Red Hat OpenShift

Red Hat OpenShift Virtualization Roadshow

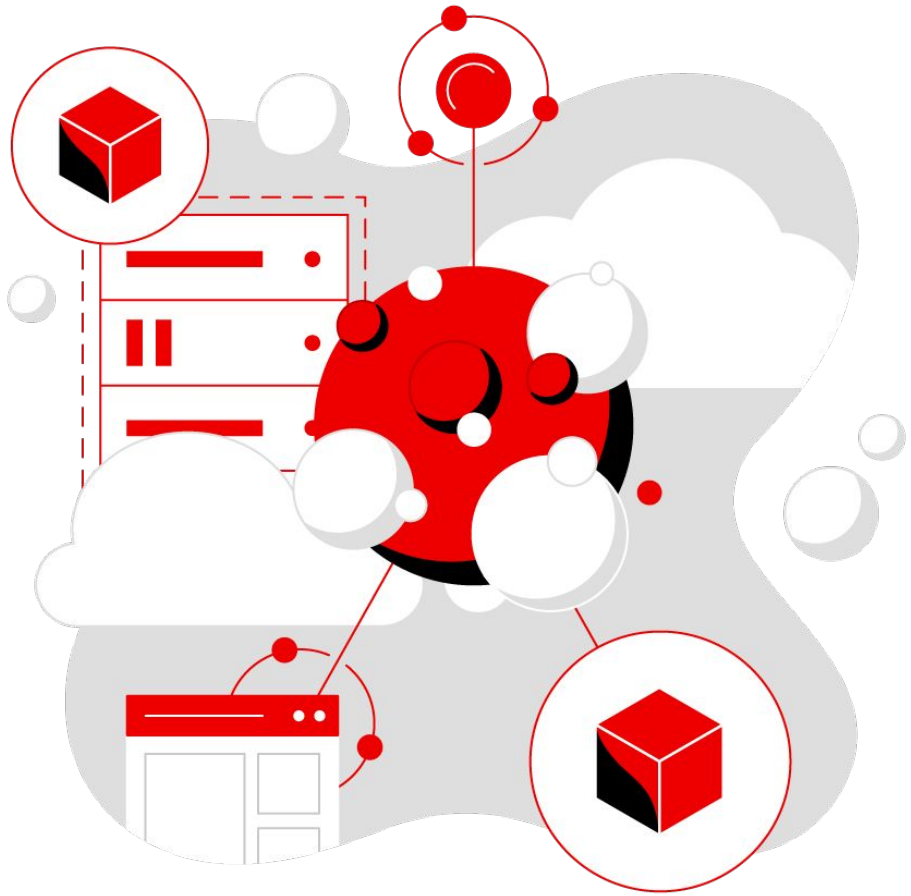
We start at 8:05 CEST

Alfred Bach
PSA
Red Hat Field Partner and Learning Team

Red Hat | Atos

Welcome to the OpenShift Virtualization Roadshow

08:00 -08:30	Overview presentation
08:30 - 10:30	Virtualization lab
10:30 - 10:45	Coffee break
11:00 - 12:30	Continued lab
12:30 - 13:00	Q&A and wrap-up

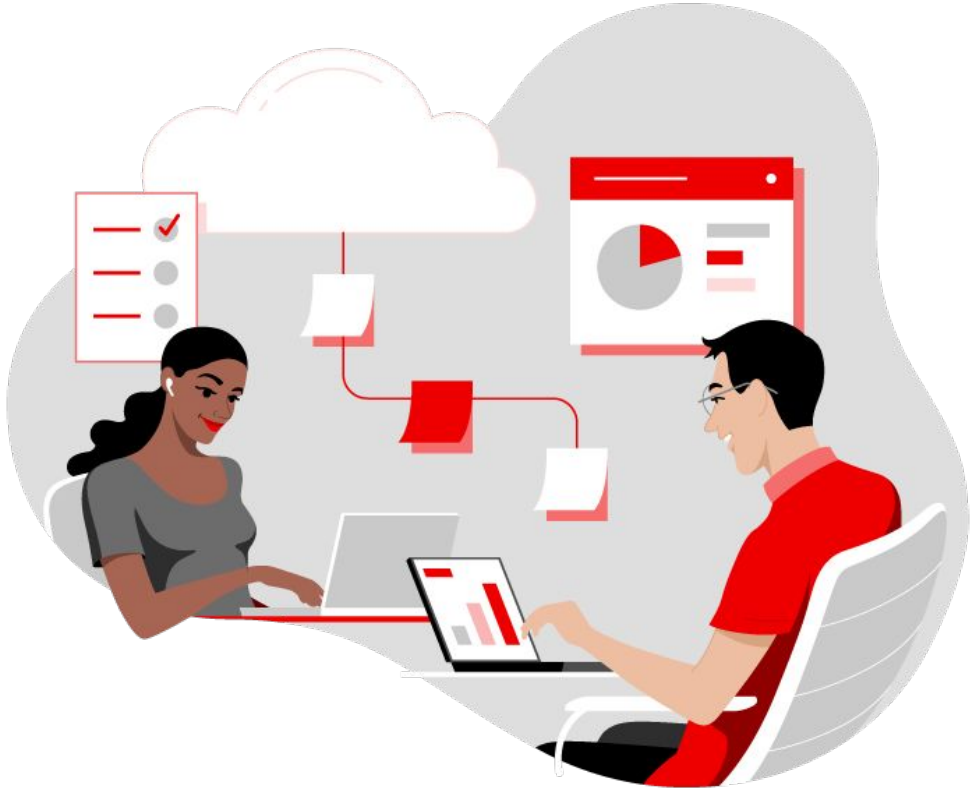


Why are you here today?

The server virtualization industry is changing dramatically

By the end of of the day....

- Consider an alternative solution for your virtual infrastructure
- Become familiar with Red Hat OpenShift Virtualization
- Understand that your migration and infrastructure modernization journey starts here



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What we will cover in the hands-on workshop

- **Virtual machine**
  Provisioning, management, and live migration
- **Platform**
  Storage, network, and load balancing
- **Migration**
  vSphere to OpenShift
- **Backup and restore**

We frequently hear from customers …

"I want to migrate ASAP"

- **Migrate off their current traditional virtualization platform completely**

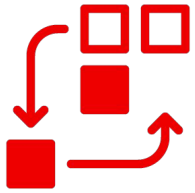
"I want to modernize"

- **Want to run their VMs leveraging the benefits associated with a hybrid and modern cloud native approach**

OpenShift 4.16 Supported Providers

Installation Experiences

aws Outposts
AWS Local Zones
Azure
Azure Stack Hub
Alibaba Cloud
Bare Metal
Google Cloud
vmware vSphere
IBM Cloud
IBM Power Systems
IBM Z
NUTANIX
RED HAT OPENSTACK PLATFORM
RED HAT VIRTUALIZATION



Full Stack Automation

Installer Provisioned Infrastructure

- Auto-provisions infrastructure
- *KS like
- Enables self-service

Pre-existing Infrastructure

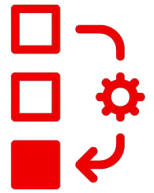
User Provisioned Infrastructure

- Bring your own hosts
- You choose infrastructure automation
- Full flexibility
- Integrate ISV solutions

Interactive – Connected

Assisted Installer

- Hosted web-based guided experience
- Agnostic, bare metal, and vSphere only
- ISO Driven



Local – Disconnected

Agent-based Installer

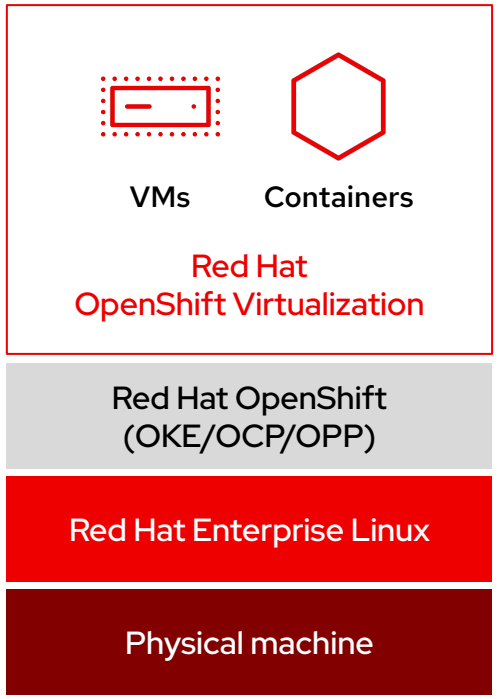
- Disconnected bare metal deployments
- Automated installations via CLI
- ISO driven

Red Hat

Product Manager(s): Marcos Entenza (AWS*, Azure*, GCP, IBM Cloud, Nutanix), Gaurav Singh (Alibaba), Ramon Acedo (BM, VMware), Peter Lauterbach (RHV & OCP Virtualization), Gil Rosenberg (OpenStack), & Duncan Hardie (IBM Z & Power)

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
- **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 and Consulting

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Migrate your traditional virtual machines

Red Hat

Bring traditional virtual machines into OpenShift

Traditional VM behavior in a modern platform

- Administrator concepts and actions
- Network connectivity
- Live migration

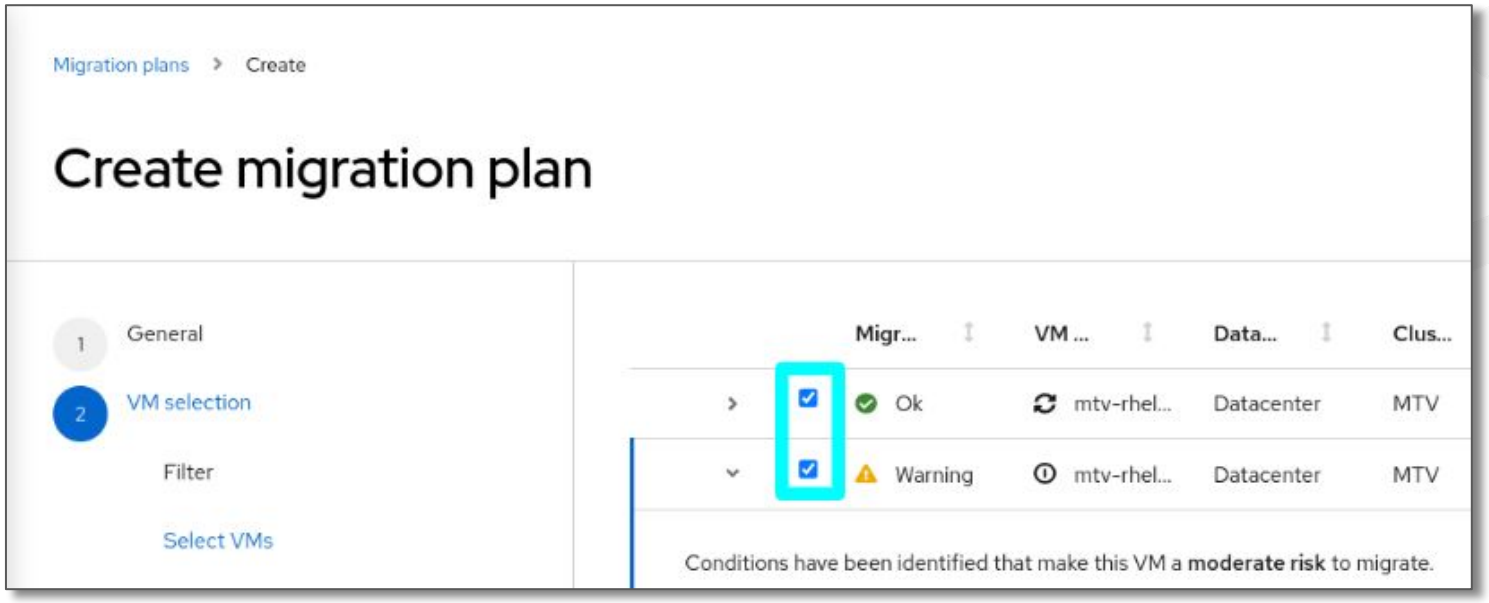
Use existing VM roles and responsibilities

- 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

Migrating VM based applications with minimal disruption

Migration Toolkit for Virtualization (MTV) Included with OpenShift

- Simple migration of virtual machines at scale



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Automating the virtualized application lifecycle

Install application

Use native Linux or Windows modules to install applications, modify configuration settings and deploy services

Automation for Linux/Windows

Orchestration

Physical network DNS, load balancers, and firewalls
Public/private cloud services Hosted database services, hypervisors, and serverless functions
Software as a Service (SaaS) ServiceNow ITSM, service catalogs, and other hosted apps
Security Audits, incident response, and remediation
Automation for Infra & ITSM/CMDB

Optimize

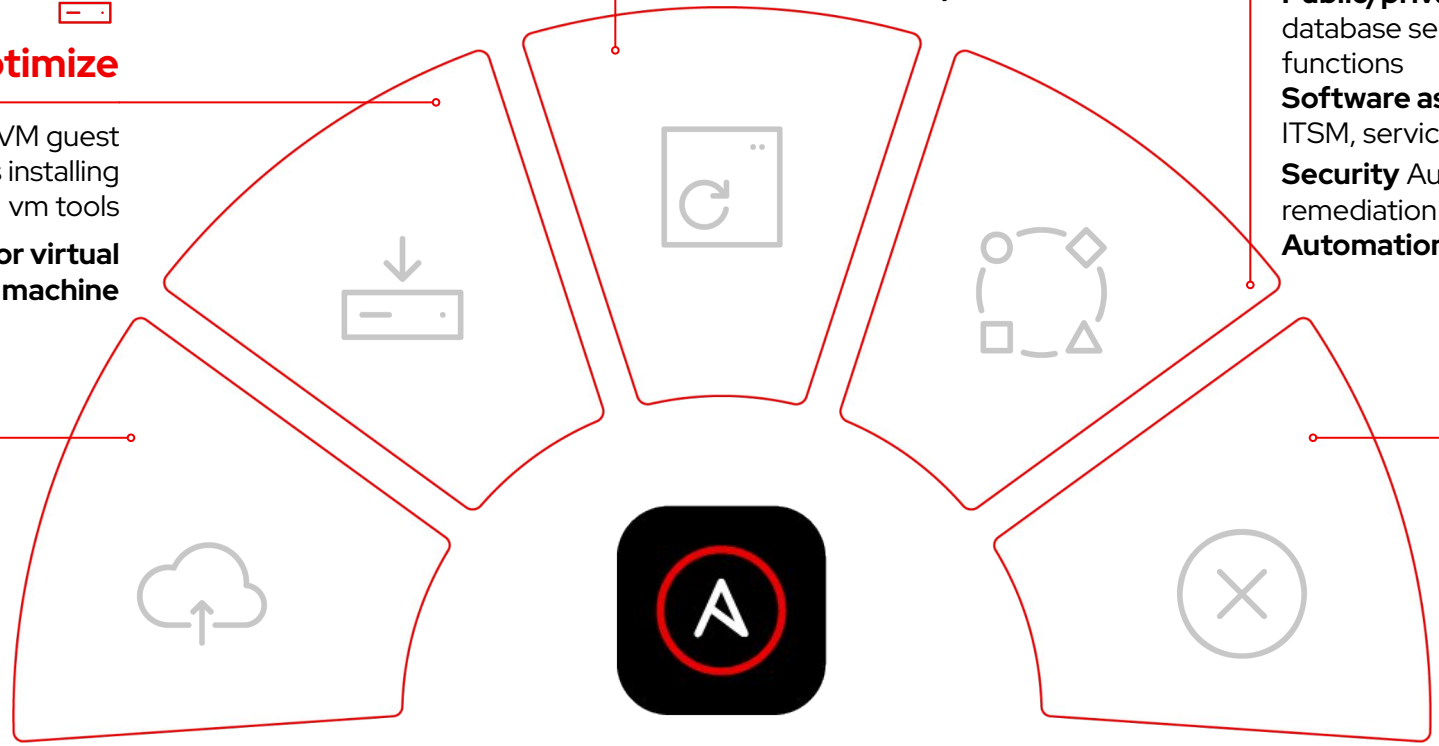
Perform VM guest modifications such as installing vm tools

Automation for virtual machine

Deploy VM

Provision virtual machine with specified resources on to OpenShift Virtualization

Automation for OpenShift Virtualization



Deprovision

Remove or stop virtual machine when application is no longer required

Automation for OpenShift Virtualization

SiriusXM

Highlights:

- The goal was to consolidate multiple virtual platforms to eventually be self-service. Red Hat OpenShift was key in this modernization project.
- The team utilized the Migration Toolkit for Virtualization. Once migrated they found: “running a VM and a container, side by side, is heaven”.
- Sirius also utilizes Ansible Automation Platform for configuration management.

*“**Migration was the easiest part**. Once you have MTV [Migration Toolkit for Virtualization] speaking to an API, [the tool] it brings [the VMs] them in quickly with little to no down time. It’s the right tool for the job. Once we have the network setup, and everything placed where it needs to be, **the VM goes exactly where you need it to go and starts working immediately**. As far as migration goes, it’s a great tool.”*

- *Nate Mason, Associate Director, Unix Systems Group SiriusXM*

[Source: Red Hat Summit keynote [starting at 22:57]

Modernize your infrastructure

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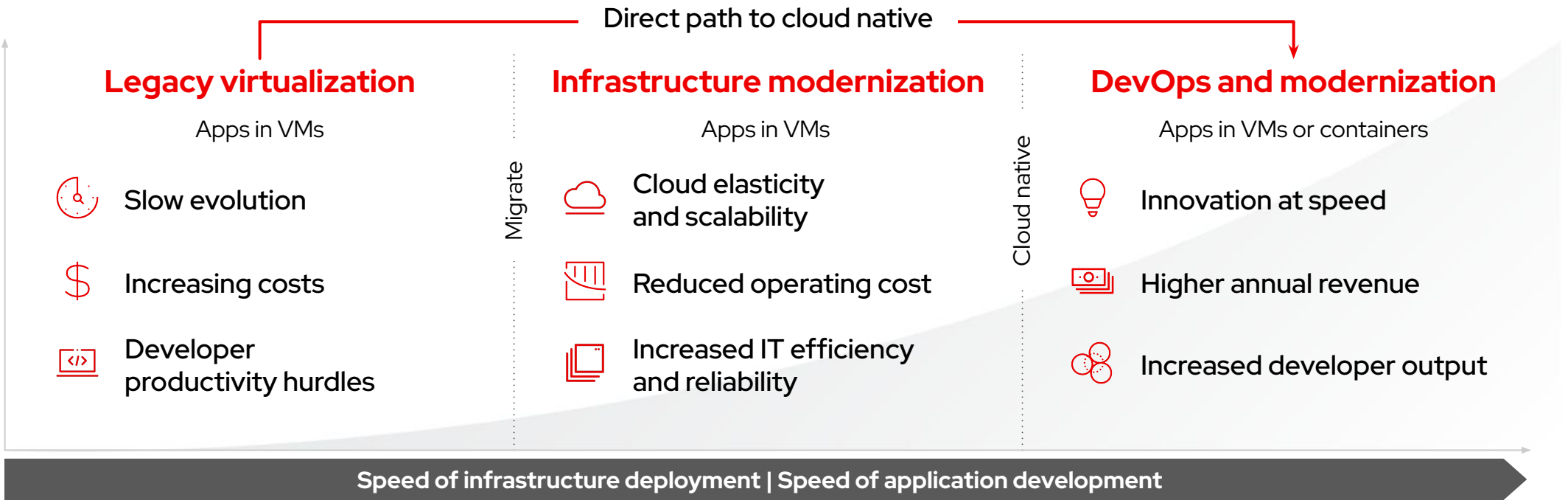
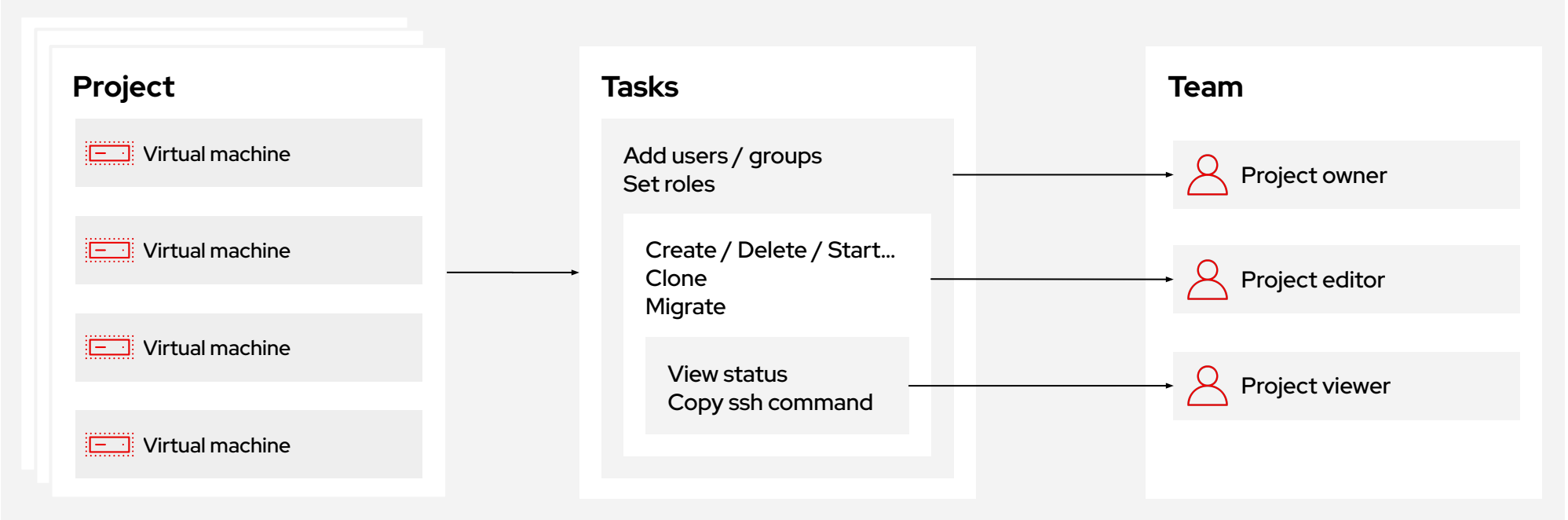
Modernize at your own pace



Self-service virtual machine by project

Assign roles and collaborate around projects as you would in the cloud



Fragmented ‘approach’ to virtual machine provisioning

A process that can take weeks trapped in queues and iterations

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

Network team (1-3 days)

Execute workflow
- Review and approve
- Assign IP and hostname
- Configure DNS (host)

Storage team (1-2 days)

Execute workflow
- Review and approve
- Allocate volumes
- Whitelist source IP

Platform team (1-2 days)

Execute workflow
- Review and approve
- Install JBoss 7.4u11
- Configure MW

Security team (2-4 days)

Execute workflow
- Review and approve
- Install security tools
- VM hardening

Network team (2-7 days)

Execute workflow
- Review and approve
- Configure LB and DNS
- Configure FW

Request for a new virtual machine

Virtualization team (1-3 days)

Execute workflow
- Review and approve
- Queue to networking and storage teams

- Create VM from virtualization template and custom parameters
- Add disks and partitions and reconfigure OS with custom file systems
- Install corporate tools and configure default users and permissions

- Queue to platform team
- Queue to security team
- Queue to networking team
- Hand over the VM: IP, credentials and metadata

VM Ready?

Next gen approach to virtual machine provisioning

A process that can be optimized down to a few minutes

Virtual machine

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Additional file systems

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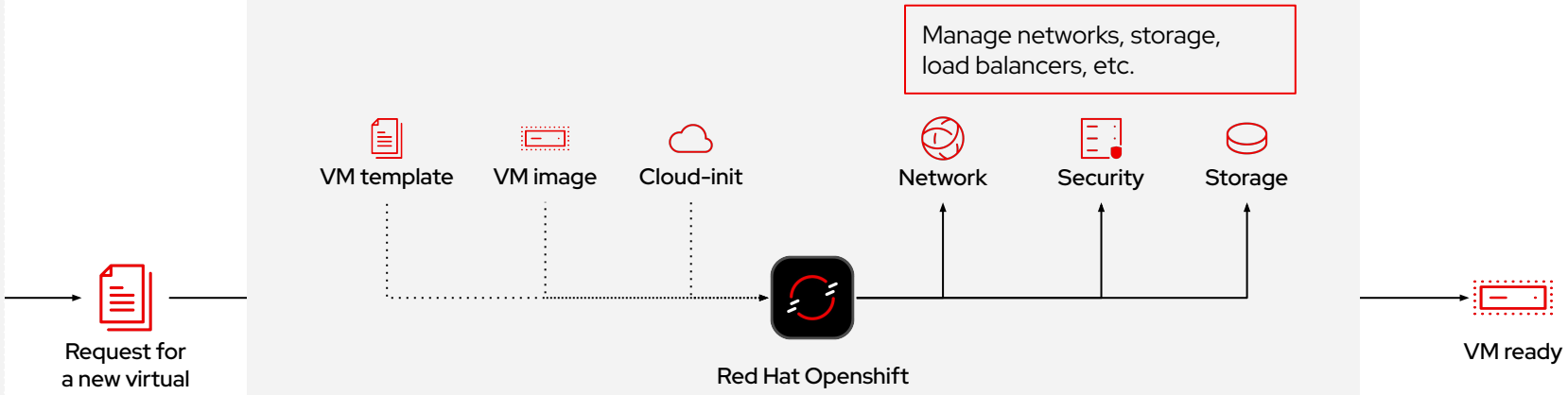
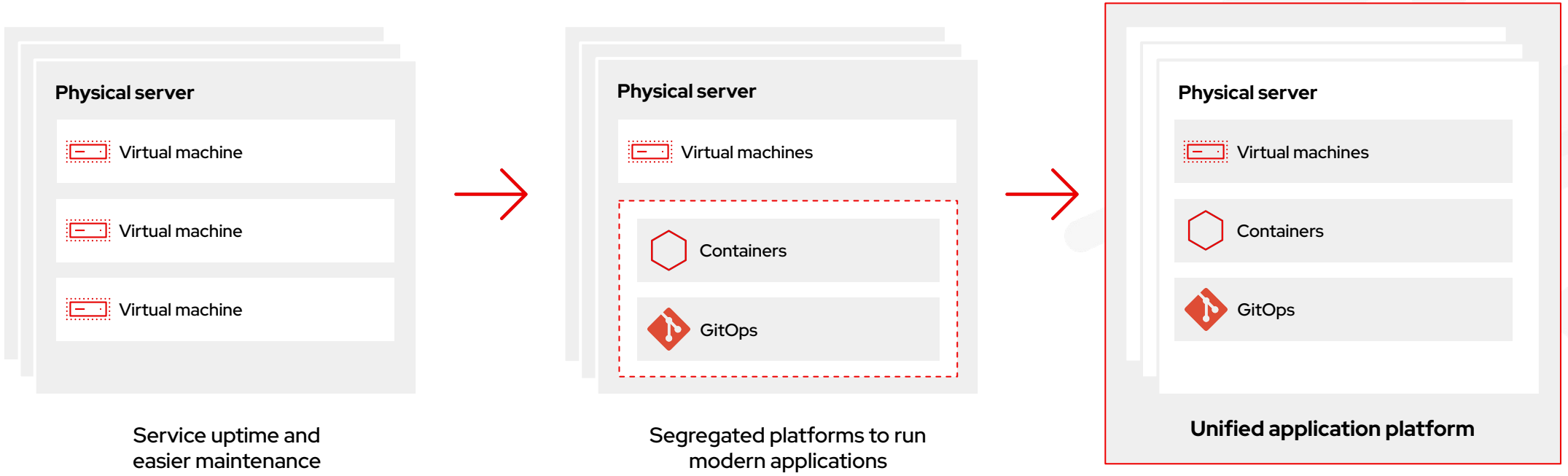


Execute workflow

- 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

Bring cloud-native functionality to virtual machines

Kubernetes benefits for virtual machines with Red Hat innovation



Service uptime and easier maintenance

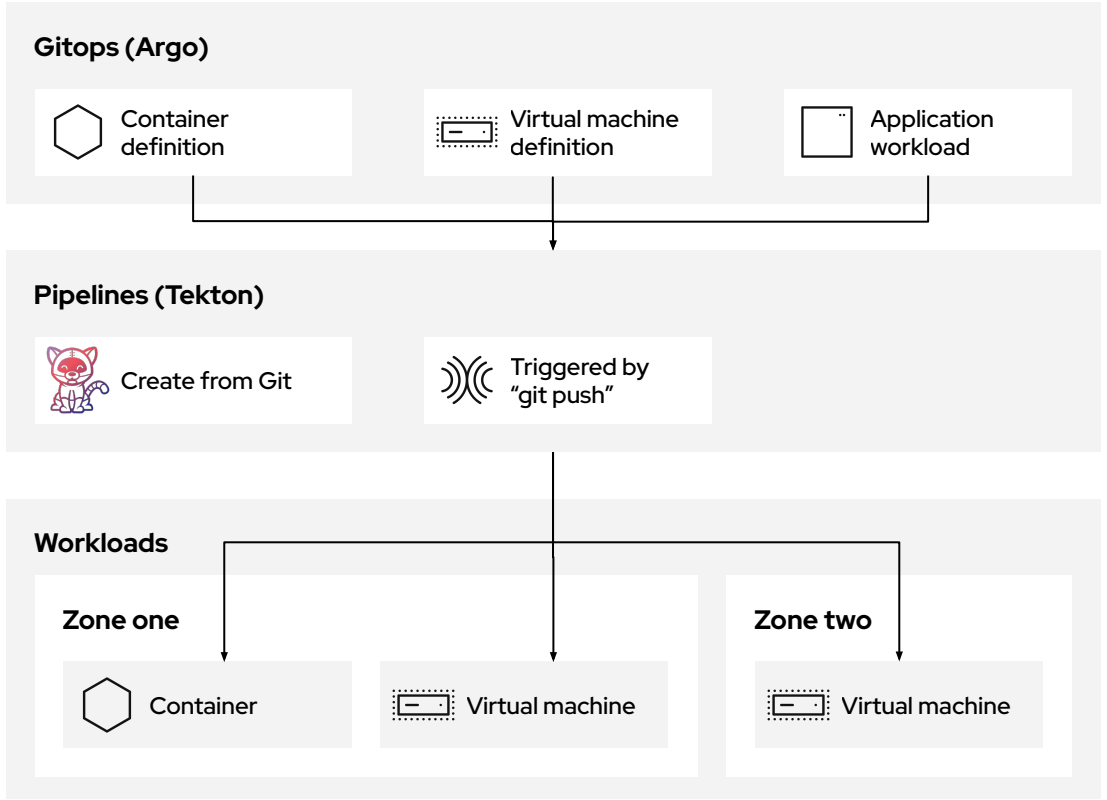
Segregated platforms to run modern applications

OpenShift Virtualization

Red Hat

Red Hat OpenShift Virtualization: build cloud-native virtual machines

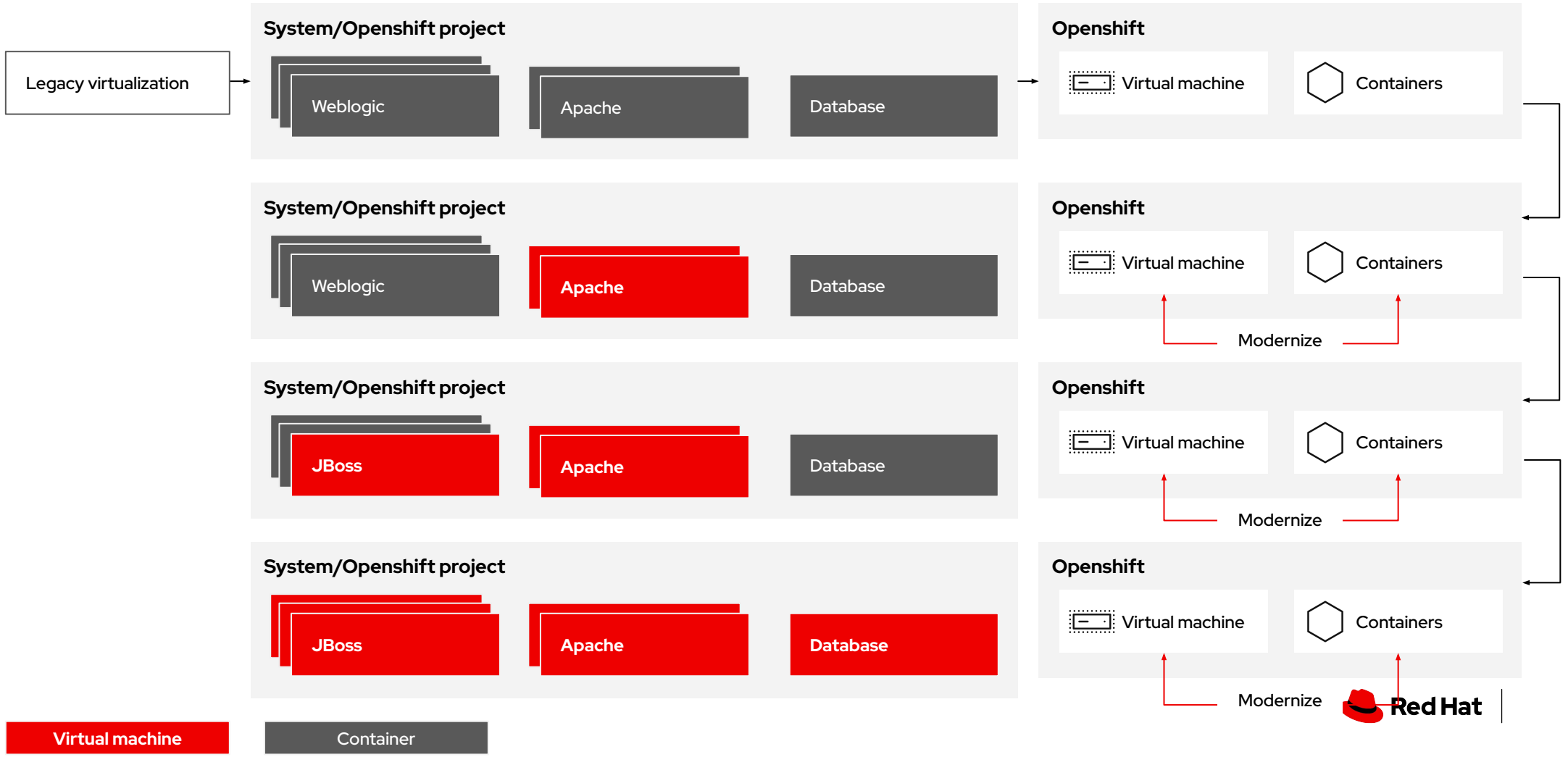
Deploy virtual machines as code with continuous delivery/continuous deployment



Integrate legacy virtual machines with a modern GitOps framework

- Deploy different security zones to run both composite applications of pods/virtual machines as well as traditional virtual machine workloads
- Deploy and automate virtual machines as code with GitOps

OpenShift Virtualization: modernize applications iteratively



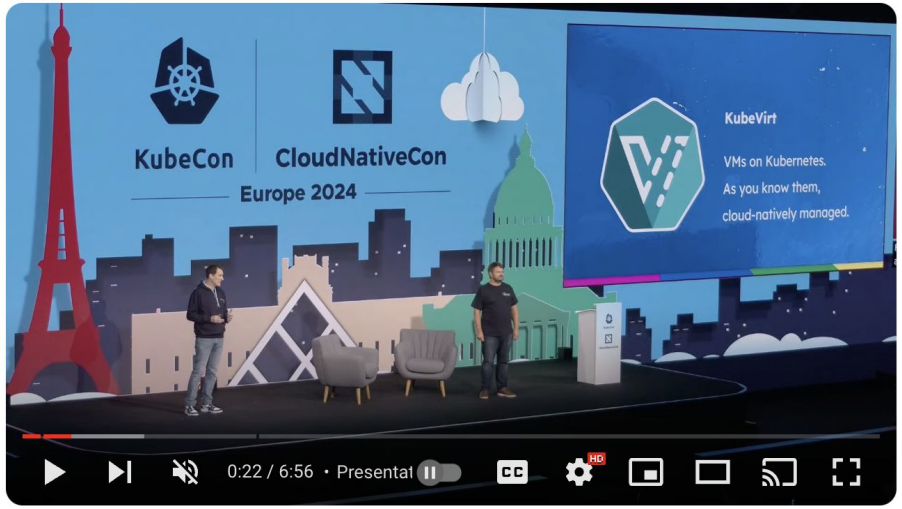
Global Investment Bank

Highlights:

- Improved operational life cycle provides"pet" levels of application availability with the benefits of a cloud-native environment.
- OpenShift Data Foundation allows live OpenShift upgrades with low impact to application availability.

*"...it allowed folks who spent the **last decade or so on existing technologies** to get up to speed with a newer subset of technologies to really help drive to **create a single solution** where we deploy one set of capacity and then burn down that capacity whether it becomes a VM or it becomes a container...a **big thanks to Red Hat team that's stuck with the project**, worked with us day in day out, and really helped enable a solution to help **modernize our underlying compute platform.**"*

- VP Tech Fellow, Global Investment Bank



Red Hat

sahibinden.com delivers reliable retail services faster with Red Hat OpenShift

sahibinden.com

"Red Hat OpenShift is the clear leader in enterprise Kubernetes. And while the virtualization market leaders can run Kubernetes on their virtualized infrastructure, only Red Hat OpenShift can run our whole virtualization environment within its Kubernetes container platform."

Hayri Yalçınkaya
Director of Infrastructure Management, sahibinden.com

Challenge

Sahibinden.com sought to modernize its IT infrastructure and work approaches to maintain its market-leading position against competition from start-ups and global retailers.

Solution

The company began a three-phase project to migrate its existing virtual machines (VMs) into container workflows with Red Hat® OpenShift®, running in a private cloud environment across its two datacenters.

Results

- Decreased system reliability incidents by 97% with active-active datacenter configuration and improved scalability
- Improved DevOps experience with combined VM and container management
- Enhanced talent attraction and retention
- Optimized container adoption with expert support and guidance

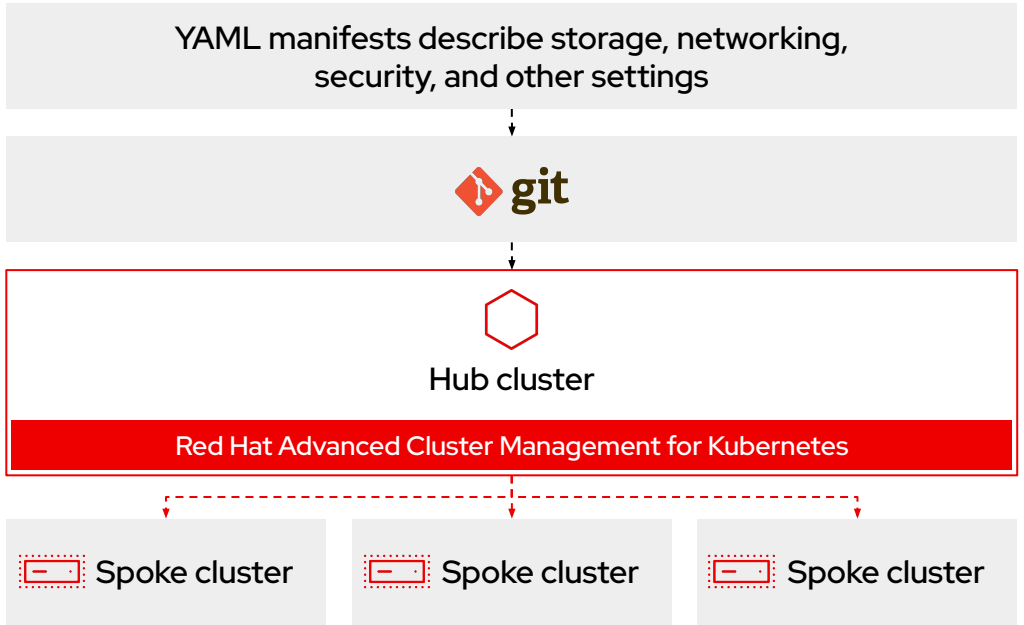
Red Hat Red Hat

Source: Red Hat case study. "sahibinden.com delivers reliable retail services faster with Red Hat OpenShift," March 2022.

NOAA AWIPS is deploying 150+ OpenShift clusters

122 Weather Forecast Offices, 13 River Forecast Centers

Advanced Weather Interactive Processing System



Managing 150+ sites - consistency is key

- Advanced Cluster Manager to apply org policies
- Advanced Cluster Security to ensure security

Current VM-based infrastructure

- Take advantage of OpenShift Virtualization

Get ready for cloud

- Remove overhead with large VMs
- Separate functions into containers (postgres, qpid, satellite ingest, python, httpd, java, etc...)
- Decompose monolithic app
- Move plugins to microservices for better scaling

Source:
https://www.youtube.com/watch?v=QXZZsdgUHhI

Let’s get familiar with the product

Accessing your lab instance

https://demo.redhat.com/workshop/ramtj7

Password: `OpenShift`

OpenShift Virtualization basics

Duration: 50 minutes

End time at 10:30

Red Hat

Break

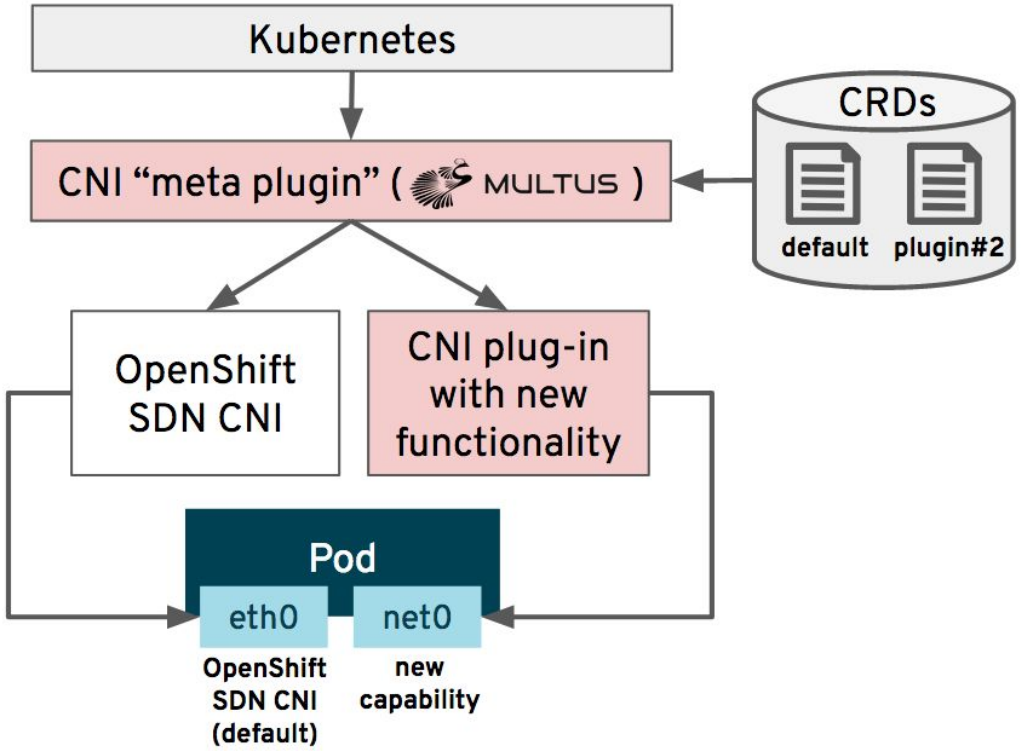
Duration: 15 minutes

End time at 10:45

Network

Virtual Machine Networking

- Virtual machines optionally connect to the standard pod network
  - OpenShift SDN, OVNKubernetes
  - Partners, such as Calico, are also supported
- Additional network interfaces accessible via Multus:
  - Bridge, SR-IOV, OVN secondary networks
  - VLAN and other networks can be created at the host level using nmstate
- When using at least one interface on the default SDN, Service, Route, and Ingress configuration applies to VM pods the same as others



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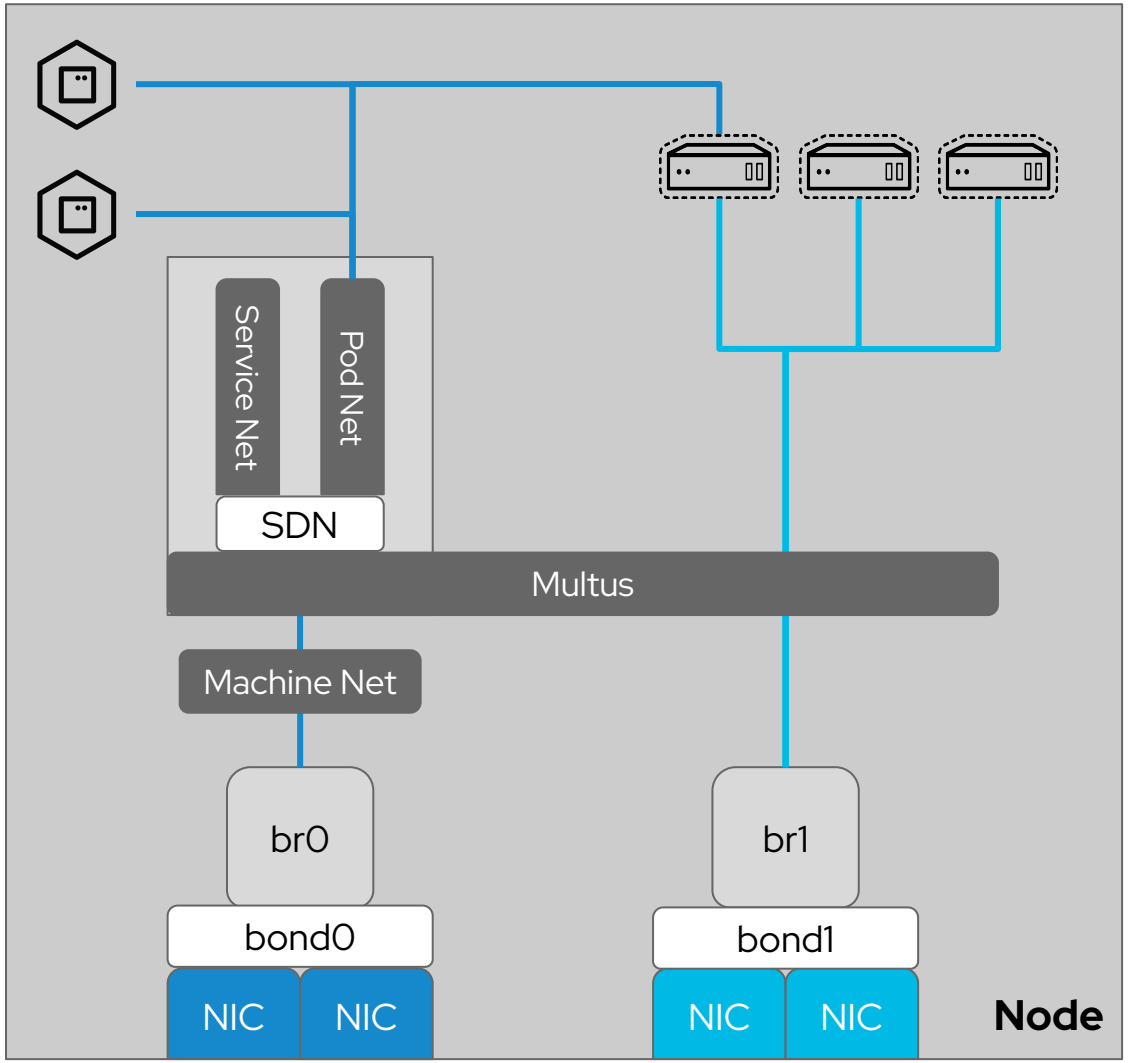
Example host network configuration

- Pod, service, and machine network are configured by OpenShift automatically
  - Use kernel parameters (dracut) for configuration at install - `bond0` in the example to the right
- Use the NMstate Operator to configure additional host network interfaces
  - `bond1` and `br1` in the example to the right
- VMs and Pods connect to one or more networks simultaneously

The following slides show an example of how this setup is configured



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Storage

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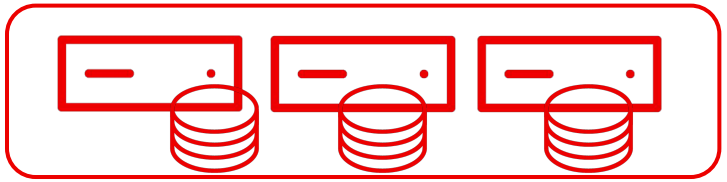
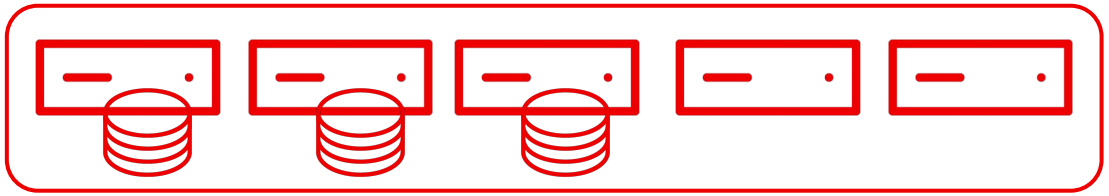
Red Hat OpenShift Data Foundation

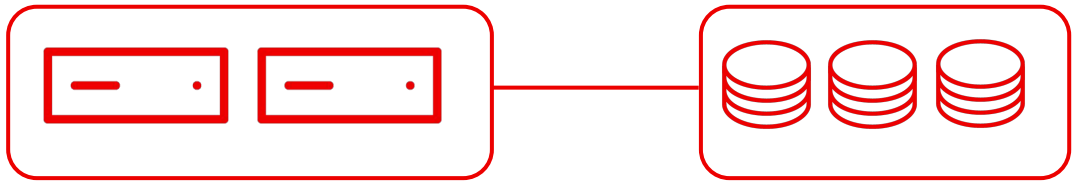
- Installed via Operator Hub
- Latest version v4.16
- Reduces complexity and increases efficiency
- Included with OPP
- Observability of PVCs health and performance
- Advanced Licensing includes Metro/Regional DR
  - Metro DR
    - ODF with external stretched Ceph Cluster
    - < 10 ms response time
    - Requires 3rd site for arbiter (< 100ms)
  - Regional DR
    - ODF Internal/HCI deployments
    - Asynchronous replication

Red Hat OpenShift Data Foundation

- Requires internal storage
- If using SAN storage:
  - Reduction in raw capacity
  - Write Amplification
  - LUN limitations
  - Storage class with replica 2
    - Reduces write amplification
    - Reduces data integrity, cannot protect against bit flip
    - Can impact performance during recovery and Increases recovery time; can only occur from single source
    - cephFS replica 2 is dev preview in v4.16
  - Multiple layers and potentially have to configure multipathing using machine configs
- Network Considerations
  - Multus for cluster and public network







Hyperconverged deployments

- Local storage deployed on same nodes as worker nodes
- Integrated OpenShift and storage cluster lifecycle, monitoring, and management.
- Compute and storage infrastructure scale together within the same cluster
- Optimized for simplicity of management

Dedicated deployments

- Local storage deployed on infrastructure or dedicated storage nodes
- Integrated OpenShift and ODF cluster lifecycle, monitoring, and management.
- Compute hosts and storage hosts scale independently within the same cluster
- Balanced

External storage

- Decoupled OpenShift and Ceph lifecycle, monitoring, and management.
- Compute and storage infrastructure scales independently in different clusters/platforms
- Optimized for scale and performance (on-premises only)

CSI Drivers

Boot Camp 2024 - Brenda

McLaren

Red Hat

- Have the vendor participate in the PoC
- Know the limitations
  - KubeVirt Support
  - Protocols
    - iSCSI
    - NFS
    - FC
    - NVMe/TCP
  - LUN Limitations
- Know the CPU/Memory requirements
- Driver must support RWX for Live Migrations

Importing virtual machines from vSphere

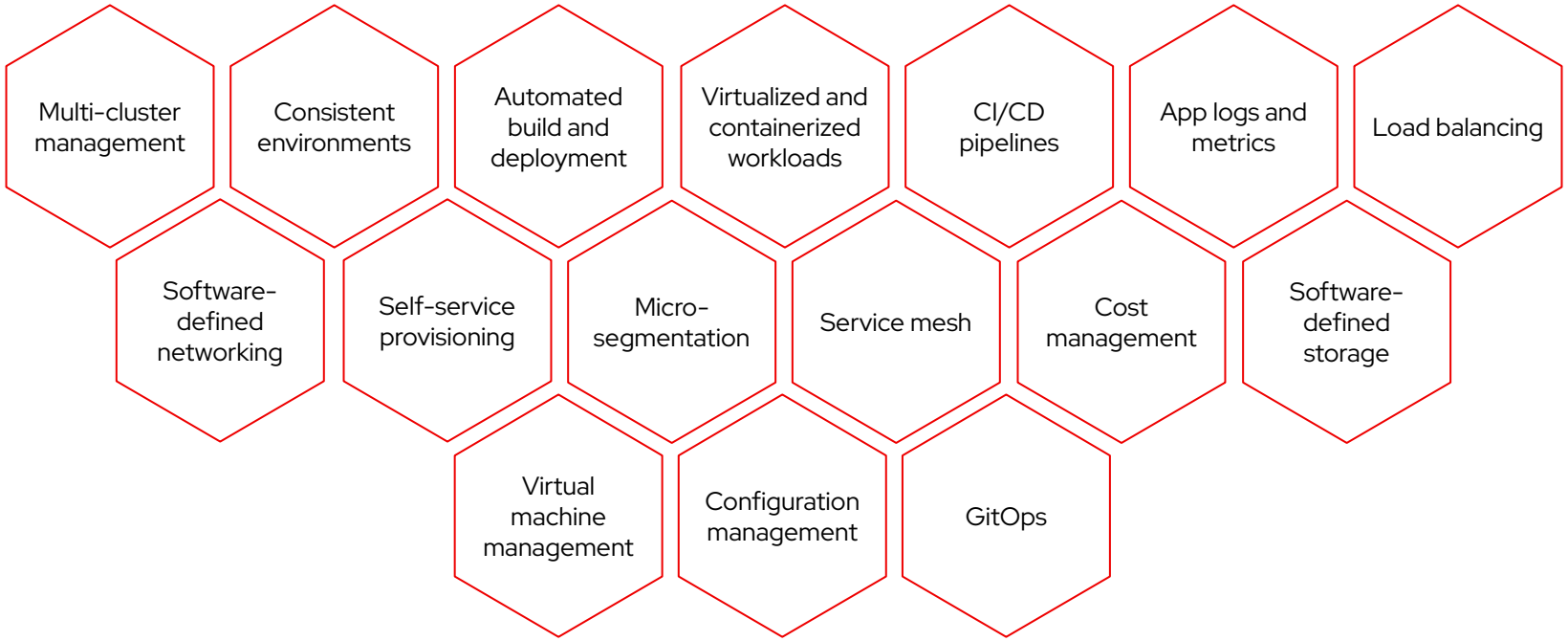
Duration: 50 minutes

End time at 12:00

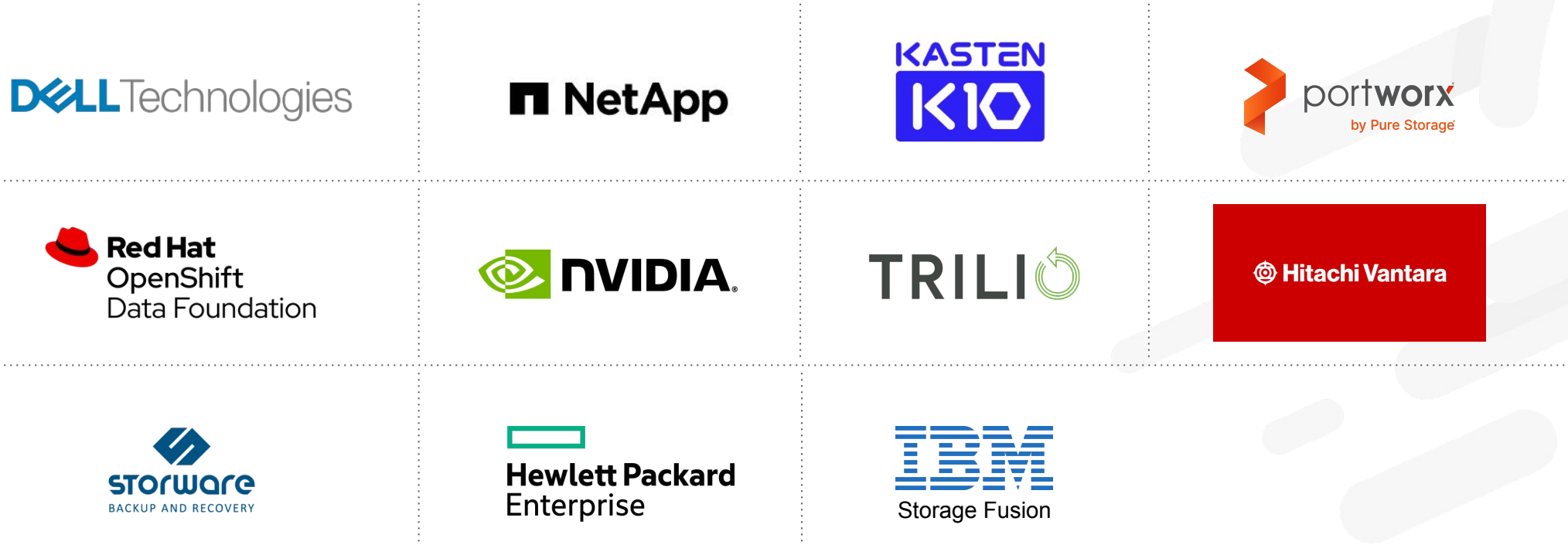
Red Hat

Your journey with Red Hat OpenShift Virtualization

A modern application platform with comprehensive lifecycle and infrastructure management



A growing infrastructure ecosystem



Red Hat OpenShift Data Foundation

Allows customers to scale storage and compute independently

- Storage - Scale up or out
- Compute - Scale number of virtual machines or expand virtual machines

Disaster recovery

- Live migration of virtual machines within cluster
- Live migration of virtual machines 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

Storage automation for virtual machines and containers

- **Storage for application layer** for containers and virtual machines
- **Enables performance** and HA for containers and virtual machines
- **Comprehensive DR** for virtual machines and containers
- **Live migration** of virtual machines and containers

Protect OpenShift Virtualization virtual machines 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 virtual machines
- Export and import virtual machines for disaster recovery and virtual machine mobility between clusters

Disaster and recovery

"Significantly accelerate time to market, while ensuring reliability and quality of the overall solution."

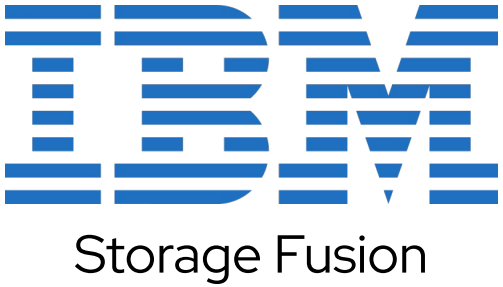
Rolled out a greenfield large scale application at the core where some components had to be in virtual machines. Architect, develop, test, and scale production-like deployments many months before a containerized version of applications being available.

- 100s of sites consolidated to run on minimum amount of hardware
- Accelerate solution by several years using non-containerized workloads

Storage Automation for virtual machines and containers

Discover enterprise-grade data protection for the Red Hat ecosystem- now with Red Hat 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)



Pair IBM data services with Red Hat OpenShift Virtualization

Manage virtual machines with operators and CRDs

- Windows and Linux virtual machines
- 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 Red Hat OpenShift applications
- Single point of contact for support

Orchestrating NVIDIA GPU accelerated virtual machines with Red Hat OpenShift

- GPU-accelerated applications running in virtual machines can be orchestrated by Red Hat OpenShift, just like ordinary enterprise applications, enabling unified management.
- In addition to AI, enabling Red Hat 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.

Industry leading storage and data management functionality for modern workload deployments

- **Support** both virtualized and containerized apps in a single infrastructure
- **Virtual machines live migration**, CSI topology awareness and storage offload
- **Fast and efficient**, best-in-class snapshots and clones
- **NetApp Astra provides functionality** to protect, move, and store apps

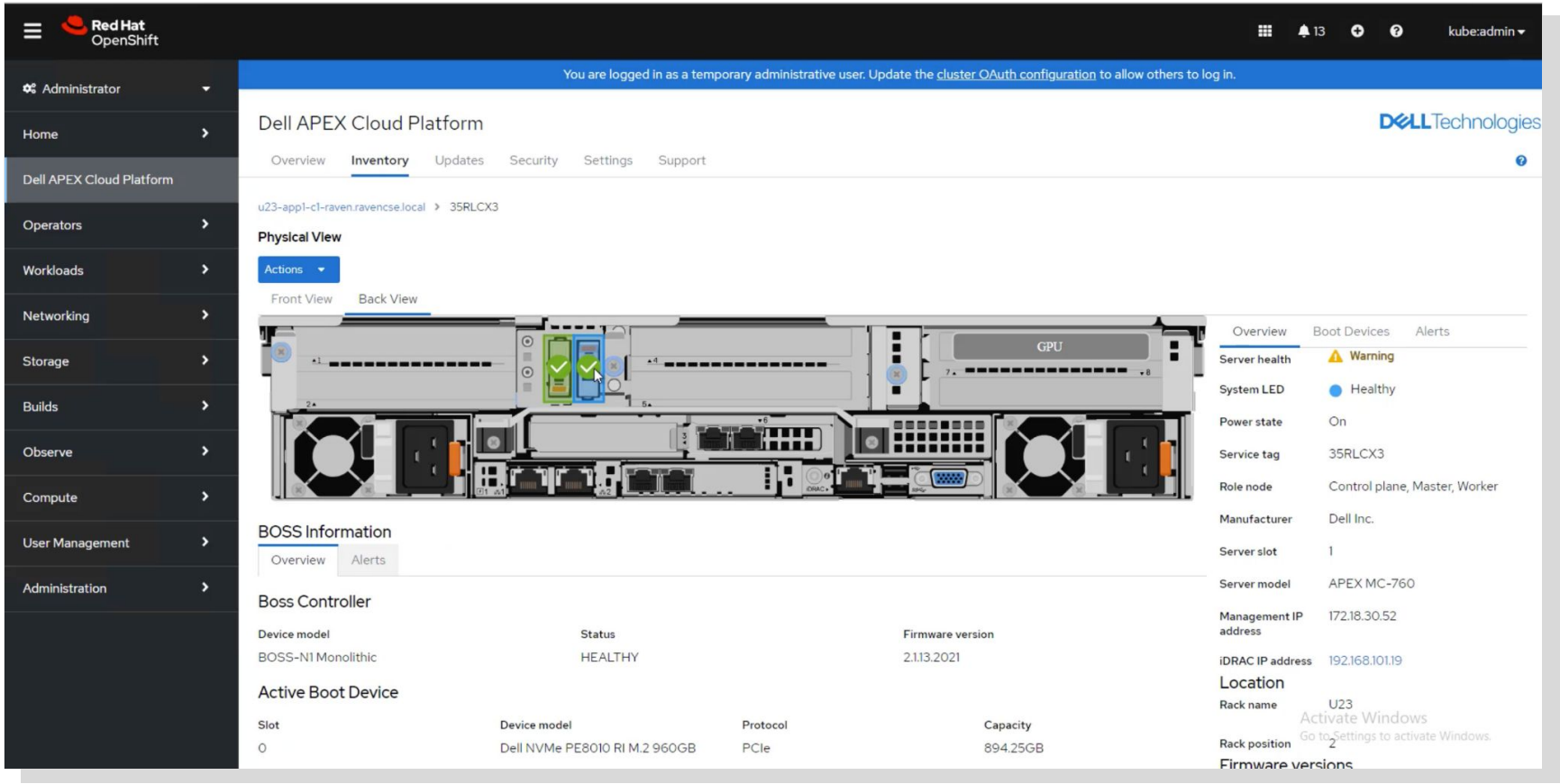
Data protection for virtual machines is coming in Q4 2023

Dell CSI storage portfolio

The CSI drivers by Dell implement an interface between OpenShift and Dell storage arrays

	PowerFlex	Target customer	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	✓	✓	✓		✓

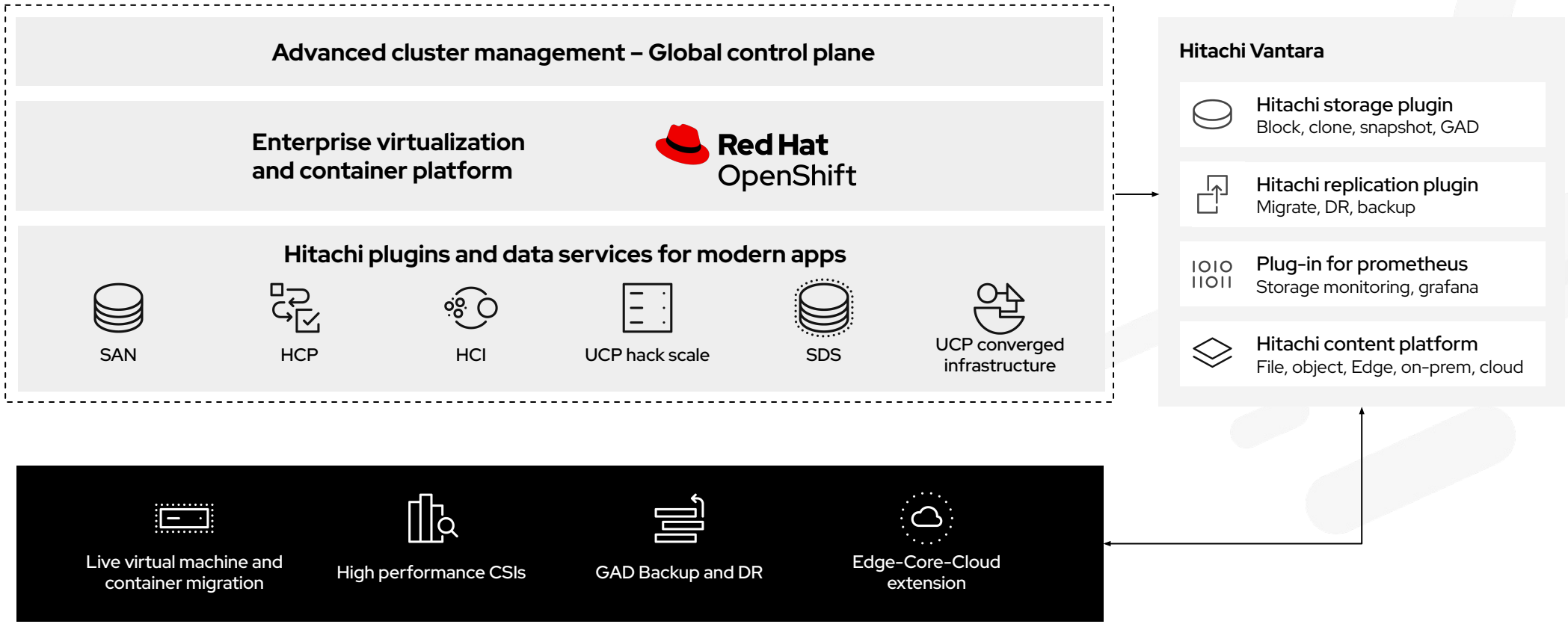
New exciting partnership with Dell



Red Hat

Red Hat OpenShift Virtualization

Hitachi Plugins and data services for modern apps, and containers



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Next steps

Choose your own adventure

Modules for roles and interests

Virtual machine administrators

- Customize virtual machines
- Windows virtual machines

Virtual infrastructure administrator

- Bare metal OpenShift
- Network and storage management
- Backup and restore

Virtual machine users

- Exposing apps using a route and using MetalLB

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Thank you

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