



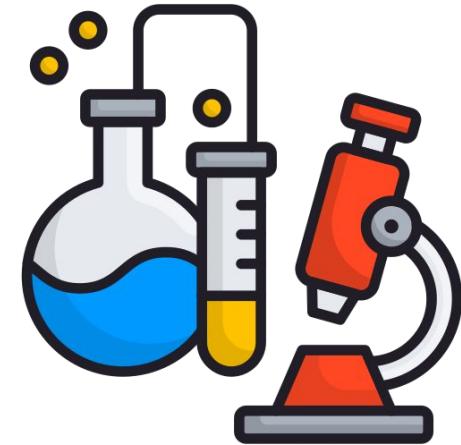
Red Hat
OpenShift

Red Hat OpenShift Virtualization Roadshow



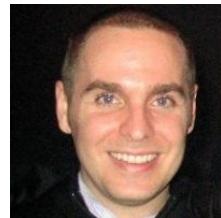
Lab Agenda

1. Virtual Machine Management
2. Migrating Existing Virtual Machines
3. Bare Metal Infrastructure Management
4. Storage Management
5. Backup and Recovery for Virtual Machines
6. Network Management
7. Template and InstanceType Management
8. Working with Virtual Machines and Applications



> whoami

APP PLATFORM ASSOCIATE
PRINCIPAL SOLUTION
ARCHITECT
513-225-9585
chrisd@redhat.com

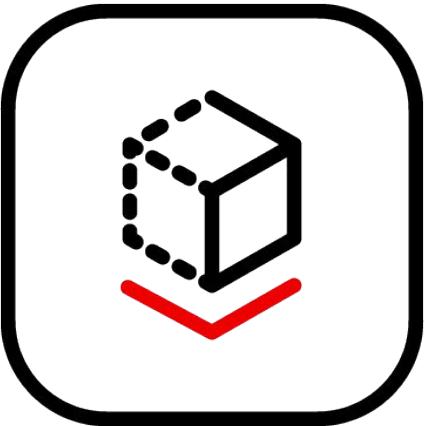


Background:
Electronic Engineering
Self-taught Software Developer

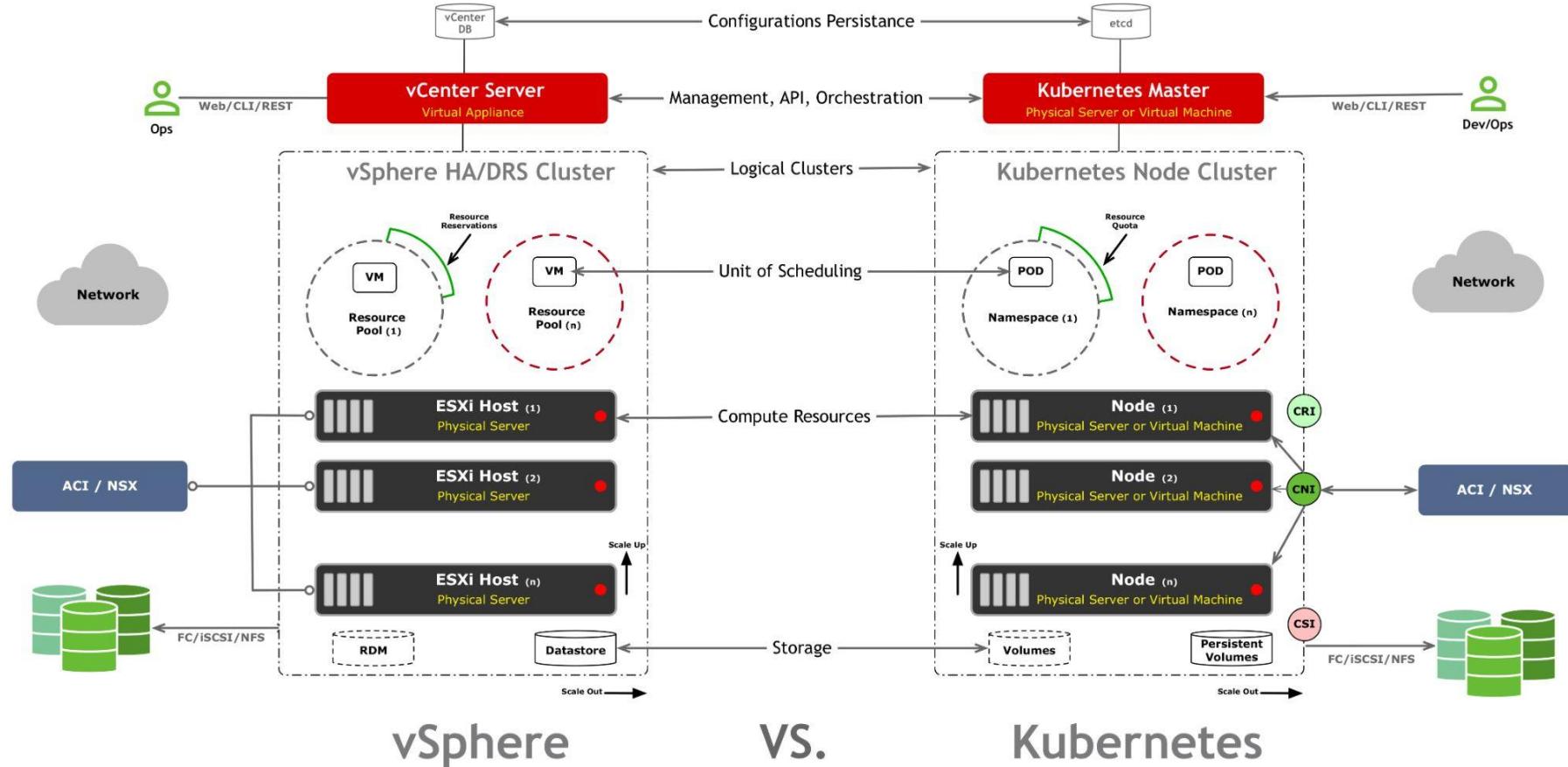


What is OpenShift Virtualization?

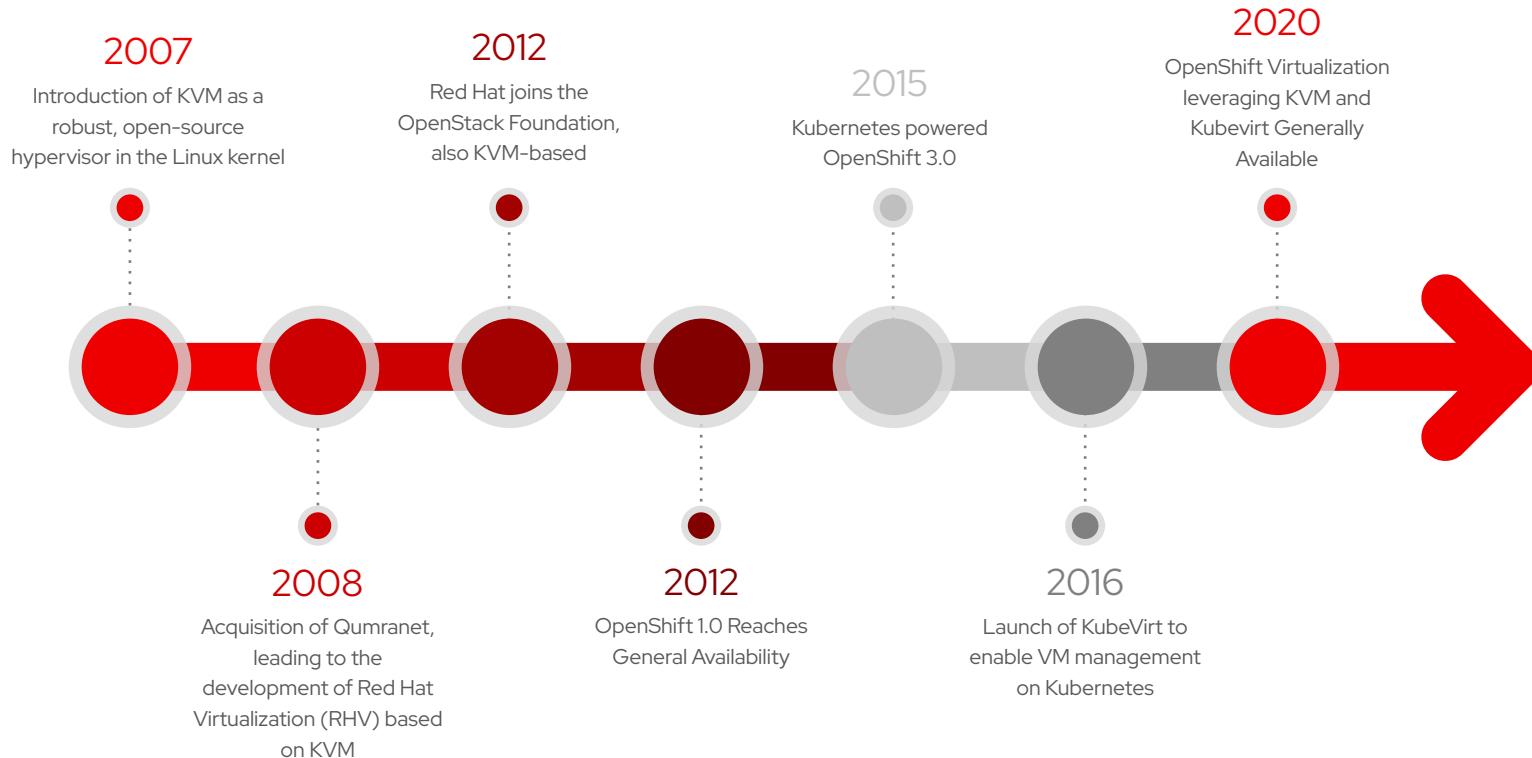
OpenShift Virtualization



A virtualization API and runtime for OpenShift, built on KubeVirt, to run and manage virtual machines using a Kubernetes-native way

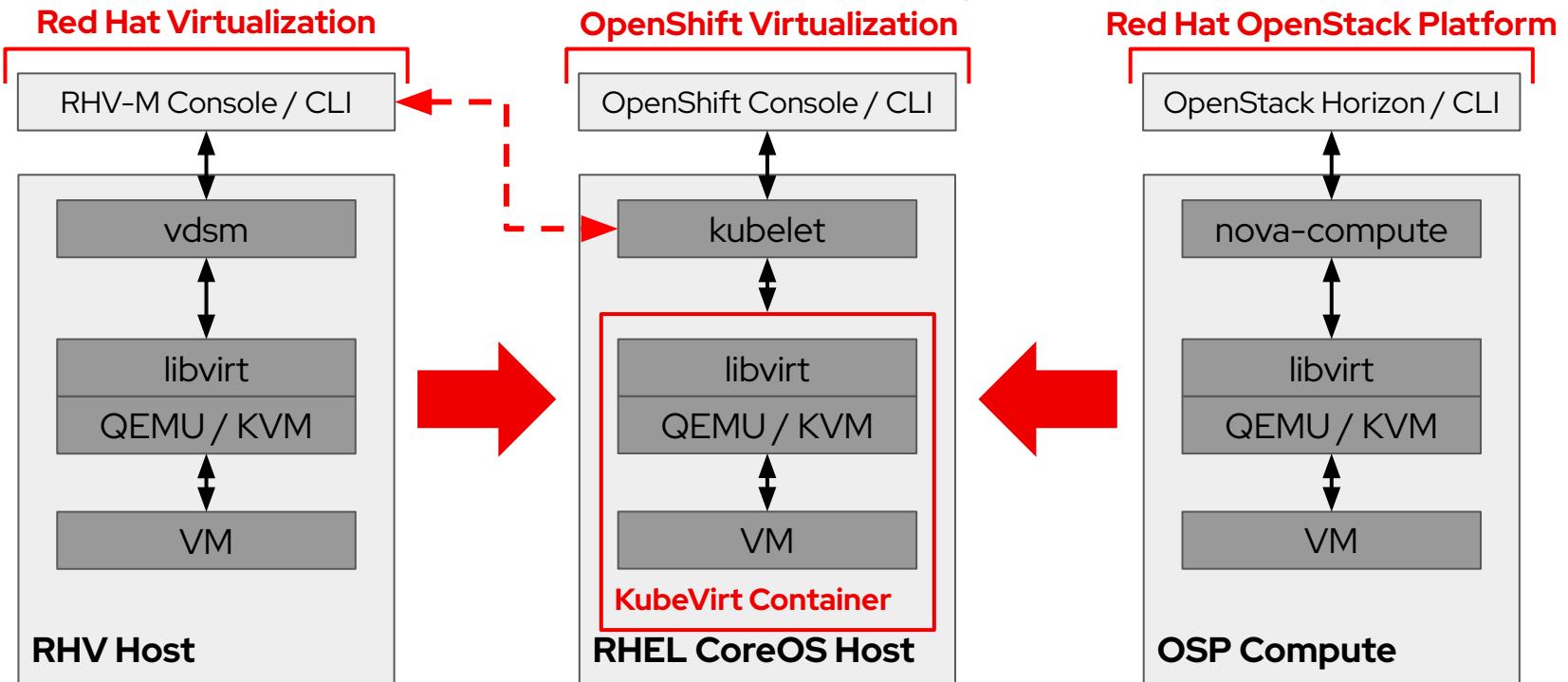


Red Hat has a long history with Virtualization



Containerizing KVM

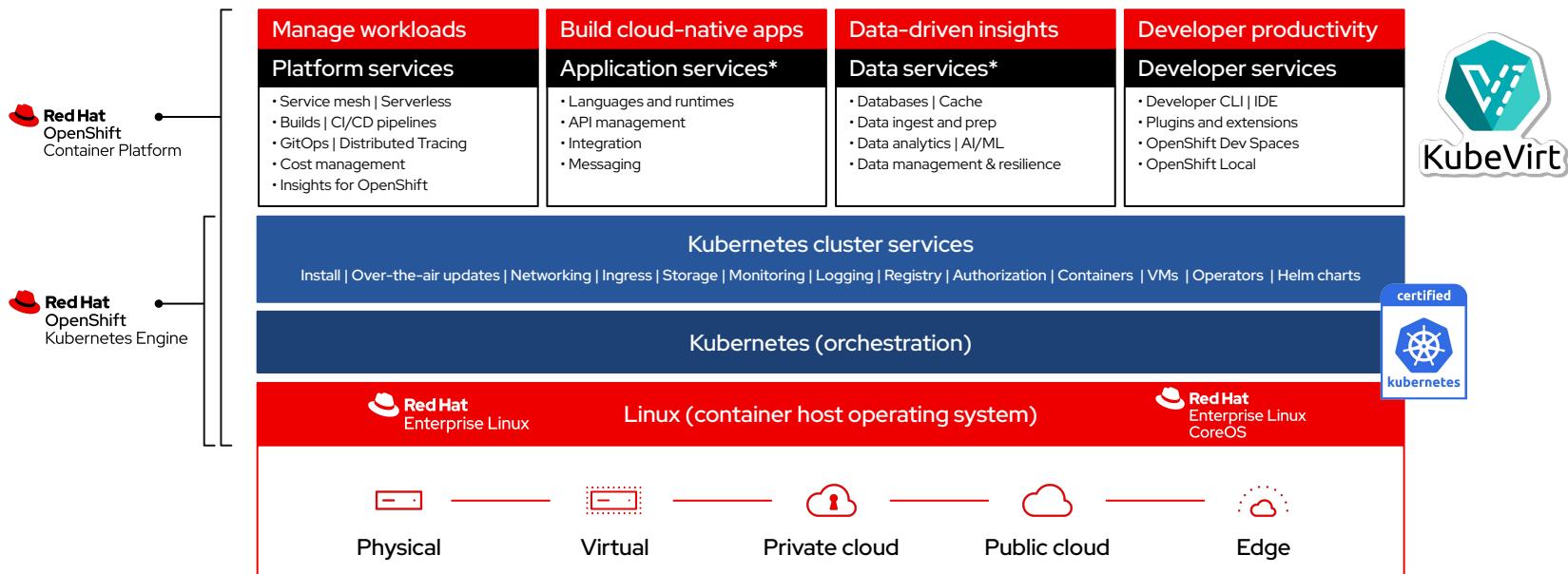
Trusted, mature KVM wrapped in modern management and automation



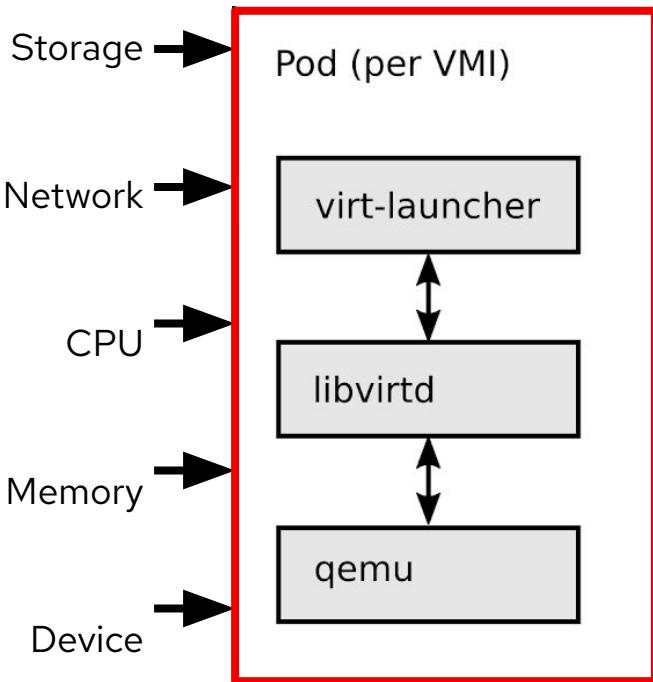
Red Hat OpenShift Container Platform

Built to deploy and manage containerized applications

- ▶ Expanded platform services (service mesh, serverless, pipelines, GitOps)
- ▶ Full developer console and services
- ▶ Enhanced application and data services



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

- RHCOS has controlled configuration by default, SELinux MCS, plus KVM isolation - inherited from the Red Hat portfolio stack

Lab environment overview

NOTE

The **Virtualization** tab is available only when Red Hat OpenShift Virtualization is installed and properly configured. In this lab environment the installation and configuration has already been performed for us.

IMPORTANT

For the next lab, it's important that we clear out the two network policies we created.

```
apiVersion: v1
kind: Service
metadata:
  name: webapp
  namespace: vmexamples
spec:
  selector:
    env: webapp
  ports:
    - protocol: TCP
      port: 80
      targetPort: 80
```



Some items are called out in NOTES, these are useful tidbits of information.

Some items are called out as IMPORTANT, these are things that must be paid attention to for the success of the roadshow.

Syntax, where it is needed, has a built-in copy function that can then be pasted into the terminal with right-click+paste, or into the OpenShift Console with **ctrl+v**, or a VM Console with the built-in paste function.

Lab Guide Overview

Lab Access

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

Password: 2c2j9gu7

Lab 1

Virtual Machine Management: In this section we will provide a review of virtual machine management fundamentals, including creating a virtual machine, and modifying its allotted resources.

Lab Sections Overview

- ▶ 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



Lab 2

Migrating Existing Virtual Machines: In this section, we will use the Migration Toolkit for Virtualization (MTV) to migrate a VM from an existing VMware vSphere environment to OpenShift Virtualization.

Lab Sections Overview

- ▶ Explore the VMware vSphere environment
- ▶ Review the configuration for the Migration Toolkit for Virtualization (MTV)
- ▶ Create a Migration Plan
- ▶ Migrate VMs into OpenShift Virtualization



Check your project



Lab 3

Bare Metal Infrastructure Management: In this section, an administrator will learn how to scale their OpenShift environment by adding in an additional worker node to host virtualized workloads.

Lab Sections Overview

- ▶ Explore the requirements for clusters running OpenShift Virtualization
- ▶ Review the physical characteristics of the lab cluster.
- ▶ Discover a new baremetal machine, and use it to scale the cluster.



Lab 4

Storage Management: The storage paradigm familiar to many administrators changes with OpenShift Virtualization. This section will explore many actions related to storage management for virtual machines.

Lab Sections Overview

- ▶ Create a new snapshot
- ▶ List all snapshots attached to a specific VM
- ▶ Revert a VM to a snapshot
- ▶ Delete an existing VM snapshot



Lab 5

Backup and Recovery for Virtual Machines: This unit introduces and demonstrates additional concepts around backing up VMs to external sites and restoring them in the event of a disaster.

Lab Sections Overview

- ▶ Review the OADP Operator
- ▶ Create a Virtual Machine Backup
- ▶ Restore From a Backup



Lab 6

Network Management: By default VMs are connected to the pod network in OpenShift. In this section we will explore creating new L2 network mappings, and configuring microsegmentation policies for multiple networks.

Lab Sections Overview

- ▶ Create a network attachment definition
- ▶ Connect a VM to the external network



Lab 7

Template and Instance Type Management: In order to streamline deployment of virtual machines, administrators will often create Templates or define Instance Types to ease deployment operations. This section will focus on those processes.

Lab Sections Overview

- ▶ Clone and Customize a Template
- ▶ Create a Windows VM Template



Make sure you did the clean up step from the previous lab.



Lab 8

Working with Virtual Machines and Applications: In this section we will perform several day-2 activities with our imported virtual machines, including setting up a load-balancer, and exposing our VM hosted applications through services and routes.

Lab Sections Overview

- ▶ MetalLB concepts
- ▶ Review the MetalLB Operator
- ▶ Configure MetalLB
- ▶ Exposing an Application with a Service/Route
- ▶ Expose the Database Externally



Thank You

Addendum

Train and certify on Red Hat OpenShift Virtualization



Managing Virtual Machines with Red Hat OpenShift Virtualization with Exam ([DO317](#))

Select self-paced training and an exam in your bundle at checkout to receive the discounted offer.



Managing Virtual Machines with Red Hat OpenShift Virtualization ([DO316](#))

Teaches the essential skills required to create and manage virtual machines (VM) on OpenShift using the Red Hat OpenShift Virtualization operator. This course does not require previous knowledge of containers and Kubernetes.



Red Hat Certified Specialist in OpenShift Virtualization ([EX316](#))

The Red Hat Certified Specialist in OpenShift Virtualization exam (EX316) tests the knowledge, skills, and ability to plan, deploy and manage virtual machines using the Red Hat OpenShift Virtualization operator in a Red Hat OpenShift Container Platform environment.



OpenShift Virtualization Glossary

Bare Metal ESXI

OpenShift Virtualization:

- Node/RHCoreOS
- A node is a virtual or bare-metal machine in a Kubernetes cluster
- Red Hat Enterprise Linux CoreOS (RHCOS) represents the next generation of single-purpose container operating system technology by providing the quality standards of Red Hat Enterprise Linux (RHEL) with automated, remote upgrade features.



Distributed Resource Scheduler

OpenShift Virtualization:

- The equivalent of VMware DRS (Distributed Resource Scheduler) in OpenShift Virtualization would be OpenShift's built-in Kubernetes scheduler and resource management features, such as pod and node affinity/anti-affinity rules, and resource limits/requests for pods.
- These features allow for the efficient scheduling and placement of workloads within the OpenShift cluster, and can be used to ensure high availability of applications by spreading them across multiple nodes.
- Additionally, OpenShift's support for Kubernetes Operators can also provide advanced automation of resource management and scaling.



High Availability

OpenShift Virtualization:

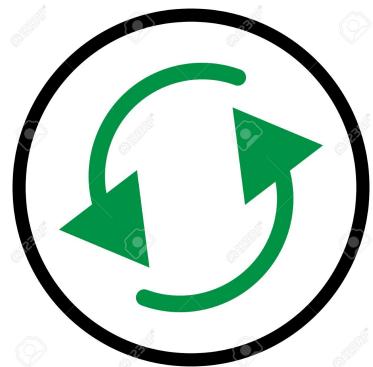
- The equivalent of VMware High Availability in OpenShift Virtualization is called HA Cluster, which allows for the automatic failover of virtual machines to a different host in the event of a host failure.



vMotion

OpenShift Virtualization:

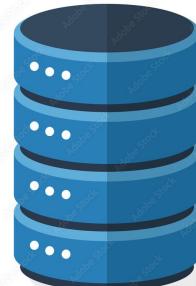
- The equivalent of VMware vMotion in OpenShift Virtualization is called Live Migration.
- It allows for the live migration of virtual machines between nodes without any downtime, ensuring high availability and reducing maintenance windows.



vSan

OpenShift Virtualization:

- OpenShift Virtualization, on the other hand, is built on top of Kubernetes and is designed to work with containers, rather than virtual machines.
- Our solution is Red Hat OpenShift Data Foundation which is software-defined storage for containers.



vCenter

OpenShift Virtualization:

- OpenShift Virtualization Manager, which is a web-based management console for managing and deploying virtual machines on OpenShift.
- It allows for creating and managing virtual machines, networks, and storage, as well as monitoring the performance and health of the virtualized environment.
- It also provides a centralized management interface for OpenShift Virtualization, similar to how vCenter provides centralized management for VMware environments.



Site Recovery Manager

OpenShift Virtualization:

- OpenShift Virtualization is the OpenShift Cluster-API, which allows for automated recovery and failover of OpenShift clusters in a disaster recovery scenario.
- Additionally, OpenShift Virtualization also supports the use of third-party disaster recovery solutions such as Velero (and more) to perform backup and restore operations of virtual machines.
- OpenShift Data Foundation also offers local and Metro failover/recovery options.



VMWare Tools

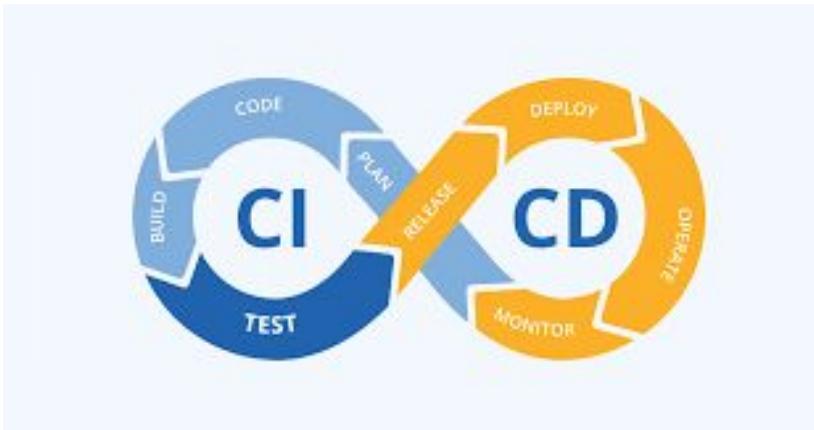
OpenShift Virtualization:

- The [QEMU guest agent](#) is a daemon that runs on the virtual machine (VM) and passes information to the host about the VM, users, file systems, and secondary networks.
- You must install the QEMU guest agent on VMs created from operating system images that are not provided by Red Hat.
- For Windows virtual machines (VMs), the QEMU guest agent is included in the VirtIO drivers. You can install the drivers during a Windows installation or on an existing Windows VM.



OpenShift Virtualization Automation Options

Open Source = Open Standards



Jenkins



PowerShell



Terraform



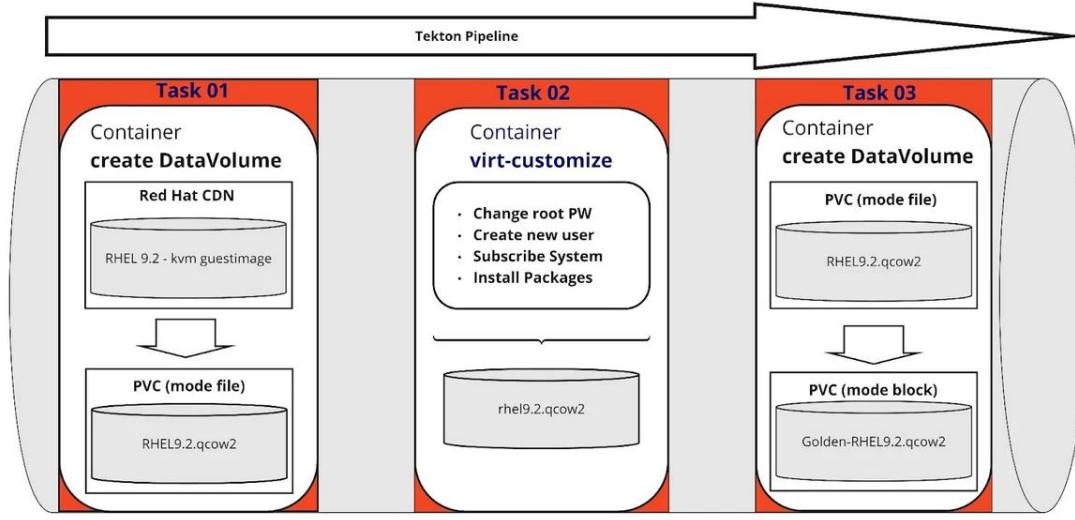
ANSIBLE



Bash



Building VM Images Using OpenShift Pipelines (Tekton)



- **Task 01** will supply a container which handles the creation of DataVolume. This DataVolume is importing the RHEL KVM guest image in qcow2 format (source), into a PVC (target). The PVC will be created in volumeMode 'Filesystem' so it can be natively consumed by the virt-customize container in the next step.
- **Task 02** will supply a container which is running virt-customize and mounts the PVC containing the qcow2 image in a well-known path to execute the virt-customize commands upon. Both the name of the PVC and the customize commands are expected parameters of this task.
- **Task 03** acts very similarly to Task 01 as both create a DataVolume, but in this case the source is pointing towards your PVC, which contains the now manipulated qcow2 image and will transfer it into a PVC with volumeMode 'Block', which is then ready to be cloned and consumed by virtual machines in the OpenShift Cluster. This new PVC will be your ready-to-use, customized 'golden image.'

Openshift Pipelines Example

Project: image-building ▾

PipelineRuns > PipelineRun details

PLR golden-image-rhel9-ndq9p ✓ Succeeded

Details YAML TaskRuns Parameters Logs Events

PipelineRun details

```
graph LR; A[create-datavolume 1/1] --> B[disk-virt-customize 1/1]; B --> C[transform-pvc-from-file-to-block 1/1]
```

🔍 🔍 ✖ ⋮

Name
golden-image-rhel9-ndq9p

Namespace
NS image-building

Status
✓ Succeeded

Pipeline
PL golden-image-rhel9



EXAMPLE

Let's see an example!



OpenShift GitOps

Treat everything as code

- Define the state of infrastructure, applications, and configurations with declarative code across environments

Git as the single source of truth

- Infrastructure and applications are stored and versioned in Git allowing for traceability and visibility into changes that affect their entire state

Operations through Git workflows

- View history, apply and deploy changes directly to target infrastructure and applications through Git workflows

Enhanced security

- Preview changes, detect configuration drifts, and take action



Visibility and audit

- Capture and trace any change to clusters through Git history

Multi-cluster consistency

- Combine GitOps with Advanced Cluster Manager for Kubernetes to configure multiple clusters and deployments reliably and consistently



VMs as Code-Wrapping It Up



GitOps



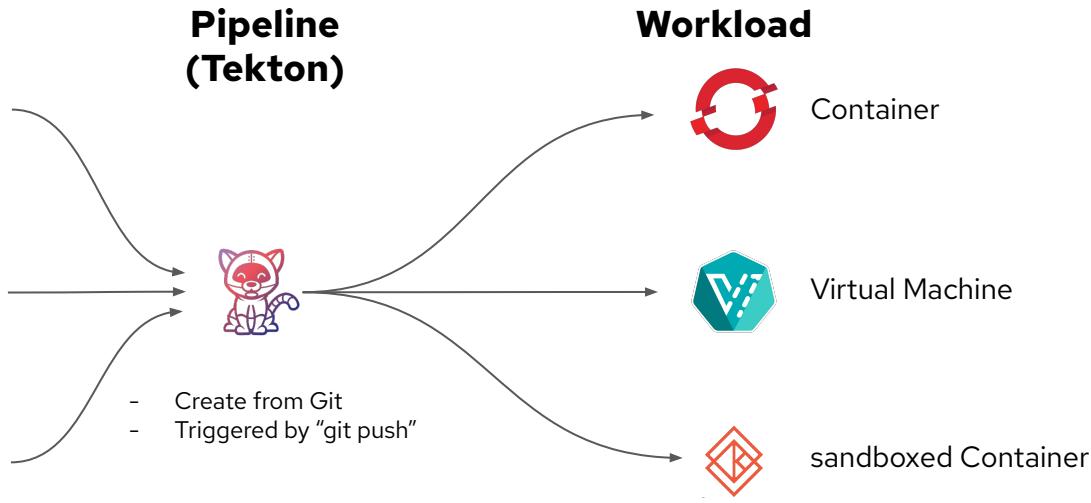
Container definition



Virtual machine definition

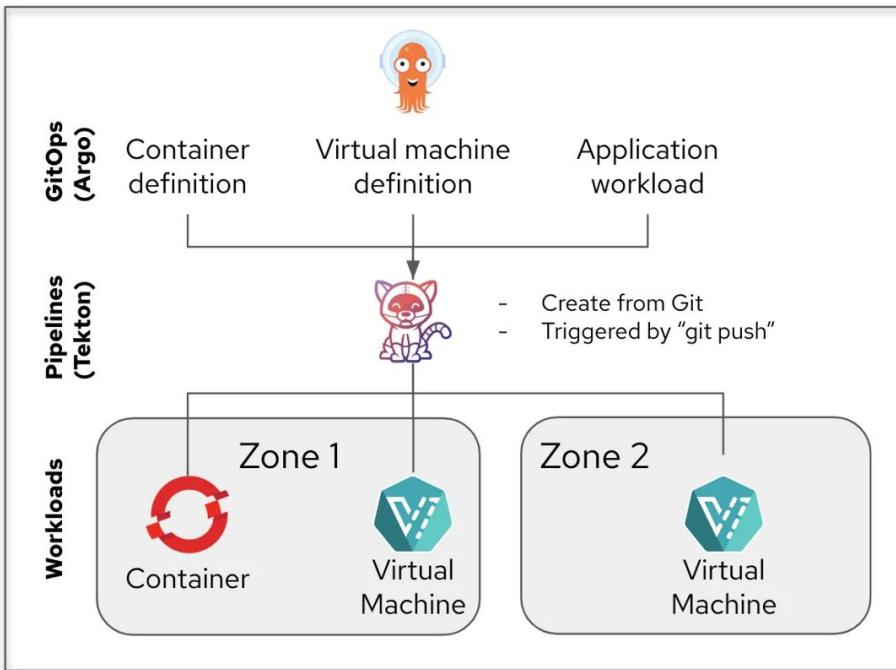


Application workload

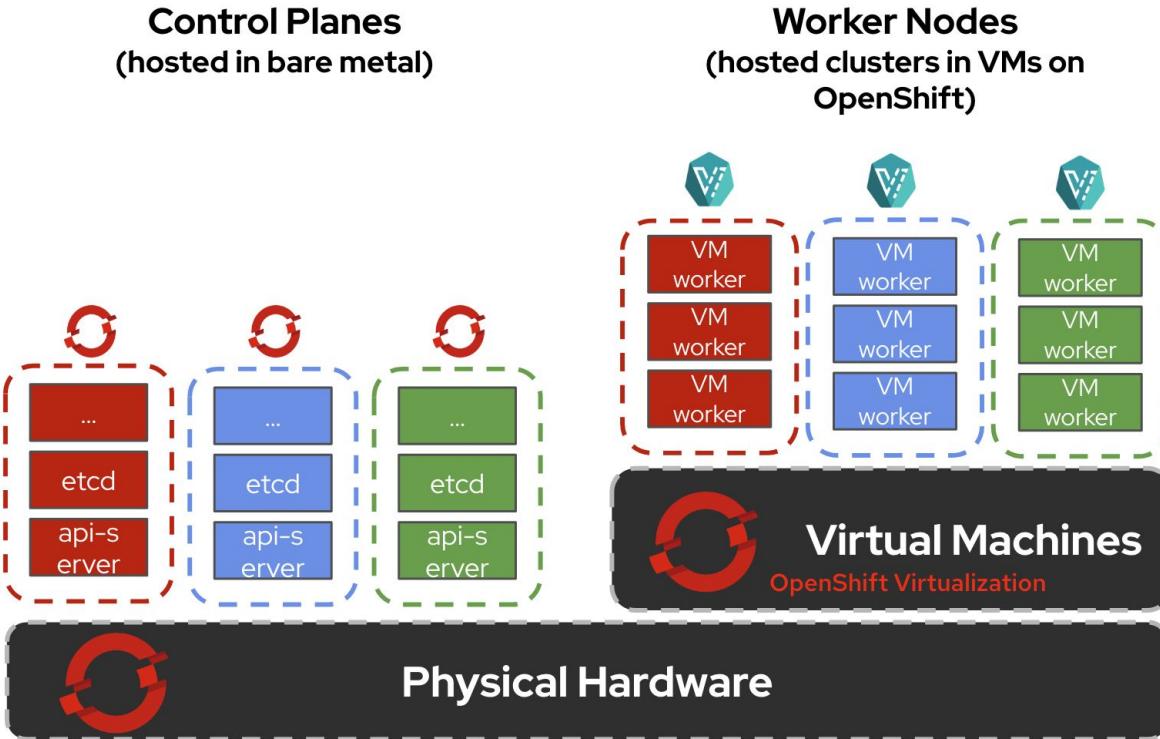


- ▶ OCP-V Infrastructure to deploy three different security zones to run both composite applications of pods/VMs as well as traditional VM Workloads
- ▶ GitOps approach to deploy and automate Virtual Machines as Code with ArgoCD plus Helm and Pipeline
- ▶ OpenShift cluster deployment with Assisted Installer / ACM resonates well with this approach

Wrapping it Together

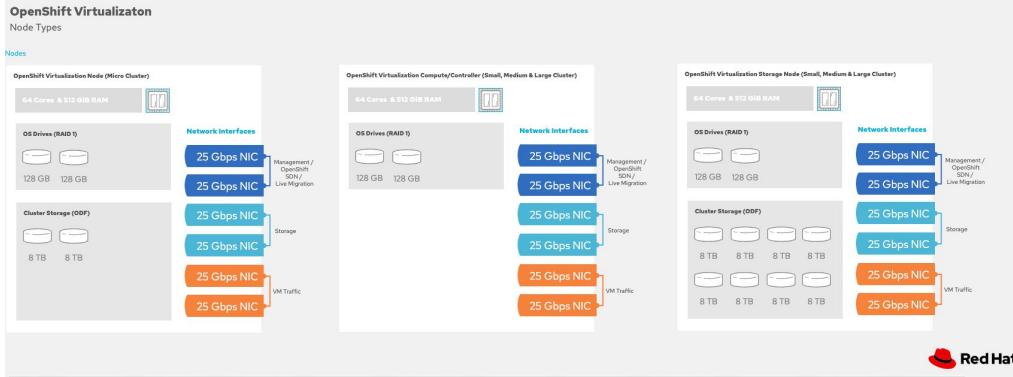


Kubernetes-Open Shift Architecture



Reference Architecture and Implementation

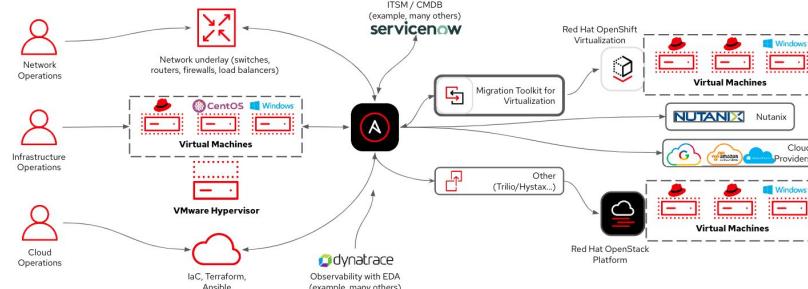
OpenShift Virtualization Reference Implementation



Public Link:

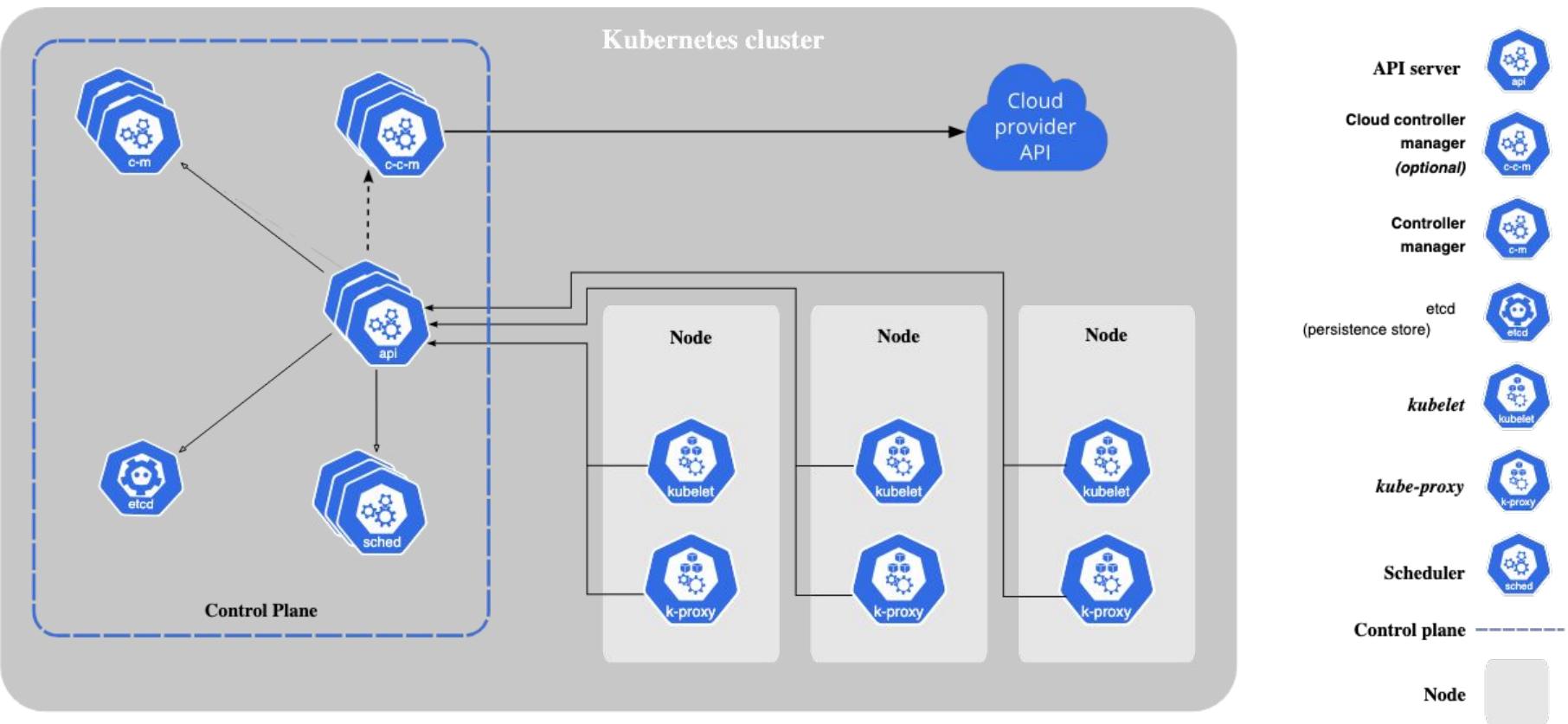
[OpenShift Virtualization Reference Implementation Guide](#)

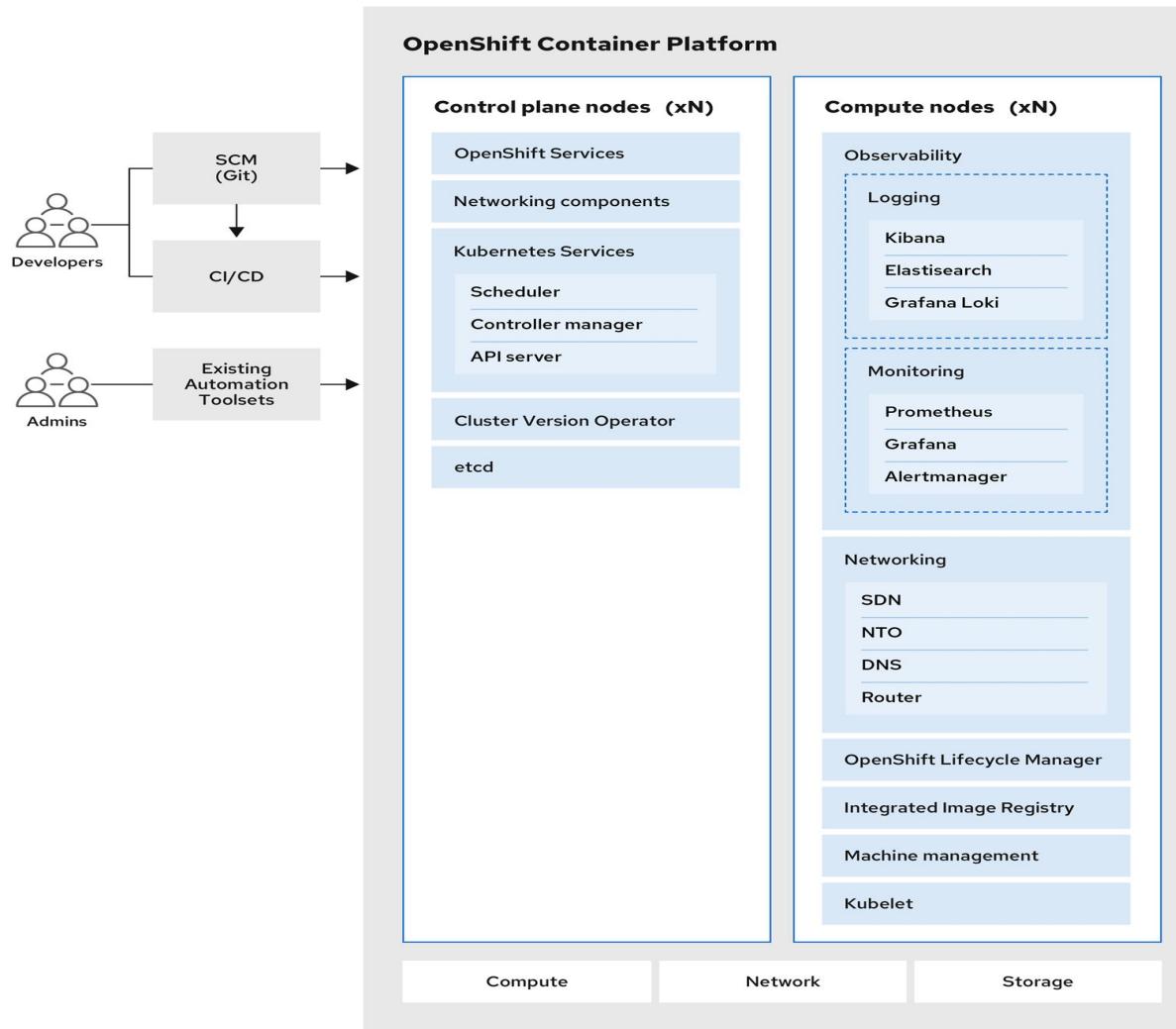
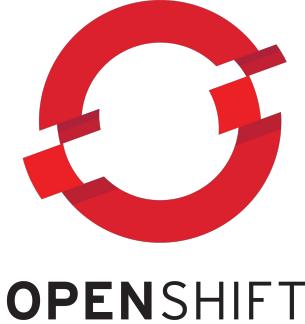
Ansible Migration Factory Reference Implementation



Public Link:

[How to automate migrations with Red Hat Ansible Automation Platform](#)





ISV Partners to Complete the Solution

Storage

Certified products for OpenShift Virt using CSI (container storage interface)



[Dell Container Storage Modules \(CSM\)](#) operator for Dell PowerScale, PowerFlex and PowerStore



[Portworx Enterprise](#) is the Cloud Native Storage Kubernetes storage platform



[Hitachi Storage plug-in for containers](#)

Backup/DR

Certified products for OpenShift



[Portworx Enterprise](#) is the Cloud Native Storage Kubernetes storage platform



[TrilioVault](#) provides native OpenShift backup and recovery



[Kasten K10](#) by Veeam is a data protection and application migration platform purpose-built for Kubernetes



[Backup solution](#) supporting wide range of sources including virtualization, containers, cloud instances, Microsoft 365 and OS agents

Networking

Certified products for OpenShift Virt using CNI (container networking interface)



[Tigera Operator](#) installs and manages Project Calico and Calico Enterprise for OpenShift Container Platform environments



[Cisco ACI CNI plugin](#) for the Red Hat OpenShift Container Platform



[eBPF-powered Networking, Observability, and Security](#)



[The F5 Container Ingress Services\(CIS\)](#) for OpenShift provides seamless management and integration of BIG-IP

Additional Information

Current product public listings and 'in progress' integrations



Red Hat Ecosystem Council

[Listings](#) of current partner products that are certified or completed statement of support.

Visit this [source page](#) to see the current 'in progress integrations' and to submit requests for additional partner product integrations.



Kubernetes-OpenShift Architecture

Red Hat OpenShift Container Platform

Complete platform for containerized application deployment



Red Hat
OpenShift
Container Platform



Trusted Enterprise Kubernetes

- Immutable infrastructure with RHEL CoreOS and Kubernetes

Cloud-like Experience Everywhere

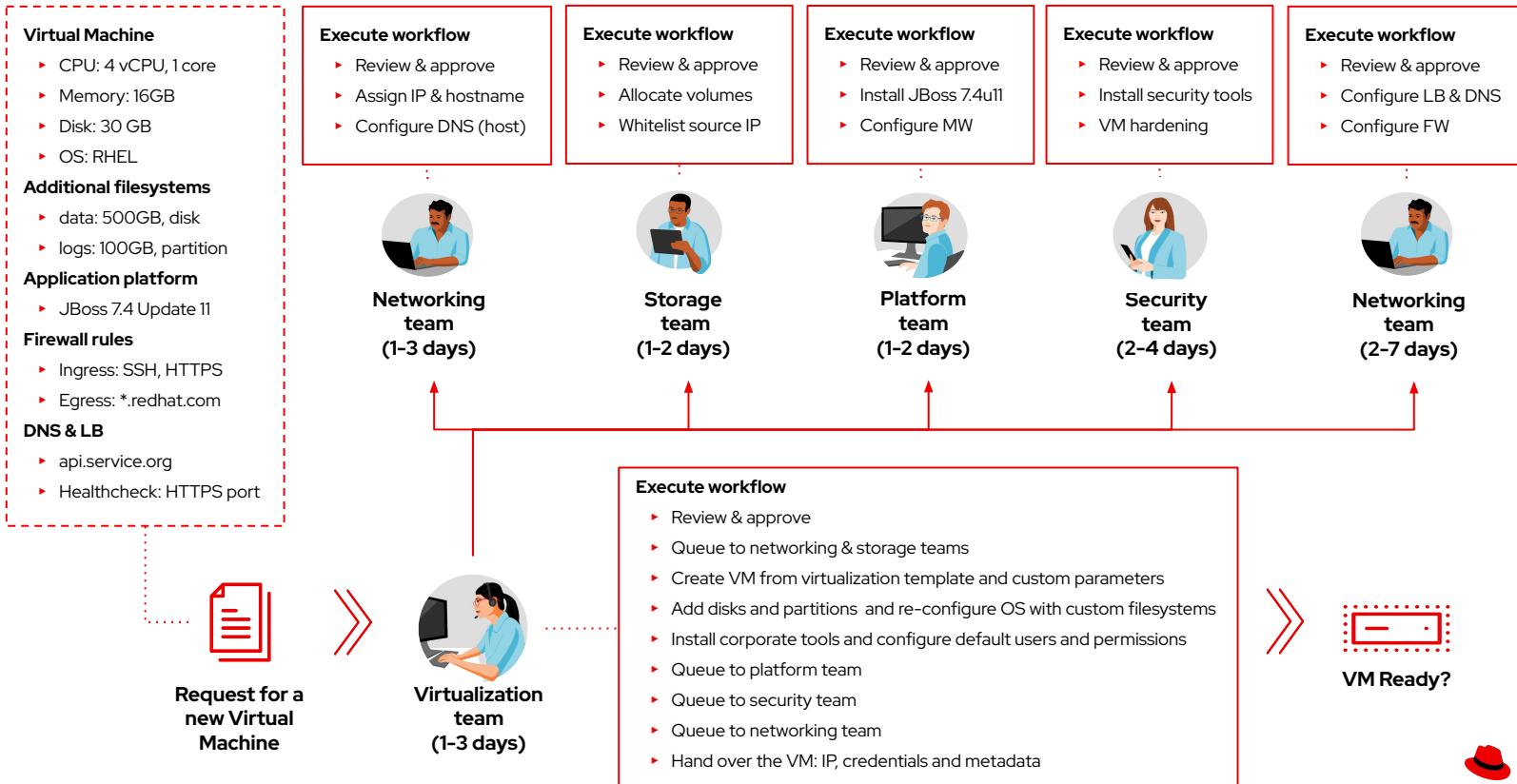
- Complete set of advanced services to enhance controls, monitoring and interfaces

Empowering Developers to Innovate

- Integrated with developer workflows to get applications to production sooner

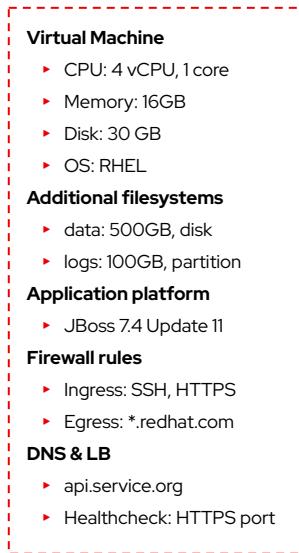
Fragmented 'Approach' to VM Provisioning

A process that can take weeks trapped in queues and iterations

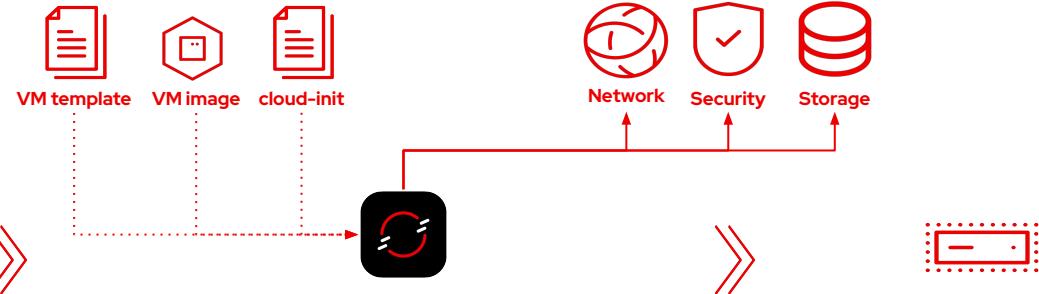


Next Gen Approach to VM Provisioning

Automated VM provisioning in minutes



Request for a
new Virtual
Machine



Execute workflow

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