redhat

RED HAT VIRTUALIZATION: VMWARE MIGRATION

TECHNOLOGY OVERVIEW

Open source allows the best
solutions to be selected.

*"KVM gets the most out of the
hardware it is placed on,
which means cheaper
infrastructure costs."*
TECH RADAR, MAY 2013

*As of April, 2016 and
July, 2015, KVM holds the
world record for 2 socket
and 4 socket virtualization
benchmark results.*
SPECVIRT_SC2013 RESULT

*"The system is so stable that
there have been no problems
over the past 18 months. The
down time currently
stands at zero."*
VINCENT VAN DER KUSSEN,
SYSTEM ENGINEER,
OPEN SYSTEM, BTR SERVICE

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INTRODUCTION

As the virtualization market matures and alternative virtualization platforms emerge, VMware customers are recognizing the advantages of deploying Red Hat Virtualization either as a second virtualization platform to coexist with VMware vSphere or as a complete replacement.

In Bejing, China, Rural Credit Bank significantly reduced the cost of virtualization and software licensing by migrating from VMware vSphere to Red Hat® Virtualization. In Belgium, LetterGen reduced system maintenance time and lowered costs by 67% after a similar migration.

The flexibility and security of open source software, improved workload density, and lower cost of ownership are among the reasons companies around the world are migrating to Red Hat Virtualization.

There are a number of tools to help enterprises migrate to Red Hat Virtualization, and third-party vendors can help automate the virtual-to-virtual (V2V) migration of virtual machines (VMs) from VMware to Red Hat Virtualization. With intuitive and easily deployed management features, the transition to Red Hat Virtualization is extremely straightforward.

This paper summarizes the migration benefits and overviews the steps required to move Linux® and Windows VMs from VMware to Red Hat Virtualization.

THE PROBLEM

Proprietary vendors, such as VMware, Oracle, and Microsoft, limit choice and increase enterprise dependence on a single vendor. VMware customers have to upgrade to more costly versions if they want to deploy advanced features. As business requirements change, solutions and other infrastructure components should not be limited by software.

Unlike at the beginning of the x86 virtualization technology, VMware is no longer the only leader in the virtualization market. Red Hat was named a "Visionary" in the 2016 Gartner Magic Quadrant for x86 Server Virtualization Infrastructure[1]–reinforcing the progress and viability of enterprise-ready open source virtualization alternatives.

RED HAT APPROACH

OPEN SOURCE IS A STRATEGIC ALTERNATIVE

Red Hat Virtualization is built on the open source development model–making it a true strategic alternative. Open standards speed up the adoption of new technologies and the speed at which enterprises can address customer needs. These same open standards allow Red Hat products to work well together and with products from other vendors–providing software flexibility that frees enterprises to choose the best solution for their needs.

1 redhat.com/en/about/press-releases/red-hat-positioned-visionaries-quadrant-gartners-2016-magic-quadrant-x86-server-virtualization-infrastructure

RED HAT® VIRTUALIZATION

Red Hat offers a downloadable evaluation subscription to help customers get started.

V2V tools convert VMware ESX/ESXi VMs to a Red Hat Virtualization VMs.

Red Hat Virtualization does not limit customers. Investing in open source software preserves its value by not locking enterprises in to a single vendor or product.

ENTERPRISE FUNCTIONALITY

Red Hat Virtualization eliminates the need for costly version upgrades to deploy advanced features with a comprehensive enterprise management system in a single SKU without stripped versions.

The table below provides a high-level feature comparison between Red Hat Virtualization and VMware vSphere.[2]

RED HAT VS VMWARE

FEATURES	RED HAT VIRTUALIZATION	VMWARE VSPHERE 5.6 ENTERPRISE EDITION
Max vCPUs per VM	160 vCPUs/VM	32 vCPUs/VM (64 with Enterprise Plus)
Management features		
Single view for centralized control	Y	Y
High availability	Y	Y
VM live migration	Y	Y
Storage live migration	Y	Y
Live snapshots	Y	Y
System scheduler: Cluster policies to automatically distribute workload evenly across cluster host servers	Y	Y
Power saver: Concentrates VMs on fewer hosts during off-peak hours	Y	Y
Thin provisioning	Y	Y
Templates: VMs can be deployed from master installations	Y	Y
Import/export of VMs in the standard open virtualization format (OVF)	Y	Y
Self-service user portal: Provides administrative access to users for creating/running VMs and managing environments	Y	N
Application programming interface (API): Programmatic access to all management commands	Y	Y

2 techradar.com/us/news/software/applications/is-it-time-to-give-kvm-hypervisor-a-go–1150037

FEATURES	RED HAT VIRTUALIZATION	VMWARE VSPHERE 5.6 ENTERPRISE EDITION
Customizable reporting engine: Reporting of historic usage, trending, and quality of service (QoS)	Y	N: Requires VMware Operations Manager Standard Edition
Integration with OpenStack® Glance and Neutron Services	Y	N

Red Hat Virtualization offers a feature-rich server virtualization management system with advanced capabilities for hosts and guests, including high availability, live migration, storage management, system scheduler, and more.

SECURITY

Red Hat Virtualization Hypervisor protects enterprises with military-grade security. Using the hardened Red Hat Enterprise Linux kernel as its security core, Red Hat Virtualization inherits the security architecture of Red Hat's flagship operating system.

Both products use kernel-level security—such as Security-Enhanced Linux (SELinux) and Secure Virtualization Using SELinux (sVirt).[3] SELinux was developed with the United States Department of Defense, National Security Agency (NSA), and vendors such as IBM, HP, and MITRE to isolate virtual machines between machines.

While proprietary virtualization products layer security on top of the hypervisor and/or operating system, Red Hat Virtualization uses SELinux to place security policies inside the kernel itself. Rogue programs can break out of layered securities and do significant harm to the host or other VMs before being detected; compromised VMs are prevented from breaking out with SELinux baked into the kernel.

COST ADVANTAGE

Because Red Hat Virtualization is open source and is offered through a subscription model, it often costs less than proprietary solutions. The example below demonstrates how Red Hat Virtualization costs 50-80% less than VMware vSphere 5.6.[4]

The following table compares costs for Red Hat Virtualization and VMware vSphere 5.6 Enterprise Edition. In this scenario, 100 virtual machines on 10 physical machines are configured to support workloads ranging from IT and web infrastructure services to business applications.

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3 redhat.com/en/resources/secure-virtualization-with-svirt

4 *This analysis considers hypervisor host and enterprise management systems and factors in licensing and support costs. Server hardware costs and virtual server operating system costs are not included, since they would be identical for both solutions.*

THREE-YEAR TOTAL COST OF OWNERSHIP (TCO) ANALYSIS	RED HAT VIRTUALIZATION	VMWARE
Number servers	10	10
Number sockets	20	20
License costs	$0.00	$69,900
Premium support	$14,990	$17,840
Cost for three years	$44,970	$122,340
Management server	$0.00	$10,492[5]
Total	$44,970	$132,832[6]

MIGRATING FROM VMWARE TO RED HAT VIRTUALIZATION

MIGRATION OVERVIEW

The process of migrating virtual server workloads, including operating systems, applications, and data, from one virtualization platform to another is called a V2V migration. Each virtualization hypervisor (e.g., Red Hat Virtualization Hypervisor and VMware ESX/ESXi) uses a different file format for the VM. There are two methods for V2V migration:

1. Manually recreate new VMs from scratch.

2. Migrate VMs using the V2V migration tools available in Red Hat Virtualization.

While manually recreating VMs in a new environment fully optimizes workload and application configurations into separate virtual servers if necessary, V2V tools (like Red Hat Virtualization's graphical and command-line tools) significantly ease migration. Instead of backing up data, rebuilding VMs and applications, and restoring data, V2V tools migrate VMs nondestructively from the old platform to the new one. In general, most V2V projects include a flexible, automated approach when possible and a manual or semi-automated approach for the most strategic and resource-intensive server workloads. In almost all cases, these projects consist of assessment, preparation, evaluation, execution, and testing phases.

PROJECT CONSIDERATIONS

V2V migrations are generally less complicated than virtualizing physical servers or physical-to-virtual (P2V) migrations. Unlike physical servers, virtual servers are not configured with a wide range of hardware devices, meaning fewer problematic hardware dependencies.

Enterprises need to understand VM performance requirements prior to the migration to ensure project success. Understanding RAM, disk, network connection, and CPU capacity requirements up front will save time and effort during migration.

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5 *20 units for three years:* vmware.com/products/vsphere.html
6 *Additional cost of vCenter Server:* vmware.com/products/vsphere.html

Start with a pilot project to ease into the V2V migration process using a Red Hat downloadable evaluation subscription as a guide. Begin by identifying a group of virtual servers to move to Red Hat Virtualization. Many customers using Red Hat Enterprise Linux as a guest operating system in a VMware cluster choose to start with VMs that support infrastructure services, internal web portals, or file/print servers. This pilot can result in valuable data that can be assessed and promoted within the enterprise.

Next, identify and assess all the virtual servers to be migrated. Analyze these VMs' average and peak CPU, memory, disk, and networking resources. The results will be used to build a new Red Hat Virtualization infrastructure and will help determine optimal VM distribution across clusters of hypervisor server hosts. Red Hat Consulting is available to support these tasks in part or in full.[7]

VIRTUAL MACHINE PORTABILITY

All VM formats consist of VM configuration data (CPUs, memory, operating system, etc.) and a binary virtual disk image. Red Hat's V2V automatically converts a VMware ESX or ESXi VM into a Red Hat Virtualization VM. However, VMs are not as portable across different hypervisor platforms since they use their own formats.

Industry efforts to develop standards that facilitate VM migration between environments has led to formats like OVF. OVF is supported by many vendors (including Red Hat, VMware, and Citrix) and packages one or more VMs into a single file for distribution. A drawback of OVF is that implementations vary by vendors and virtual disk content since OVF does not mandate virtual disk formats or contents. VMware vSphere uses the virtual machine disk file (VMDK) format, Microsoft Hyper-V uses the virtual hard disk (VHD) format, and Red Hat Virtualization uses the raw format for pre-allocated virtual files and the QEMU copy on write (QCOW) format for thin-provisioned virtual disks.

To migrate VMs between hypervisors, the virtual disk image needs to be converted to the target hypervisor's native virtual disk image. VMDK virtual disk images include content such as VMware tools and drivers that are not portable and work only with a VMware hypervisor. These tools and drivers must be removed and replaced with device drivers that are native to Red Hat Virtualization. For example, if a Windows VM was configured in the VMware environment, it was likely installed with VMware tools, a number of paravirtualized drivers, and perhaps sound card emulation. These VMware drivers are not portable—they must be removed and replaced with Red Hat Virtualization virtualized drivers, which can be easily installed as part of the migration process using Red Hat tools.

CONVERTING VIRTUAL MACHINES

The lack of standardization for the virtual disk format and content means there is no true VM portability across different hypervisor hosts. VMs must be converted to the target hypervisor's native format during V2V migration.

In general, performing a V2V migration consists of:

1. Reading the VMs' configuration file and creating a VM with the target hypervisor's configuration.

2. Copying the VMDK and converting it to Red Hat Virtualization's raw or QCOW format.

3. Replacing VMware tools and virtualized drivers in the guest operating system (inside the virtual disk) with Red Hat Virtualization tools and virtual device drivers.

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7 redhat.com/en/services/consulting

Red Hat Virtualization's open source V2V migration tool helps customers automatically convert and import VMs created on other systems, including VMware ESX/ESXi. This tool, known as virt-v2v, is available from the command line and Red Hat Virtualization Manager. It automatically packages VMs as OVF files and uploads them to Red Hat Virtualization. The supported guest operating systems include:

- Red Hat Enterprise Linux 3 and later

- Fedora

- Windows Server 2003, 2003R2, 2008, 2008R2, 2012R, and 2012

- Windows XP

- Windows 7 and 8

- SUSE Linux Enterprise Server 10 and 11

This automated process includes:

- Pulling VM configurations

- Changing the disk formats to Red Hat Virtualization hypervisor standards

- Changing the registry (applicable to Windows guests)

- Installing paravirtualized drivers for optimal disk and network performance

- Importing the VM into Red Hat Virtualization

The command-line tool can easily run on a large scale, automating hundreds of VM migrations with simple scripts. The V2V tool operates on a copy of the original guest image,[8] and the conversion takes less than a minute after copying. The tool creates the OVF file on the Red Hat Virtualization export domain, and the VM will appear in the Red Hat Virtualization Manager console as an available VM.

Red Hat Virtualization Manager's graphical tool features an additional option to add a VMware vSphere environment as an external provider—allowing multiple imports to occur over a period of time. Administrators can use the tool to scan VMware data stores and select one or many virtual machines to import.

RED HAT VIRTUALIZATION SERVICES

Red Hat Consulting offers a range of migration services, from foundation and quickstart options to onsite migration planning, project scoping, and execution support. Red Hat Training and Certification offers online, classroom, and onsite training, as well as a certification program that ensures staff members and consultants have advanced Red Hat Virtualization knowledge in addition to basic virtualization skills.

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8 *Images larger than 10GB will take longer.*

WHAT NEXT

For more information, visit redhat.com/rhv or contact your local Red Hat Virtualization sales contact.

REFERENCE

VMware vSphere Pricing:
vmware.com/products/vsphere.html

For additional technical information on the virt-v2v tool:
https://access.redhat.com/articles/1351473

For additional information on Red Hat Virtualization:
https://access.redhat.com/documentation/en/red-hat-virtualization/

For additional information on Red Hat Virtualization and Security:
https://www.redhat.com/en/resources/secure-virtualization-with-svirt
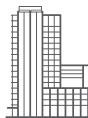
ABOUT RED HAT

Red Hat is the world's leading provider of open source software solutions, using a community-powered approach to provide reliable and high-performing cloud, Linux, middleware, storage, and virtualization technologies. Red Hat also offers award-winning support, training, and consulting services. As a connective hub in a global network of enterprises, partners, and open source communities, Red Hat helps create relevant, innovative technologies that liberate resources for growth and prepare customers for the future of IT.

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