



Red Hat Virtualization

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AGENDA



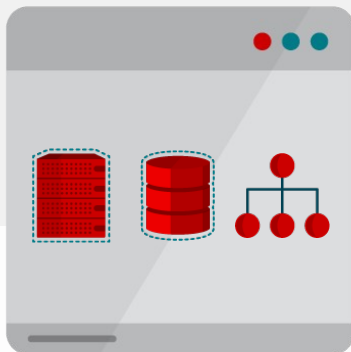
- › Overview
- › Architecture
- › Deployment options
- › Deep dive
- › Core features
- › Major integration points

A large bridge with a teal overlay. The bridge's steel truss structure and suspension cables are visible against a clear sky. The bridge deck is in the foreground, leading towards the horizon.

RED HAT VIRTUALIZATION OVERVIEW

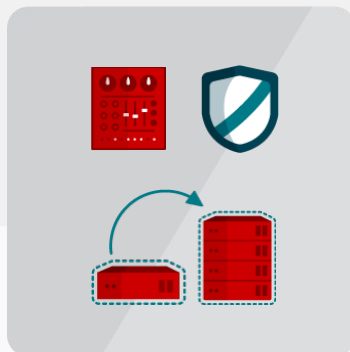
OVERVIEW

An easy-to-use software-defined platform for virtualized Linux® and Windows, built on Red Hat® Enterprise Linux and KVM technologies



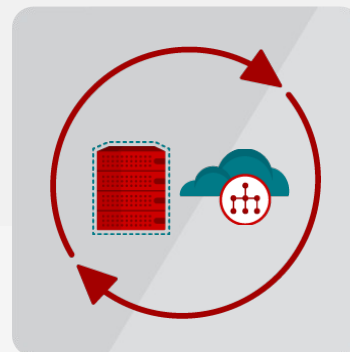
CENTRALIZED MANAGEMENT

Virtualized compute, network, and storage resources using the open source KVM hypervisor



AUTOMATED WORKLOAD

Management, scalability, and security features for virtualized applications



OPTIMIZATION OF CURRENT I.T.

Integrates with future technologies using RESTful application program interface (API)

USE CASES



PERFORMANCE SENSITIVE

Unmatched scale and performance for enterprise workloads, including SAP® and Oracle, on x86 and Power®



DEV AND TEST ENVIRONMENTS

Simple, inexpensive self-serve infrastructure for enterprise development environments



HYBRID AND MULTIHYPERVISOR

Integrated Red Hat OpenStack® and easily managed by Red Hat CloudForms for a smooth transition into private and public clouds



TECH WORKSTATIONS

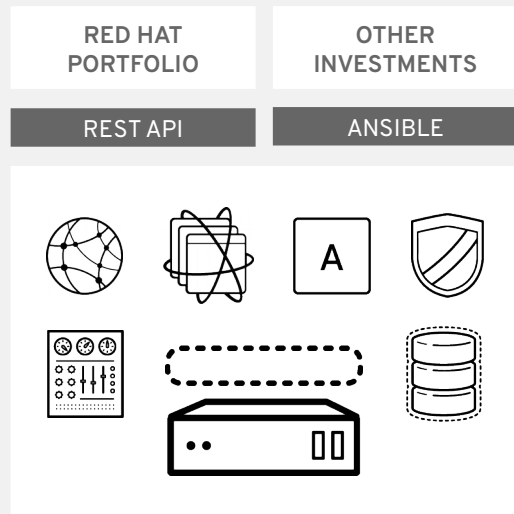
Improved performance and reduced cost of resource-intensive Linux workstations—e.g. computer-aided design (CAD) and computer-aided manufacturing (CAM)



SERVER CONSOLIDATION

Low total cost of ownership (TCO), faster return on investment (ROI), and accelerated break-even point

RED HAT VIRTUALIZATION OVERVIEW



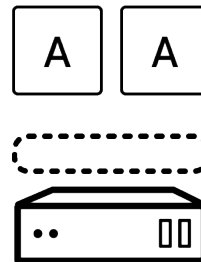
RED HAT VIRTUALIZATION

Centralized management for the KVM hypervisor, as well as compute, network, and storage resources

Enterprise features to support business-critical applications

Cross-portfolio integration, APIs, and software development kits (SDKs) to enable automation

Red Hat Virtualization is built on Red Hat Enterprise Linux + KVM



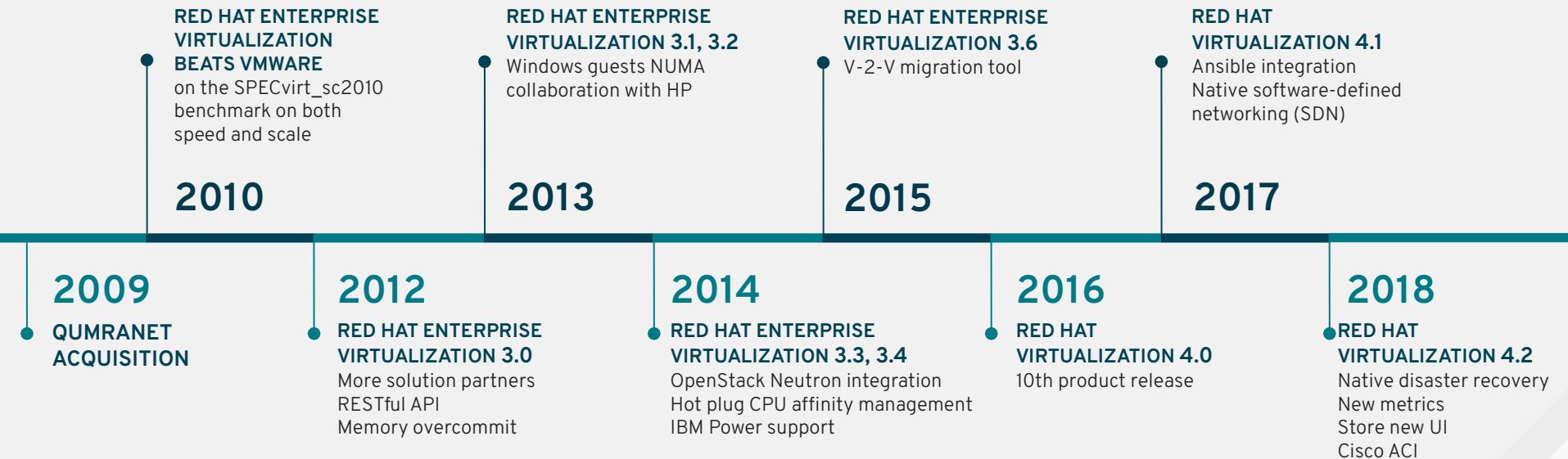
RED HAT ENTERPRISE LINUX + KVM

Basic virtualization

No enterprise virtualization management features or APIs

Limited number of VMs allowed

HISTORY OF RED HAT VIRTUALIZATION



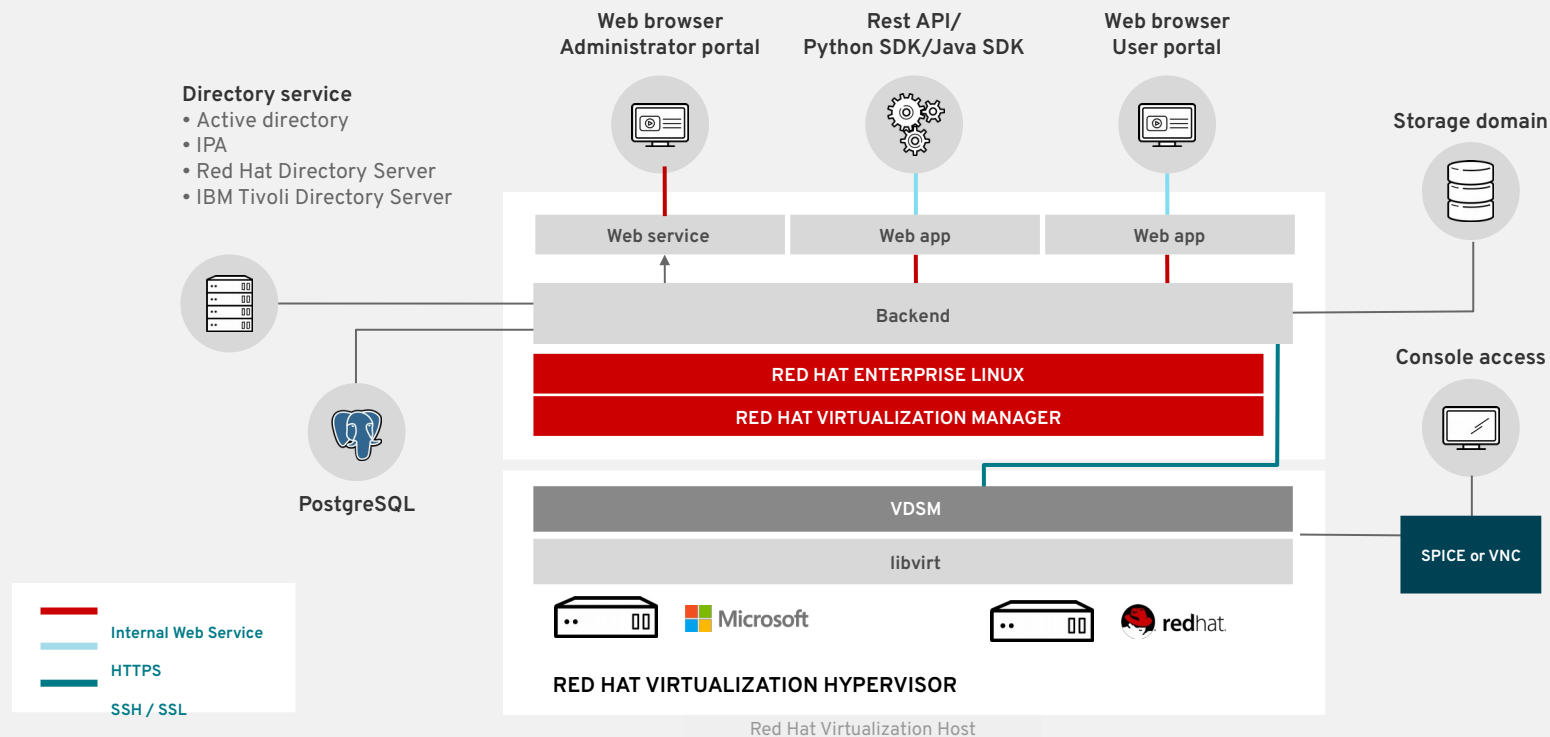
DEVELOPMENT MODEL



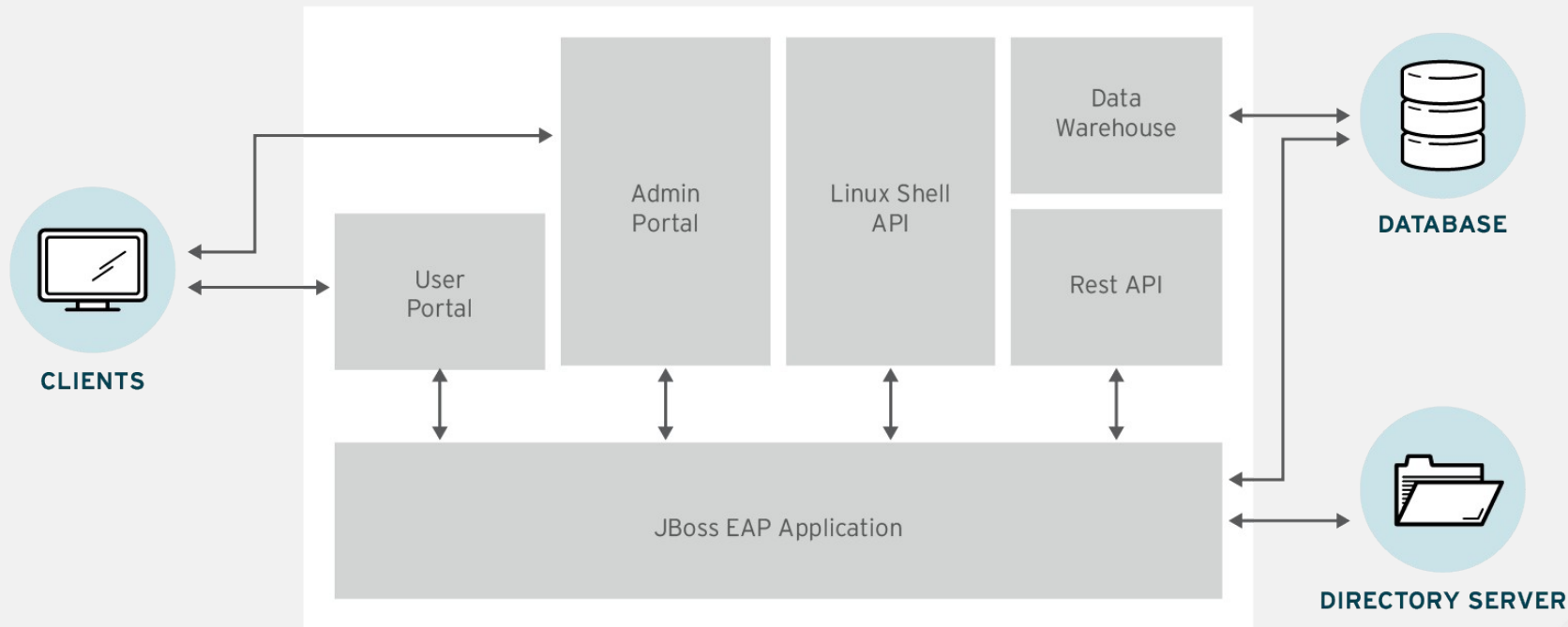
A large bridge with a teal overlay. The bridge has a complex steel truss structure and multiple lanes. The teal overlay is a semi-transparent layer that covers most of the image, with some geometric shapes like triangles and lines. The text "RED HAT VIRTUALIZATION ARCHITECTURE" is centered in white.

RED HAT VIRTUALIZATION ARCHITECTURE

OVERVIEW



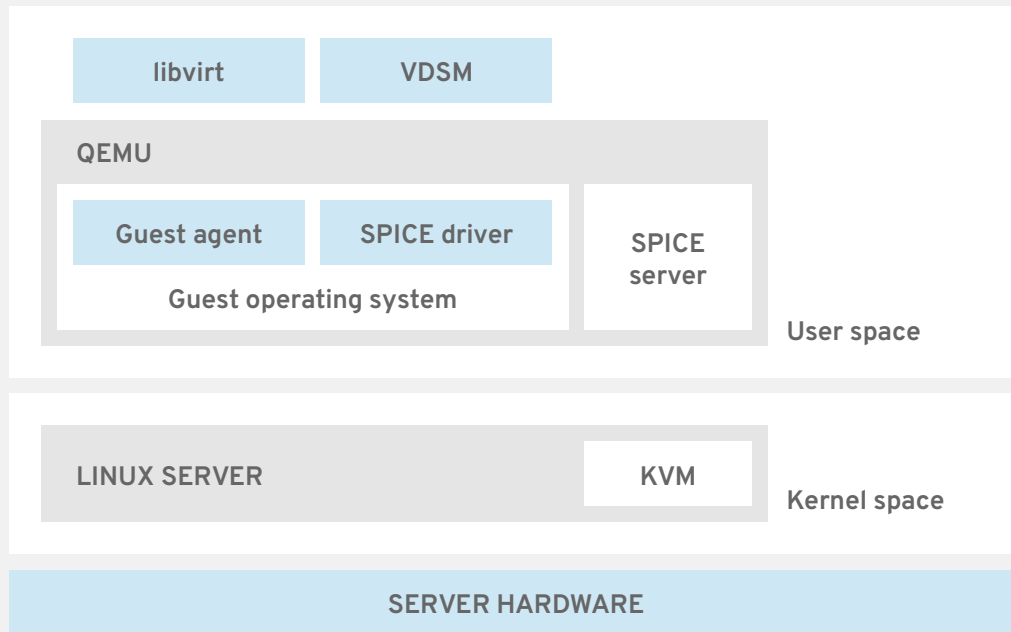
ARCHITECTURE



Red Hat Virtualization Manager

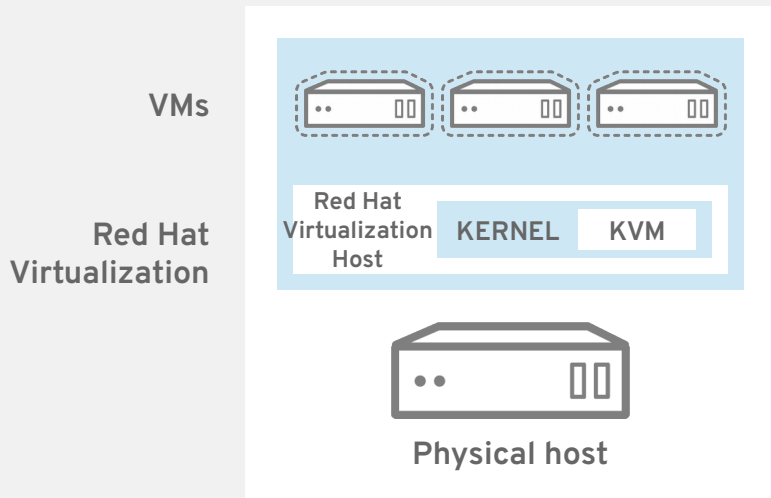
ARCHITECTURE

KVM



KVM INTEGRATION

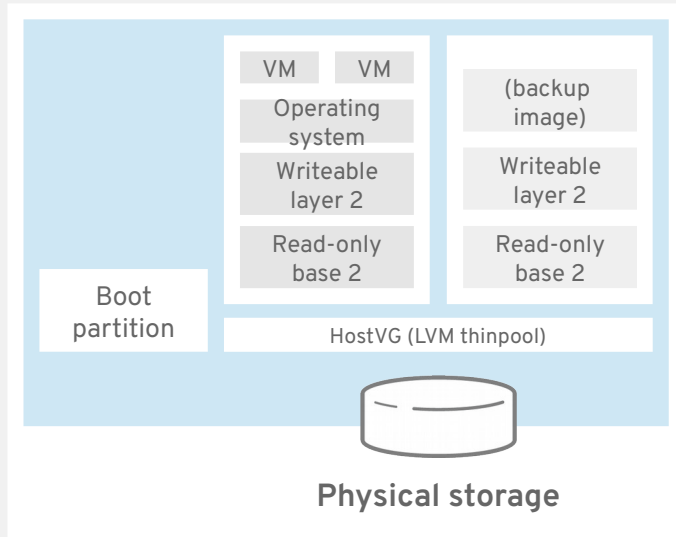
As Red Hat Enterprise Linux advances, Red Hat Virtualization advances



- KVM is part of the Linux kernel
- Uses existing features of the Linux operating system:
 - Security features
 - Memory management
 - Process scheduler
 - Device drivers
 - Network stack
- Requires integration and quality engineering with full stack as well as support of hardware and software ecosystem

ARCHITECTURE

Red Hat Virtualization Host



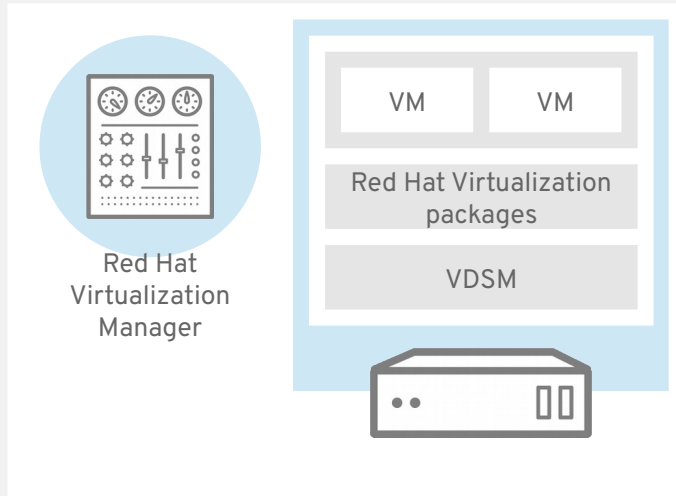
LIGHTWEIGHT HOST

- Red Hat Virtualization Host—Purpose built node built on Red Hat Enterprise Linux
- Can be deployed via ISO, PXE, USB, cloned, etc
- Writable root file system
- Uses trimmed down Anaconda installer
- Cockpit administrative console
- Security and services are pretuned to support virtual machines

Red Hat Virtualization Host is designed around LVM Thinpools and “imgbased,” resulting in a lightweight and flexible architecture.

ARCHITECTURE

Red Hat Enterprise Linux node

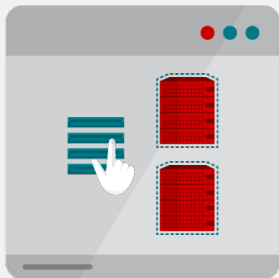


“FULL” HOST

- Red Hat Virtualization 4 supports Red Hat Enterprise Linux 7 as a node
- Uses QEMU-KVM-RHV
- Larger footprint as compared to Red Hat Virtualization Host
- Red Hat Virtualization Manager will configure security and VDSM
- Cockpit needs to be manually installed and configured

Red Hat Enterprise Linux 7 is fully supported as a host in Red Hat Virtualization. RHV-related packages and policies are deployed by RHV-M.

MANAGEMENT INTERFACES



RED HAT VIRTUALIZATION MANAGER

- Designed for large scale (500+ hosts and 5,000+ VMs)
- REST API to integrate with Red Hat portfolio, third-party applications, backup and recovery software
- Can be integrated with existing infrastructure—active directory, Red Hat CloudForms®, OpenStack, etc.



COCKPIT

- Included as part of Red Hat Virtualization Host image
- Used to configure networking, storage, tuning, subscriptions, and other aspects of the virtualization host
- Can be used to deploy Red Hat Virtualization in high availability

A large bridge with a teal overlay. The bridge's steel truss structure is visible, and the road surface is in the foreground. The text is centered in white.

RED HAT VIRTUALIZATION DEPLOYMENT OPTIONS

RED HAT VIRTUALIZATION MANAGER DEPLOYMENT OPTIONS

Comparing Standard with Hosted Engine

STANDARD DEPLOYMENT

Red Hat Virtualization Manager (engine) deployed as standalone or virtual machine

Pros

- Easy for lab
- Easy to customize

Cons

- No high availability
 - (but if you don't need it...)

HOSTED ENGINE DEPLOYMENT

Red Hat Virtualization Manager (engine) deployed as virtual machine appliance in high availability (HA) configuration

Pros

- HA for Red Hat Virtualization Manager (engine)
- Reduced hardware footprint
- Less to manage

Cons

- Not as easy to customize
 - (But it can be done)

USE CASE DETERMINES WHICH ONE IS BEST FOR YOUR ENVIRONMENT

HOST DEPLOYMENT OPTIONS

Comparing use of Red Hat Enterprise Linux host to Red Hat Virtualization Host

HOSTED ENGINE (Red Hat Enterprise Linux)

Pros

- Ability to highly customize per security, business needs

Cons

- Not as purpose built as Red Hat Virtualization hardware

HOSTED ENGINE (Red Hat Virtualization hardware)

Pros

- Appliance approach to host and management (pre-configured)
- Cockpit includes Red Hat Virtualization specific tools

Cons

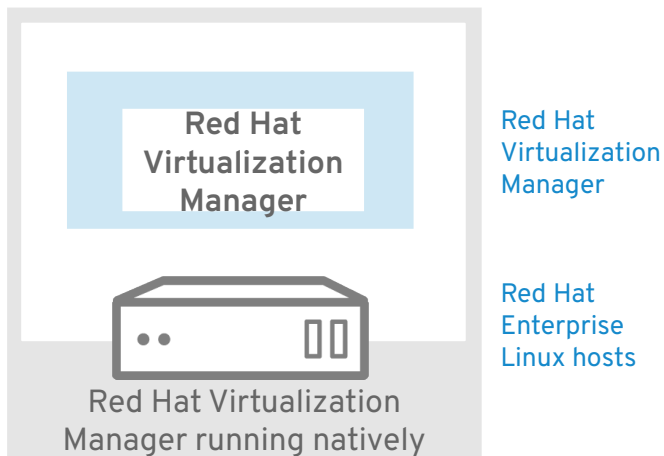
- No custom filesystem layout
 - (But if you don't need it...)

USE CASE DETERMINES WHICH ONE IS BEST FOR YOUR ENVIRONMENT

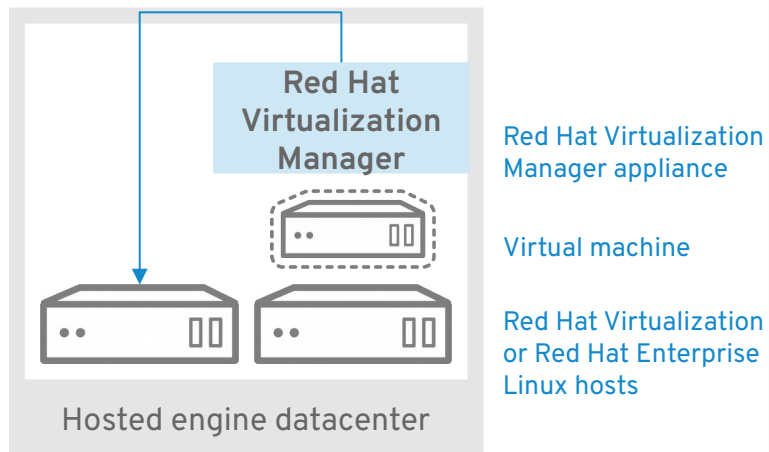
COMPARING RED HAT VIRTUALIZATION MANAGER DEPLOYMENTS

Physical vs. virtual appliance

RED HAT VIRTUALIZATION MANAGER ON BARE METAL

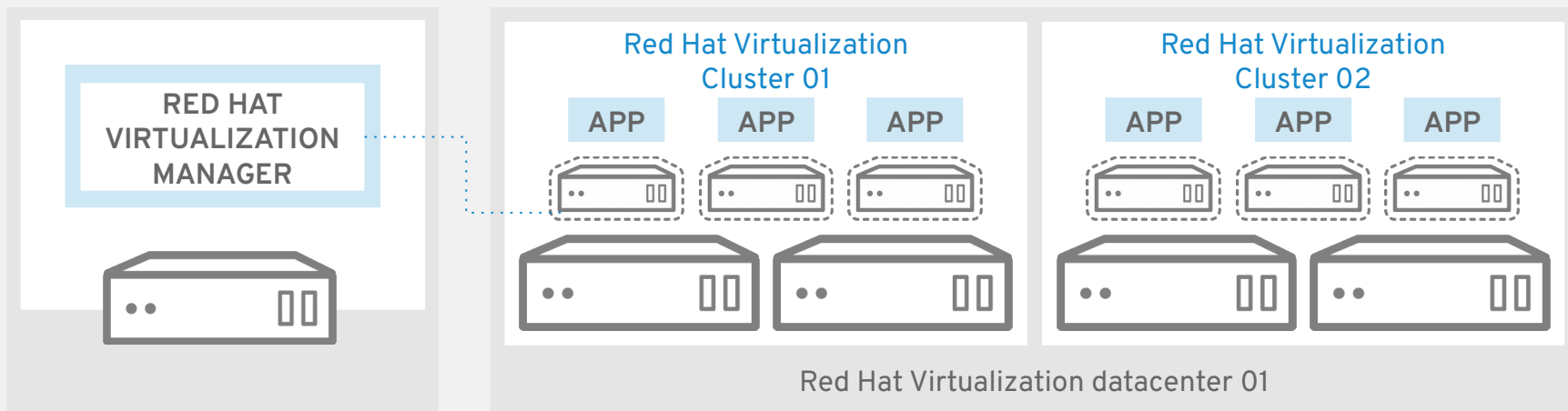


RED HAT VIRTUALIZATION MANAGER ON VM (HOSTED ENGINE)



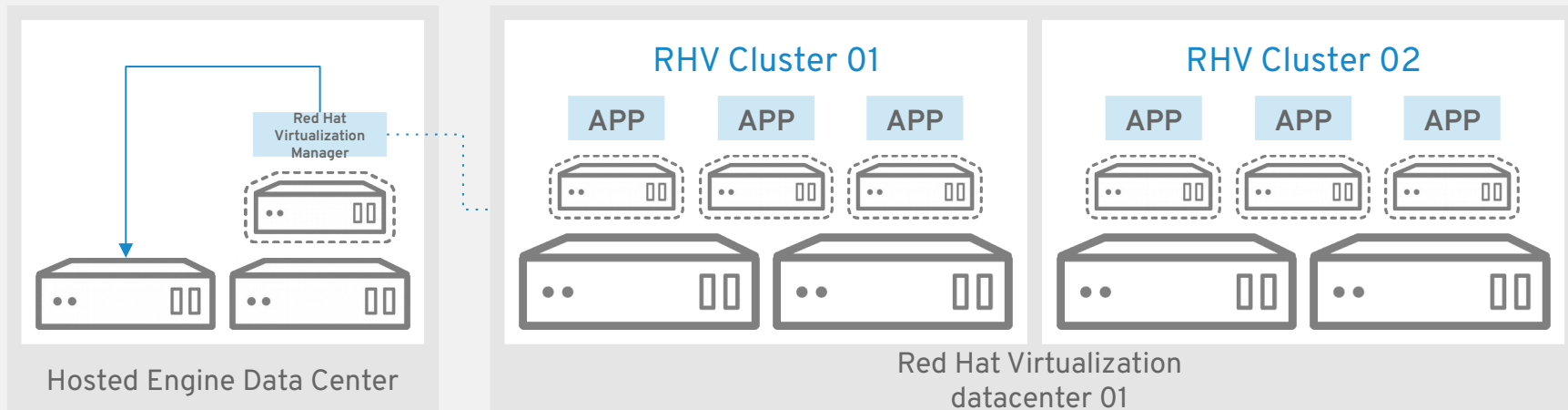
STANDARD RED HAT VIRTUALIZATION MANAGER DEPLOYMENT

Standard deployment of Red Hat Virtualization Manager
(No high availability for Red Hat Virtualization Manager)



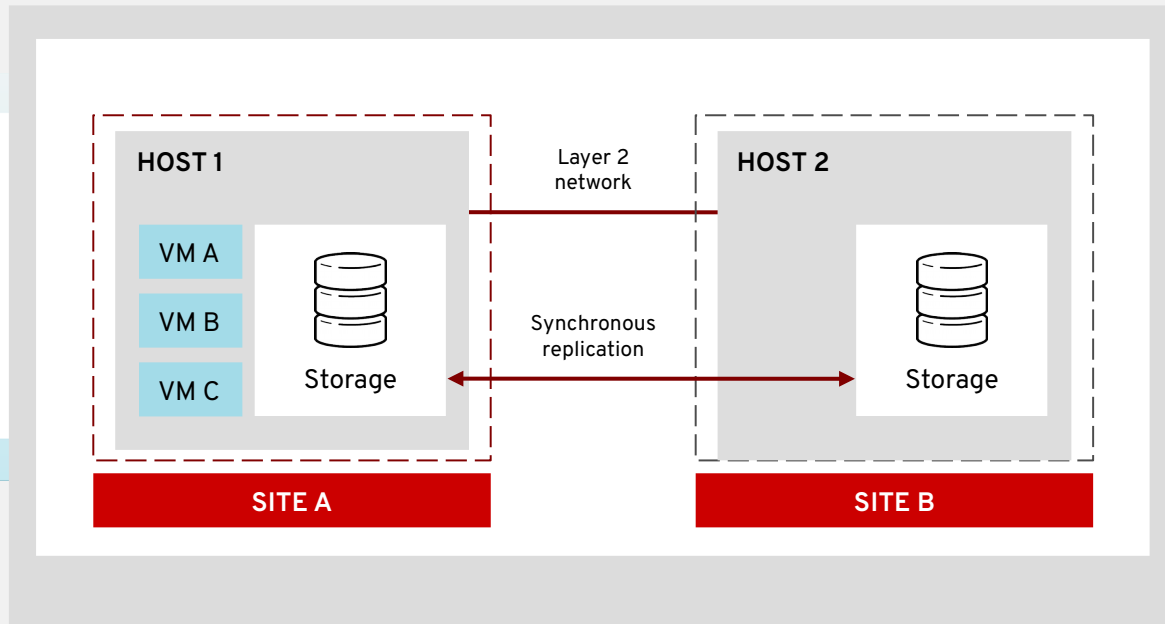
SELF-HOSTED ENGINE DEPLOYMENT

Red Hat Virtualization Manager in self-hosted engine deployment
(High availability for Red Hat Virtualization Manager)



MULTISITE DEPLOYMENT

Site to site failover and failback

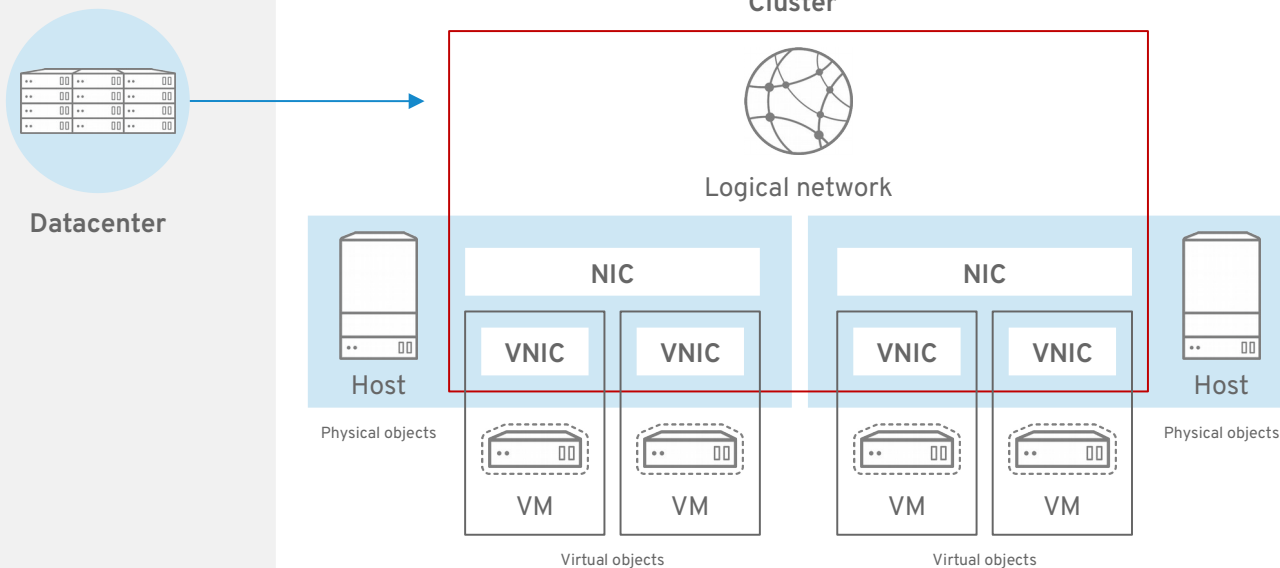


The background of the slide is a photograph of a large bridge, likely the Bix Creek Creek Bridge in San Francisco, viewed from below. The bridge's steel truss and suspension cables are visible. A large, semi-transparent teal triangle is overlaid on the left side of the image, pointing towards the center. The title text is centered within this teal area.

RED HAT VIRTUALIZATION DEEP DIVE

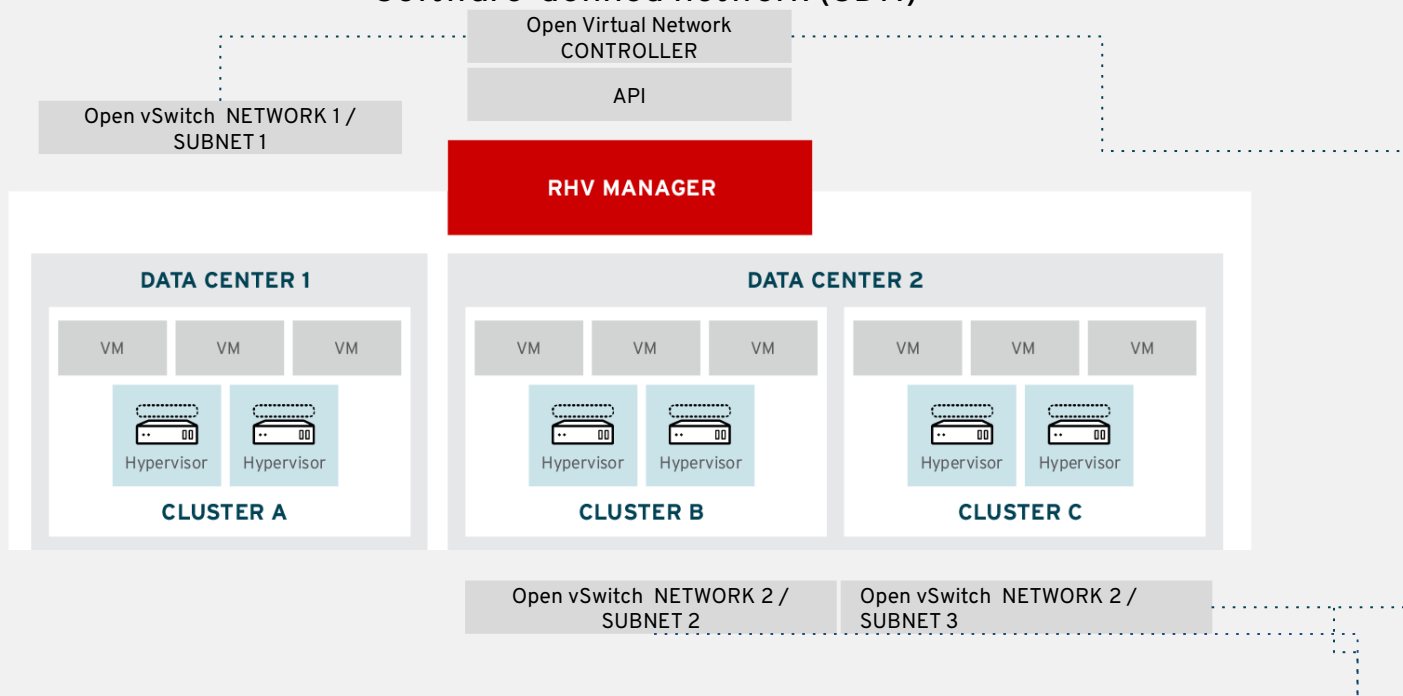
DEEP DIVE

Network



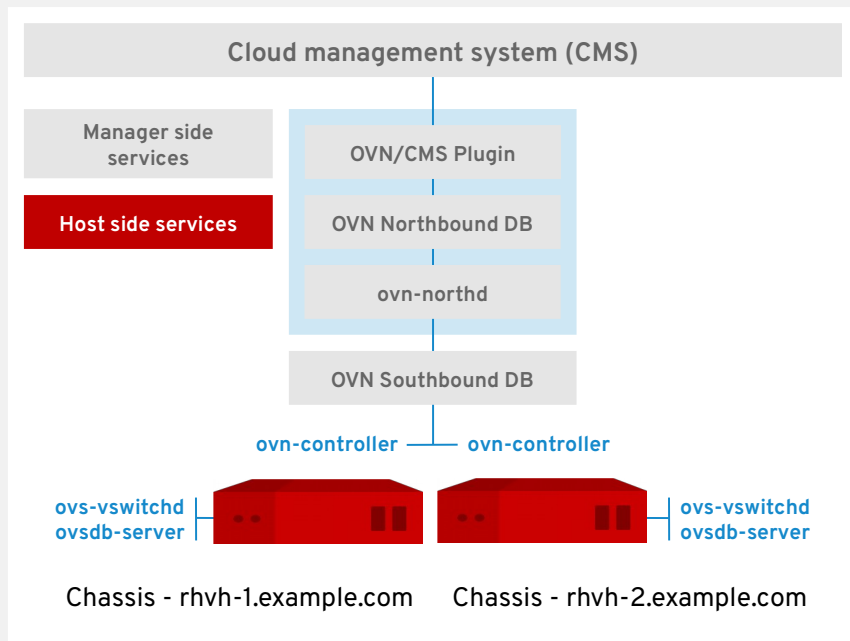
DEEP DIVE

Software-defined network (SDN)



DEEP DIVE

Software-defined network (SDN) continued



In this scenario, Red Hat Virtualization is the cloud management system (CMS).

The CMS plugin translates the CMS' logical network configuration into a format understood by OVN. The Neutron-like API that handles overlay management is also here.

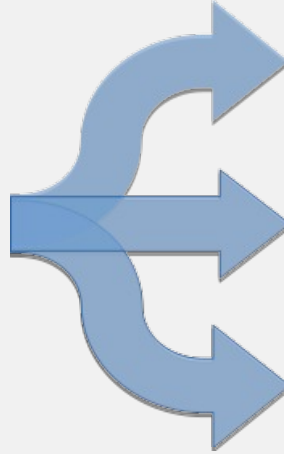
The OVN Northbound database receives logical network configuration from the CMS plugin.

The ovn-northd translates network concepts from above to datapath flows below.

The OVN Southbound database stores physical network tables, logical network tables, and binding tables the link the first two together.

A chassis is represented by a hypervisor host, and each one runs the ovn-controller agent and other components.

oVirt external network provider

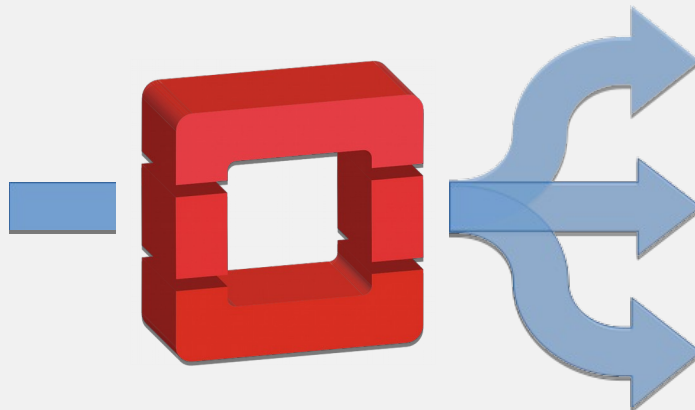


Network Management
System

Openstack
Neutron

Open vSwitch
OVN

oVirt network provider API



Network Management
System

Openstack
Neutron

Open vSwitch
OVN

oVirt network provider API

==

OpenStack Networking API

DEEP DIVE

Storage

STORAGE DOMAIN TYPES (DATA STORES)

- **Data domain**—Stores virtual hard disks, snapshots, OVF files.
- **ISO domain**—Stores ISO files and virtual floppy disks.
- **Export domain**—Temporary storage repositories to move images between data centers and import from disparate platforms.

SUPPORTED STORAGE PROTOCOLS

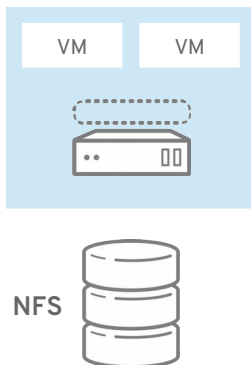
- NFS
- GlusterFS
- Fibre channel and FCoE
- iSCSI
- POSIX compliant

DEEP DIVE

Storage—disk allocation and file format

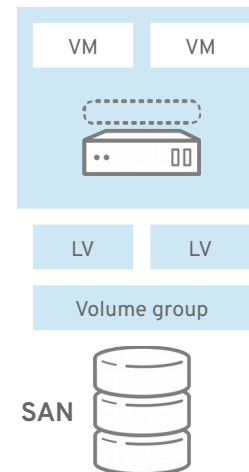
Network File System

- All disks, snapshots, and templates are files
- Can be sparse



SAN

- All disks, snapshots, and templates are logical volumes
- Can be sparse or preallocated
- Virtual disks can be QCOW2 or raw



EASY TO AUTOMATE


RED HAT VIRTUALIZATION **INCLUDES ANSIBLE AUTOMATION**

- Removes manual steps from deployment and reconfiguration.
- Streamlines operations, frees up resources to focus on strategic initiatives.
- Provides single support stack for for virtualization and automation.
- Includes and supports Ansible Automation roles for Red Hat Virtualization.

APPLICATION PROTECTION

High availability (HA) is not a separate product or SKU

RED HAT VIRTUALIZATION
**PROVIDES MULTIPLE MEANS
OF CONTINUITY.**

- 
- Restarts VMs automatically on host failure.
 - Guarantees capacity for high-availability VMs with resource reservation.
 - Offers self-hosted engine to make high-availability.
 - Provides native disaster recovery solution.

VIRTUAL GRAPHICS PROCESSING UNIT

vGPU provides significantly lower TCO for high-tech workstations



Some of the tunables include:

- ▶ NVIDIA (GRID and Quadro vDWS)—maintainer of mediated device framework (mdev)
- ▶ Intel (GVT-G)—driver development and reviewer for mdev

High-powered technical workstation focus:

- ▶ Conducive to running Linux or Windows
- ▶ Compute (e.g. AI/ML) and 3D/rendering workloads

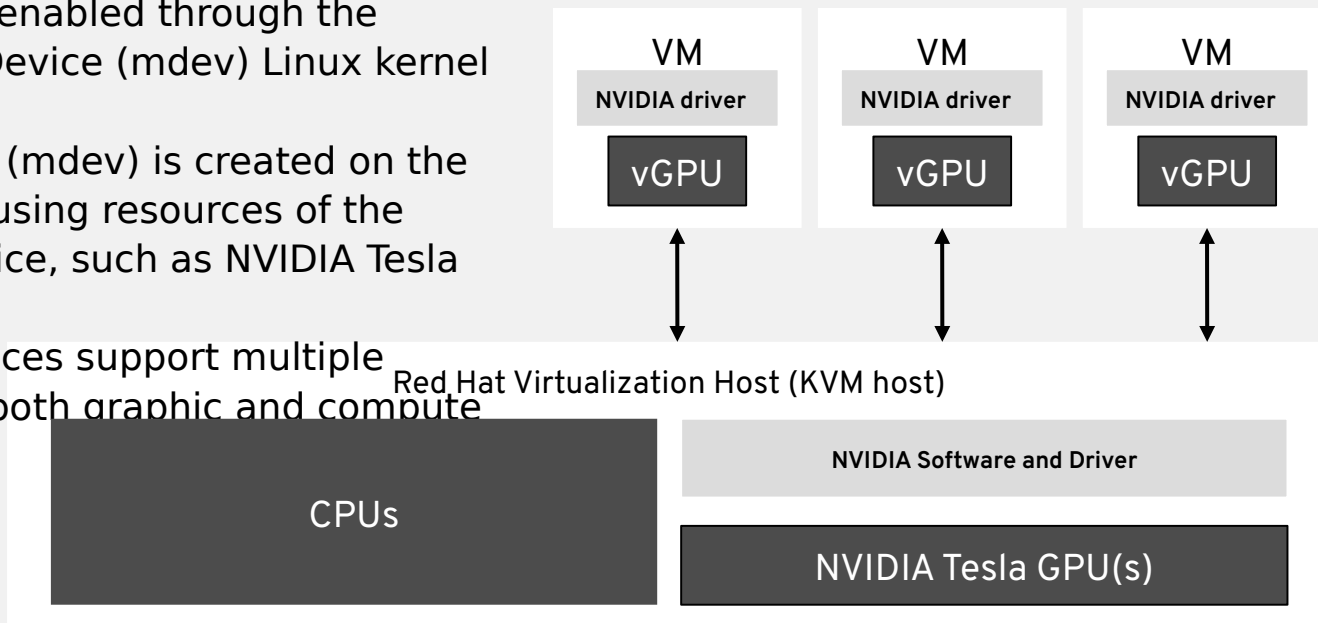
Target markets:

- ▶ Oil and gas
- ▶ Sciences and education
- ▶ Animation
- ▶ Energy
- ▶ Manufacturing and engineering
- ▶ Gaming

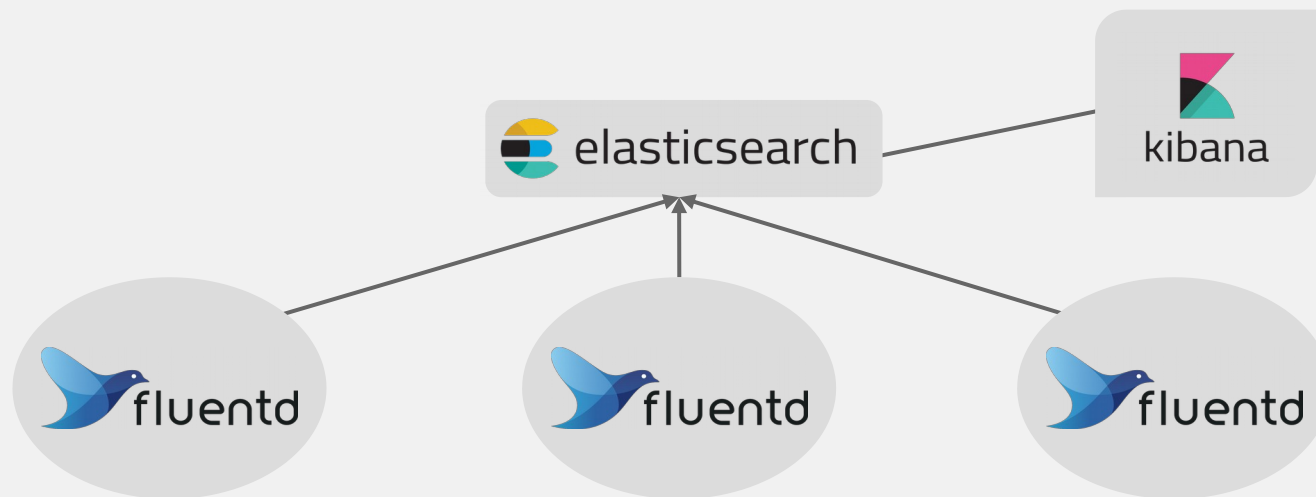
MORE INFORMATION ON vGPU

TECHNICAL WORKSTATIONS

- vGPUs are enabled through the Mediated Device (mdev) Linux kernel framework
- Each vGPU (mdev) is created on the KVM host, using resources of the parent device, such as NVIDIA Tesla GPUs
- Parent devices support multiple vGPUs for both graphic and compute workloads



MORE INFORMATION ON METRICS AND REPORTING



collectd - Simple and powerful daemon that gathers metrics from various sources

fluentd - Data collector that unifies the metrics and logs data

Kibana - Visualize trends in real time, slice and dice the data from Elasticsearch on the fly

A large bridge with a teal overlay. The bridge's steel truss structure and suspension cables are visible against a light sky. The foreground shows the bridge deck with lane markings. A semi-transparent teal triangle is positioned on the left side of the image.

RED HAT VIRTUALIZATION CORE FEATURES

RED HAT VIRTUALIZATION

Basic features

Live migration	High availability virtual machines
CPU pinning	Non-uniform memory access (NUMA) support
Role-based access control (RBAC) and tiered access	Browser-based management
Power management	PCI passthrough
VM templates	USB passthrough
Firewall/Security-Enhanced Linux (SELinux)	REST API
Support for Red Hat Enterprise Linux and Windows	Python, Ruby, and Java™ SDKs

RED HAT VIRTUALIZATION

Advanced features

Host affinity and Anti-affinity	Resource reservation
Migrate and import VMs	Automatic VM reset
Automated resource mgmt and load balancing	Overcommit (memory ballooning)
CPU quality of service (QoS)	Memory page sharing
Red Hat Enterprise Linux Atomic Support	Large page support
Hot add memory and CPU	Virt-sparsify
Hot unplug CPU	Import VMs from VMware
Native site-to-site failover (disaster recovery)	Metrics store and visualization

RED HAT VIRTUALIZATION

Network features

VLAN tagging	Open virtual network (SDN)
Network QoS	IPv6 Support (guest)
NIC Bonding	Jumbo frames
VM-FEX Support	Network labels

RED HAT VIRTUALIZATION

Storage features

Storage live migration	REST API for backup/restore
ISCSI, NFS, FC, POSIX, GlusterFS	Storage QoS
Live snapshots/merge	Thin and thick provisioning
Block discard	Storage-based fencing

RED HAT VIRTUALIZATION

Limits

COMPONENT	LIMIT
Logical CPUs per hypervisor	288
Cores per hypervisor	Unlimited
RAM per hypervisor	12 TB
VMs per hypervisor	No Hard Limit
Hosts per cluster	400
VMs per cluster	No Hard Limit
VCPUs per VM	240
RAM per VM	4 TB

RED HAT VIRTUALIZATION INTEGRATION

INTEGRATION AND AUTOMATION

RED HAT® CLOUDFORMS

Red Hat Virtualization is a first class infrastructure provider for Red Hat CloudForms.

The integration delivers features such as:

- Automation.
- Orchestration.
- Chargeback.
- Compliance and security policies.
- Self-service portal.



EXTENDED MANAGEMENT FUNCTIONALITY FOR RED HAT VIRTUALIZATION

Management functionality includes:

- **Manage** federated deployments across datacenters and sites.
- **Provide** insight and cloud intelligence with cloud intelligence dashboard.
- **Centralized** management for open virtual network add to self-service.
- **Advanced** self-service capabilities, life cycle, quotas, and security.
- **Enforce** compliance and policy with SmartState Analysis.
- **Capacity** planning and right sizing.
- **Automation** management for Ansible roles.

INTEGRATION AND AUTOMATION



Red Hat Virtualization and Red Hat Ansible Automation 2.5 are integrated in order to provide streamlined configuration for:

- Virtual machines.
- Virtual networks.
- Virtual storage.
- Configuration.
- Updates.



EXTENDED AUTOMATION
FUNCTIONALITY FOR
RED HAT VIRTUALIZATION

Automation functionality:

- **Removes** manual steps from deployment and reconfiguration.
- **Streamlines** operations, freeing up resources to focus on strategic initiatives.
- **Provides** a single support stack for virtualization and automation.
- **Includes** and supports Ansible roles for Red Hat Virtualization.

INTEGRATION AND AUTOMATION

RED HAT® OPENSTACK® PLATFORM

Red Hat Virtualization provides the latest support for Red Hat OpenStack Platform:

- Glance image services
- Neutron network services
- Red Hat OpenStack Platform director
- Director and overcloud control plane virtualization

RED HAT® SATELLITE

Red Hat Virtualization provides the latest capabilities for Red Hat Satellite:

- Provisions and updates nodes and VMs
- Enforces compliance, including OpenSCAP
- Queries errata with Red Hat Virtualization Manager for hosts and guests.
- Receives and applies software updates from Satellite.
- Simplifies updates for hosts and VMs with host update manager.

INTEGRATION AND AUTOMATION

RED HAT® GLUSTER STORAGE

Used as a storage domain for:

- Virtual machines.
- Templates.
- Snapshots.

Managed within Red Hat
Virtualization Manager as a
virtual resource.

RED HAT® HYPERCONVERGED INFRASTRUCTURE

Red Hat Hyperconverged Infrastructure
is a solution for remote office/branch office (ROBO)
use case (separate product and SKU).

ADDITIONAL DOCUMENTS



OFFICIAL DOCUMENTS

- ▶ [Product page](#)
- ▶ [Product documentation](#)



BLOGS

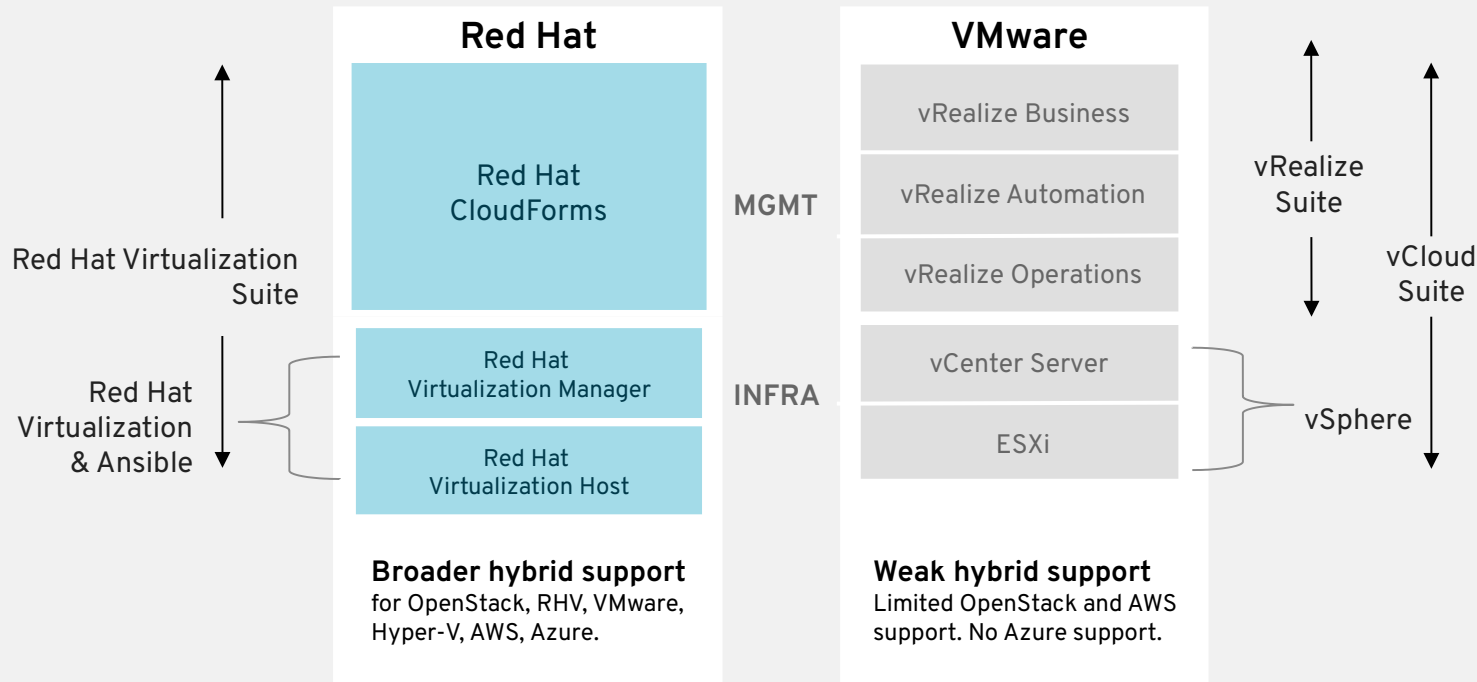
- ▶ Red Hat Enterprise Linux [blog](#)
- ▶ [Captain KVM](#)



THANK YOU



MORE INFORMATION ON PORTFOLIO CORRELATION



RED HAT VIRTUALIZATION or RED HAT OPENSTACK PLATFORM?

I'd like to move away from VMware...

Traditional virtualization or private cloud?

The considerations are certainly bigger than this, but these are the areas that need to be drilled down on in order to help the customer make the best decision. The considerations need to be made as a whole, meaning a single consideration alone should not be the decision point.

App characteristics & appetite for change

Technical depth and size of staff

Expectation of HA, SLA, rates of change

Red Hat Integration

Investment protection

Scale up vs Scale out, optimize vs agility

I have traditional or "n-tier" applications that won't be rebuilt.

I have a small team of dedicated people.

HA is handled by the platform; VM will restart upon failure.

I need to integrate with other Red Hat products.

I need to integrate with other investments.

I need to optimize/consolidate what I have.

RHV

I have applications that I'm willing to rebuild for the cloud.

I have a large team of people w/ deep knowledge.

HA is handled by the app; failure is localized.

I need to integrate with other Red Hat products.

I need to integrate with other investments.

I need agility in the infrastructure.

RHOSP

I have both n-tier and cloud native apps or apps that span both.

I have a large team of people w/ deep knowledge.

I have varied needs in HA, SLA; per app, per season, etc

I need to integrate with other Red Hat products.

I need to integrate with other investments.

Need to balance trad & agile in path forward

BOTH