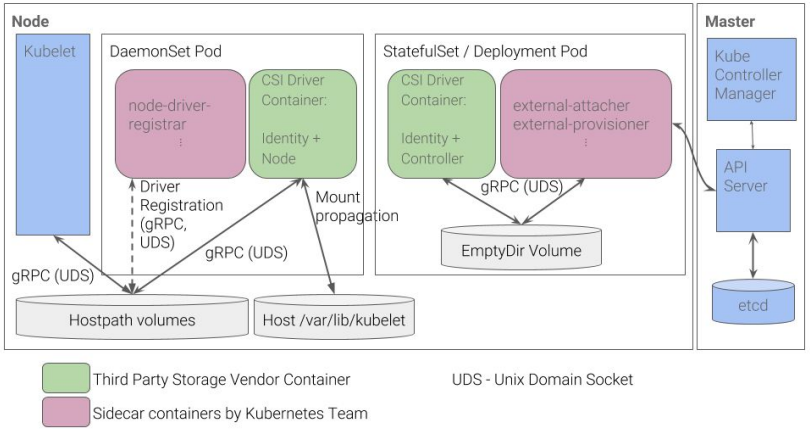
Red Hat

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.



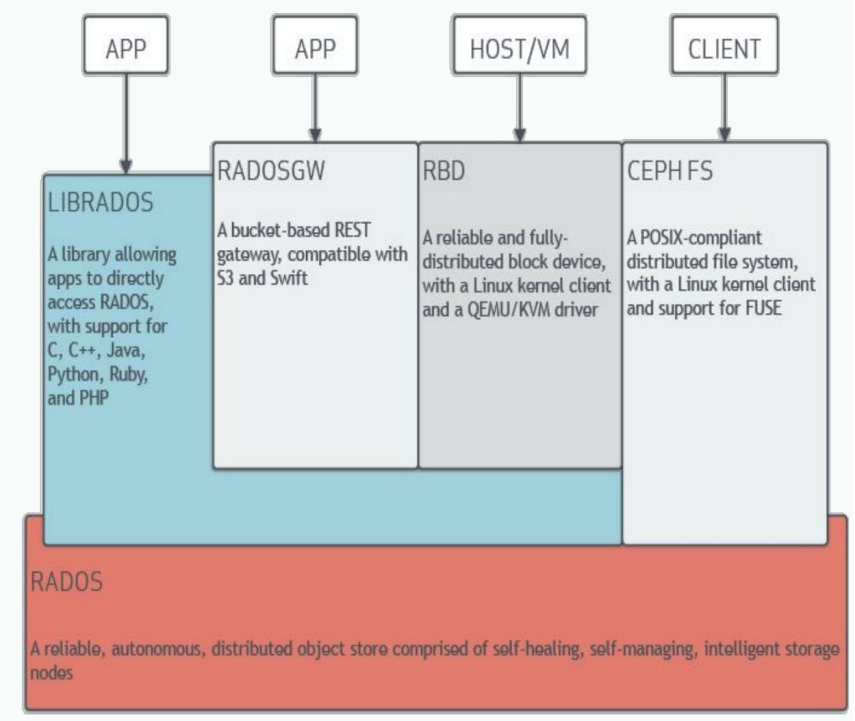
CONTAINER STORAGE INTERFACE

Red Hat

ceph

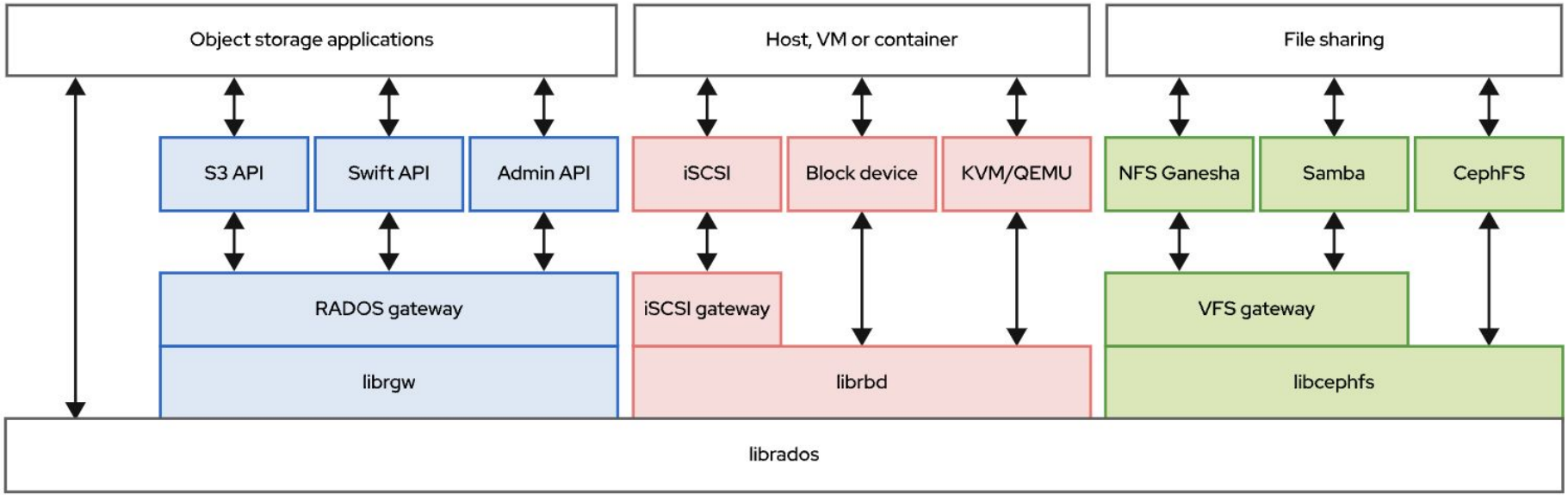
- CEPH is an open source, massively scalable, intelligent, reliable and highly available distributed software defined storage solution

- It is an all in one unified storage system, supporting
  - Object Storage: RADOS GATEWAY (RGW)
  - Block storage: RADOS Block Device (RBD)
  - Filesystem: Ceph Filesystem (CephFS)



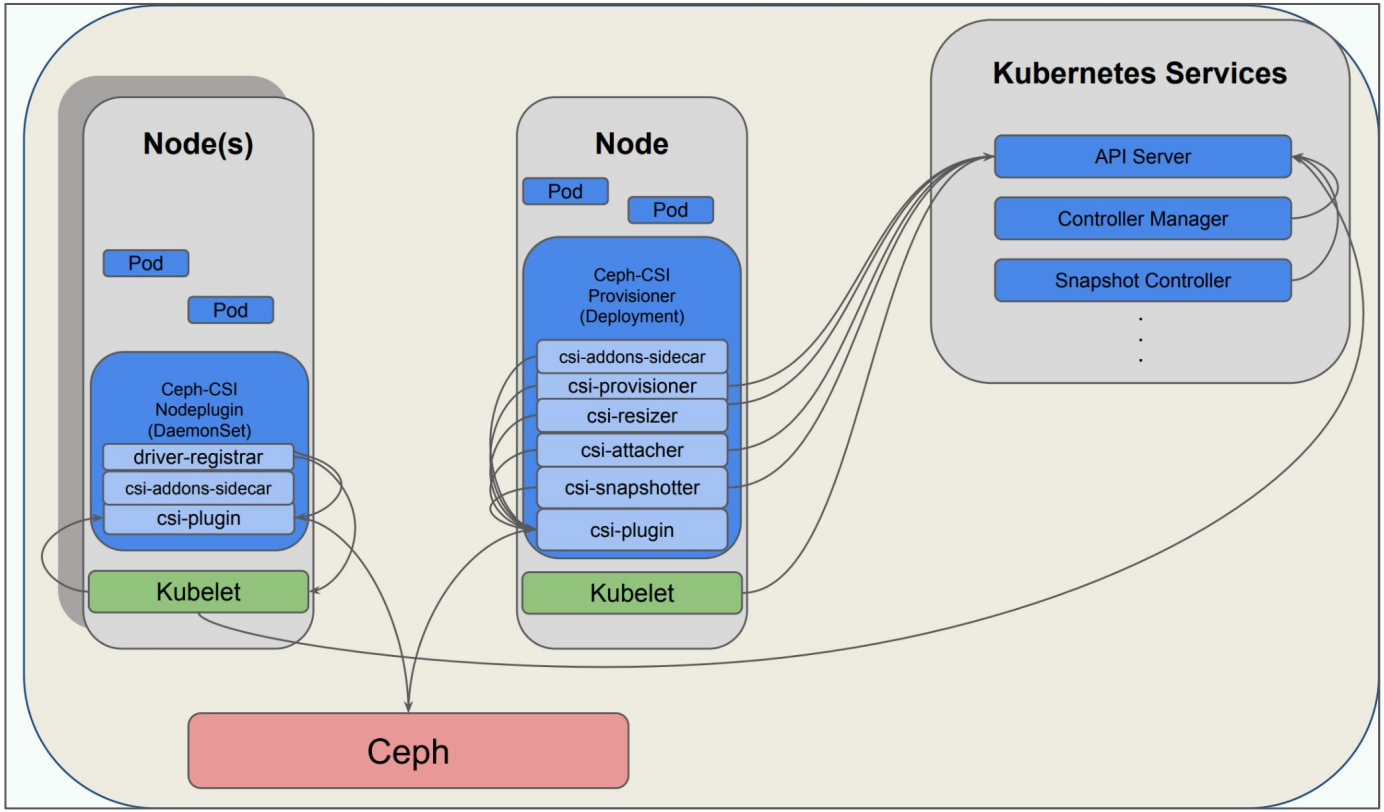
Red Hat

CEPH Components



Red Hat

CEPH CSI

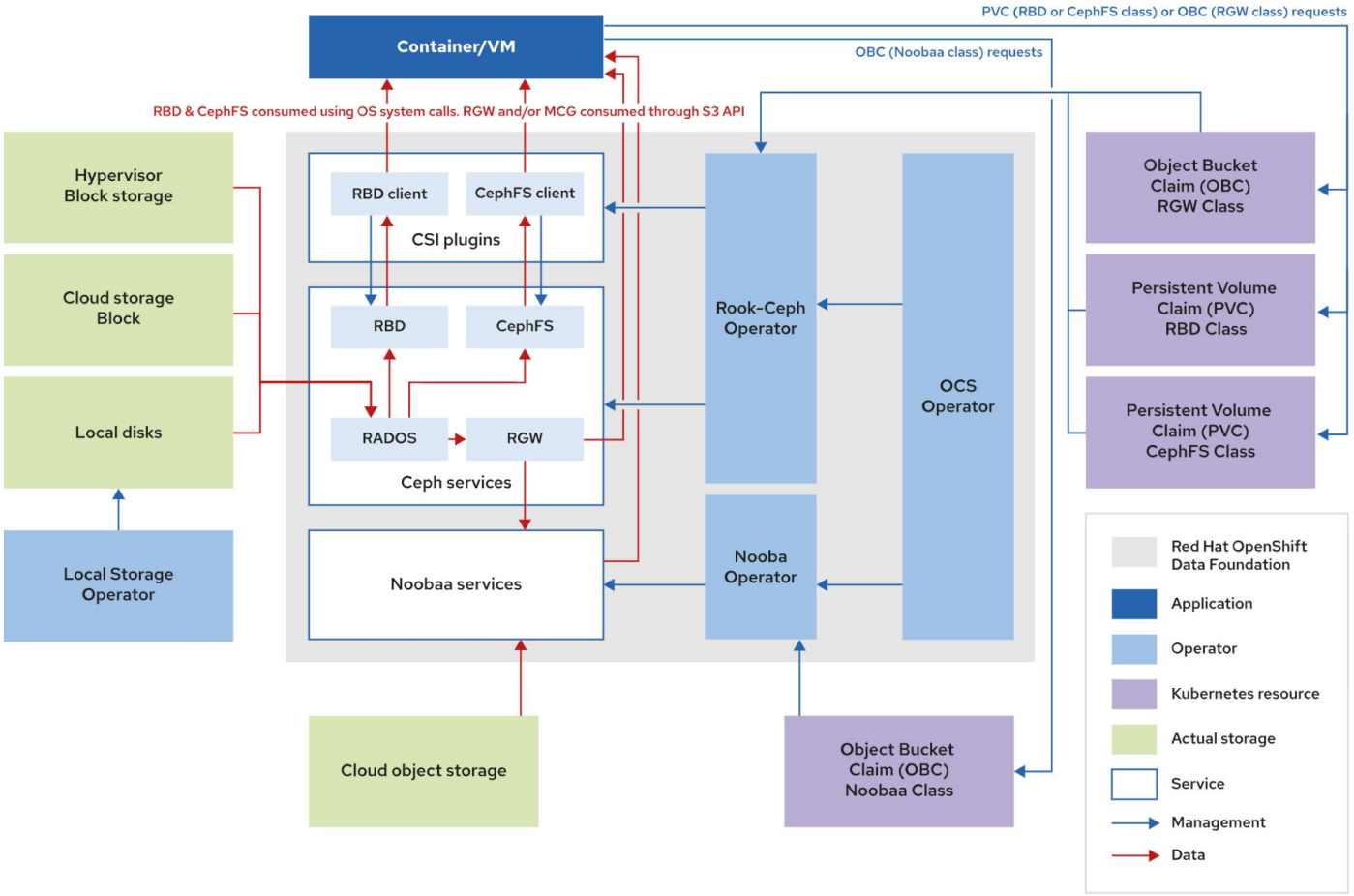


CEPH CSI Driver:

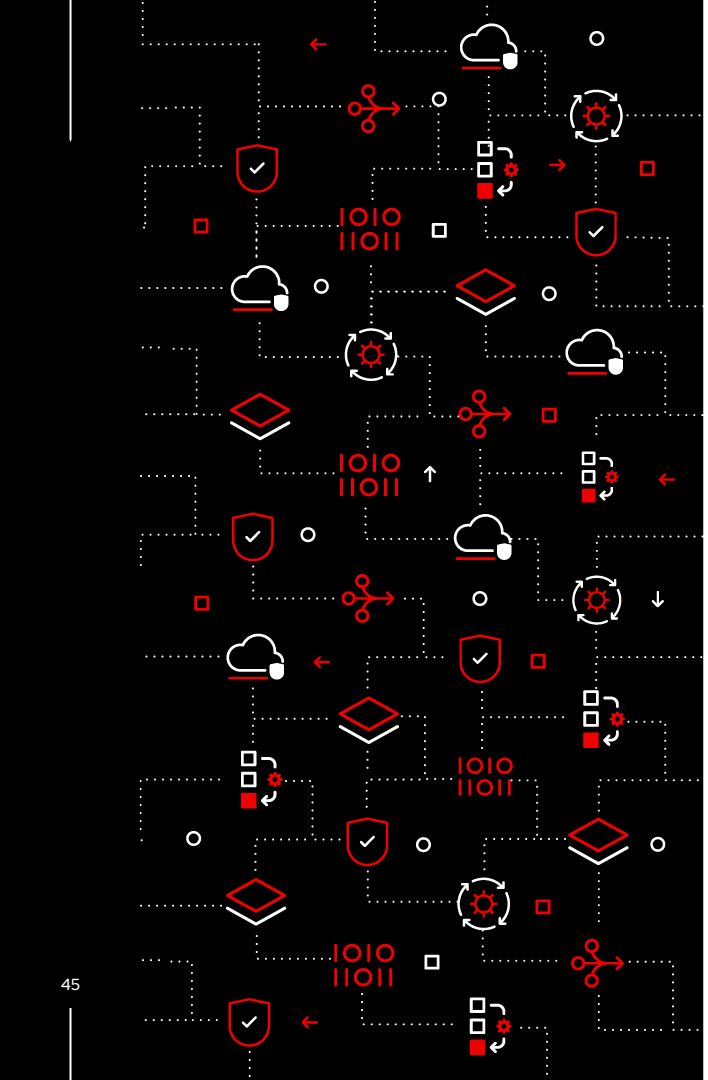
- Provisioner Deployment
  - For Volume / Snapshot Creation, Expansion and Deletion
  - Usually deployed with count 2 and leader election enabled for HA
- Nodeplugin Daemonset
  - For Volume Mounting and Unmounting
  - Deployed one per node

Red Hat

OpenShift Data Foundation Architecture Overview



Red Hat



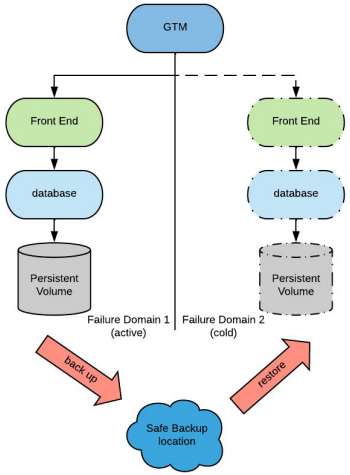
DR / HA

Red Hat

High-level DR Approaches

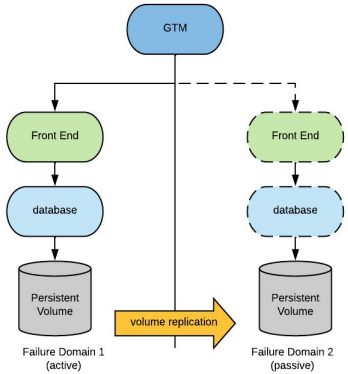
Failure Domain is either a data center or a cloud region

Active/Passive



Backup / Restore

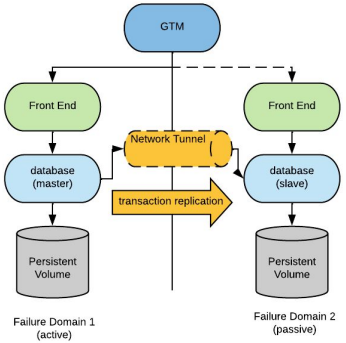
RPO ~= frequency of backup
RTO ~= hours



Storage-layer Replication

Asynchronous:
- RPO ~= unbounded (typically ms)
- RTO ~= typically minutes *

Synchronous:
- RPO = 0
- RTO ~= typically minutes*

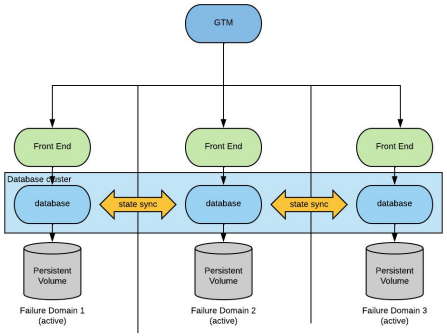


Application-layer Replication

Asynchronous:
- RPO ~= unbounded (typically ms)
- RTO ~= typically minutes *

Synchronous:
- RPO = 0
- RTO ~= typically minutes*

Active/Active



Distributed Stateful Workloads

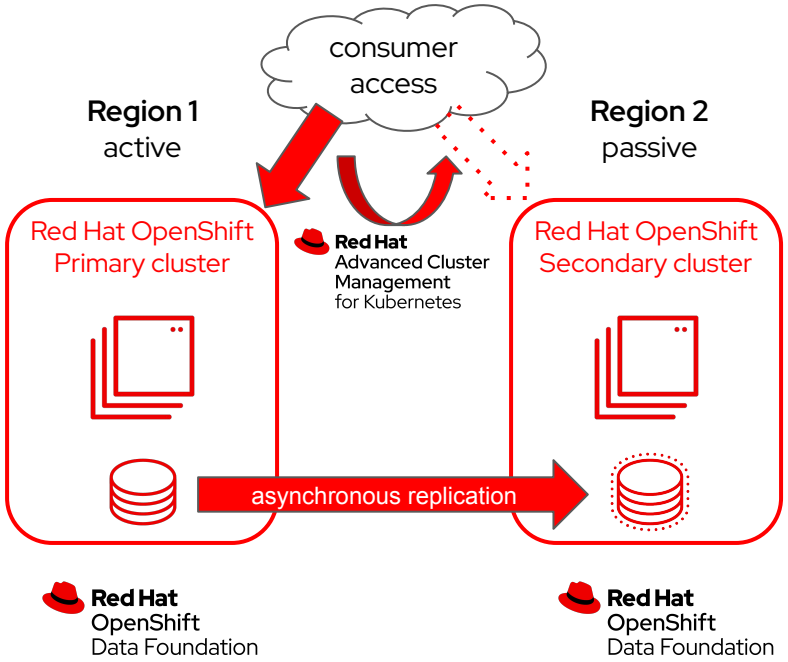
Strong Consistency:
- RPO = 0
- RTO ~= seconds

Eventual Consistency (**)
- RPO ~= 0
- RTO ~= seconds

(*) a database can take an unbounded amount of time to recover from a crash consistent volume
(**) eventual consistency does not imply eventual correctness

Red Hat

Red Hat OpenShift-Regional Disaster Recovery

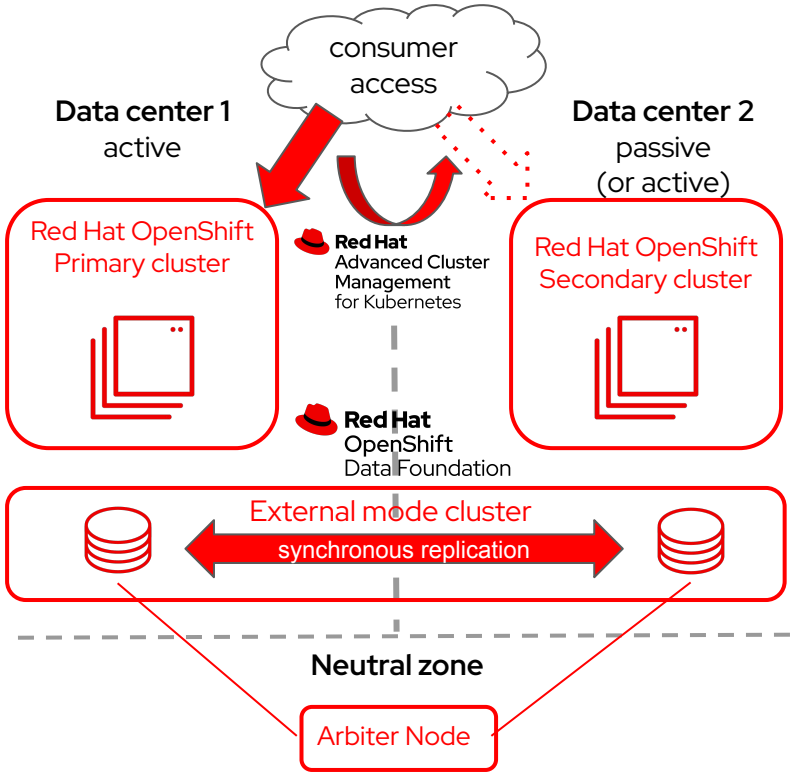


Protection against geographic scale disasters

- 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



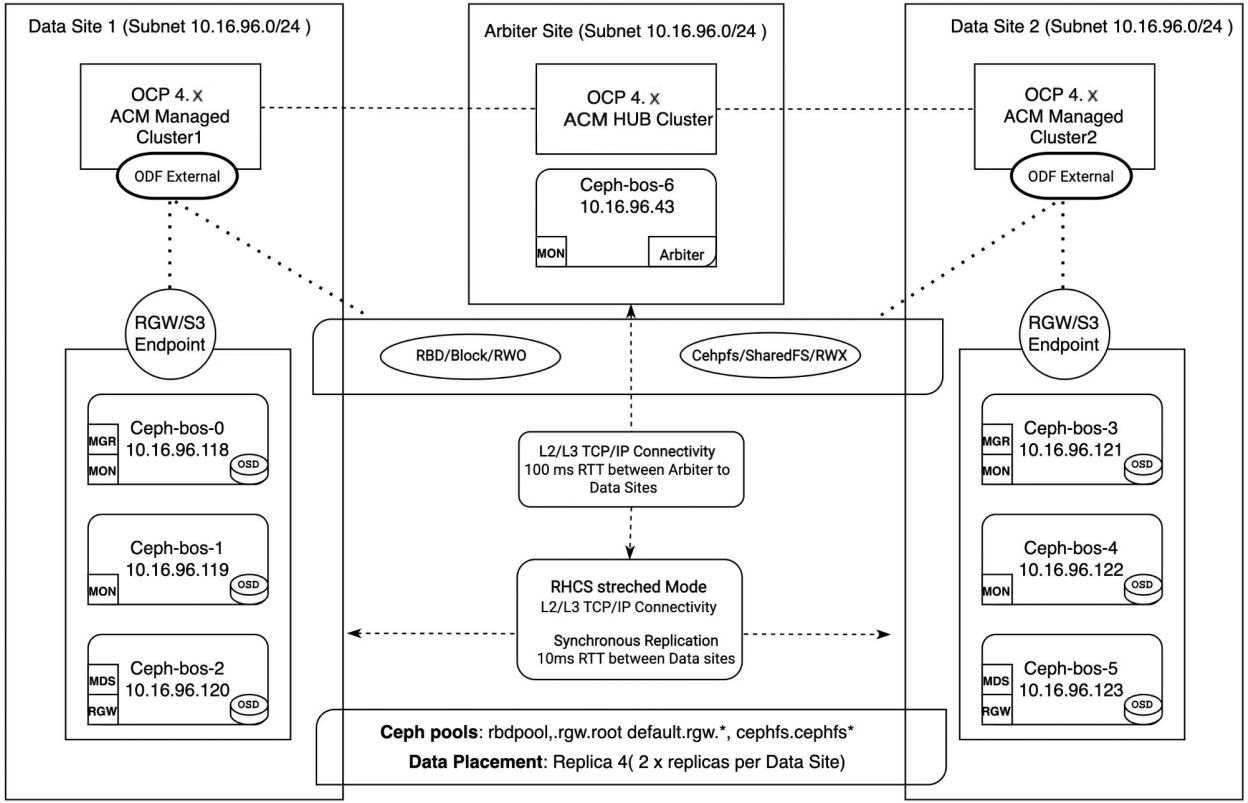
Protection against data loss across multiple clusters with Metropolitan disaster recovery

- 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

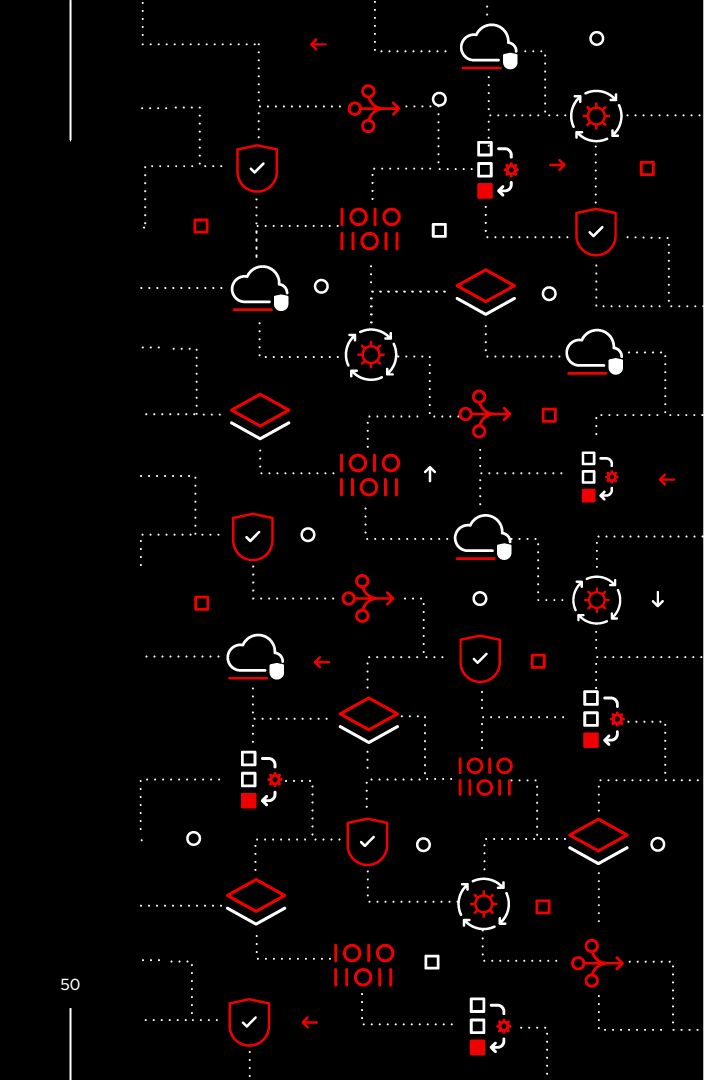
Red Hat

Disaster Recovery for Red Hat OpenShift workloads

Stretched Ceph Storage Deployment Architecture



Red Hat



Migration from VMware

Red Hat

Red Hat
OpenShift

OpenShift Virtualization Capabilities and Workflow Mapping to VMware: A Rosetta Stone

North American OpenShift Consulting Practice

Red Hat and Partners only

****Presentation** to Customers **only**. Do Not Leave Behind With Customer**

Red Hat
Learning

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 (See Slide 11 & Slide 12)	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

Workflow Mapping

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

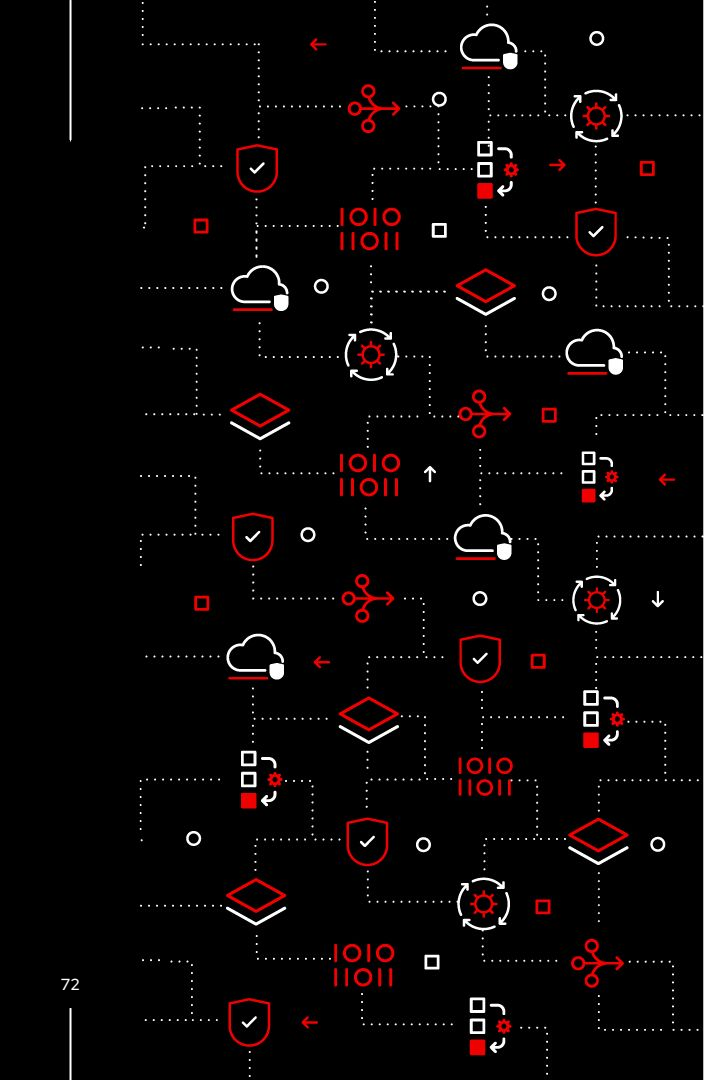
	OpenShift	VMware
Hosting pods on hypervisor nodes	Pods and VMs are native peers, there is no difference between them with OpenShift Virtualization	vSphere with Kubernetes allows “native” Pods to be deployed against the cluster, however they are still running using a VM shim
Efficient cluster provisioning	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



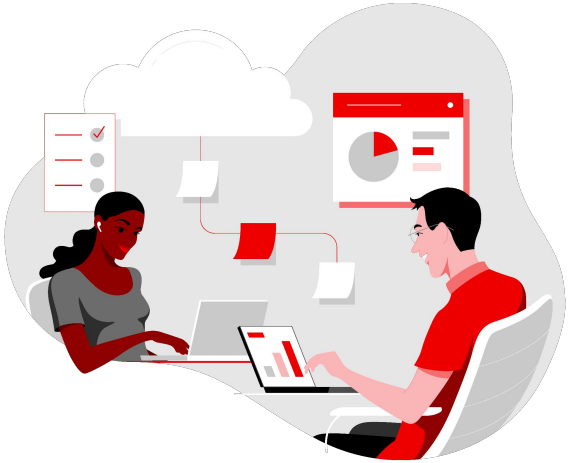
Migration Factory

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

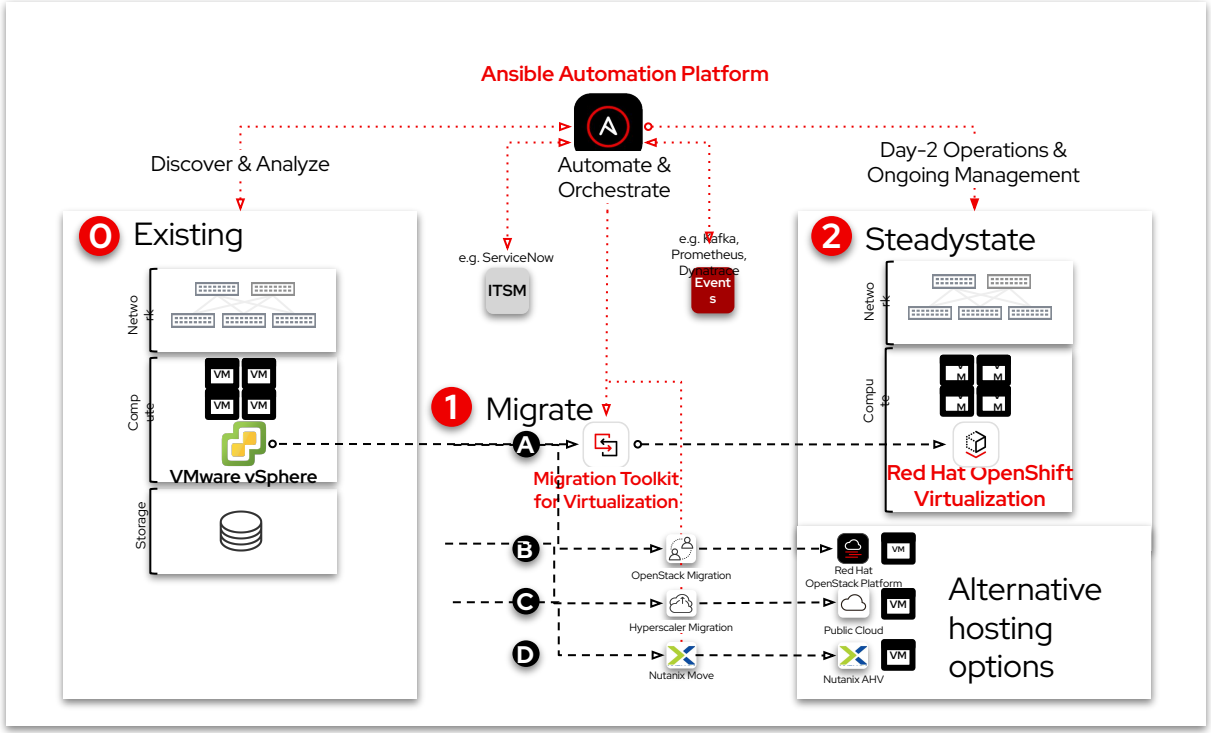
Accelerating Migrations at Scale with AAP

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.

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



Red Hat Learning

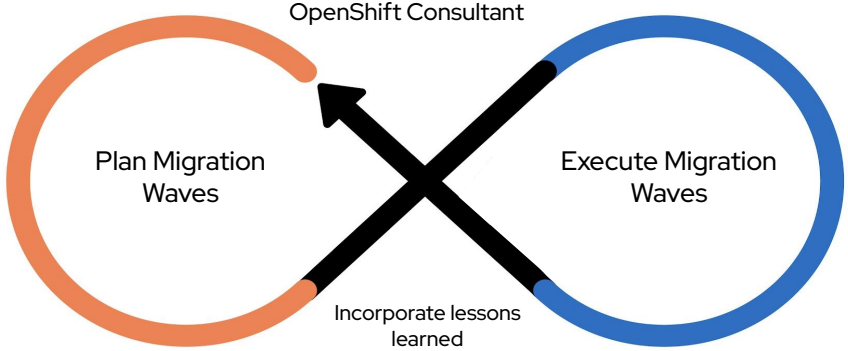
Squad Model

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

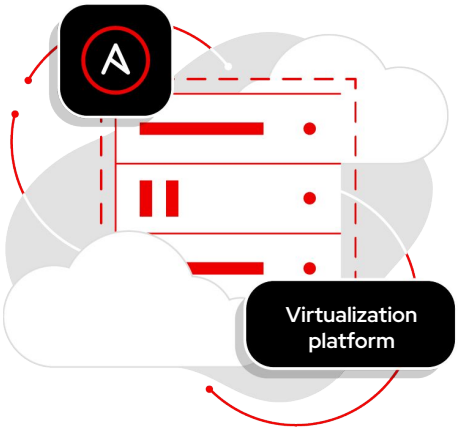
Red Hat Learning

Collection Overview

Accelerating Engagement with the Ansible for OpenShift Virtualization Migration Content Collection

Red Hat Services supports customers at every stage of their **Virtualization Migration journey.** Helping organizations in managing costs and minimizing risks by prioritizing, planning, migrating, and ultimately retiring legacy virtual machine (VM) workloads. This approach lays the groundwork for accelerated application modernization in the future.

Ansible for OpenShift Virtualization Migration Content Collection accelerates this process by leveraging the power and flexibility of Ansible automation. Developed by Red Hat Consultants, **automates key steps**, from assessment to execution and Day 2 operation in line with the Virtualization Migration Factory (VMF) Solution.



This collection will first be **deployed in pilot consulting engagements**, followed by a robust launch in early Q3 of 2025 for partners eager to provide their own migration services. Customers are strongly encouraged to utilize Red Hat and partner migration services as the recommended starting point for their migration journey.

Red Hat

How Services Leverage the Collection

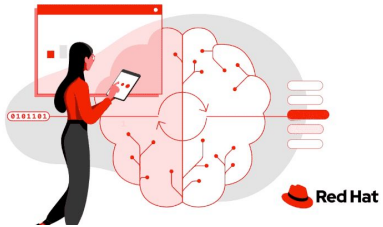
Pilot Resources

A new content collection for OpenShift Virtualization Migration is now available in the Automation Hub. Currently **in pilot**, it is meant for **targeted consulting engagements with specific customers**. This collection enhances the Ansible Automation Platform and OpenShift Virtualization subscriptions through a services-led approach. (Internal use only).

You can find the download link for collection, along with key resources such as documentation and relevant information, on the solution's Source page.

https://source.redhat.com/projects_and_programs/ansible_for_openshift_virtualization_migration

Red Hat



Ready to Migrate, Ready to Scale

Virtualization Migration Assessment (VMA) First!!

VMA Comes First – Understand Before You Automate

The VMA is the discovery and scoping phase. It helps identify:

- What workloads are being migrated
- The source/target infrastructure details
- Application dependencies, complexity, and risks
- This phase produces the insights needed to plan and design the migration properly.

The Collection is Leveraged for Migration Tasks

Once the migration is scoped and planned via the VMA, the Ansible Collection is used to:

- Automate migration steps (e.g., VM export/import, network/storage configuration)
- Ensure repeatable, reliable processes across large-scale environments
- Support both Red Hat Consulting and partner-led migrations

Controlled Usage – Not for Self-Service

The collection **is validated (not certified)**, meaning:

- It works as tested but is not officially supported by Red Hat Support
- It is **highly recommended to be used by trained consultants/partners – not end customers directly.**
- Messaging around the collection always points back to using Red Hat Consulting or certified partners

Red Hat

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.

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

Agenda Day 1

09:00 - 10:15

- Welcome and Introductions
- Sales Motion and Getting the Technical Win (GTM Strategy)
- ISV Overview

10:30 - 12:00

- All the Labs were presented and explained by the facilitator, with no hands-on for the attendees
- LAB - OpenShift Virtualization Basics
- LAB - Network Management
- LAB - Storage Management Lab

12:00 - 13:00 Lunch

13:00 - 14:45

- LAB - Introduction to virtual machine customization
- LAB - GitOps

14:45 - 15:00 BREAK

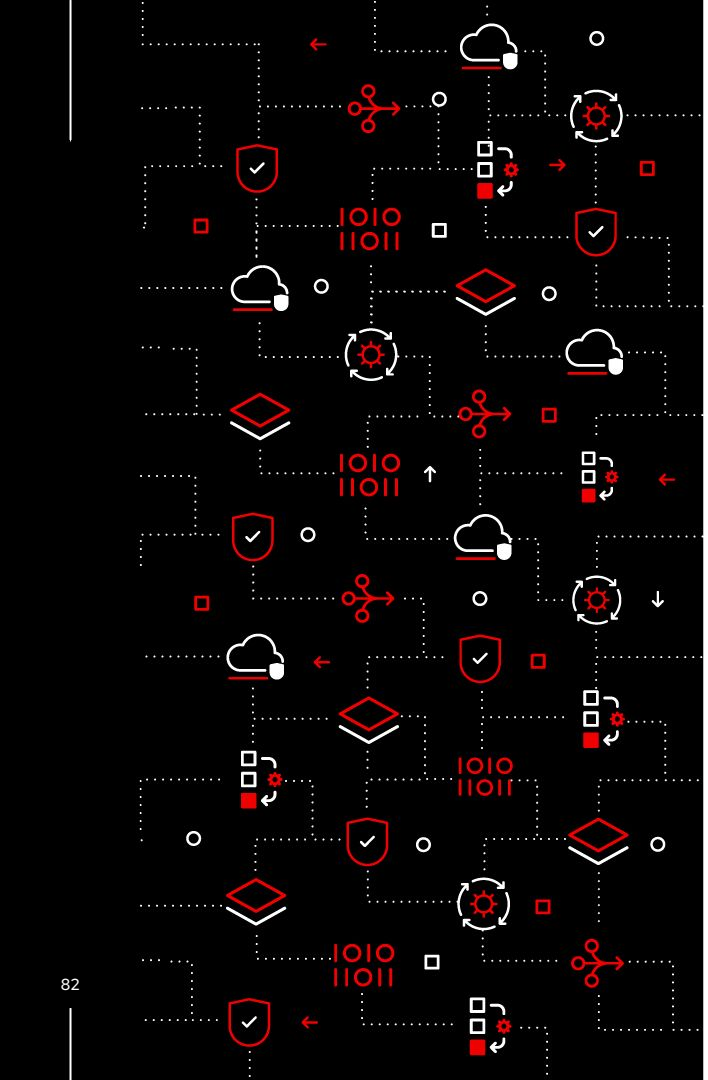
15:00 - 16:00

- VMware vSphere Overview Presentation
- VMware to OpenShift Presentation

16:00 - 17:00

- Migration Factory
- Deep Dive on the Migration Factory offering
- OpenShift Virtualization Ansible Migration Factory Demo

Red Hat



End of Day One

Red Hat

Red Hat OpenShift Virtualization

DeepDive Day two

Alfred Bach
Principal Learning and Development Instructor

Agenda Day 1

09:00 - 10:15

- Welcome and Introductions
- Sales Motion and Getting the Technical Win (GTM Strategy)
- ISV Overview

10:30 - 12:00

- All the Labs were presented and explained by the facilitator, with no hands-on for the attendees
- LAB - OpenShift Virtualization Basics
- LAB - Network Management
- LAB - Storage Management Lab

12:00 - 13:00 Lunch

13:00 - 14:45

- LAB - Introduction to virtual machine customization
- LAB - GitOps

14:45 - 15:00 BREAK

15:00 - 16:00

- VMware vSphere Overview Presentation
- VMware to OpenShift Presentation

16:00 - 17:00

- Migration Factory
- Deep Dive on the Migration Factory offering
- OpenShift Virtualization Ansible Migration Factory Demo

Red Hat

Agenda Day 2

09:00 - 10:00

- Showcase of the VMA

10:00 - 12:00

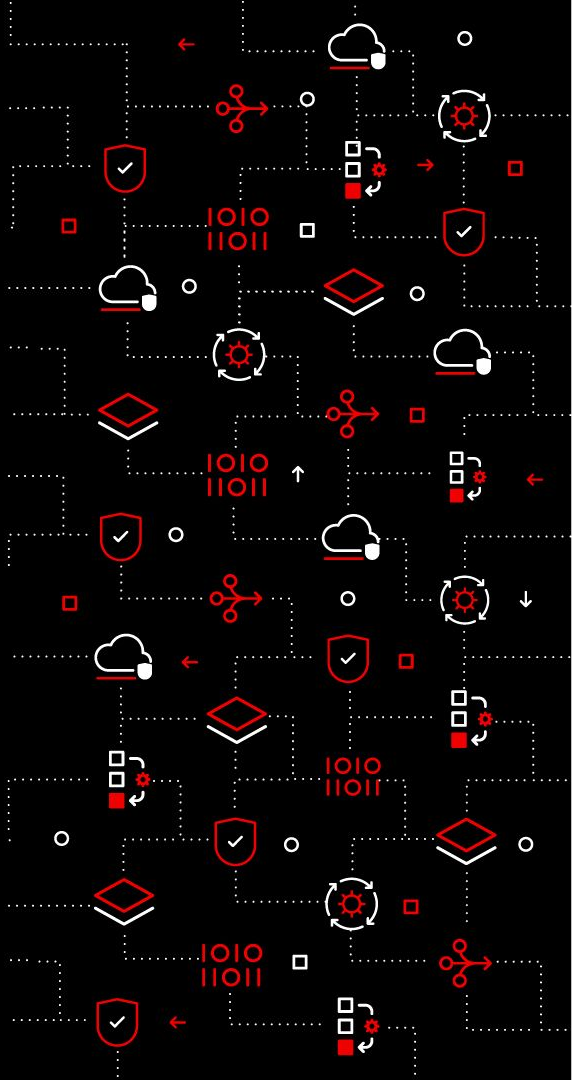
- Migration discussion based on a real-world scenario
- Discussion on migration risks
- Estimating a project

12:00 - 13:00 Lunch

13:00 - 16:45

- Advanced Cluster Management for Virtualization (ACM-V)
- Subscription offerings
- Creating a Lab/Demo environment
- Demos available on demo.partner.redhat.com
- Questions and recap

Red Hat



VMA

Red Hat

Virtualization Migration Assessment

Strategize and plan for migration

Strategy | Foundation | Expand | Evolve

- **Analyze current VM architecture**, existing investments and gather requirements for your future state
- **Identify VM workloads** and define integrations such as storage, networking and clustering requirements
- **Understand day-2 operations** including automation, configure management., monitoring, backups, etc
- **Propose a high-level solution design** for your custom OpenShift Virtualization based on your business needs
- **Generate a roadmap** for adoption of OpenShift Virtualization and determine next steps

Datasheet: Red Hat Consulting: Virtualization Migration Assessment

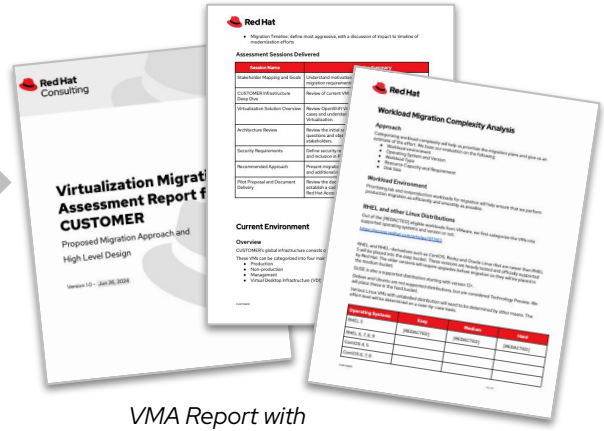
Virtualization Migration Assessment

What We Cover

- OpenShift Virtualization features
- Virtual environment deep dive: networking, storage, security, backup, and disaster recovery
- High level solution design
- Workload migration analysis and recommended migration approach
- Cost and duration estimates for full migration with Red Hat Services

Customer Outcomes

- Understand the **solution, the path to adoption, the timeline, and the cost**
- Understand **workload and migration complexity**
- Leverage **OpenShift, Ansible, and ACM product capabilities** to meet requirements
- Achieve faster time-to-value with **Red Hat Consulting, Training, and TAM**



VMA Report with proposed solution design and approach

Red Hat Learning

Migration Services Journey

Virtualization Migration Assessment (VMA)

Plan to quickly and safely migrate from legacy virtualization platform

- Capture current VM architecture, analyze workload complexity, propose a high-level design and roadmap

Virtualization Migration Factory (VMF)

Deploy virtualization migration technology. Prepare to operate at scale

- Deploy OpenShift cluster, enable virtualization features, validate integrations, migrate first workloads and prepare for production

Achieve steady state migration - Reduce legacy footprint

- Migrate workloads, validate and automate migration pattern, scale and complete migration

Explaining what the VMA is (and isn't)

The VMA is:

- A paid in depth assessment of the customer's current VM estate
- Answers 1) where the customer is going 2) how they're going to get there 3) how long it will take and 4) how much it will cost
- Requires about a week of customer pre-work followed by a week of onsite time with the customer
- **Unlocks** the Virtualization Migration Promotion (VMP) and firm fixed-price (FFP) consulting from Red Hat

The VMA is not:

- A discovery session and must never be positioned as so; discovery takes place prior to the VMA

Virtualization Migration Assessment

Our Approach

Planning Activities

- Identify stakeholders
- Send pre-work including RVTools export needed

Onsite Activities

- Whiteboarding
- Requirements gathering
- Decision making
- Removing blockers

Post Work Activities

- Crunch the RVTools data to build migration estimate
- Complete HLD
- Present Exec Summary and Next Steps

Red Hat

VMA Customer and Red Hat Roles

Customer Attendee	Role
Project Sponsor(s)	Responsible for setting goals and determining the measures of success for open-source adoption.
Business and IT decision-makers	Key Decision-makers from Business and IT Operations.
Enterprise Architect	The architect is responsible for data and systems interactions across the organization.
Virtualization Product Owner	The product owner for the current virtualization platform.
Infrastructure Teams representatives	Representatives for the infrastructure team: computing, storage, and network.
Director and/or Manager of Application Development	Oversees Software Development Technologies and Processes
Director and/or Manager of IT Operations	Oversees Infrastructure Platform and Operations
Relevant leads and members of Developer teams	Architects, Leaders, and Managers for internal projects and initiatives
Relevant leads and members of the IT Operations team	Infrastructure, Platform, or Software Owner(s)
Various	Other interested parties within the organization

Red Hat Attendees
Sr. Architect
Engagement Lead
Strategic Account Executive
Sales Specialists
Senior Account Solution Architect
Customer Success Executive

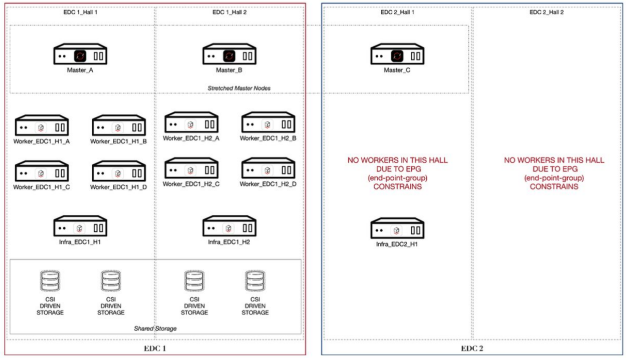
Red Hat
Learning

Walkthrough of Sample VMA

Sample Masked VMA Output

Target Architecture and Infrastructure Considerations

- Car Manufacturer existing physical server, networking, and storage architecture is an ideal model and landing zone for OpenShift Virtualization, and has been used as the starting point for the infrastructure design. No red flags have been identified with the existing infrastructure
- The architectural layout will consist of four (4) deployment architectures each dedicated to a specific use case:
  1) EDC, 2) “Stretched” EDC, 3) Plant/Distributed, and 4) Standalone. The topology will be laid out to take advantage of multiple failure domains where available.
- The “Stretched” EDC is architecture that is designed specifically for VM workloads that currently use the VMWare NSX feature today. This would be an OpenShift Virtualization cluster where storage (using ODF) is stretched across both data centers.



EDC Architecture

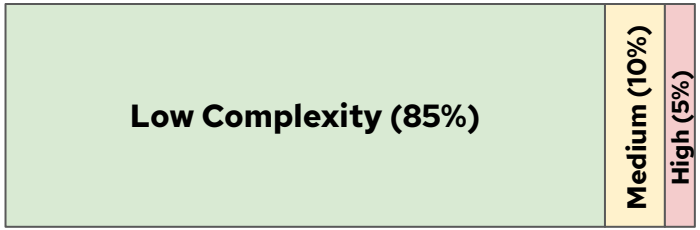
“Stretched” EDC Architecture

Red Hat

VM Workload Breakdown and Planning

Complexity Analysis

- The workload analysis shows a 85/10/5 easy/medium/hard distribution of workloads
  - 97% of VMs are sized as easy to migrate
  - A small number of VMs (1%) are very large and may need to be V2P migrations
  - 2% of VMs are running Ubuntu and non-RHEL distros and will need to be further evaluated during Phase 1
  - During Phase 1, we will build patterns for the appliances and COTS migrations, determining what can be moved to a native container.

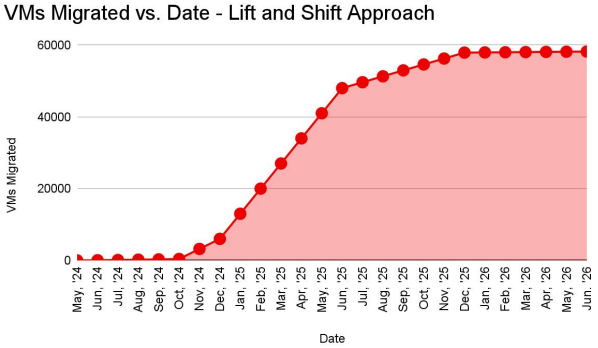


Factor	Easy	Medium	Hard
Storage Size	64087	2167	153
Workload Type	53128	11497	0
Operating System	51336	6736	1237

Financial Services VM Migration Velocity Projection Example

1. Visa's global infrastructure consists of more than 71,000 virtual machines (VMs) distributed across data centers in six countries.
2. These VMs can be categorized into four main types:
   - Production: 26,000 VMs
   - Non-production: 33,000 VMs
   - Management: 7,000 VMs
   - Virtual Desktop Infrastructure (VDI): 5,000 VMs
3. The VDI VMs are based on Citrix/Hyper-V technology, while the other three categories (production, non-production, and management) are VMware-based. This means that out of 71,000 VMs, 66,000 are potentially migratable to a new platform.
4. Approximately 17,000 VMs are under the responsibility of the Operations and Infrastructure (O&I) team while the remaining VMs are owned by various product teams within the Visa organization.

Date	VMs Migrated (V2V)	VMs Retired (V2C, V2P, Decomm)	vSphere VMs Remaining
PHASE 1 BEGINS			
June 2024	0	0	66,000
October 2024	400	100	65,500
PHASE 1 ENDS / MIGRATION FACTORY BEGINS			
December 2024	6,000	500	59,500
June 2025	48,000	2,500	18,500
December 2025	57,900	6,600	1,500
MIGRATION FACTORY ENDS / ONGOING SUPPORT BEGINS			
June 2026	58,200	7,800	0



** Velocity is based on optimal rate, without resource or process constraints.*
*** Assumes production workloads can be migrated on weekdays*
**** Assumes migration windows of 4 hours per day, 5 days per week*
***** Full assumptions in Appendix*

Red Hat | IBM

Virtualization Migration Assessment

Example Migration Schedule: 50,000 VMs

Strategy | **Foundation** | **Expand**

MONTH 0 | MONTH 1 | MONTH 2 | MONTH 3 | MONTH 4 | MONTH 5 | MONTHS 6 - 20

Virt. Migration Assessment
2 weeks

Virtualization Phase 1
12 weeks

Prod. Readiness & Migration Factory Build
8 weeks

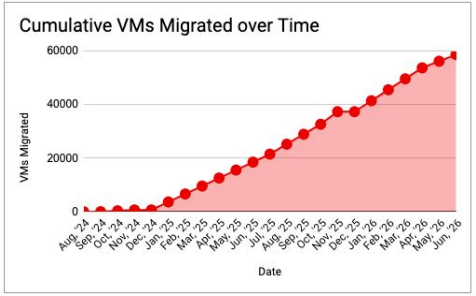
Migration Waves
Squad Model
~12 months

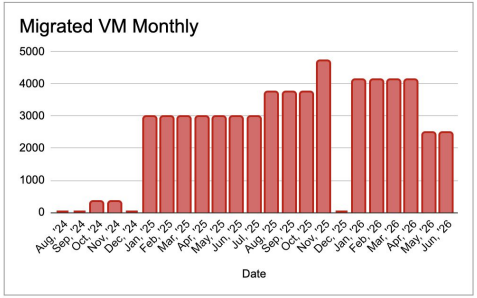
Red Hat Software Engineering and Customer Experience Engineering resource investment
Ongoing dedicated experts from Red Hat's PGE and CEE organizations

Red Hat Consulting Migration Program Management, Red Hat Technical Account Management

Customer

Application Testing of Migrated VMs
Customer led / Red Hat support





Red Hat

Mapping the Solution with Ecosystem Partners

VMware Portfolio

VMware Subscription Level	Select	Subscription / Core Count
VMware Cloud Foundation (VCF)		
VMware vSphere Foundation (VVF)	X	
VMware vSphere Standard (VVS)		
VMware vSphere Essentials Plus Kit (VVEP)		

VMware Product	Feature	Used (Y/N)
vSphere		Y
vSAN	Supported Storage Protocol	N
	Dynamic Volume Provisioning	N
	RWX for Live Migration	N
	Snapshot Support	N
	Clone Support	N
NSX (small set of clusters)	Microsegmentation	N
	Multi-Cloud Networking	Y
	Tunnels (IPSec, VPN)	Y
	Dynamic Routing (Distributed / Logical)	Y
	Central Network Management	N
	MPLS	N
	QoS	N
Aria Operations (vROP)	Performance Analytics (vSphere VMs)	Y
	Health Score	Y
	Alerting	Y

VMware Product	Feature	Used (Y/N)
BMC (today)	ITOM/ITSM integration (ServiceNow)	Y
	Recommendation Engine (e.g. rightsizing)	Y
	Automated Optimization	N
	True Visibility Suite	Y
Aria Automation (vRA)/vRo	Infrastructure provisioning (LCM)	Y
	Application Blueprints/workflows	Y
(Chef/Habitat)	Configuration Management	Y
	Service Catalog	Y
	Cloud Assembly	Y
Aria Log Insights		Y
HCX (Hybrid Cloud Extensions)		N
DSM (Data Services Manager)		N
DRS (Distributed Resource Scheduler)		Y
Storage DRS	use when needed	N
VDS (vSphere Distributed Switch)		Y
VMware Site Recovery Manager		Y
VMware Tanzu Kubernetes Service		N
VMware Tanzu Application Service (TAS, PCF)		N

3rd Party ISV Portfolio

Component	Existing Vendor
Backup & Recovery	NetApp Snap, SQL Veeam, IBM spectrum protect (TSM) / Tape *Plants, Cohesity (future)
DR	SRM, MSSQL Always ON, Oracle-Mirror, IBM spectrum protect (TSM) / Tape *Plants,NetApp Snap, SQL Veeam, ZDLRA
Monitoring	Dynatrace, WhatsUp Gold, vRealize, ACM Observability, Coming NetApp Insights,j
Logging	Splunk, Google Bucket, VM Insights, QRadar,
Metrics Collection & Alerts	Alertmanager, Webex Teams workplace, BMC, vRealize, AI-Ops , Turbonomic
Secrets Management	HashiCorp Vault
Certificate Management	Globalsign
Security in VM/Container	AV - ACS (Container Scanning) ,Cisco Traffic Watch and ACLs, vTPM, data encrypted at rest (SAN/NAS), compliance operator
Day 1 Operations	Habitat,chef,custom scripts
Automation and Configuration Management	Habitat,chef,custom scripts

Note: Analysis of the Red Hat Services Accelerated Migration Approach, not an analysis of Red Hat OpenShift Virtualization

Example

FSICorp Assumptions & Inputs to Model

Additional scoping (e.g. VMA) can be done to get a more accurate target solution proposal

Assumptions:

- **10%** of VMs will be consolidated, retired, or moved to another platform (e.g. public cloud).
- Hybrid modernization scenario with **20%** of current VM estate will be app modernized/containerized.
- Server hardware will be upgraded to two-socket 128 total cores
- Assuming VMware Cloud Foundation subscription is being used for VMware environment.
- Assuming FSICorp OpenShift cost is covered under current ESA, and Red Hat software costs only include ACM, AAP, and RHEL is needed.
- Existing environment used as baseline; does not account for future increases due to growth.

Environment Inputs provided by FSICorp	
Number of ESXi hosts	2,900
Average sockets per server	2
Average cores per socket	32
Total number of cores	185,600
Total number of CPU sockets	5,800
Total VMs in Environment	35,800

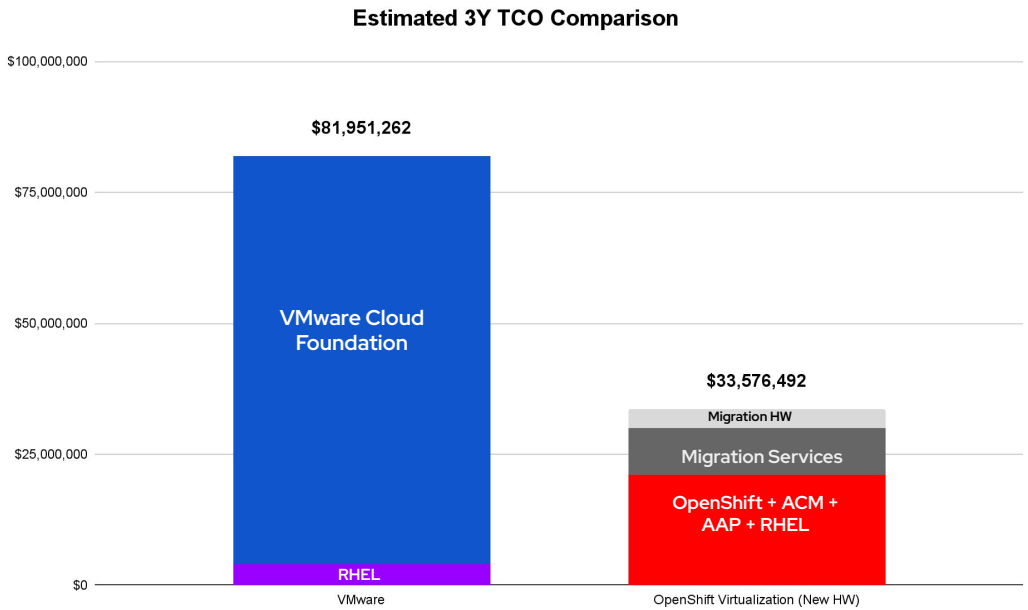
Extrapolated Inputs	
Average cores per VM	5.18
Applications running in environment	4,475
VM Density	12

Example

OpenShift Virtualization Will Yield Substantial Cost Savings

FSICorp will avoid new higher Broadcom subscriptions and benefit from a modern application platform

Three-Year Cost Comparison for In-Scope VMs



3-Year Savings: $48.3M
Virtualization Cost Reduction: 59%

In addition to virtualization cost savings, **customers who use OpenShift as an application platform** realize powerful operational benefits, which deliver financial returns to the business:

- ➔ Less unplanned downtime, **protecting revenue and reputation**
- ➔ Faster application development, **accelerating time-to-market**
- ➔ Increased IT productivity, **boosting cost efficiency**

3-yr Cost Components	VMware	Red Hat
VMware Subscriptions	$77,952,000	
RHEL Subscriptions	$3,999,262	$3,999,26
OpenShift Subscriptions		$9,670,050
AAP Subscriptions		$7,684,669
Migration Services		$8,968,438
Migration Hardware		$3,654,000
3Y Total Cost	$81,951,262	$33,576,492
Total Cost Savings with OCP		$48,374,770
% Cost Savings with OCP		59%

Example

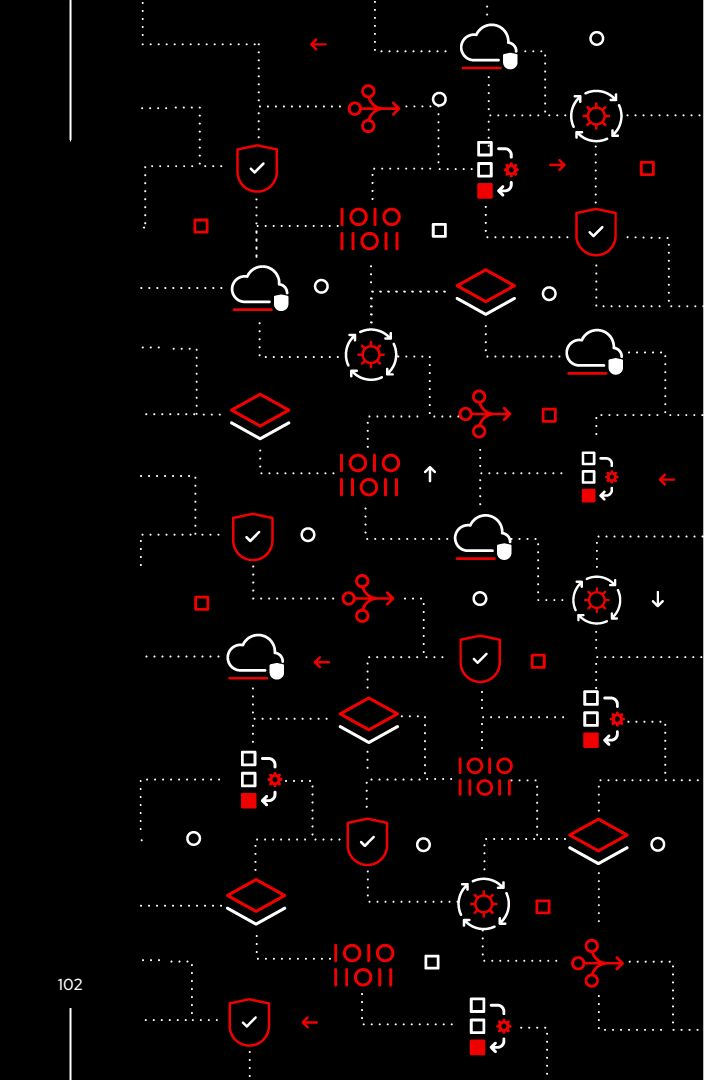
Additional Benefits of App Modernization to FSICorp

5-yr VMware Migration Benefits Analysis

	Scenario 1 - "Lift and Shift"	Scenario 2 - "Hybrid Modernize"
Approach	1:1 migration of VMs from VMware to Openshift Virtualization	1:1 migration from VMware plus 20% identified for modernization in-flight
Estimated Benefits	**$53.1M cost savings over Initial 3 years (65% reduction)**	**Overall 5-yr project ROI of 178%**
Annual Software Cost Reduction	**-79% ($26m down to $6m)**	**-63% ($26m down to $16m)**
Benefits to Approach	• Faster migration time • lowest risk profile • lower investment	• Decreased time to market, • improved operational efficiency • Improved dev efficiency
Key Trade-offs	Limited to software cost reduction	Longer migration and investment cost

Red Hat

Source: IDC report on "The Business Value of Red Hat



VMA – Workshop

Red Hat

What we will be doing:

- We are going to split the participants into five (5) teams
- Each team will get a working space to work on their virtual customer scenario
- Instructions for the scenario:
  - The idea of the scenario is to simulate the data captured from a Virtualization Migration Assessment from a customer
  - Your team will need to create the following output from the scenario provided:
    - High Level Design with component description
    - Migration scope and approach
    - Identify which constraints and assumptions influenced your design and roadmap decisions
    - Present your VMA findings to the class, like you present to a customer

Scenario 1: Financial Services (Large European Bank)

Ask

The customer wants to migrate their current virtualized environment to a new platform due to financial pressures from the current vendor.

Current Environment Specifications

Software & Data Center Config

- VMware vSphere Foundation (from versions 6.5 to 8.0)
- 2 physical data centers
  - Main production data center (Naboo)
  - DR / Dev data center (Coruscant)
- 1 main vSphere vCenter

Hardware

- Total of 254 hypervisors
  - 55% of hypervisors in Naboo
  - 45% of hypervisors in Coruscant
- Dell Technologies is the preferred server vendor

Connectivity

- Cisco is the preferred network vendor
  - Cisco Nexus are in use
  - CLOS Leaf-Spine topology deployed
- Server Network Interface Controllers:
- 4x 10 gbps
  - 2x management/oob network
  - 2x data plane network
- 1x FC HBA connected to MDS Switches

Storage

- Dell Technologies is the preferred Storage vendor
- Storages in use:
  - Dell PowerMax (tier 1) - 400TB
  - Dell PowerFlex (tier 2) - 800TB
  - Local Storage [raid 5 sas] (tier 3) - 900TB

Workloads

- 18k workloads
- Mix of Operating Systems
  - 70% windows
    - Windows Server 2003 - 10 %
    - Windows 2016 - 50 %
    - Windows Server 2019 - 30 %
    - Windows Server 2022 - 10 %
  - 25% Linux
    - RHEL 7 - 45%
    - Ubuntu Server - 25 %
    - RHEL 8 - 30%
  - 5% Other
    - Solaris various (80%)
    - OpenServer (20%)

Other Considerations

- Other things to consider:
  - No NSX in use
  - There is no new hardware for migrating virtual machines; re-use is necessary!
  - The customer wants OpenShift Virtualization exclusively on bare metal, with no container workloads.
  - Security compliance needs to be taken into account for the design.
  - Some apps in scope:
    - Oracle RAC
    - Red Hat OpenShift AI
    - ActiveDirectory Server

Red Hat

Scenario 2: Tier 1 Telco

Ask

The customer wants to migrate 1440 hypervisors to a new platform due to financial pressures from the current vendor and to have an opportunity to modernize.

Current Environment Specifications

Software & Data Center Config

- VMware vSphere Foundation
- 12 physical data centers (3 per network zones)
- 4 vSphere vCenter
- Divided into network zones:
  - Hogwarts
  - Mahoutokoro
  - Castelobruxo
  - Ilvermorny

Hardware

- Total of 1440 hypervisors
  - Equally distributed between all data centers
- Various hardware technologies being used

Connectivity

- Juniper Fabric
  - CLOS Leaf-Spine topology deployed
- Servers:
  - 2x 1gbps NIC
    - management/oob network
  - 2x 10 gbps NIC
    - 1 - data
  - 1 FC HBA to Brocade Switch

Storage

- Various types of storage, including:
  - EMC Symmetric
  - Oracle FS1
  - Dell EqualLogic
  - Pure FlashArrayX
  - VMware VSAN

Workloads

- ~40K workloads
- Mix of Operating Systems
  - 70% windows
    - Windows Vista - 2%
    - Windows XP - 3%
    - Windows Server 2003 - 10 %
    - Windows 2016 - 45 %
    - Windows Server 2019 - 20 %
    - Windows Server 2022 - 20 %
  - 25% Linux
    - RHEL 7 - 35%
    - Ubuntu Server - 25 %
    - RHEL 8 - 30 %
    - RHEL 9 - 10%
  - 5% Other
    - Solaris various (30%)
    - Other Unix (80%)

Other Considerations

- Other things to consider:
  - No NSX in use
  - New hardware can be procured with a refresh cycle; reusing will be good
  - The customer wants OpenShift for virtualization and container workloads
  - The customer wants to use new container & application management technologies to manage virtual machines (gitops, etc.)
  - 20% of the workloads are telco network workloads:
    - vEPC
    - vRAN
  - 80% of the workloads are IT workloads, including:
    - JBOSS servers , Databases (Microsoft SQL Server) , .NET 8.x applications

Red Hat

Scenario 3: Government Agency

Ask

The customer wants to migrate their current virtualized environment to a new platform due to financial pressures from the current vendor.

Current Environment Specifications

Software & Data Center Config

- VMware Cloud Foundation
- 4 Physical data centers
- 3 main DCs
  - Westeros
  - Pentos
  - Dorne
- 1 Disaster Recovery DC
  - Winterfell

Hardware

- Total of 820 hypervisors
- Mix of Cisco Servers and HPE

Connectivity

- Mix: Cisco Nexus / Dell PowerSwitch
- CLOS leaf-spine topology
- Servers:
  - 2x 10gbps NIC
    - management
  - 4x 25 gbps NIC
    - data

Storage

- Multiple NetApp NAS
- Multiple IBM SAN (iscsi)

Workloads

- ~25K workloads
- Mix of Operating Systems
  - 50% windows
    - Windows Server 2K - a few…
    - Windows Vista - 2%
    - Windows XP - 3%
    - Windows Server 2003 - 10 %
    - Windows 2016 - 45 %
    - Windows Server 2019 - 20 %
    - Windows Server 2022 - 20 %
  - 45% Linux
    - RHEL 7 - 35%
    - Ubuntu Server - 15 %
    - RHEL 8 - 30 %
    - RHEL 9 - 10%
    - SLES - 5%
    - Other Linux - 5%
  - 5% Other
    - Solaris various (30%)
    - Other Unix (80%)

Other Considerations

- Other things to consider:
  - NSX is in use
  - No hardware to be procured
  - The customer wants OpenShift for virtualization and container workloads. Wants proposal for container workload virtualized and in bare metal.
  - Microsegmentation is a must as part of the proposal
  - High Availability is a must for all components of the design (no SPOF)
  - Some specific workloads:
    - SAP
    - Datagrid
    - MongoDB workloads
    - NodeJS

Red Hat

Scenario 4: Large Automotive Manufacturer

Ask

The customer wants to migrate their current virtualized environment to a new platform due to financial pressures from the current vendor.

Current Environment Specifications

Software & Data Center Config

- VMware Cloud Foundation
- 2 main DCs
  - motor-city
  - wind-city
- 16 in-factory Data Centers
  - Running all production workloads for the factory (including the assembly line)

Hardware

- Total of 1500 hypervisors
- Mix of Cisco Servers and HPE

Connectivity

- Mix: Cisco Nexus / Dell PowerSwitch
- CLOS leaf-spine topology
- Servers:
  - 2x 10gbps NIC
    - management
  - 4x 25 gbps NIC
    - data

Storage

- Multiple NetApp NAS
- Multiple Pure Storage SAN

Workloads

- ~75K workloads
- Mix of Operating Systems
  - 40% windows
    - Windows Server 2K - a few…
    - Windows Vista - 2%
    - Windows XP - 3%
    - Windows Server 2003 - 10 %
    - Windows 2016 - 45 %
    - Windows Server 2019 - 20 %
    - Windows Server 2022 - 20 %
  - 55% Linux
    - RHEL 7 - 35%
    - Ubuntu Server - 15 %
    - RHEL 8 - 30 %
    - RHEL 9 - 10%
    - SLES - 5%
    - Other Linux - 5%
  - 5% Other
    - Solaris various (30%)
    - Other Unix (80%)

Other Considerations

- Other things to consider:
  - NSX is in use
  - No hardware to be procured
  - The customer wants OpenShift for virtualization and container workloads. Wants proposal for container workload virtualized and in bare metal.
  - Microsegmentation is a must as part of the proposal
  - High Availability is a must for all components of the design (no SPOF)
  - Some specific workloads:
    - SAP
    - Datagrid

Red Hat

Scenario 5: Healthcare Provider Company

Ask

The customer wants to migrate 4400 hypervisors to a new platform due to financial pressures from the current vendor and to have an opportunity to modernize.

Current Environment Specifications

Software & Data Center Config

- VMware vSphere Foundation
- 8 physical data centers (2 per network zones)
- 4 vSphere vCenter
- Divided into network zones:
  - Malaga
  - Madrid
  - Barcelona
  - Vigo

Hardware

- Total of 4400 hypervisors
  - Equally distributed between all data centers
- Various hardware technologies being used

Connectivity

- Juniper Fabric
- CLOS Leaf-Spine topology deployed
- Servers:
  - 2x 1gbps NIC
    - management/oob network
  - 2x 10 gbps NIC
    - 1 - data

Storage

- Various types of storage, including:
  - Pure FlashArrayX
  - VMware VSAN

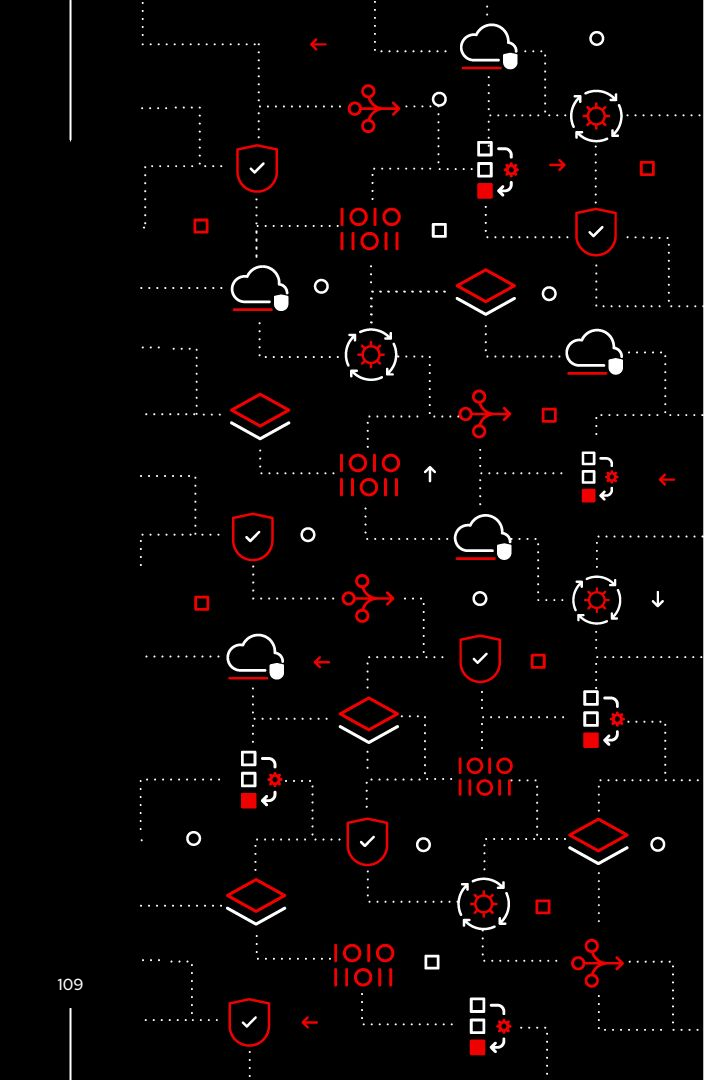
Workloads

- ~80K workloads
- Mix of Operating Systems
  - 60% windows
    - Windows Vista - 2%
    - Windows XP - 3%
    - Windows Server 2003 - 10 %
    - Windows 2016 - 45 %
    - Windows Server 2019 - 20 %
    - Windows Server 2022 - 20 %
  - 35% Linux
    - RHEL 7 - 35%
    - Ubuntu Server - 25 %
    - RHEL 8 - 30 %
    - RHEL 9 - 10%
  - 5% Other
    - Solaris various (30%)
    - Other Unix (80%)

Other Considerations

- Other things to consider:
  - New hardware can be procured with a refresh cycle; reusing will be good
  - The customer wants OpenShift for virtualization and container workloads
  - The customer wants to use new container & application management technologies to manage virtual machines (gitops, etc.)

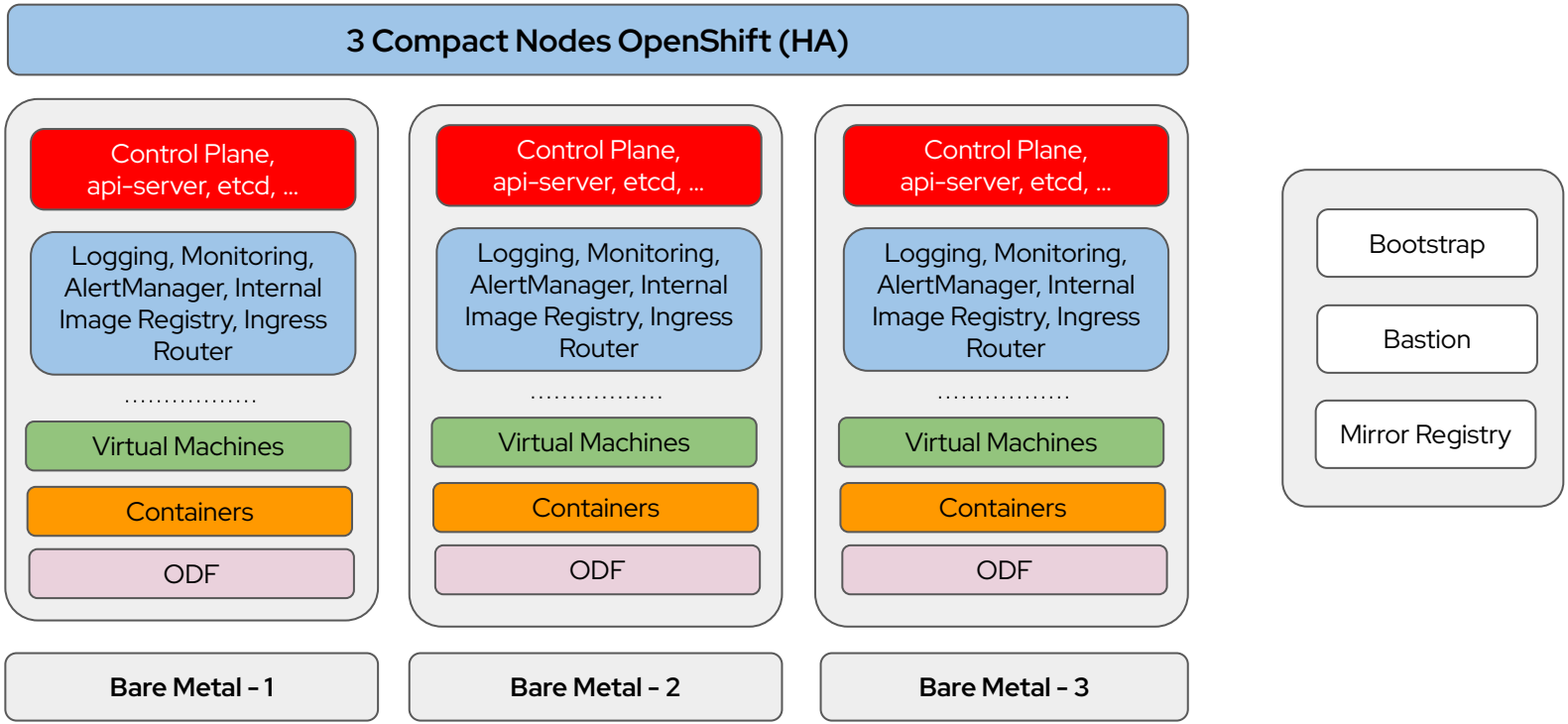
Red Hat



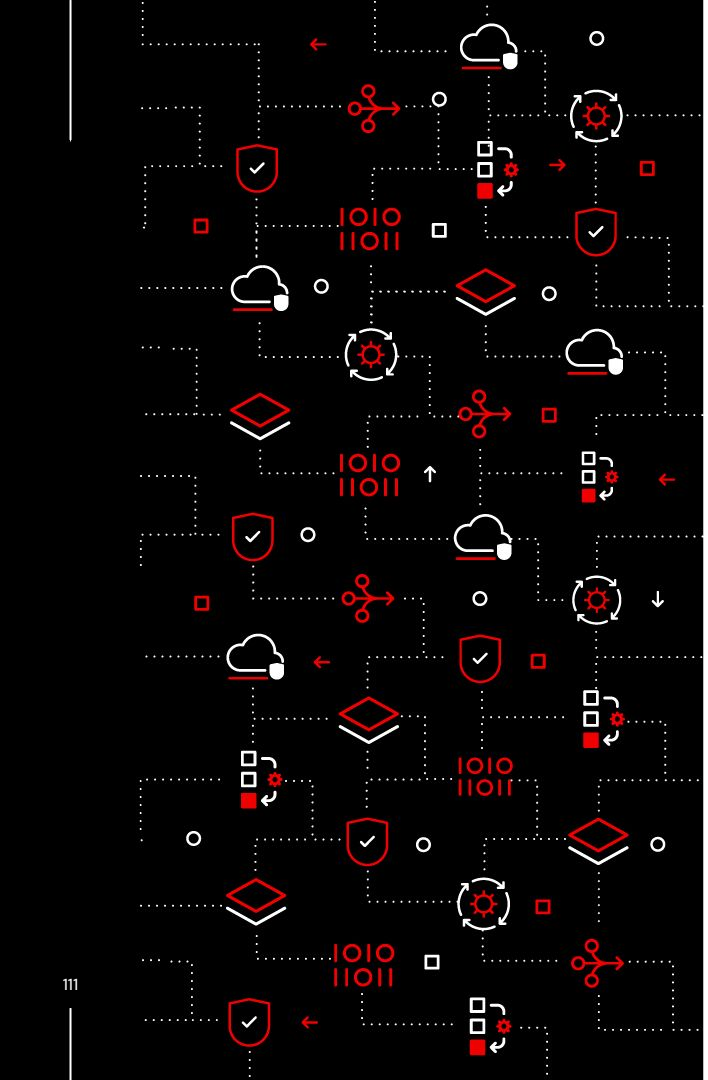
Lunch Break

Red Hat

Minimal Deployment Architecture (3 Nodes Compact)



Red Hat

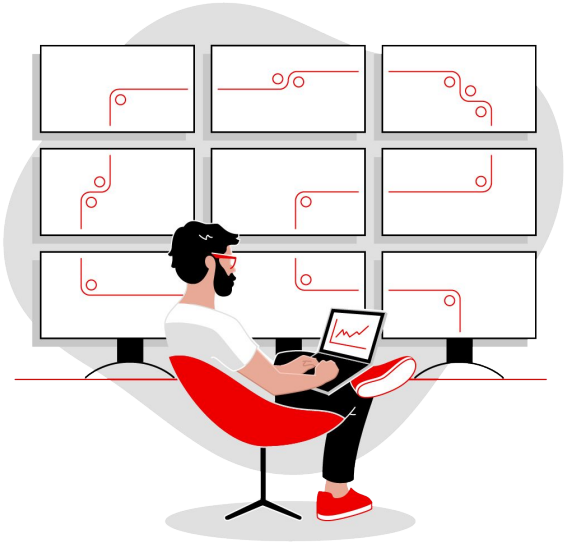


Advanced Cluster Management for Virt (ACM-V)

Red Hat

Red Hat Advanced Cluster Management

A guide to the subscriptions



- Red Hat Advanced Cluster Management for **Virtualization** manages Red Hat OpenShift **Virtualization Engine**
- Red Hat Advanced Cluster Management for **Kubernetes** manages Red Hat **OpenShift platforms**

Red Hat

Advanced Cluster Management for Virtualization

Reduce fragmented visibility and manual context switching across VM estates

Business continuity from Day 0 to Day 2

Increase business resiliency to enhance SRE experience, minimize operational risk, enable backup and disaster recovery

Manage applications and virtual machines with ApplicationSets

Deploy VM applications from code source to ease deployment and streamline management at scale

Dynamic search & observability

See all virtual machines in your fleet. Understand health and capacity holistically using ready-to-use dashboards

Manage VMs directly from ACM

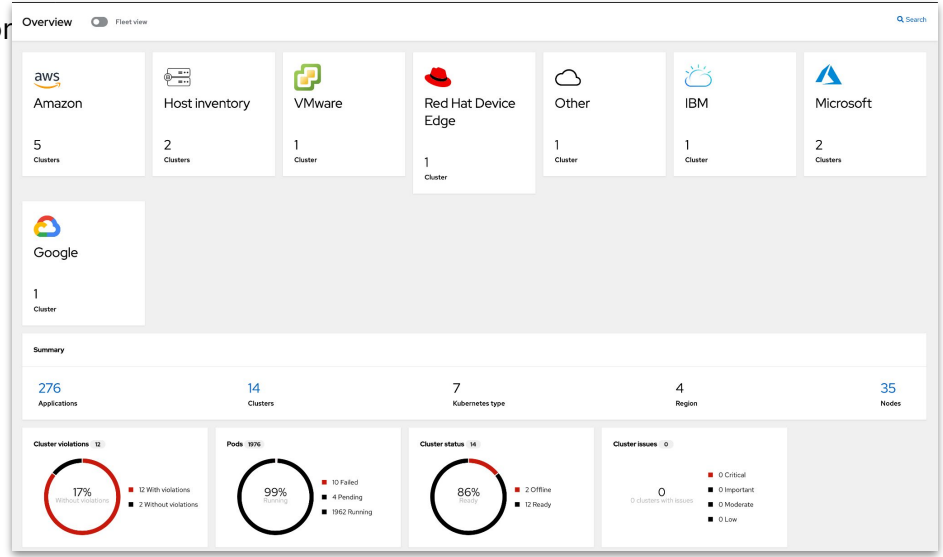
Stop, start, restart, pause and unpause VMs directly from ACM

Red Hat

Business continuity from Day 0 to Day 2

Increase business resiliency

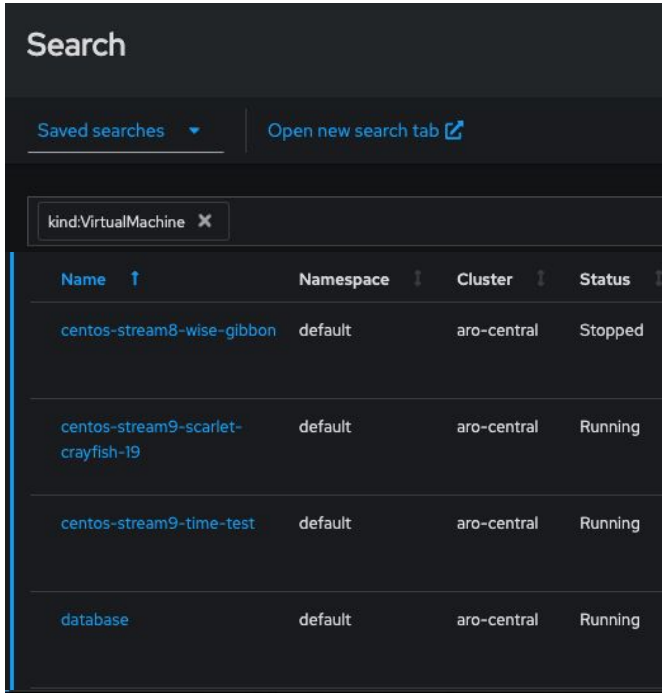
- Multicluster observability for VM health & optimization for an **enhanced SRE experience**
- Unified multicluster lifecycle management across the full-stack to **reduce VM complexity**
- Policy-driven governance, risk & compliance that **minimizes operational risks**
- Rapid service backup & disaster recovery to ensure **consistent user experiences**



Red Hat

Dynamic search & observability

A hybrid cloud view for all virtual machines & containers



- Quickly see all VMs in your fleet
- Gain deeper insights & visibility into your OpenShift Virtualization inventory with ready-to-use dashboards

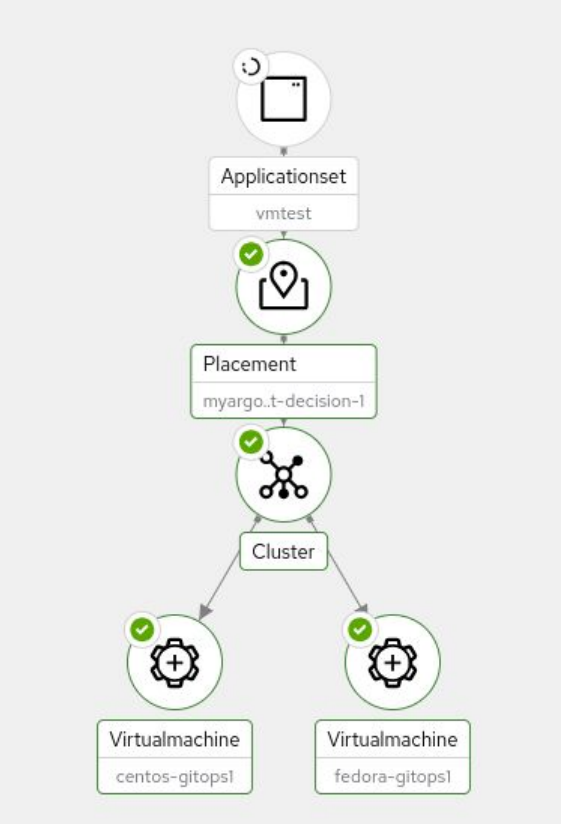
Red Hat

Manage OpenShift Virtualization with ApplicationSets

Ease deployment and streamline management at scale

Scenarios:

- Manage applications from Git-Repositories
- Supports multiple deployment patterns
  - Ex: Push/Pull Model
- Mass deployments to different namespaces
- Use placement for unplanned cluster failures
- See all Virtual Machines across multiple hubs at a Global Hub using Global Hub Search
- Prepare for Metro-DR and Regional-DR scenarios using Red Hat Open Data Foundation

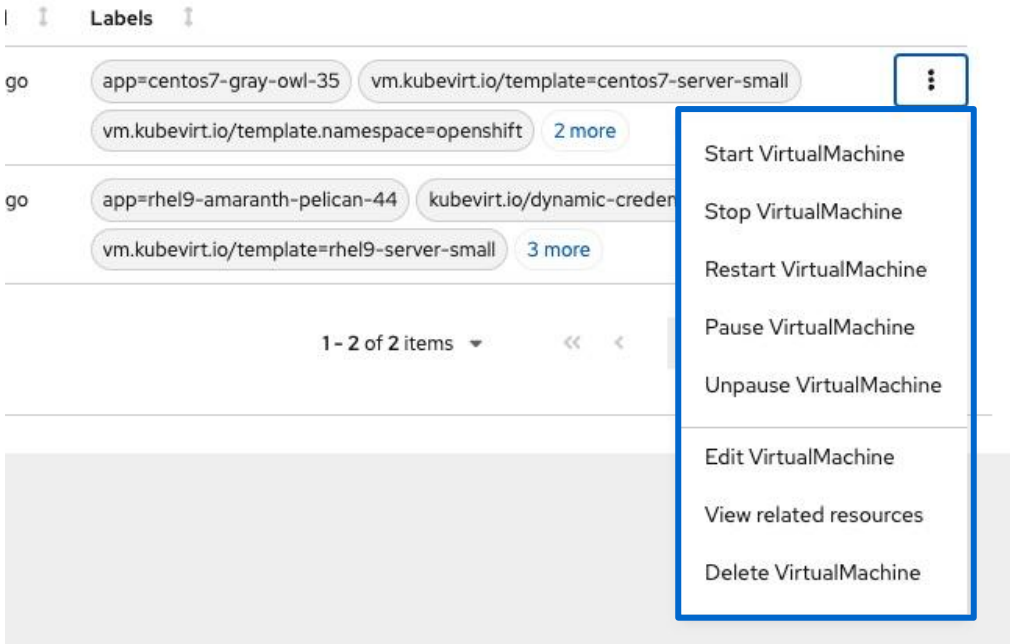


Manage virtual machines from Advanced Cluster Management

Control without the context switching

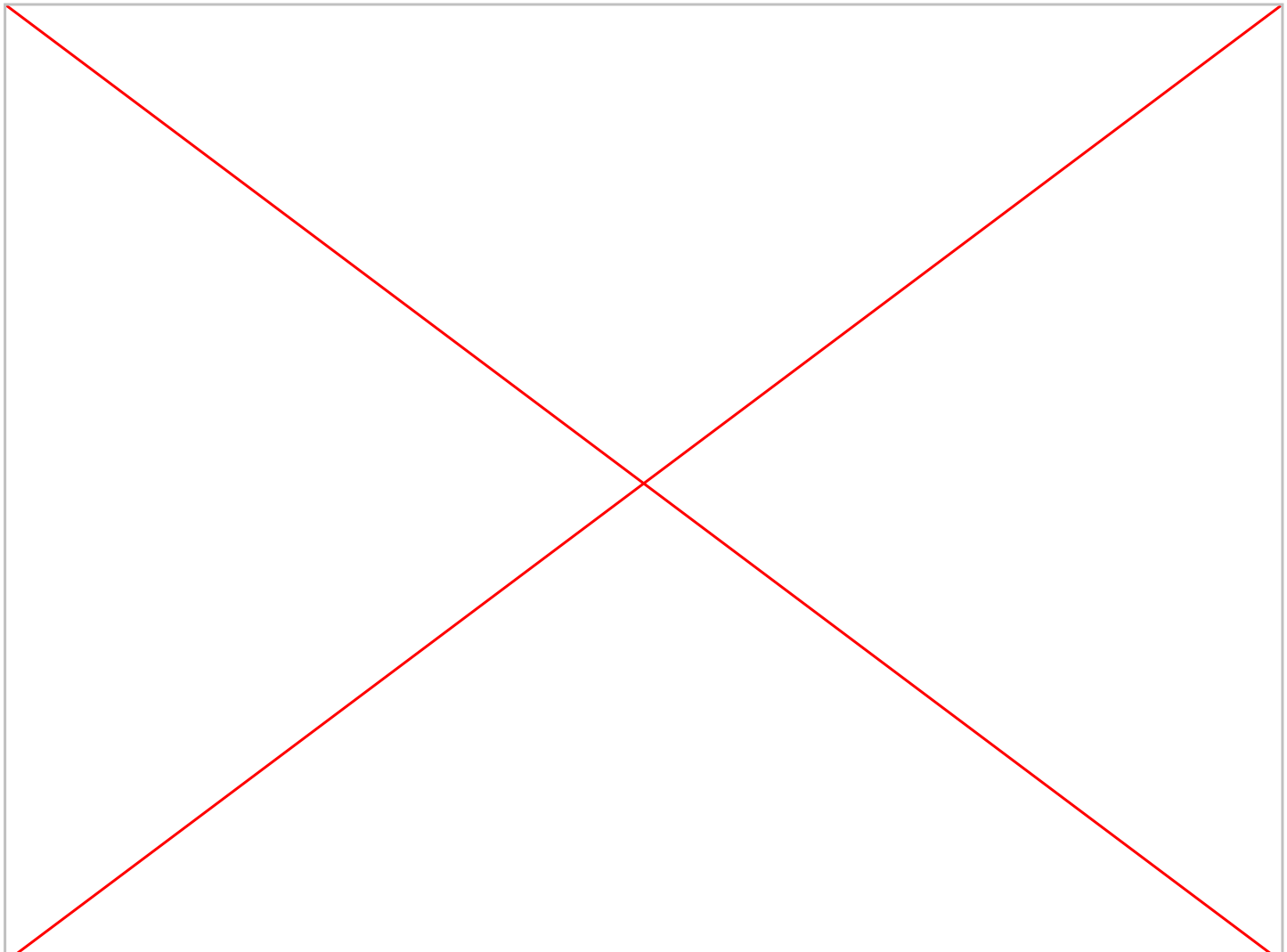
Manage VM's directly from ACM 2.12:

- Start
- Stop
- Restart
- Pause
- Unpause
- Edit
- View
- Delete

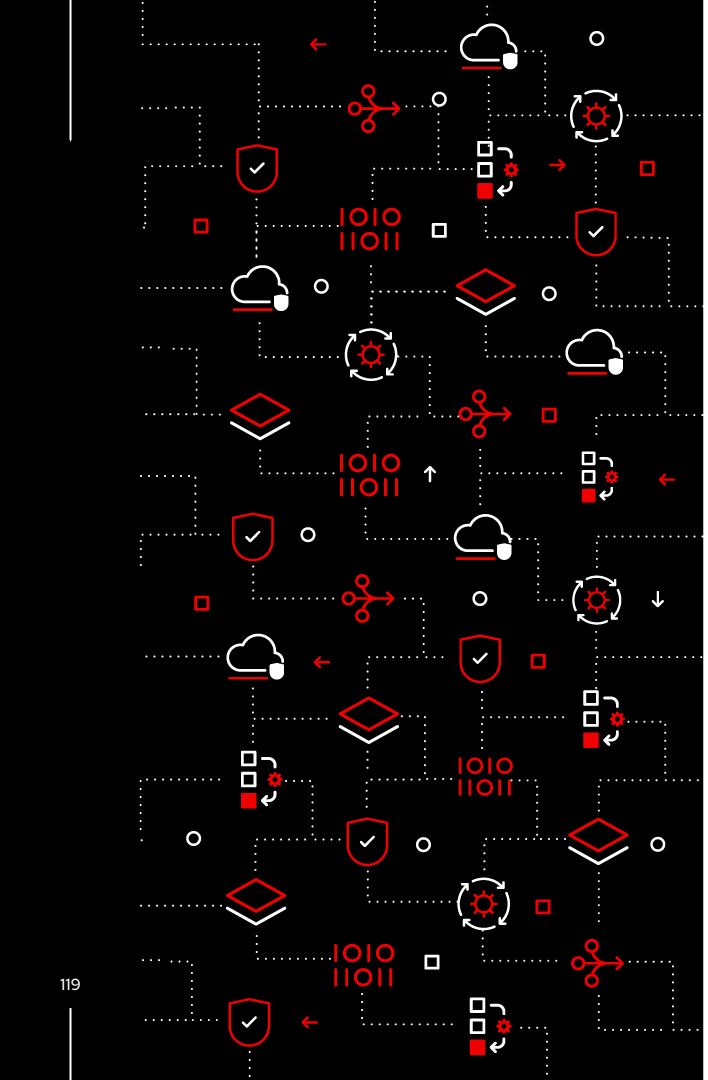


Red Hat

ACM-V
Demo



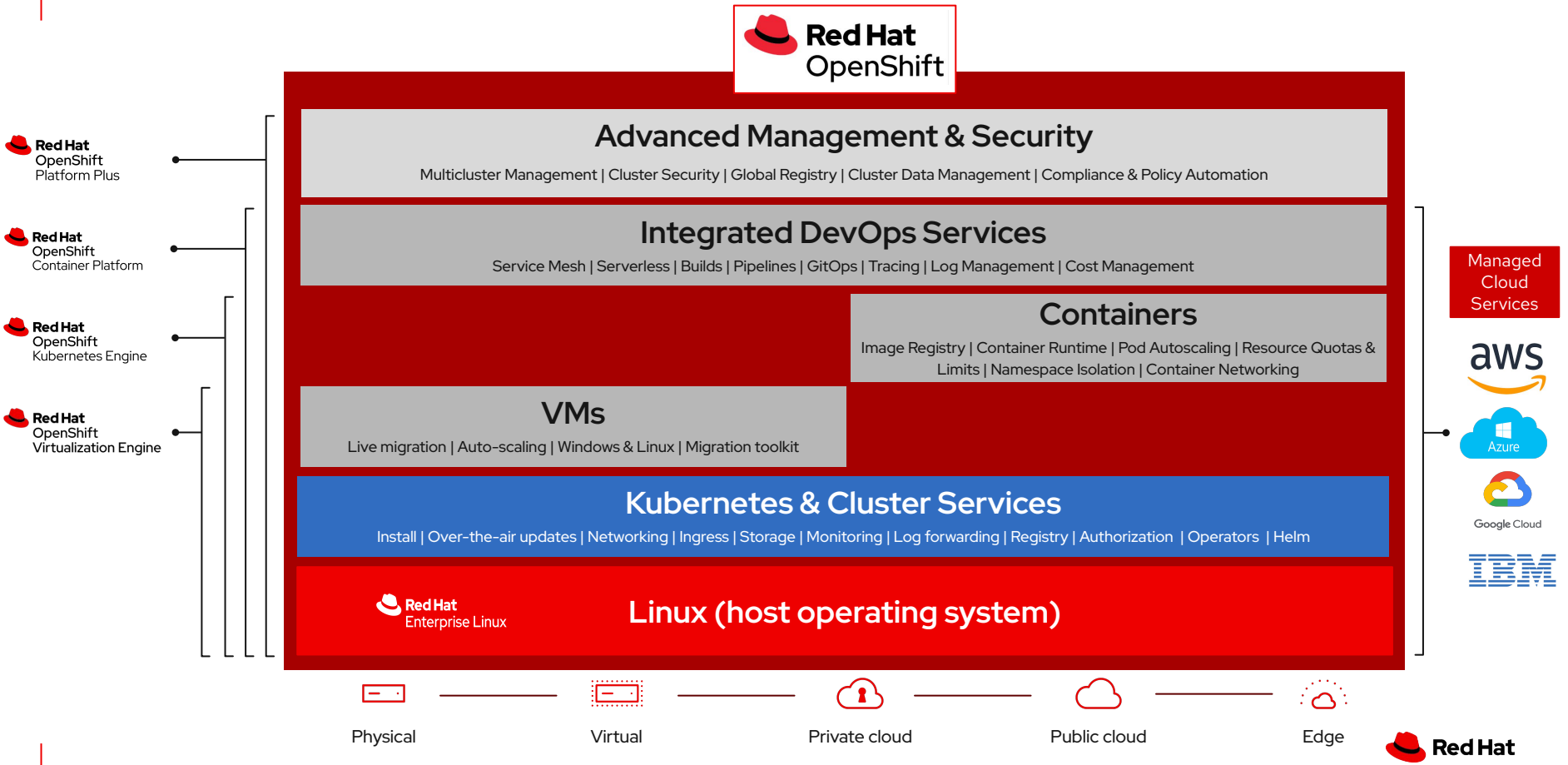
Red Hat



Subscription Offerings

Red Hat

Hybrid cloud application platform



OpenShift Kubernetes Engine (OKE) vs OpenShift Container Platform (OCP)

	OpenShift Kubernetes Engine (OKE)	OpenShift Container Platform (OCP)	OpenShift Container Platform Platform Plus (OPP)
Fully Automated Installers	✅	✅	✅
Over the Air Smart Updates	✅	✅	✅
Enterprise Secured Kubernetes	✅	✅	✅
Kubectl and oc automated command line	✅	✅	✅
Operator Lifecycle Manager (OLM)	✅	✅	✅
Administrator Web Console	✅	✅	✅
OpenShift Virtualization	✅	✅	✅
Cluster Monitoring	✅	✅	✅
Cost Management SaaS Services	✅	✅	✅

Red Hat

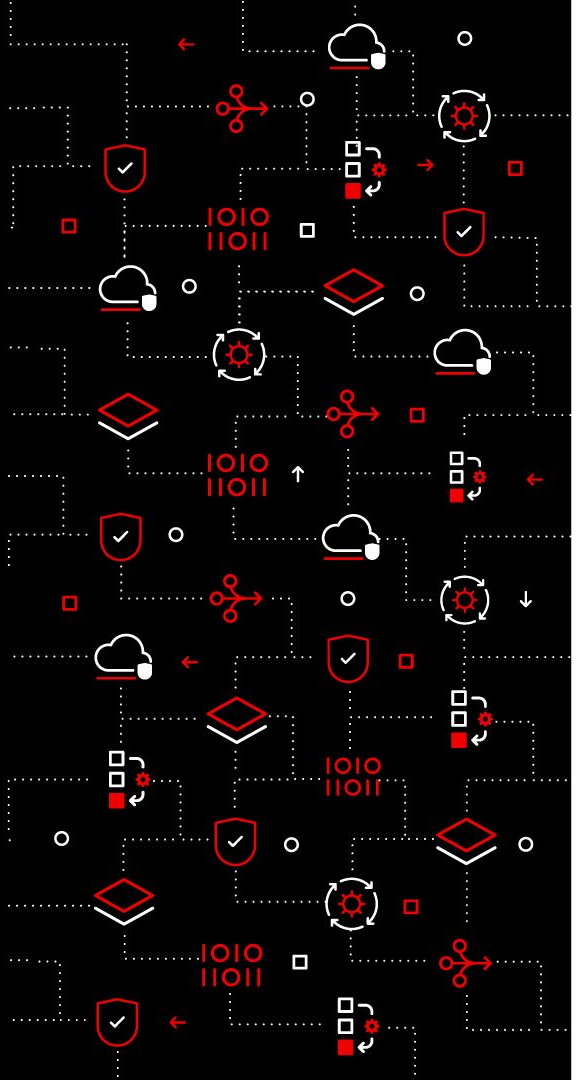
OpenShift Kubernetes Engine (OKE) vs OpenShift Container Platform (OCP)

	OpenShift Kubernetes Engine (OKE)	OpenShift Container Platform (OCP)	OpenShift Container Platform Plus (OPP)
User Workload Monitoring	❌	✅	✅
Platform Logging	❌	✅	✅
Developer Web Console	❌	✅	✅
Developer Application Catalog	❌	✅	✅
Source to Image and Builder Automation (Tekton)	❌	✅	✅
OpenShift Service Mesh (Maistra, Kiali and Jaeger)	❌	✅	✅
OpenShift Distributed tracing (Jaeger)	❌	✅	✅
OpenShift Serverless (Knative)	❌	✅	✅
OpenShift Pipelines (Jenkins and Tekton)	❌	✅	✅

OpenShift Kubernetes Engine (OKE) vs OpenShift Container Platform (OCP)

	OpenShift Kubernetes Engine (OKE)	OpenShift Container Platform (OCP)	OpenShift Container Platform Plus (OPP)
Embedded Component of IBM Cloud Pak and RHT MW Bundles	❌	✅	✅
OpenShift sandboxed containers	❌	✅	✅
Red Hat Advanced Cluster Management for Kubernetes	❌	❌	✅
Red Hat Advanced Cluster Security for Kubernetes	❌	❌	✅
Red Hat Quay	❌	❌	✅
Red Hat OpenShift Data Foundation	❌	❌	✅

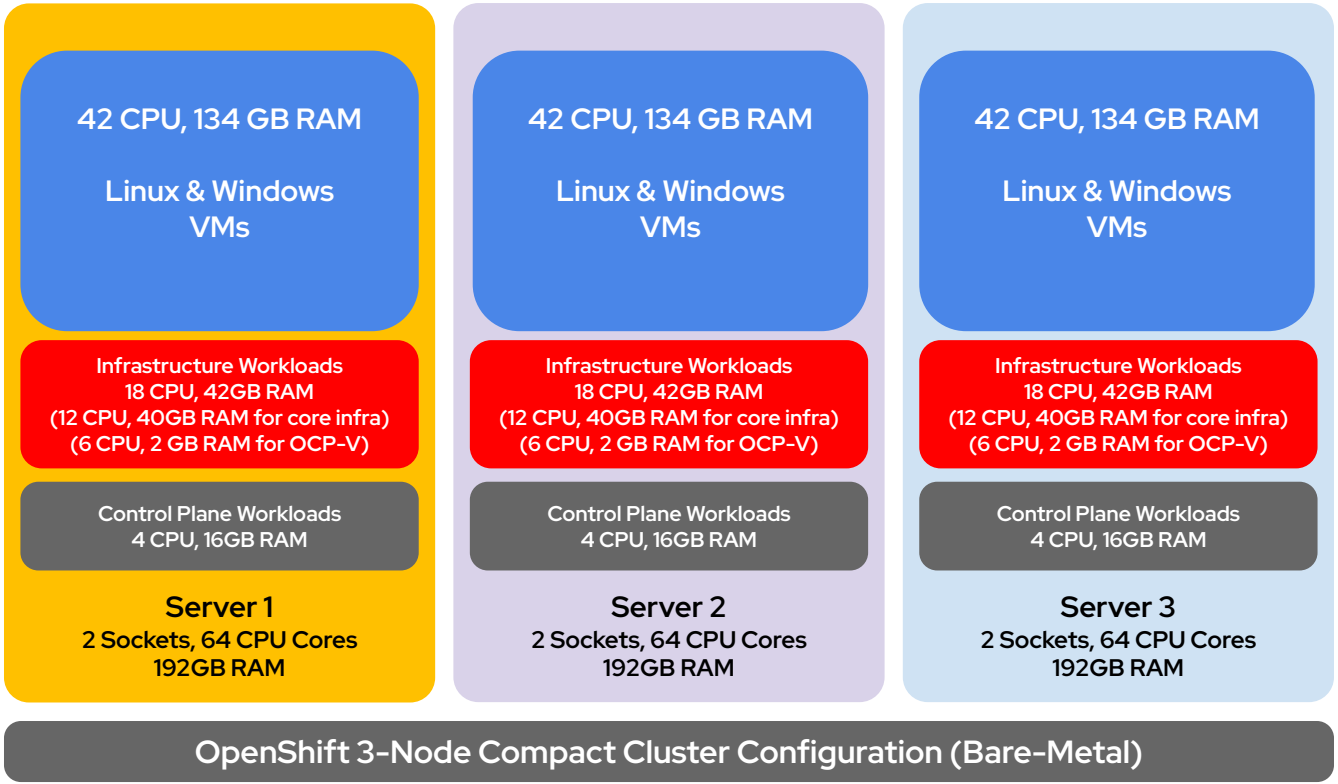
Red Hat



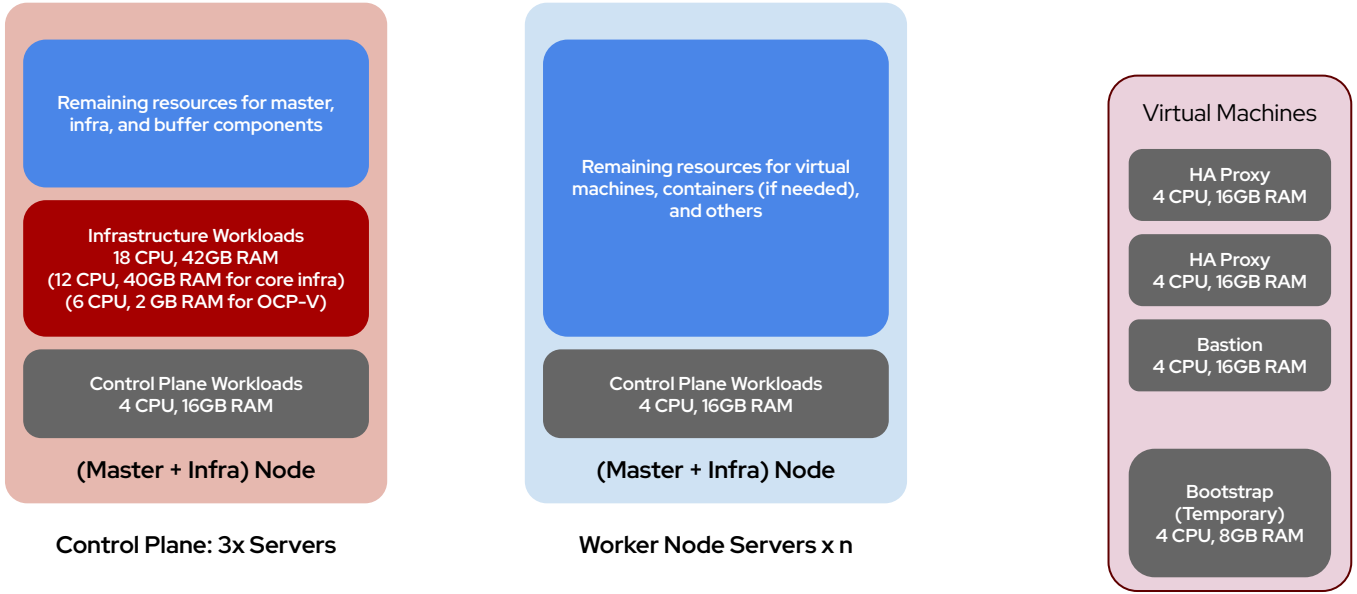
Sample Configs

Red Hat

Baseline Production Workload Requirements



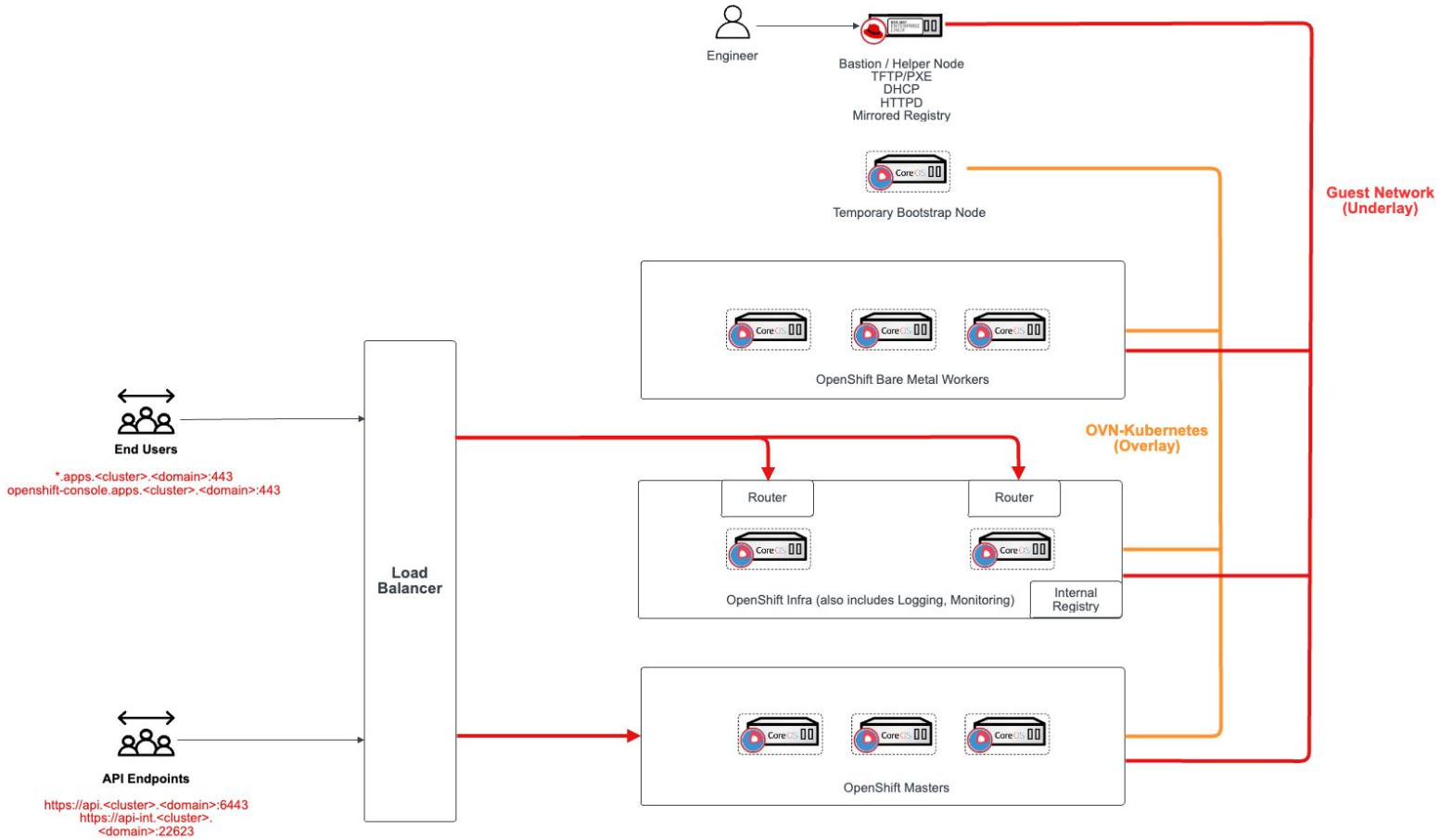
Alternative/Larger Production Workload Requirements



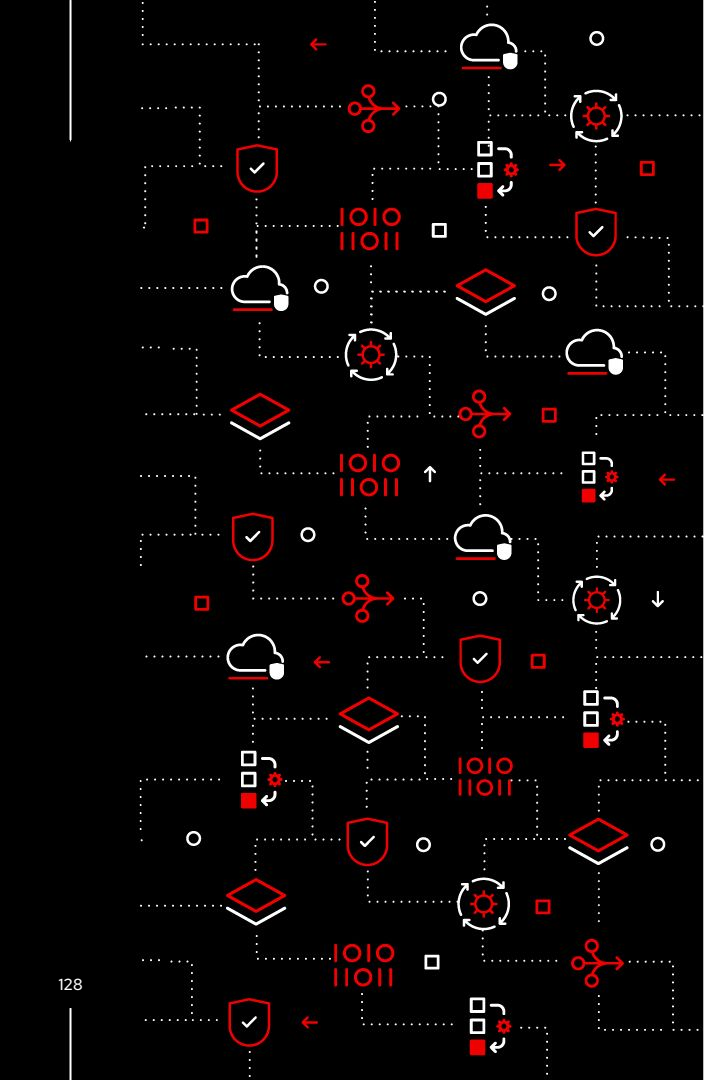
Medium Cluster Configuration

Note: Assumes mapping of 1 CPU core to 2 vCPUs

Sample Full Cluster Logical Layout

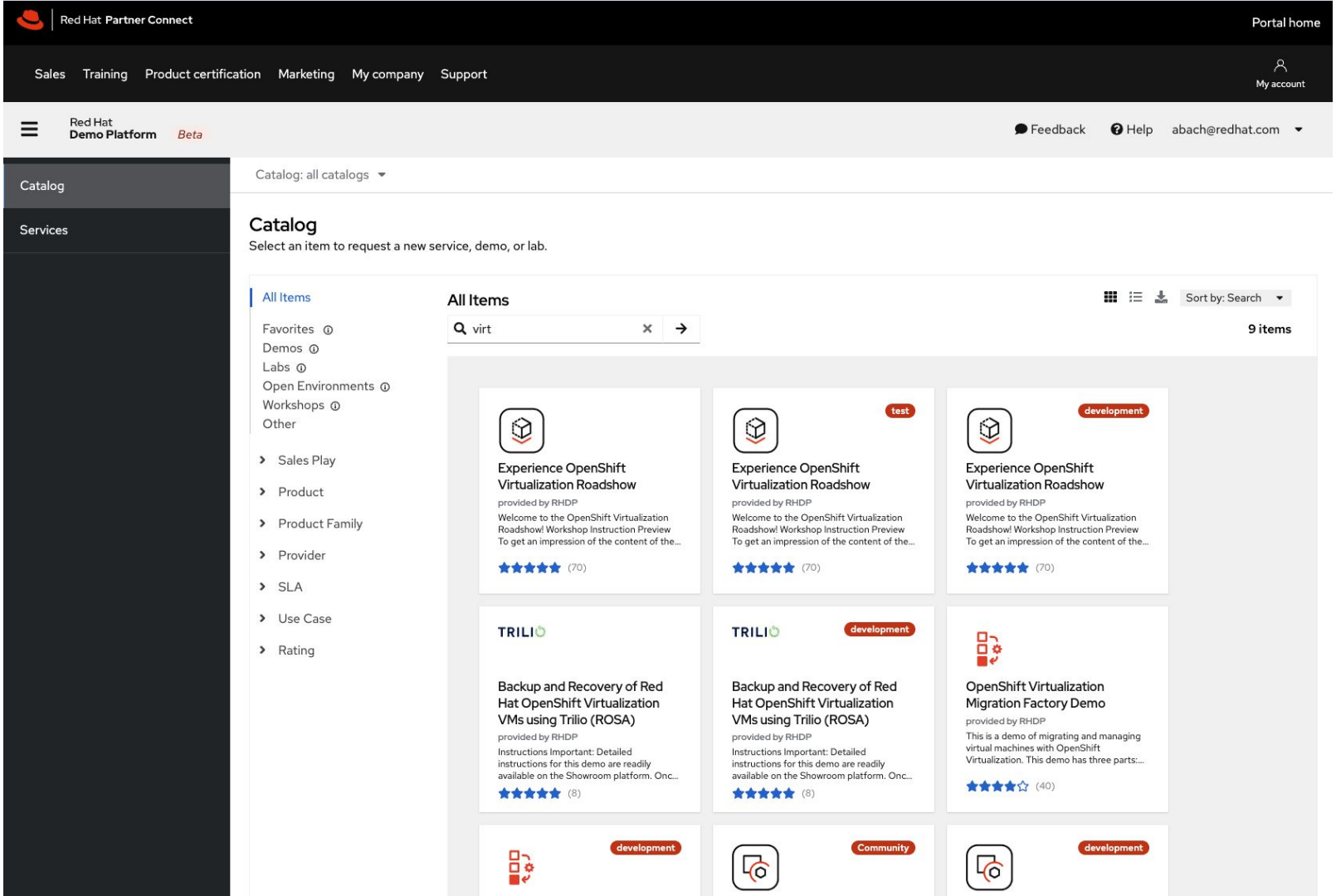


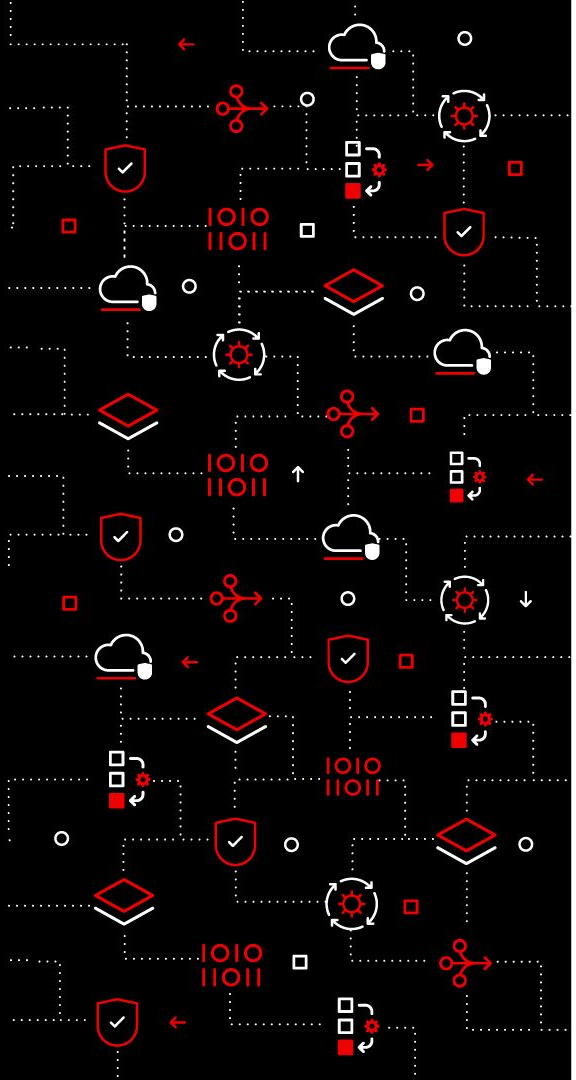
Red Hat



Demo Offerings

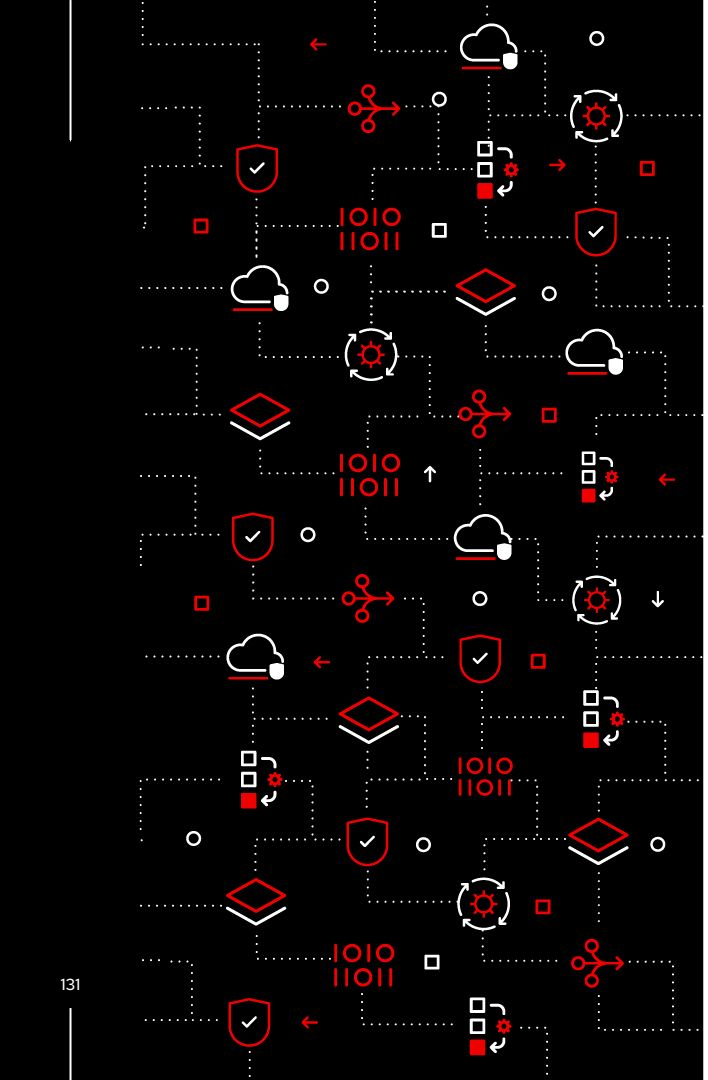
Red Hat


Red Hat Partner Connect
Portal home
Sales
Training
Product certification
Marketing
My company
Support
My account
Red Hat
Demo Platform
Beta
Feedback
Help
abach@redhat.com
Catalog
Services
Catalog: all catalogs
Catalog
Select an item to request a new service, demo, or lab.
All Items
Favorites
Demos
Labs
Open Environments
Workshops
Other
Sales Play
Product
Product Family
Provider
SLA
Use Case
Rating
All Items
virt
Sort by: Search
9 items
Experience OpenShift Virtualization Roadshow
provided by RHDP
Welcome to the OpenShift Virtualization Roadshow! Workshop Instruction Preview To get an impression of the content of the...
(70)
test
Experience OpenShift Virtualization Roadshow
provided by RHDP
Welcome to the OpenShift Virtualization Roadshow! Workshop Instruction Preview To get an impression of the content of the...
(70)
development
Experience OpenShift Virtualization Roadshow
provided by RHDP
Welcome to the OpenShift Virtualization Roadshow! Workshop Instruction Preview To get an impression of the content of the...
(70)
TRILIO
Backup and Recovery of Red Hat OpenShift Virtualization VMs using Trilio (ROSA)
provided by RHDP
Instructions Important: Detailed instructions for this demo are readily available on the Showroom platform. Onc...
(8)
TRILIO
development
Backup and Recovery of Red Hat OpenShift Virtualization VMs using Trilio (ROSA)
provided by RHDP
Instructions Important: Detailed instructions for this demo are readily available on the Showroom platform. Onc...
(8)
OpenShift Virtualization Migration Factory Demo
provided by RHDP
This is a demo of migrating and managing virtual machines with OpenShift Virtualization. This demo has three parts:...
(40)
development
Community
development



Q&A

Red Hat



Workshop Time
Starts now

Red Hat

Thank you

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


linkedin.com/company/red-hat


youtube.com/user/RedHatVideos


facebook.com/redhatinc


twitter.com/RedHat

Red Hat