

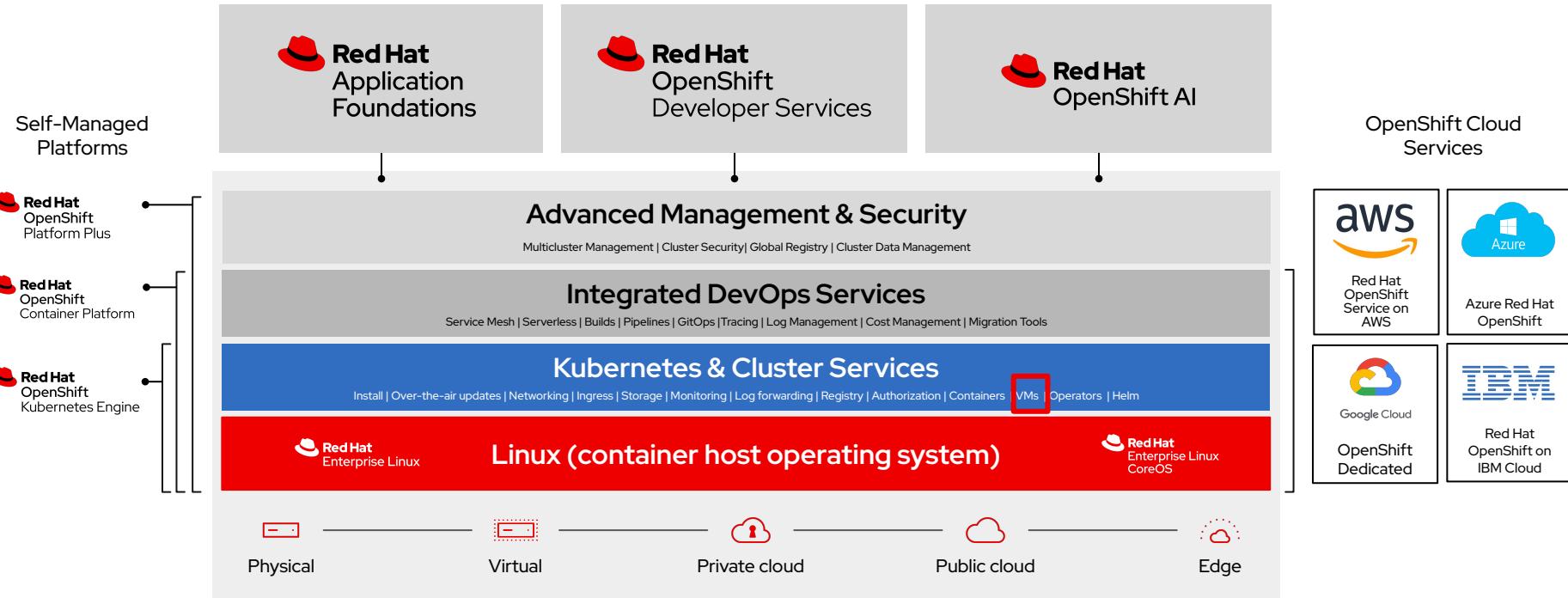
Red Hat OpenShift Virtualization

Overview

Alfred Bach

Principal Learning and Development Instructor

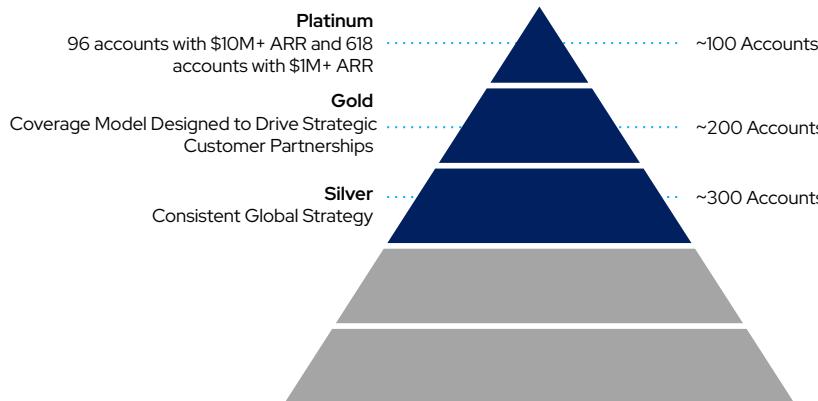
Red Hat Open Hybrid Cloud Platform



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



[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.

Disruptions to VMware Partners...

Broadcom Takes Top VMware Accounts Direct 'Effective Immediately'

BY O'RYAN JOHNSON ►

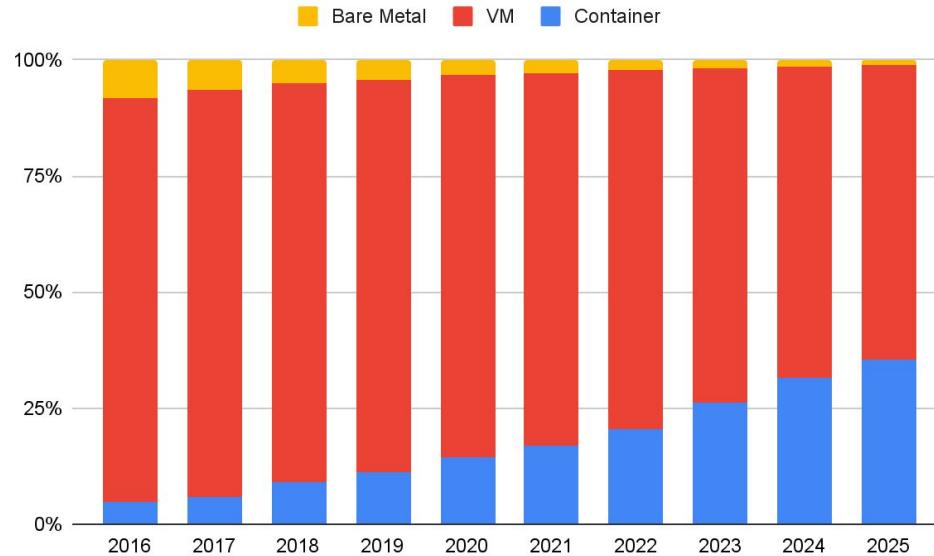
JANUARY 8, 2024, 8:42 AM EST

'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.



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)

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

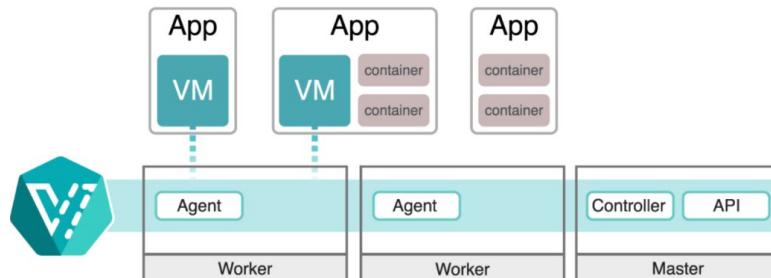
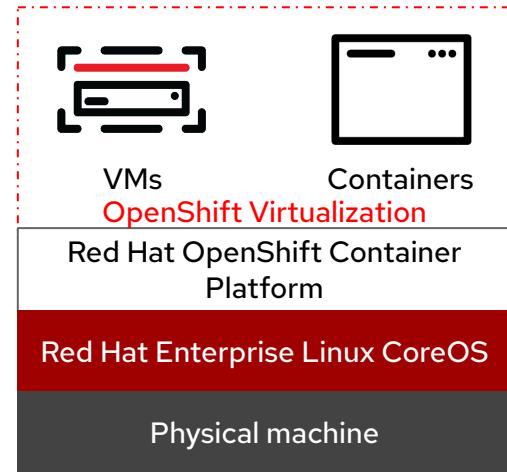
Replatform by “upgrading” the application into a container-based architecture

3

Refactor applications from monolithic to microservices

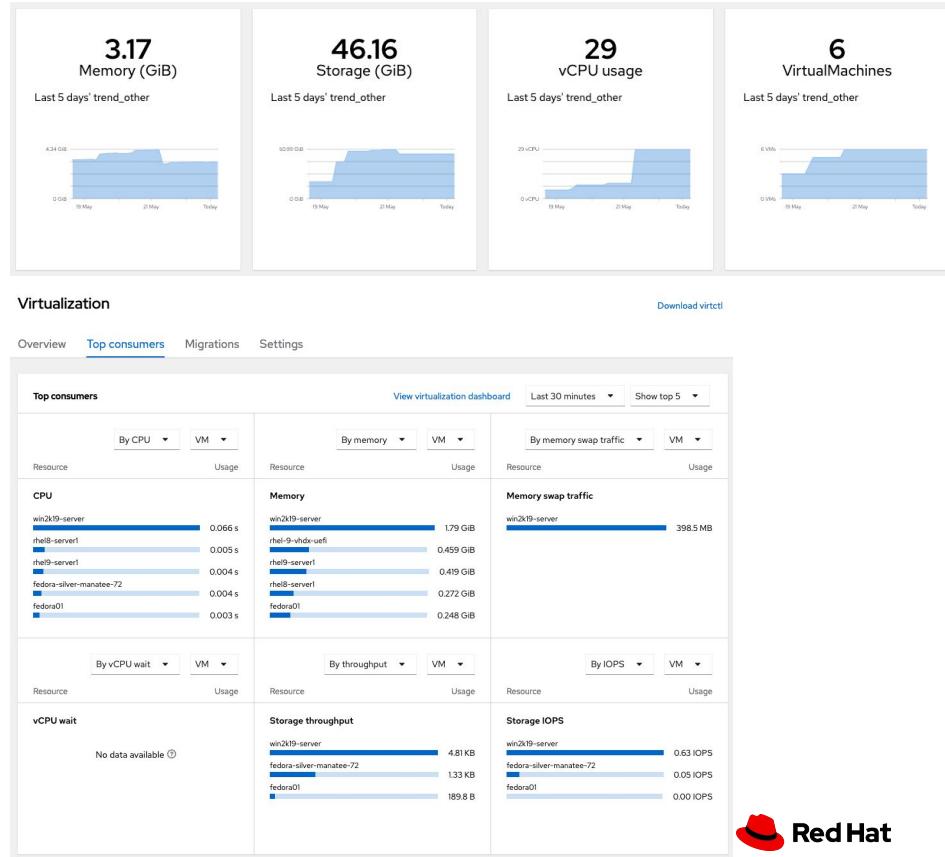
What is OpenShift Virtualization?

- 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)

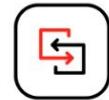


OpenShift Virtualization Overview

- 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)



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

The screenshot displays the Red Hat OpenShift MTV interface. It features a sidebar on the left with navigation links: Home, Operators, Workloads, Migration (selected), and Virtualization. The Migration section is expanded, showing sub-options: Providers for virtualization, Plans for virtualization, NetworkMaps for virtualization, and StorageMaps for virtualization. The main content area is divided into two tabs: 'Providers' and 'NetworkMaps'. The 'Providers' tab shows a list of providers with columns for Name, Status, Type, Endpoint, Type, VMs, Network, and Hosts. It lists three providers: vSphere (Ready, VMware source), iHV (Ready, oVirt source), and KubeVirt (Ready, KubeVirt source). The 'NetworkMaps' tab shows a list of network maps with columns for Name, Source..., Target..., From, Status, and To. It lists two network maps: vSphere-map (Ready, From: vSphere, To: Pod network) and OpenShift-map (Ready, From: OpenShift, To: Pod network). A 'Show managed' toggle is present in the NetworkMaps tab.

Modernize at your own pace

Legacy Virtualization

Apps in VMs

Slow evolution
⌚

Increasing costs
💲



Developer toil

Infrastructure Modernization

Apps in VMs



Cloud elasticity + scalability



Reduced cost



Increase IT efficiency +
reliability

Migration
Toolkit for
VMs

DevOps & Infrastructure Modernization

Apps in VMs or Containers



Innovate at speed



Higher annual revenue



Increased developer output

Cloud
Native

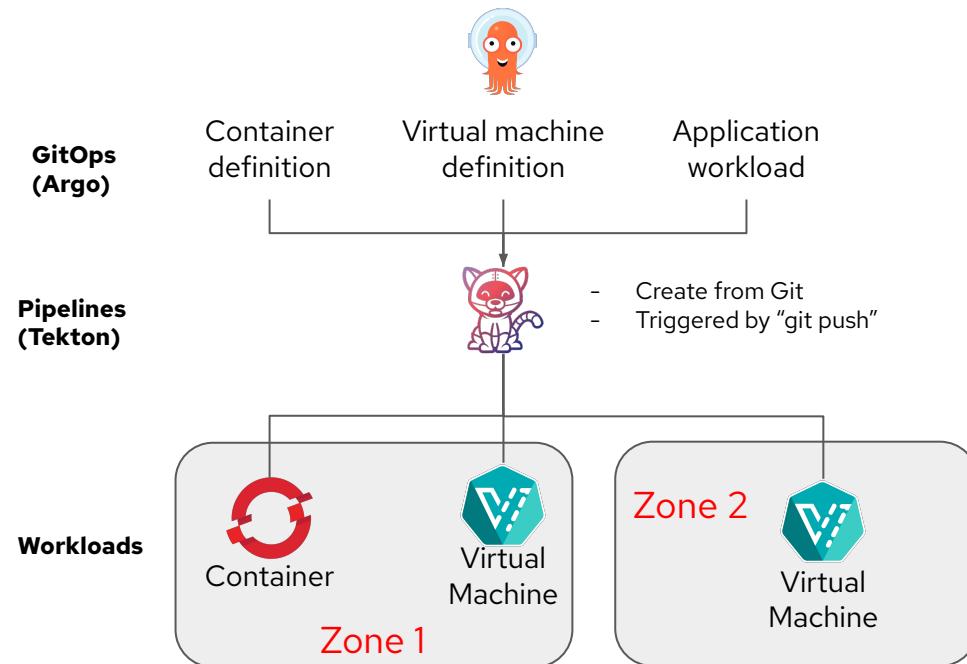
Direct path to cloud native

Speed of Infrastructure Deployment
Speed of Application Development



OpenShift Virtualization: Build Cloud-native VMs

Deploy VMs as Code with CI/CD



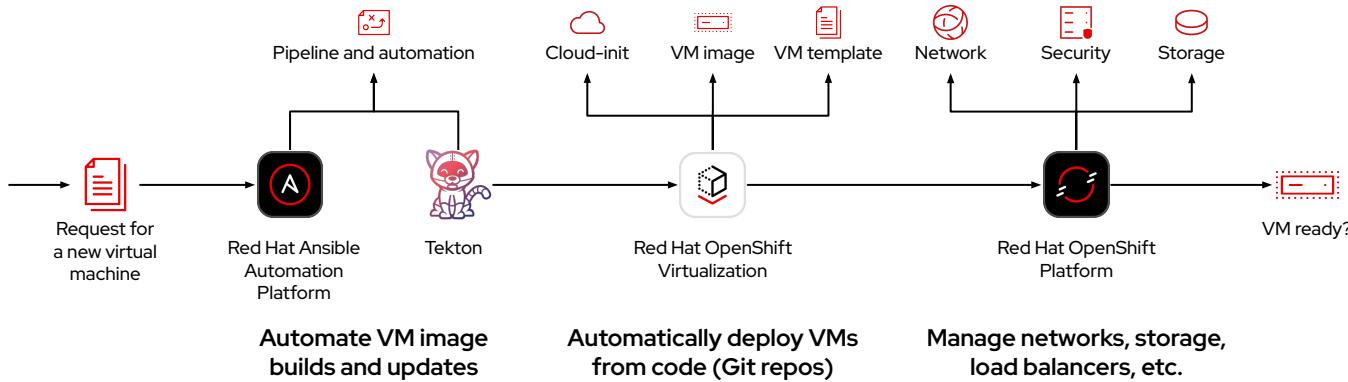
Integrate legacy VMs with a modern GitOps framework

- ▶ 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

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



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

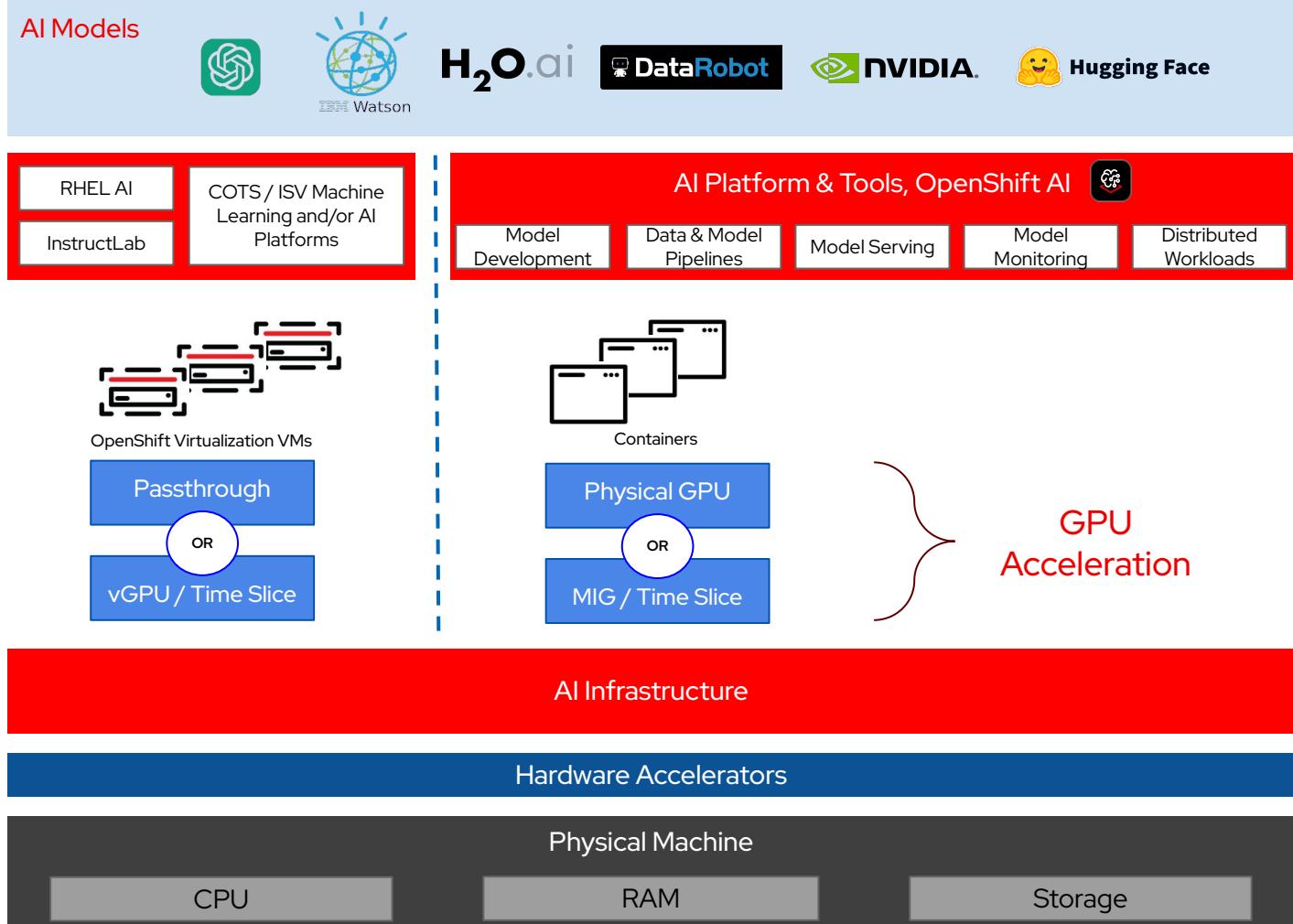


Virtual Machine migration

Move workloads to OpenShift safely

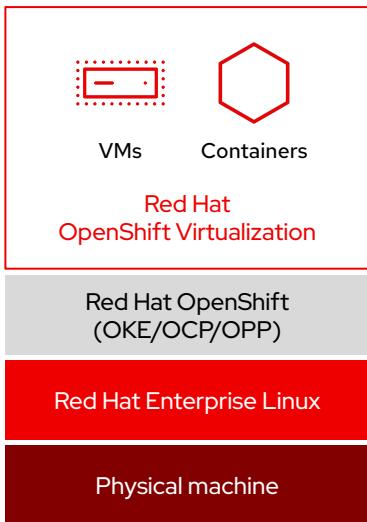
- ▶ Pre and Post processing for VM Migration from vSphere
- ▶ Last mile configuration checks

OpenShift Virtualization for AI



Red Hat OpenShift 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

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



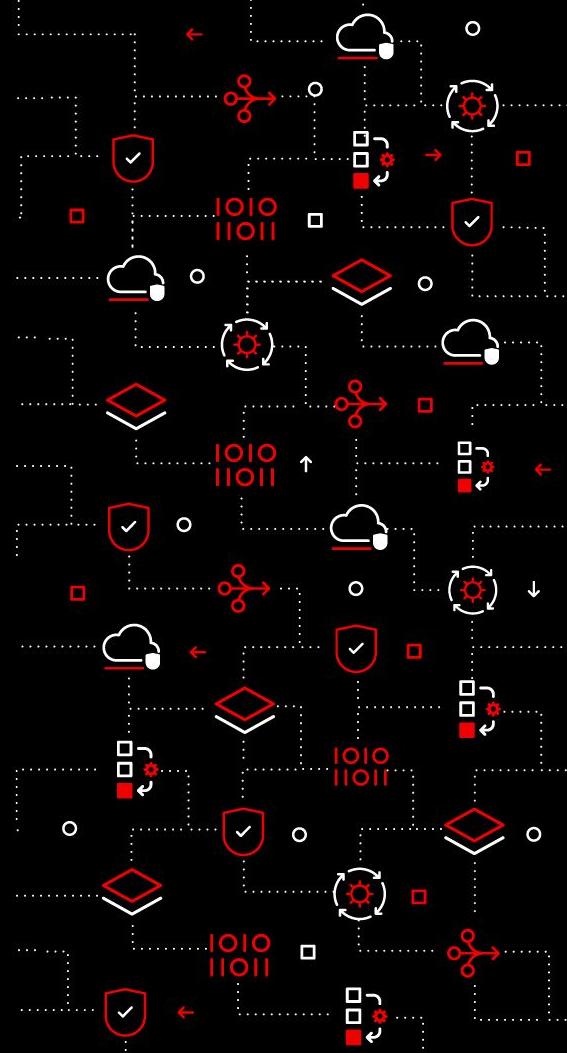
Up to 21% Higher
Operational
Infrastructure Efficiency*



Consistency of
Management



Up to 42% reduction of
Unplanned Outages*



Partner Ecosystem

ISV Partners*

Storage

Products for OpenShift Virt using CSI (container storage interface)



Backup/DR

Products for OpenShift



Networking

Products for OpenShift Virt using CNI (container networking interface)



ISOVALENT



TIGERA



Cloud Services

Current public cloud providers offering OpenShift virtualization



Additional Information

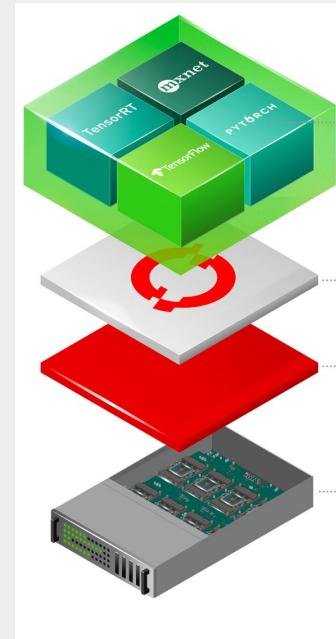
 [Listings](#) of current partner products that are certified or completed statement of support.

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



Orchestrating NVIDIA GPU accelerated Virtual Machines with OpenShift

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



OpenShift Data Foundation

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



VMs

Containers

OpenShift Data Foundation Block, File, NFS, Object



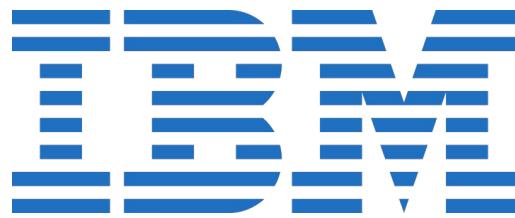
Bare metal

Virtual

Private
cloud

Public
cloud





Pair IBM Data Services with Red Hat OpenShift Virtualization

Manage VMs with operators and CRDs

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

Define application-aware backups with “recipes”

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

Flexible deployment options

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



Comparison Chart:

Each next level
builds up capability
from ODF to FDF

FDF = Fusion Data Foundation, a.k.a. Fusion SDS, Fusion Software (SW)

ODF & FDF available on
all major platforms!

x86, IBM Power, IBM Z & LinuxONE

RH ODF Essentials, ODF Advanced, IBM Fusion FDF (SW, SDS) compared			
SDS = Software Defined Storage			
Features	ODF Essentials	ODF Advanced	IBM Fusion FDF
Block & File Storage	✓	✓	✓
Object Storage	✓	✓	✓
Multicloud Gateway	✓	✓	✓
Node & Disk Resiliency	✓	✓	✓
Storage Operations Based Automation	✓	✓	✓
Compression	✓	✓	✓
Deduplication for Multicloud Object Gateway	✓	✓	✓
Local Snapshots & Clones	✓	✓	✓
Basic Cluster-wide Encryption	✓	✓	✓
Cross-Availability Zone HA (3 zones)	✓	✓	✓
Internal Deployment Mode	✓	✓	✓
Stretch Cluster (OCP & ODF stretched over 2 zones + arbitrator)		✓	✓
Advanced Encryption & KMS Support		✓	✓
Metro DR (sync replication)		✓	✓
Regional DR (async replication)		✓	✓
External Deployment Mode		✓	✓
Multi-Cluster Support		✓	✓
Mixed Workload Support		✓	✓
Catalog Backup & Restore			✓
Searchable Restore			✓
Restore to an Alternate Location (DR)			✓
Non-Disruptive Application Aware Backup			✓
IBM Storage Fusion Discover: - Identify Unstructured Data - Regulatory Compliance - Faster Time to Insights - Identification of Redundant Data to Reduce Costs - Governance1			✓

FDF
is like
ODF++!

Fusion HCI System

Integrated system
designed for OpenShift
applications



Solution components

Hardware

- Hyperconverged x86 appliance
- Self-contained internal high-speed storage network
- Factory integrated

Operating System

- OpenShift Container Platform
- Bare metal deployment
- Support Windows and Linux VMs with OCP Virtualization
- Integrated support for Hosted Control Planes

Fusion data services

- Persistent Volumes (PV)
- Backup/Restore (B/R)
- Replication and mobility
- Data cataloging

Lifecycle management

- Version management
- Health and maintenance
- Non-disruptive scale-out

Solution value

Accelerate and de-risk container projects

- Fast set-up
- Engineered for performance
- Fault tolerant architecture

Eliminate risk of poor cluster design and missed SLOs.

Cost Effective

- Unified management of hardware and software
- Non-disruptive version upgrades and scale-out
- Single-point-of-contact for support from IBM

Enable Platform teams to efficiently deliver application services

Complete data services

- PV: RWO/RWX file, S3 object, optional block support
- B/R: Snapshots and application consistent backup / restore
- HA: Metro DR and Regional DR data replication

Production ready data services



Dell CSI Storage Portfolio



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

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

Dell APEX Cloud Platform (ACP) Dashboard Overview

The screenshot shows the Dell APEX Cloud Platform (ACP) Dashboard Overview. The left sidebar is a navigation menu for Red Hat OpenShift, with the 'Dell APEX Cloud Platform' option selected. The main dashboard area has a blue header bar with the text: 'You are logged in as a temporary administrative user. Update the [cluster OAuth configuration](#) to allow others to log in.' and the Dell Technologies logo.

Details

- Compute Cluster ID: b8bfc0dc-4736-40e2-b209-d243b350cb2a
- APEX Cloud Platform Foundation Software Version: 03.00.00.00
- Red Hat OpenShift Container Platform Version: 4.13.12

Status

- Cluster: ✓ Cluster
- Certificate: ⚠ Certificate Nearly Expired
- Updates: 💡 Available 0

Alerts: 9 Alerts (0 Critical, 2 Warning, 7 Informational) [View All](#)

CPU Usage: 1.82% of 512.00 c (Used 9.29 c, Available 502.71 c)

Memory Usage: 6.76% of 2013.53 GiB (Used 136.17 GiB, Available 1877.35 GiB)

[View Performance](#)

Dell APEX Cloud Platform (ACP) Inventory View

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

Dell APEX Cloud Platform

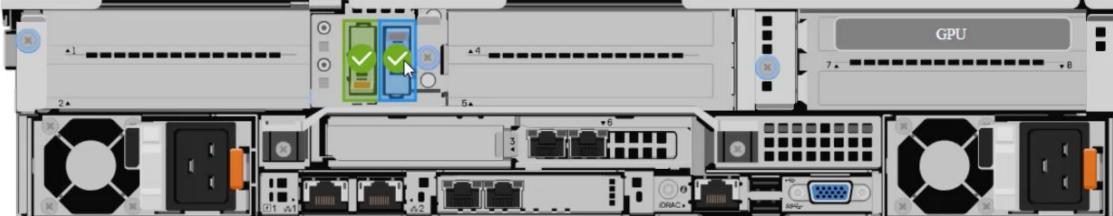
Overview Inventory Updates Security Settings Support

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

Physical View

Actions

Front View Back View



GPU

Overview Boot Devices Alerts

Server health Warning

System LED Healthy

Power state On

Service tag 35RLCX3

Role node Control plane, Master, Worker

Manufacturer Dell Inc.

Server slot 1

Server model APEX MC-760

Management IP address 172.18.30.52

iDRAC IP address 192.168.101.19

Location

Rack name U23

Activate Windows

Rack position 2

Go to Settings to activate Windows.

Firmware versions

BOSS Information

Overview Alerts

Boss Controller

Device model	Status	Firmware version
BOSS-N1 Monolithic	HEALTHY	2.1.13.2021

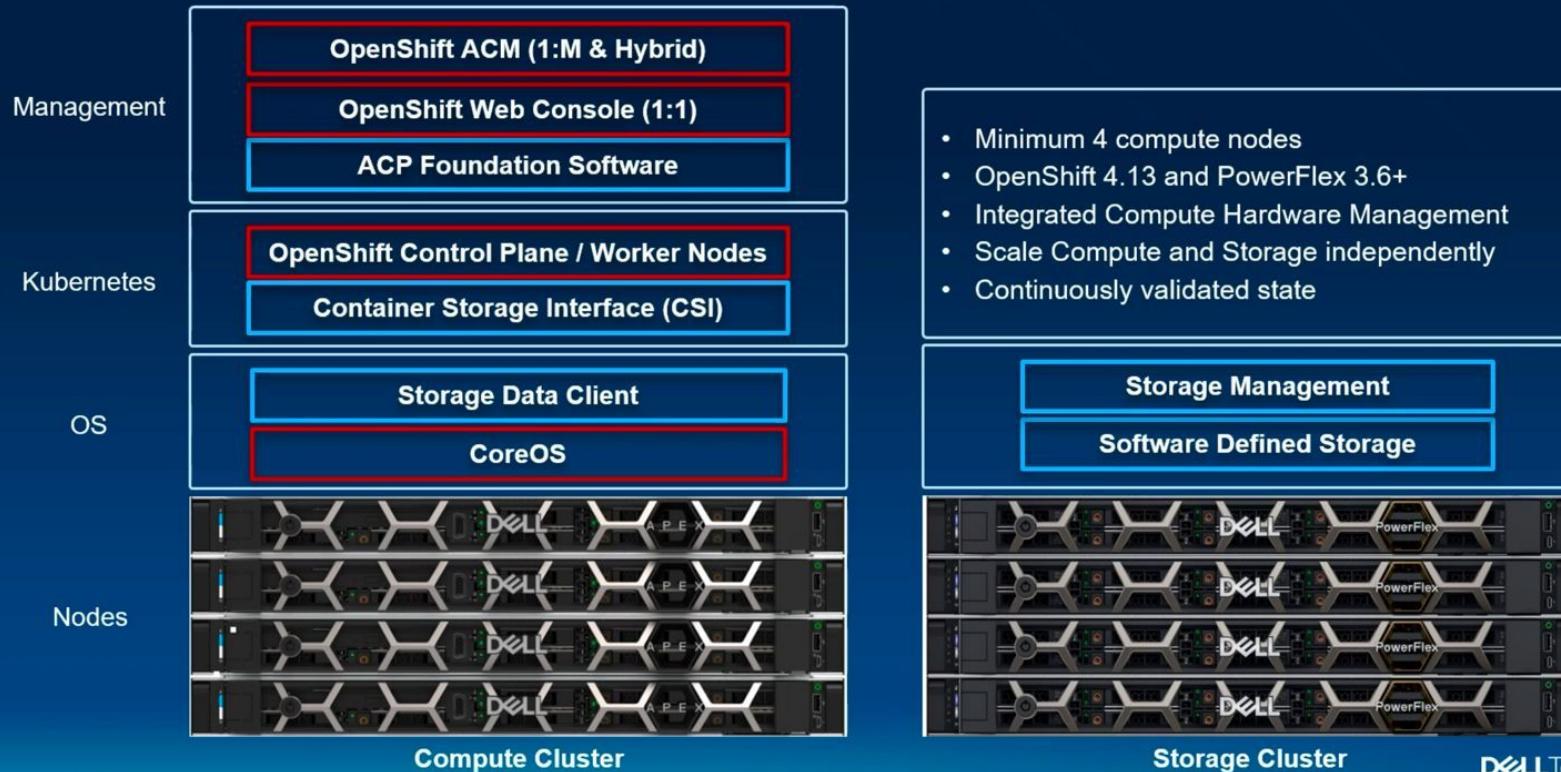
Active Boot Device

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

Dell APEX Cloud Platform (ACP) Architecture

Two-Layer Architecture

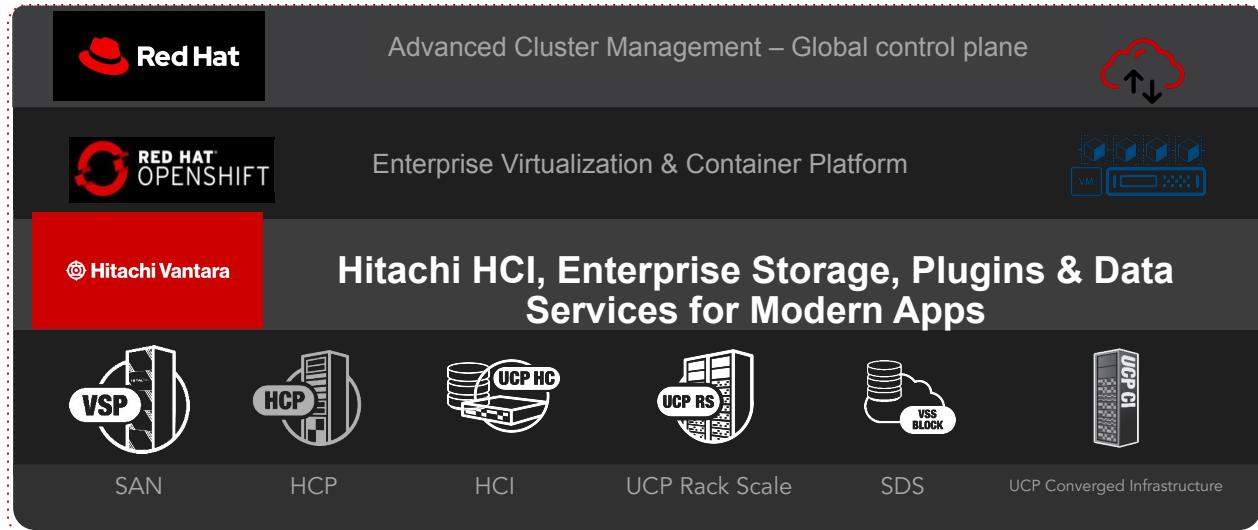
Disaggregated architecture allows compute and storage to scale independently



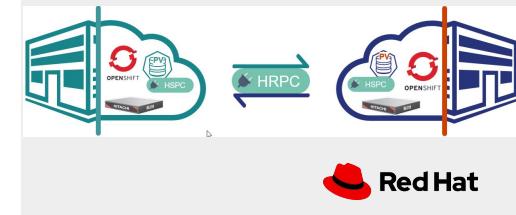
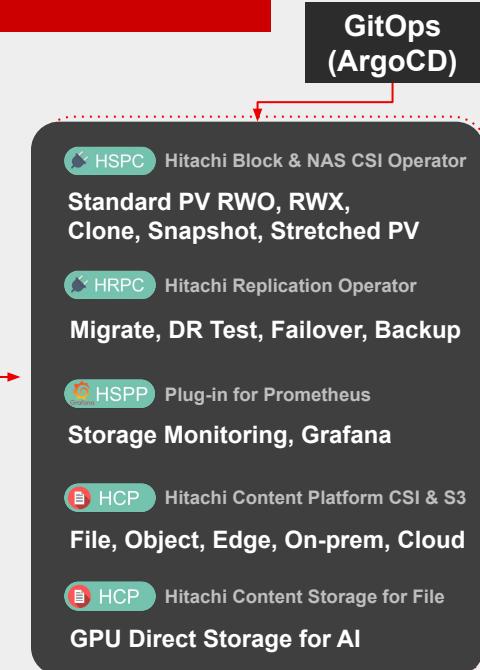
OpenShift Virtualization with Hitachi

Hyperconverged, Storage Operators & Data Services for Apps

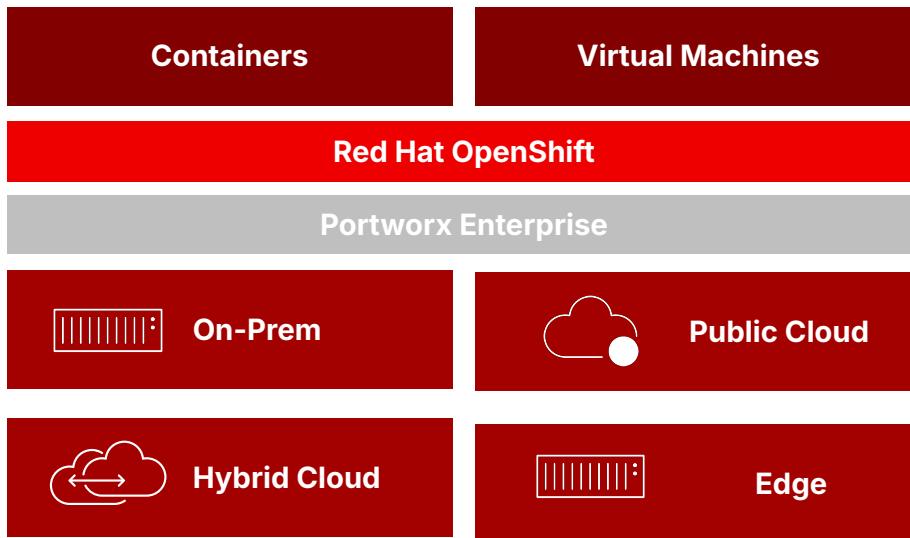
Hitachi Vantara



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



Storage Automation for VMs and Containers



Storage for application layer for containers & VMs

Enables performance and HA for containers & VMs

Comprehensive DR for VMs and containers

Live migration of VMs and containers



Protect OpenShift Virtualization VMs and Containers side by side

K10 5.5 launched in October 2022 with VM capabilities:

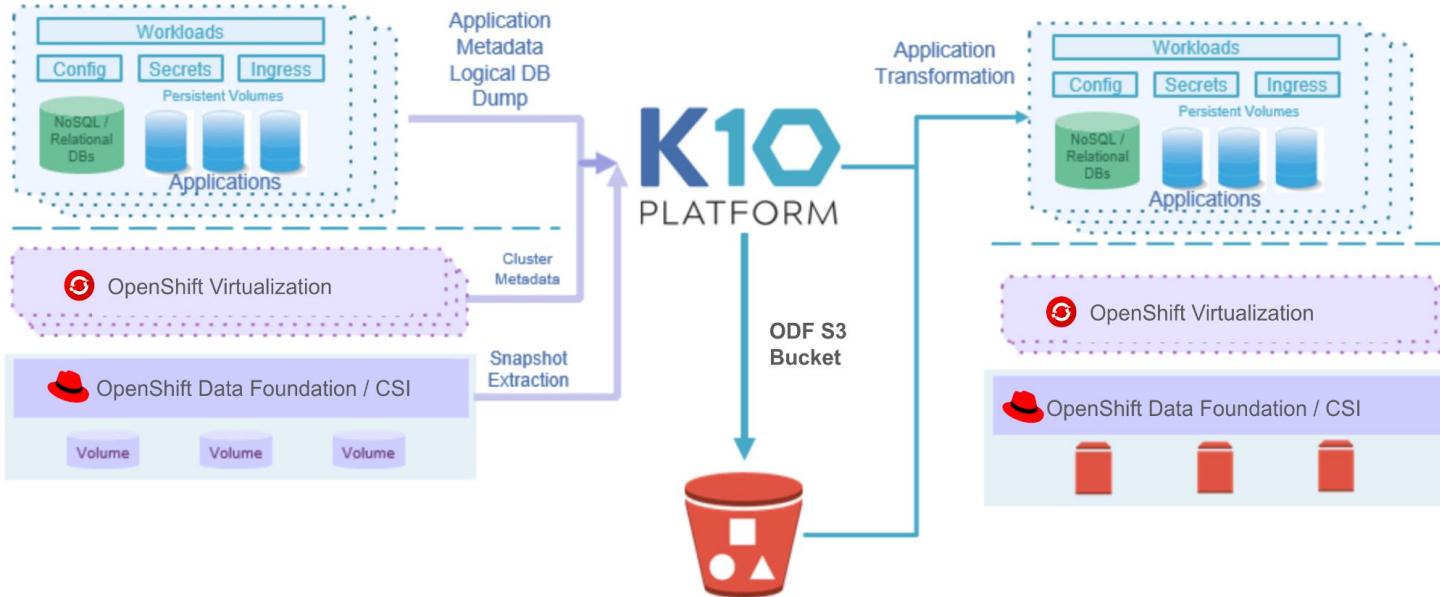
- Discover VMs: snapshot VM configuration and VM storage
- Freeze a VM before snapshot (optional annotation) w/ timeouts and unfreeze
- Restore VM snapshots with resource transforms and automatic orchestration

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

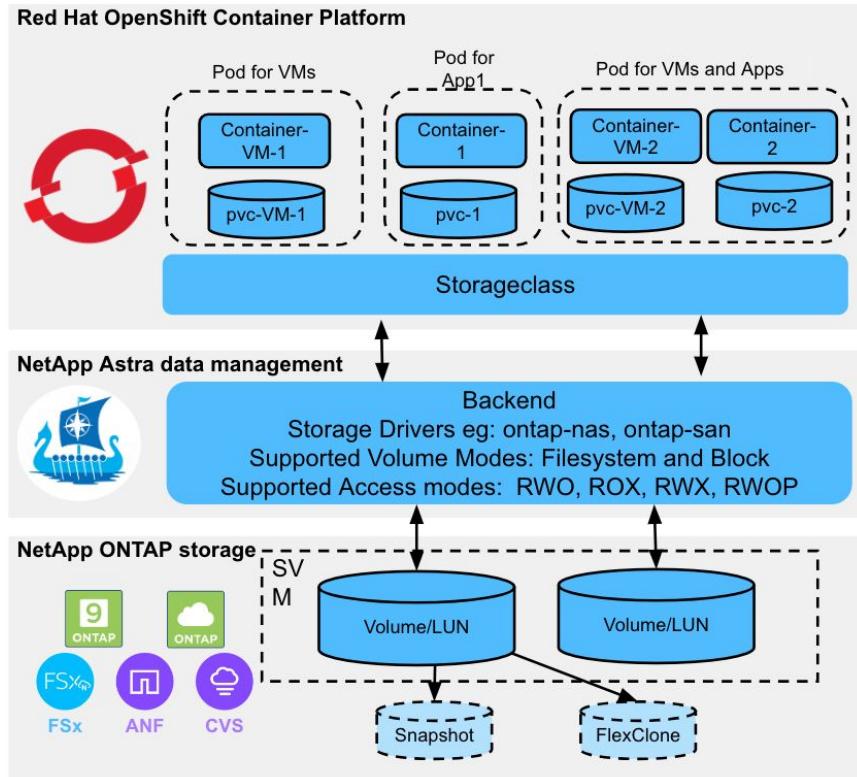
- Apply K10 policies to vms
- Export and import VMs for disaster recovery and VM mobility between clusters



Kasten K10 Backup/Restore Solution



Industry leading storage and data management functionality for modern workload deployments



Support both virtualized and containerized apps in a single infrastructure

VM live migration, CSI topology awareness and storage offload

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

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

Data protection for VMs is coming in Q4 2023

Disaster and Recovery

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

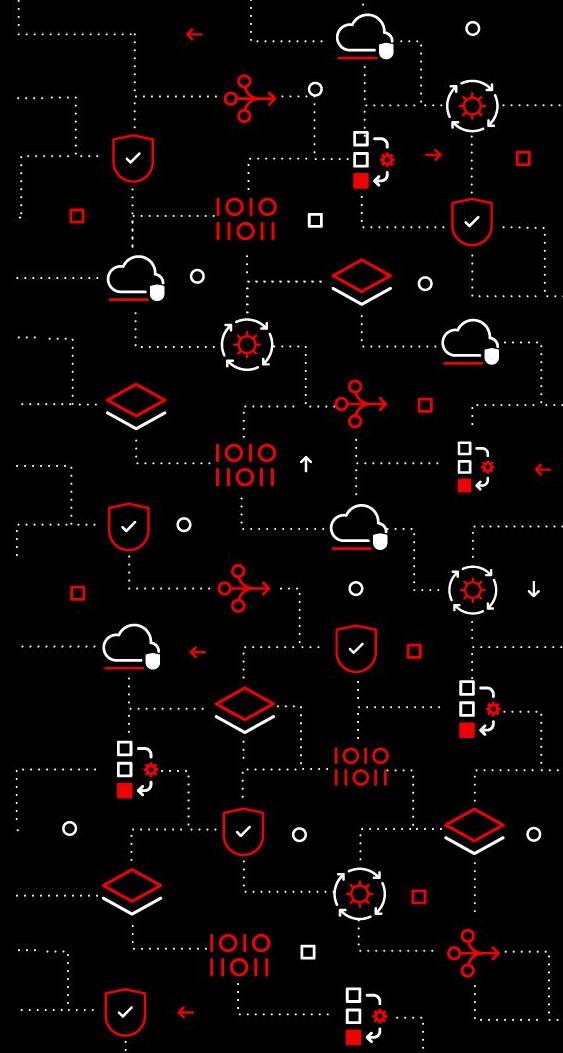


Storage Automation for VMs and Containers

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

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





Reference Customers and Ongoing Proof of Concepts

Customers are Realizing the Power of OpenShift Virtualization

Production (or moving in)



POC / Evaluation



Our Customer Success Stories



[Israeli Ministry of Defense offers private cloud services using Red Hat OpenShift Virtualization](#)

The Israel Defense Forces (IDF) Center of Computing and Information Systems, or Mamram, selected OpenShift as the new internal cloud solution, to run both VMs and containers on a unified platform with a single coherent API.



[NOAA- Safely navigating storm clouds with Red Hat OpenShift Virtualization](#)

National Oceanic and Atmospheric Administration (NOAA) to analyze weather data to help pilots know when it's safe to fly and when to alert the public of upcoming tornado and flood situations. With over 150 clusters deployed from Guam, Hawaii, and Puerto Rico to Pennsylvania, New Jersey, and New York, their work preserves and even saves lives.



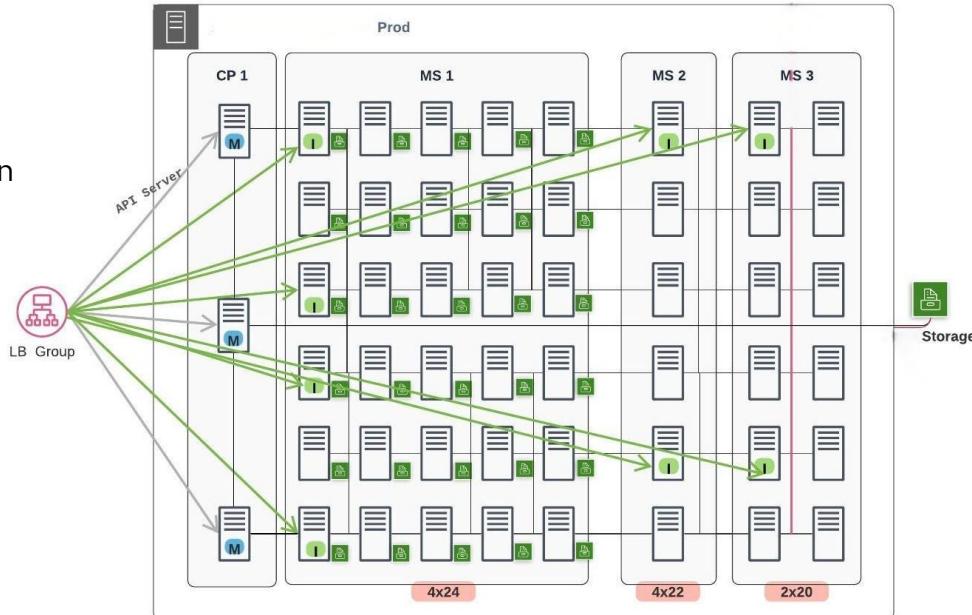
[Kubernetes Operational Excellence with GitOps using OCP, RHACM and AAP at Morgan Stanley](#)

Morgan Stanley needed to meet rigid security and resiliency requirements while respecting legacy services. Their modern application platform enables developer innovation with effective management of regulatory and operational risks. At production scale, a small number of engineers deploy new features with consistency and adherence to investment banking [security]standards.

Large Web Retailer in EMEA

Online platform for real estate, cars and a broad variety of goods and services.

- ▶ 4th most visited site in region (After GOOG, FB, YT)
- ▶ Aggressive deployment of OpenShift & OpenShift Data Foundation in 6 months to production
- ▶ Modernize existing infrastructure & VM apps to containers
- ▶ Innovative technology to attract & retain IT talent
- ▶ Currently running 1400 VMs on ~ 60 hosts
- ▶ Deploying second data center for DR



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



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



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twitter.com/RedHat