



QUALCOMM ACHIEVES SIGNIFICANT COST SAVINGS AND IMPROVED PERFORMANCE WITH RED HAT ENTERPRISE VIRTUALIZATION

FAST FACTS

Customer	Qualcomm
Industry	Telecommunications and technology
Geography	Global
Business challenge	To create a standard and stable virtualization platform for Red Hat® Enterprise Linux® applications that cost-effectively supports the company's need to rapidly expand global IT resources
Solution	To virtualize and consolidate Red Hat Enterprise Linux workloads onto a Red Hat Enterprise Virtualization environment
Software	Red Hat Enterprise Virtualization (Red Hat Enterprise Virtualization Manager, Red Hat Enterprise Linux (KVM) hypervisor), Red Hat Enterprise Linux, Red Hat Consulting
Hardware	Two tier-1 server hardware vendors, tier-1 networking, and two tier-1 storage vendors
Workloads	Virtual machines for development groups created through the self-service portal; Java-based workloads, database workloads, and customer-service applications; Customer-facing application stacks including web and application tiers, some of which are deployed as virtual machine appliances
Benefits	Improved space utilization; Lowered power and cooling requirements; Reduced load on systems group; Improved customer service resulting in significant time savings to customers; Achieved significant cost savings; Improved system administration with easy-to-use graphical user interface and power search functions; Achieved high resource utilization with an average of 3,500 percent storage overcommit and an average of 54 percent memory overcommit



BACKGROUND

Qualcomm is the world leader in 3G and next-generation mobile technologies. The firm provides many of the innovative solutions and breakthroughs that enable its global customers to drive the convergence of mobile communications and consumer electronics. The company's many digital wireless communications products and services have helped connect millions of people more closely to information, entertainment, and each other.

Founded in San Diego, CA in 1985, Qualcomm is a Fortune 500 firm with more than 20,000 workers in nearly 172 locations worldwide. Qualcomm is a founding member of the Open Handset Alliance and has been recognized by Fortune as one of the "100 Best Companies to Work For" and by ComputerWorld as one of the "100 Best Places to Work for in IT."

BUSINESS CHALLENGE

Qualcomm realized in the early 2000s that without virtualization, it would not be able to build IT capacity quickly enough to respond to its vast growth. Qualcomm also understood that virtualization would reduce the cost of its expansion, as it would cut the datacenter footprint required as well as cooling and heating costs.

Qualcomm had prior success with Red Hat as it used Red Hat Enterprise Linux to run a diverse set of applications and workloads, file-serving and database workloads, and customer-service applications--most of which were Java-based. In the first five years since deploying Red Hat Enterprise Linux, Qualcomm experienced a 600 percent growth with its servers running Red Hat Enterprise Linux.

Qualcomm also had a large Windows population, and a substantial number of proprietary UNIX machines running Solaris.

“We were especially interested in using virtualization for our remote sites, as it would be easy to deploy multiple virtual machines (VMs) on a single piece of hardware,” said Micheal Waltz, the lead engineer on the project, who worked in Qualcomm’s UNIX/Linux Engineering Group and oversaw the provisioning and management of UNIX and Linux systems. “This would allow us to cut costs and better control and operate virtual operating system instances, even for VMs located on the other side of the world.”

For the Linux-based applications and workloads, the UNIX/Linux Engineering Group was keen to deploy an open source-based virtualization platform due to both the cost saving advantages as well as the inherent advantages of deploying Linux virtual machines on a Linux-based hypervisor host. The group was also looking for ways to more efficiently and quickly respond to the requests from the development groups for new Linux servers.

Having already established a strong relationship with Red Hat due to its extensive use of Red Hat Enterprise Linux, the UNIX Engineering Group team decided to begin deploying physical servers running the Red Hat Enterprise Linux 5 Xen-based virtualization technology with Red Hat Cluster Suite. Although this allowed Qualcomm to create a standard virtualization platform for Red Hat Enterprise Linux applications, the combination was difficult to manage and was not meeting the full needs of the team.

SOLUTION

Qualcomm started its evaluation of Red Hat Enterprise Virtualization with the first beta of the solution, beginning in July 2009. Instead of utilizing Xen, Red Hat Enterprise Virtualization utilizes the open source Kernel-based Virtual Machine (KVM) technology for the hypervisor virtualization host. It also features a centralized enterprise-class management system to efficiently manage clusters of host servers.

By the time that Red Hat Enterprise Virtualization was formally released in November 2009, Qualcomm had completed its evaluation and testing and proceeded to move the product into production within a few weeks. The transition from Red Hat Enterprise Linux with Xen to Red Hat Enterprise Virtualization based on KVM was straightforward. Although initially deploying it on just eight physical servers, the enterprise found that it immediately gained traction and today has more than 40 physical machines in six clusters running Red Hat Enterprise Virtualization, powering more than 400 VMs and growing rapidly.

The virtualized workload profiles include: database, web content management and services, application stacks, monitoring, encryption, development, and production.

The six Red Hat Enterprise Virtualization clusters currently in service utilize the Red Hat Enterprise Linux KVM hypervisor on each of the eight two-socket six-core hosts that are deployed within each cluster. Each host server is configured with 72GB of RAM with 2TB of shared disk (SAN and 10g NFS). The networking infrastructure is 10GB Ethernet and network bonding is used for redundancy and storage.

The first of the two Red Hat Enterprise Virtualization cluster workload profiles are heavy, Java-based develop and test workloads that are deployed at an average density of about 50 VMs per cluster. The second Red Hat Enterprise Virtualization cluster workload profile is the ‘AutoLinux,’ a Red Hat Enterprise Linux VM self-service provisioning portal used by development groups. This workload profile is deployed at an average density of 400 VMs per Red Hat Enterprise Virtualization cluster.

AutoLinux is powered by Red Hat Enterprise Virtualization and includes an internally developed web front-end that allows a development engineer to deploy and renew Red Hat Enterprise Linux-based virtual servers. This self-provisioning portal has resulted in the systems group processing significantly fewer requests. The VM lifespan is limited by default (up to 90 days), but can be renewed for a longer duration if necessary. This enforced VM lifespan management has resulted in minimal virtual server sprawl that could easily occur in self-provisioning environments. This project was initiated by Qualcomm, which later engaged Red Hat Consulting to help with migration to the Red Hat Enterprise Virtualization REST-API for scripting automation.



QUALCOMM DEPLOYMENT OF RED HAT ENTERPRISE VIRTUALIZATION

Red Hat Products

- Red Hat Enterprise Virtualization
RHEL KVM Hypervisor
RHEV Manager
- Red Hat Enterprise Linux

Workloads

- Test/Develop servers created through AutoLinux self-service portal
- Database Servers
- Custom Java-Based Application Servers
- LDAP Servers

Virtual Machines

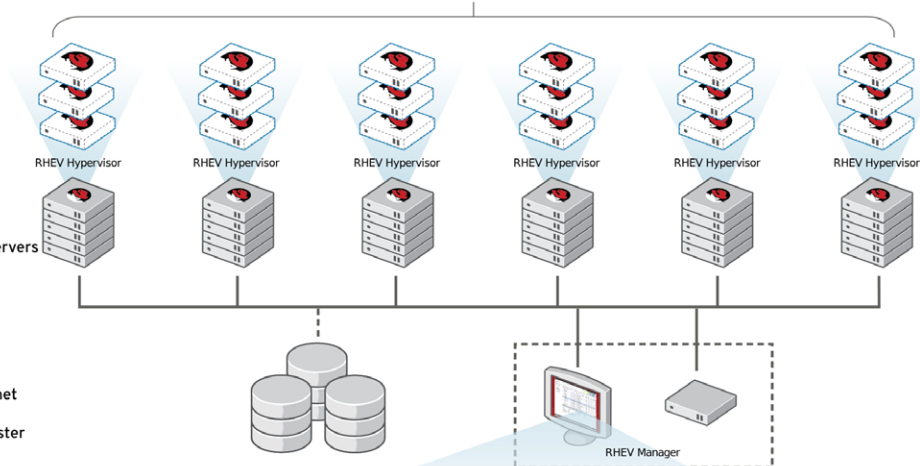
- Over 1000 RHEL VMs

Servers

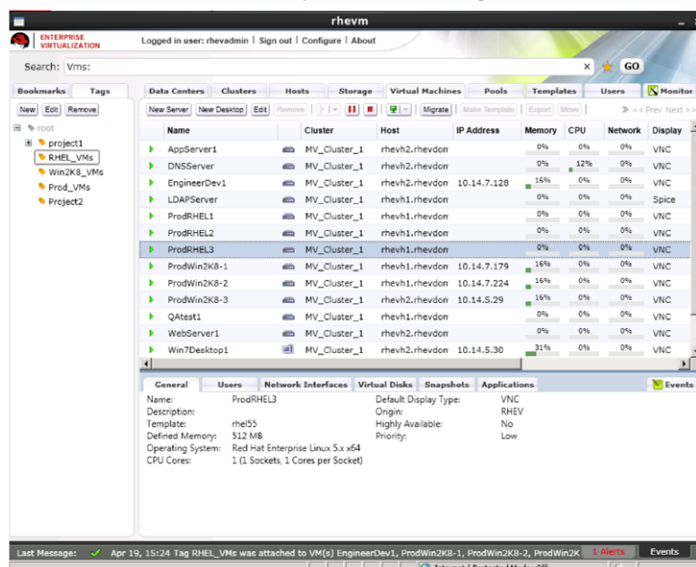
- 100 RHEV Hypervisors
- 2 socket quad-core x86 servers
- 96GB of RAM per server

Storage / Networking

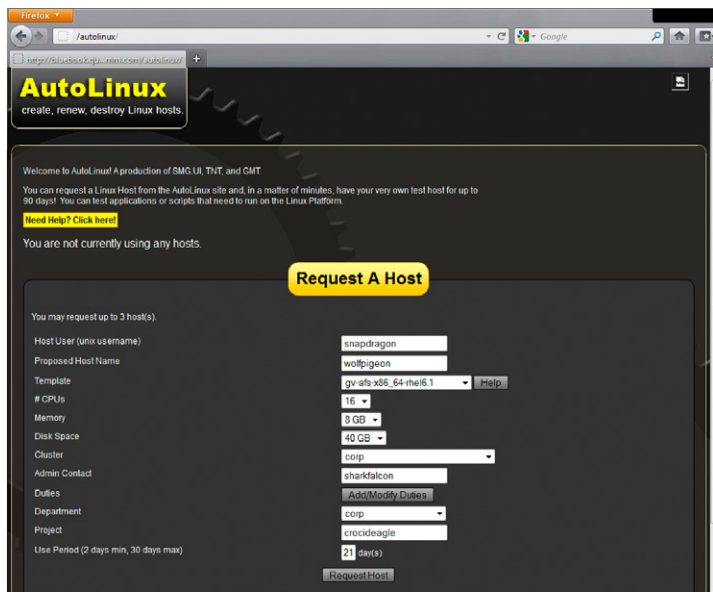
- Network - 10 Gigabit Ethernet
- SAN over 4 Gigabit Fiber
- 2 TB of shared disk per cluster



Red Hat Enterprise Virtualization Manager

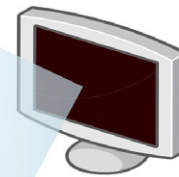


QUALCOMM AUTO LINUX IS A RHEL VM SELF-SERVICE PROVISION PORTAL



The screenshot shows a web browser window with the URL <http://56.100.100.100:8080/autolinux/>. The page title is "AutoLinux" with the tagline "create, renew, destroy Linux hosts." Below the header, there is a welcome message and a "Request A Host" button. The form contains the following fields:

Field	Value
Host User (unix username)	snapdragon
Proposed Host Name	wolpigeon
Template	gv-afs-x86_64-rhel6.1
# CPUs	16
Memory	8 GB
Disk Space	40 GB
Cluster	corp
Admin Contact	sharkfalcon
Duties	Add/Modify Duties
Department	corp
Project	crecidangle
Use Period (2 days min, 30 days max)	21 Day(s)



Web-based Front End

The "Auto Linux" self-provisioning portal is powered by RHEV and includes an internally developed web front end which allows a development engineer to deploy and renew their own RHEL-based virtual servers.

BENEFITS

Cost savings

Qualcomm immediately began to reduce costs after deploying Red Hat Enterprise Virtualization. "Instead of having to deploy a large number of physical machines, we can get a large number of virtual machines on a single server and manage them from a single Red Hat Enterprise Virtualization Manager console," said Waltz. "This gives us much better space utilization as well as savings on power and cooling. As a result, we get a significantly higher return on investment."

Additionally, the overall density available with Red Hat Enterprise Virtualization enables Qualcomm to save a significant amount of money. This is largely because most operating system licenses for VMs are available on a per-server basis. The higher number of VMs that can be supported on a host result in a lower per-VM license cost.



Qualcomm has also been able to reduce costs for the existing virtualization environment by moving all Red Hat Enterprise Linux workloads to Red Hat Enterprise Virtualization. By segregating its VMs so that Windows VM instances are only deployed on host servers with a Windows Datacenter license and Red Hat Enterprise Linux VM instances are deployed on host servers with an unlimited Red Hat Enterprise Linux license, the company gets the most out of its subscriptions and licenses for unlimited VMs.

“We see a clear ROI from our use of Red Hat Enterprise Virtualization, not only for the hardware costs, but also from the manpower it takes from spinning up a cluster and getting VMs deployed and managed,” said Waltz.

Improved performance, scalability, and reliability

Additionally, because of the hardware abstraction made possible through the hypervisor, Qualcomm was not locked into continuing to purchase the same hardware year after year. “We can upgrade and easily migrate the virtual machines over to the new hardware at any point, improving performance, scalability, and reliability as new hardware becomes available,” said Waltz.

Qualcomm was also able to achieve higher storage density with Red Hat Enterprise Virtualization. “In the past, a key bottleneck was the SAN storage,” said Waltz. “Not just because of performance, but because it was so expensive. Our ability to support growth had always been limited because of this.” Red Hat Enterprise Virtualization has delivered an outstanding storage density with an average of 3,500 percent in storage overcommit. “And Red Hat Enterprise Virtualization achieved this much-higher storage density without sacrificing performance.”

Moving to Red Hat Enterprise Virtualization has delivered significant enhancements, and performance has improved steadily over time. The average number of VMs per host is 4.8:1 for Red Hat Enterprise Linux Xen, and 5.8:1 for Red Hat Enterprise Virtualization. “Red Hat Enterprise Virtualization helps you squeeze as much as you possibly can out of a piece of hardware,” said Waltz.

“For example, one customer was running a simulation on a single piece of hardware on a bare metal Red Hat Enterprise Linux installation,” said Waltz. “He then put Red Hat Enterprise Virtualization on it and ran it as a single

node cluster. Using the Red Hat Enterprise Virtualization KVM hypervisor, he was able to run four VMs on the same hardware. And by splitting up the simulation among the VMs, he actually saw better overall throughput and faster results than he had with a single operating system.”

Improved customer satisfaction

The UNIX/Linux Engineering Group is now able to provide customers with better response times. “We can launch directly into a hypervisor manager like Red Hat Enterprise Virtualization Manager and manage the virtual machines directly by getting into the consoles, powering them on and off, and migrating them to other hardware,” said Waltz. For example, if the memory or hard drive of a node is failing, Waltz can migrate VMs onto other nodes in real time by using the Red Hat Enterprise Virtualization cluster. This allows him to initiate a repair without any downtime. “Customers really appreciate this.” Additionally, he can move a virtual machine from one node to a newer node or even to hardware using a completely different chip set without users knowing.

“We see a clear ROI from our use of Red Hat Enterprise Virtualization, not only from the hardware savings, but also from manpower efficiencies due to how fast we can spin up clusters and deploy virtual machines. And our software licensing costs are dramatically less with Red Hat Enterprise Virtualization as well.”

– Micheal Waltz, UNIX/Linux Engineering Group,
Qualcomm

With the AutoLinux portal, Qualcomm has also been able to perform automated deployments of virtual machines. “Engineers from the development groups can request Red Hat Enterprise Linux-based virtual machines that are



then automatically deployed," said Waltz. "This allows our customers to get a new virtual machine very quickly. They don't have to buy new hardware every time they need additional capacity. They don't have to go through an arduous quote or procurement process. And instead of waiting for months for a new server they get what they need in just hours. And this has resulted in a significant reduction in requests that have to be processed by our systems group."

The system group also benefits from the power search capability, simple graphical user interface, and the powerful API of Red Hat Enterprise Virtualization Manager. The group also finds value in the fact that Red Hat Enterprise Virtualization is based on Red Hat Enterprise Linux, and enjoys the efficiency, performance, and stability of Linux running on Linux, as well as the easy integration with directory services.

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