Level Up with OpenShift Virtualization

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Why OpenShift

Red Hat

Without Linux no containers

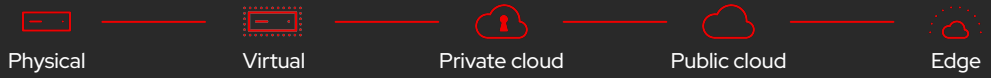
- Automatic updates
  - No interaction for administrators
  - Staying up to date → security fixes applied
- Centrally configured infrastructure
  - Need a change? Update configs and re-provision.
- User software runs in containers
  - Host updates are more reliable

RED HAT®
ENTERPRISE LINUX CoreOS

An operating system for containers

- Container based packaging
- Kubernetes cluster based management
- Delivered and updated with OpenShift
- Industry standard RHEL security & compliance
- Certified Red Hat Container ISV ecosystem

Linux (container host OS)



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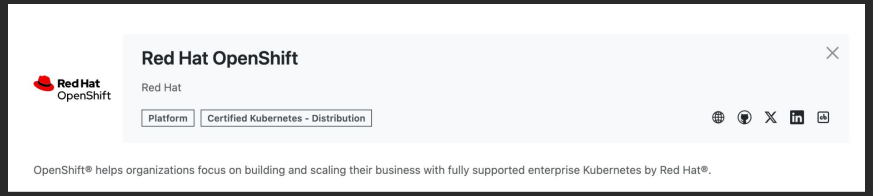
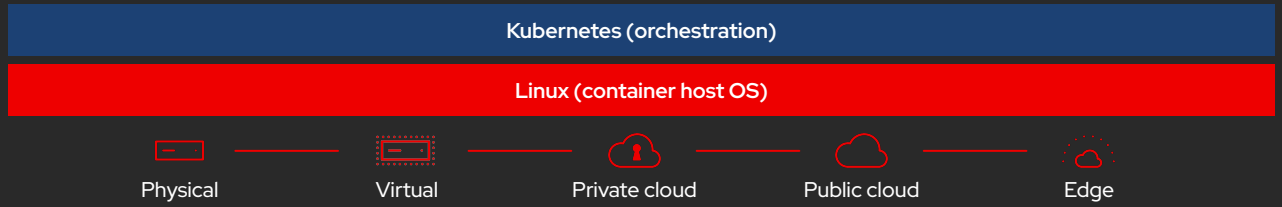
Kubernetes is the core of Red Hat OpenShift

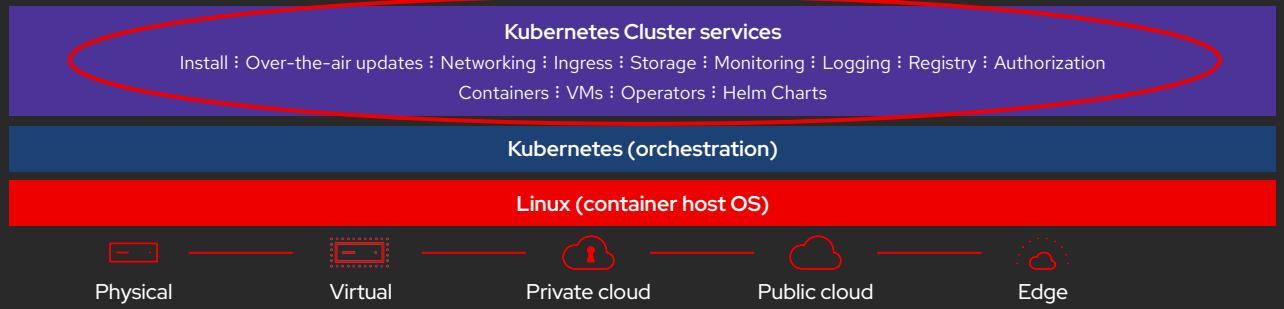




Red Hat

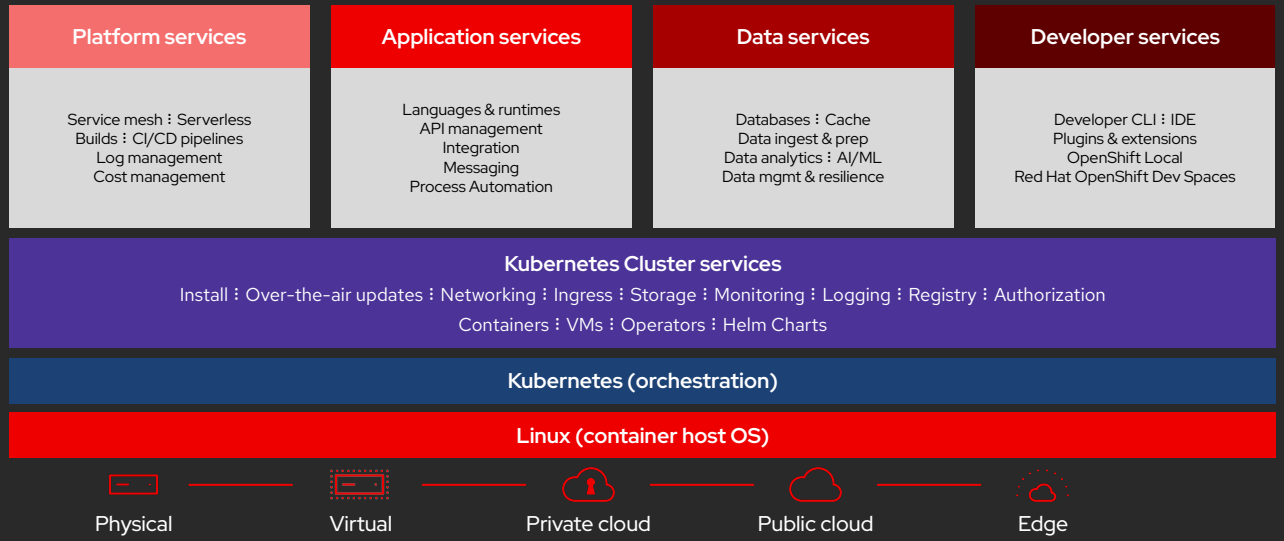
OpenShift – Enterprise Containerization

- Fully automated OpenShift installer provisioned infrastructure
- Immutable over the air or air gapped updates with telemetry
- Integrated OpenShift SDN (OVS/OVN), ingress & CNI plugins
- Kubernetes native storage (Ceph/Rook) & certified CSI plugins
- Deploy and manage both Containers & VMs (Kubevirt)
- Prometheus monitoring and alerts for to manage your clusters
- Log collection & forwarding to external log management systems
- Built in OpenShift Registry to securely manage container images
- Integrated authentication, authorization & deployment policies
- Leverage Kubernetes Operators & Helm Charts to manage deployments



Red Hat

Platform/Application/Data/Developer



Red Hat

OpenShift is built on the CNCF foundation

Red Hat is a leading contributor to CNCF, OpenSSF, and Kubernetes SIGs

Build applications

- **Runtimes**
  Java, Node.js, Python, and more
- **Apache Tomcat**
  Java application server
- #1 **Podman Desktop**
  Build and run containers locally
- #1 **Eclipse Che**
  Web-IDE and developer workspace
- #1 **Knative**
  Serverless applications and function
- #1 **Keycloak**
  Identity and access management
- #6 **Cloud-Native Buildpacks**
  Build containers images from source

Deliver applications

- #1 **Tekton Pipelines**
  Kubernetes-native CI/CD pipelines
- #2 **Argo CD & Argo Rollouts**
  GitOps & continuous delivery
- #2 **Shipwright**
  Automate building container images
- #1 **KubeVirt**
  Run virtual machines on Kubernetes
- **SigStore**
  Sign, verify and protect images
- #3 **Helm**
  Application packaging for Kubernetes
- #1 **Operator Framework**
  Tools for building operators

Operate applications

- #9 **Istio**
  Service mesh & application networking
- #4 **KEDA**
  Event-driven auto-scaling
- #3 **Prometheus**
  Monitoring and alerting
- **OpenTelemetry**
  Instrumentation and telemetry
- #2 **Jaeger**
  Distributed tracing
- **Loki**
  Scalable log aggregation
- **Cert-manager**
  X.509 certificate managemen

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(Volvo Scalable Product Architecture (SPA))

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platform/infrastructure

is your choice

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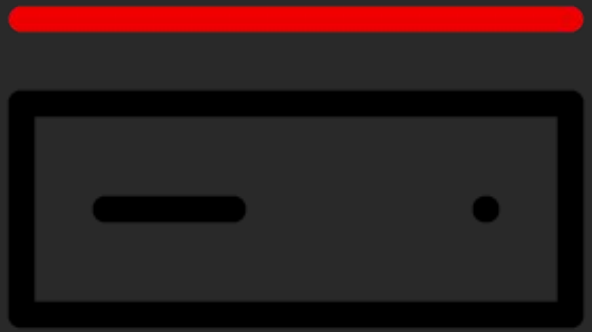
If you choose



OpenShift on bare metal

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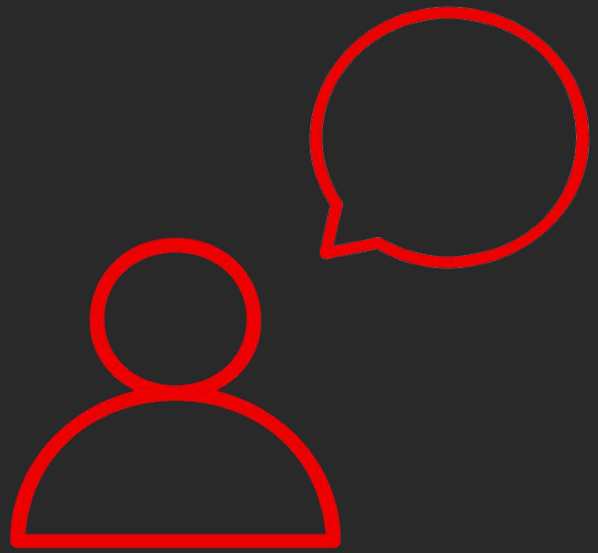
you can make



VM’s fun again

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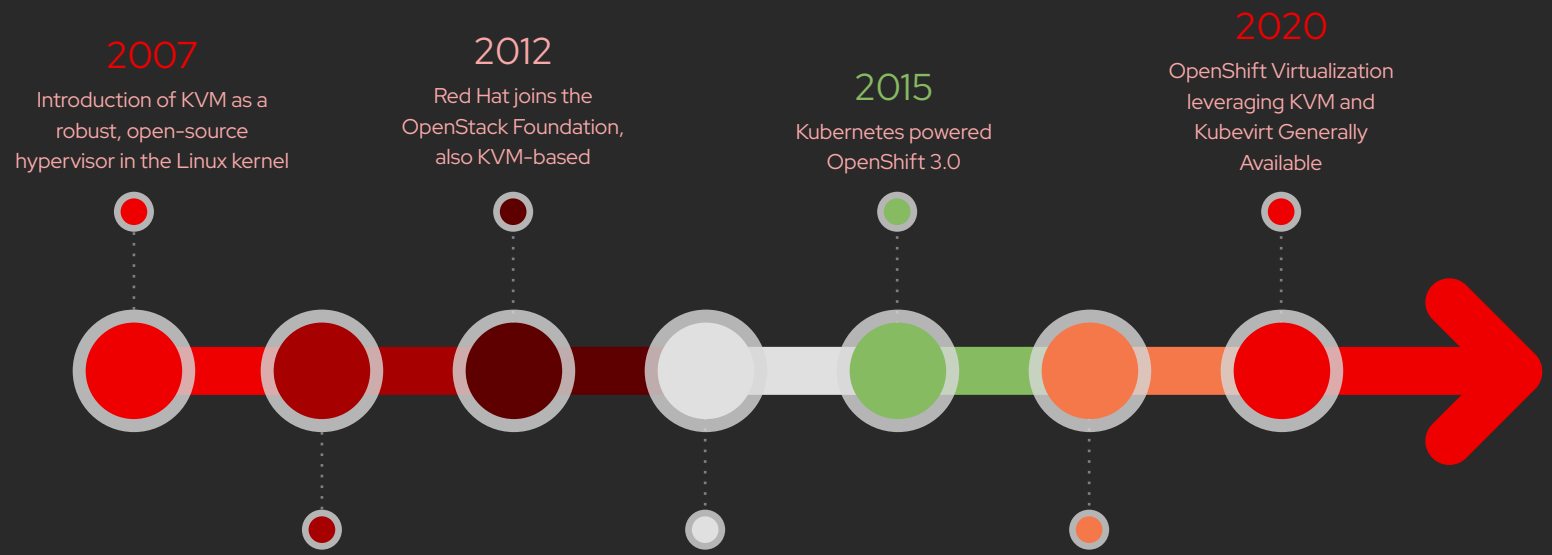
Red Hat has a long history with Virtualization



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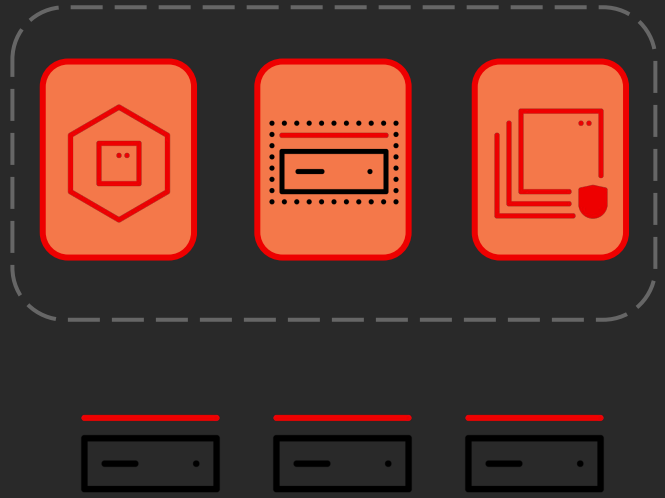
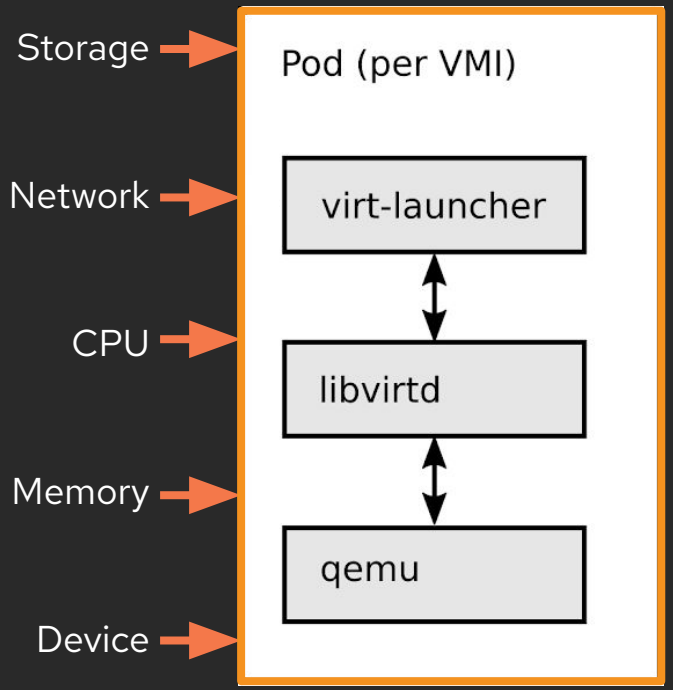
Virtual machines can be put into containers

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



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.

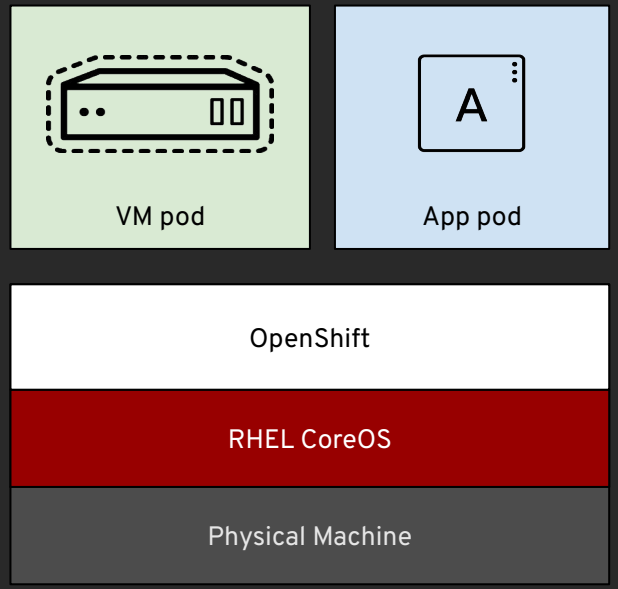
Security - Defense in depth

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

Red Hat

Virtual machines in a container world

- Provides a way to transition application components which can't be directly containerized into a Kubernetes system
  - Integrates directly into existing k8s clusters
  - Follows Kubernetes paradigms:
    - Container Networking Interface (CNI)
    - Container Storage Interface (CSI)
    - Custom Resource Definitions (CRD, CR)
- Schedule, connect, and consume VM resources as container-native



KubeVirt

KubeVirt is mature and key

200+ Contributing companies

60 Releases

Top 10 CNCF active projects

50% increase in Contributing companies in CY23

Virtualization native to Kubernetes

- Operators are a Kubernetes-native way to introduce new capabilities by extending the API
- New CustomResourceDefinitions (CRDs) for native VM integration, for example:
  - `VirtualMachine`
  - `VirtualMachineInstance`
  - `VirtualMachineInstanceMigration`
  - `VirtualMachineSnapshot`
  - `DataVolume`

```yaml
apiVersion: kubevirt.io/v1alpha3
kind: VirtualMachine
metadata:
  labels:
    app: demo
    flavor.template.kubevirt.io/small: "true"
  name: rhel
spec:
  dataVolumeTemplates:
  - apiVersion: cdi.kubevirt.io/v1alpha1
    kind: DataVolume
    metadata:
      creationTimestamp: null
      name: rhel-rootdisk
    spec:
      pvc:
        accessModes:
        - ReadWriteMany
        resources:
          requests:
            storage: 20Gi
        storageClassName: managed-nfs-storage
        volumeMode: Filesystem
```

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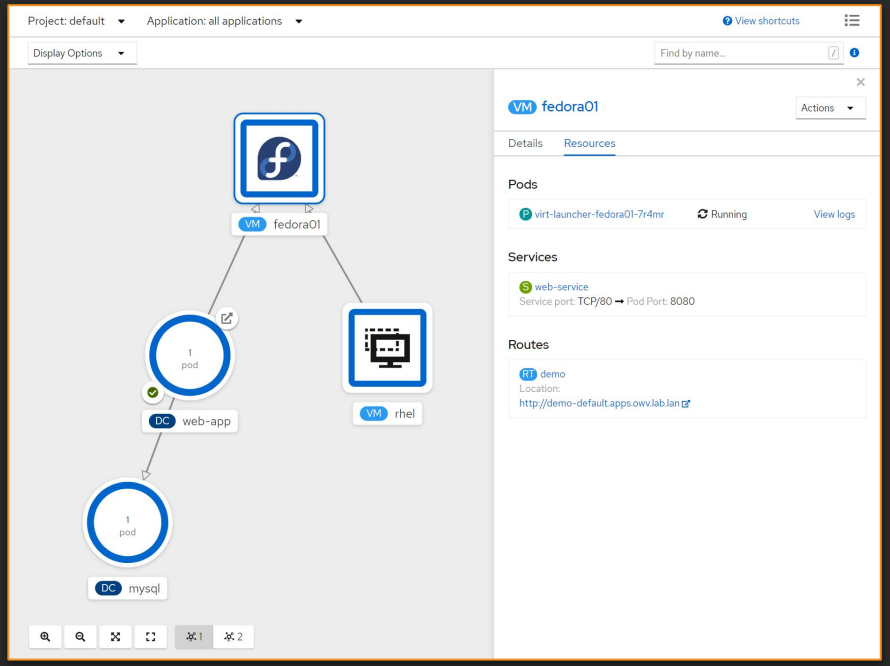
Using VMs and containers together

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



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Use all the nice K8S abstractions

- OpenShift Virtualization attaches disks to VMs for injecting data
  - Cloud-Init
  - ConfigMap
  - Secrets
  - ServiceAccount
- These disks are read-only and can be mounted by the OS to access the data within
- Similar to VMware Tools virtual disc

```yaml
spec:
  domain:
    devices:
      - disk:
          bus: virtio
        name: cloudinitdisk
  volumes:
    - cloudInitNoCloud:
        userData: |-
          #cloud-config
          password: redhat
          chpasswd: { expire: False }
      name: cloudinitdisk
```

Name	Source	Size	Interface	Storage Class	
cloudinitdisk	Other	-	VirtIO	-	⋮

Red Hat

OpenShift 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
- **Diverse ecosystem**
  of Red Hat & partner operators

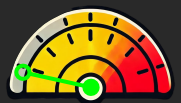
- **Includes Red Hat Enterprise Linux**
  guest entitlements
- **Supports Microsoft Windows**
  guests through Microsoft SVVP
- **Inbound guest migration**
  using Ansible Automation Platform + Migration Toolkit for Virtualization, Training, Partners & Consulting

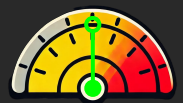
Red Hat

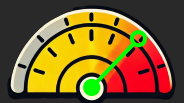
OpenShift Virtualization Fun-O-Meter

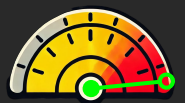
Efficiently migrate VMs now to reduce operating costs and unlock additional value in the future

MAINTAIN	MIGRATE	MODERNIZE	
vSphere Foundation *Stay as-is*	**OpenShift Virtualization Engine** *Replace VMware* *Utilize Automation and Services*	**OpenShift** *Application Modernization* *Automation for Day 2 Ops*	**OpenShift AI** *New applications*
Slow evolution	Dedicated VM management	Integrate containers and VMs	AI/ML Management
Increasing costs	Reduce operating cost	Faster time to market	Increase revenue
Low developer productivity	Increase IT efficiency and reliability	Higher developer output	Reduce skill sprawl


Boring


More fun


Fun!


Super Fun!

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Migrate your traditional virtual machines

Red Hat

Red Hat's validated approach for an open virtualization infrastructure

VM host management at scale
Advanced Cluster Management for Virtualization (ACM for Virt.)

VM migration automation, networking automation, Day 2 operations
Ansible Automation Platform (AAP)

OpenShift Virtualization

ISV partners (storage, networking, public cloud, backup/DR, networking)

Red Hat

Bring traditional virtual machines into OpenShift

Traditional VM behavior in a modern platform

- Administrator concepts and actions
- Network connectivity
- Live migration

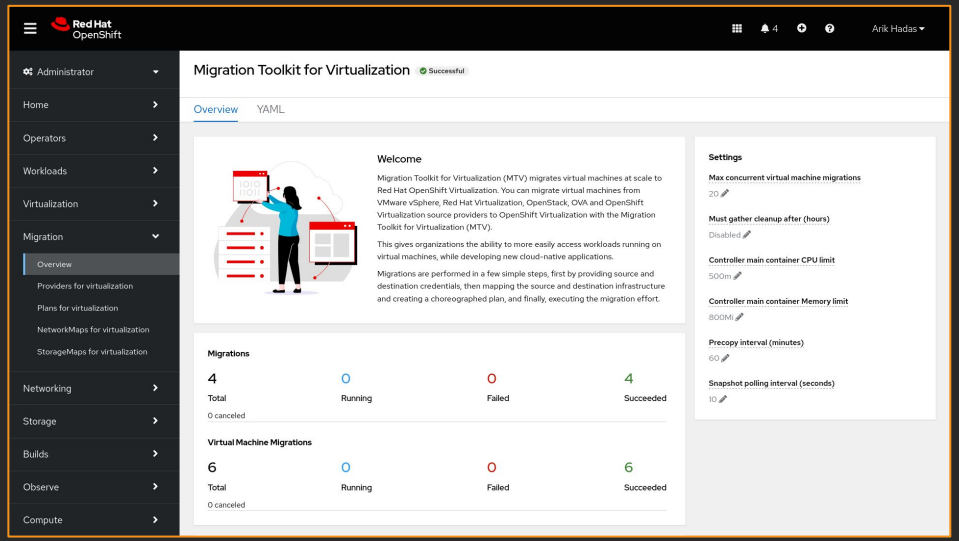
Use existing VM roles and responsibilities

- Migrate traditional VMs easily with a set of comprehensive tools
- Maintain application components that are business critical
- Modernize application workloads and skill sets over time

Red Hat

Migrating VM-based applications with minimal disruption

Migration toolkit for virtualization (MTV) included with OpenShift



Easy migration of virtual machines

- Migrate virtual machines to OpenShift Virtualization in a few simple steps
- Provide source and destination credentials, map infrastructure, and create migration plans

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Modernize your virtual machines

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Super Fun!

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Project QUAY

Istio

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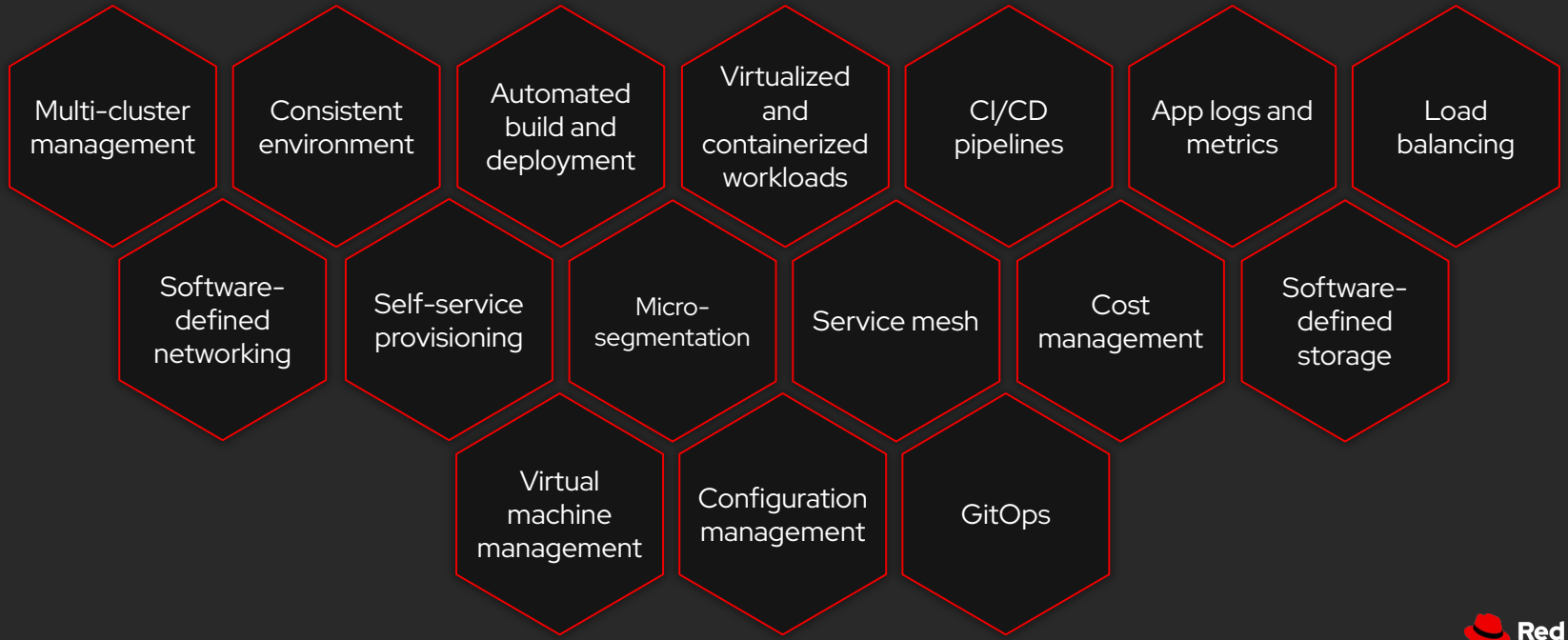
A Modern application platform with comprehensive lifecycle and infrastructure management



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OpenShift ❤ VM's

Next Gen approach to VM provisioning

Use a cloud native approach to VM lifecycle management

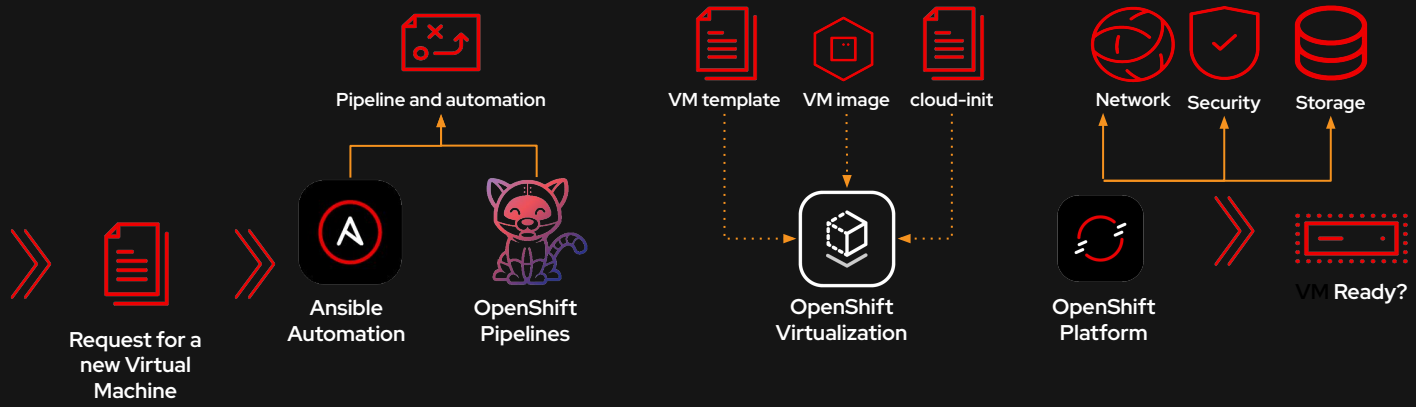
Virtual Machine
- CPU: 4 vCPU, 1 core
- Memory: 16GB
- Disk: 30 GB
- OS: RHEL

Additional filesystems
- data: 500GB, disk
- logs: 100GB, partition

Application platform
- JBoss 7.4 Update 11

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

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



Automate VM image builds & updates

Automatically deploy VMs from code (Git repos)

Manage networks, **storage**, **load balancers**, **autoscaling**, etc.

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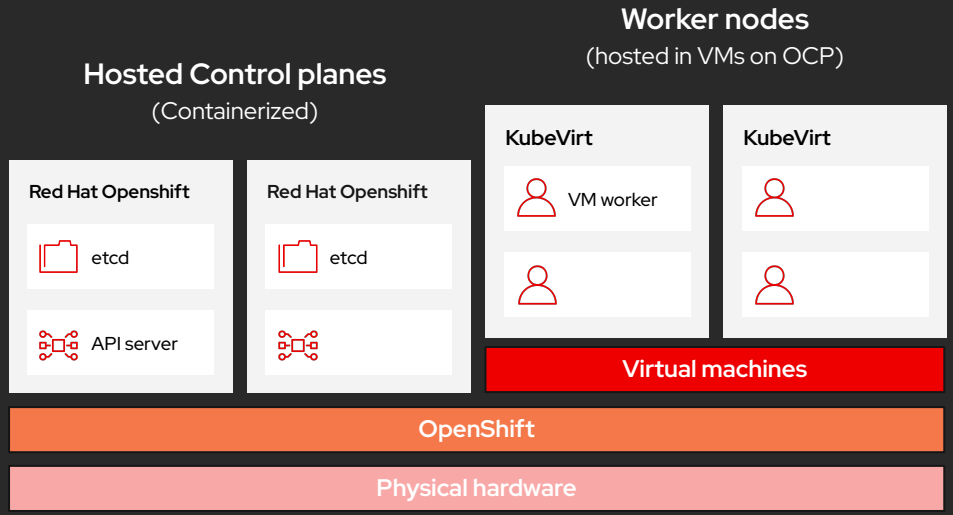
OpenShift Virtualization to consolidate OpenShift clusters

Increase efficiency of infrastructure

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

Reduce dependency on legacy virtualization

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



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Demo

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

Get 70% off the Red Hat OpenShift Virtualization Training and Certification bundle!

Scan to access bundle course page:

URL red.ht/DO317

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Select the self-paced version of training and an exam in the bundle at checkout to apply this discount to the local MSRP of DO317. This offer may not be combined with other offers or discounts.

Red Hat

Level up!

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