



## Medical Center Reduces Costs, Increases Application Availability with Virtualization

### Overview

**Country or Region:** United States

**Industry:** Healthcare--Provider

### Customer Profile

Dartmouth-Hitchcock Medical Center (DHMC) is New Hampshire's only academic medical center, with 10,000 employees working in four locations. DHMC offers a full spectrum of care and education.

### Business Situation

DHMC had already trimmed server costs using virtualization but wanted to eliminate even more servers, further reduce costs, and move demanding and highly available applications to a virtual environment.

### Solution

DHMC implemented the Windows Server<sup>®</sup> 2008 operating system with Hyper-V<sup>™</sup> technology and manages its virtualization environment with Microsoft<sup>®</sup> System Center Virtual Machine Manager 2008.

### Benefits

- Servers reduced by 75 percent
- Ability to virtualize more applications
- High availability to meet service levels
- Easier server management

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*Robert McShinsky, Senior Systems Administrator, Dartmouth-Hitchcock Medical Center*

Based in New Hampshire, Dartmouth-Hitchcock Medical Center (DHMC) began using server virtualization three years ago to curb server proliferation and rising electrical costs. The hospital and teaching facility initially used Microsoft<sup>®</sup> Virtual Server 2005 R2 to trim 75 servers but wanted to move even more applications to virtual machines. DHMC decided to move its virtualization infrastructure to the Windows Server<sup>®</sup> 2008 operating system with Hyper-V<sup>™</sup> technology, using Microsoft System Center Virtual Machine Manager 2008 to manage its server landscape. DHMC expects to reduce total server holdings by 75 percent and save U.S.\$4,300 per server in hardware, maintenance, electrical, and real-estate costs. It can now virtualize its most demanding applications and expects to improve service levels, save 30 hours each month in server management, and create a more dynamic IT environment.



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## **Situation**

Dartmouth-Hitchcock Medical Center (DHMC) is New Hampshire's only academic medical center. Internationally renowned, nationally ranked, and regionally respected, DHMC integrates high-quality patient care, advanced medical education, and research to provide a full spectrum of healthcare. In addition to its main campus in Lebanon, DHMC has four major sites in Concord, Keene, Manchester, and Nashua, New Hampshire. It also maintains many smaller practices throughout New Hampshire and Vermont. DHMC employs 10,000 people across its hospital, clinics, and teaching staff.

The DHMC IT staff began to look into virtualization three years ago because of limited space in its data center and rising electrical costs. At the time, the staff evaluated virtualization solutions from both VMware and Microsoft® Virtual Server 2005. “VMware was a beast from a management perspective, very expensive, and didn't really meet our needs,” says Robert McShinsky, Senior Systems Administrator at Dartmouth-Hitchcock Medical Center. “We had over 200 servers, most of which were severely underutilized. Many of our applications run on Web-based servers that don't have particularly heavy workloads but still require dedicated servers.”

DHMC adopted Virtual Server 2005 in 2005 and consolidated as many server resources as possible, converting 75 servers to virtual machines. As the IT staff demonstrated the benefits of virtualization, however, it actually added new applications to its virtual environment and grew its physical server holdings. Routine server provisioning and management again consumed most of the IT staff's time. Because Virtual Server 2005 only supported one processor per server, DHMC could not use it for its most demanding applications. Virtual Server also lacked support for clustering, which the staff

required to provide higher reliability for some applications.

DHMC had successfully used virtualization to improve server fault tolerance and recoverability when errors occurred during application updates, upgrades, and backups. However, the IT staff had written a series of custom scripts to manage these activities, and these scripts represented an ongoing maintenance burden. In some instances, these scripts would interfere with the functionality of the virtual machines and produce unintended downtime, which interfered with the hospital's patient services.

## **Solution**

When IT staff members learned about the Windows Server® 2008 operating system and Hyper-V™ virtualization technology, they were immediately interested. With its support for clustering and multicore/multiprocessor servers, Hyper-V would provide the increased performance for virtual workloads that DHMC sought. It also provided integrated management capabilities, snapshot backups, and rapid recovery using Microsoft System Center Virtual Machine Manager 2008.

“It was getting harder to manage our virtualized environment, so we were really excited about the management efficiencies we would get with System Center Virtual Machine Manager 2008,” McShinsky says. “The Quick Migration feature and central Administrator Console would really simplify and speed routine server management.” The Quick Migration tool simplifies and speeds the ability to move running workloads across different host systems with minimal downtime. The Administrator Console provides a central place for managing and tuning virtual machines.

Moving to Hyper-V was a natural progression for DHMC. “Moving to VMware at this stage of

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the game would have caused a large upheaval to our existing environment and cut into our cost savings,” McShinsky says. “We knew that we faced a hurdle in eliminating the next tier of physical servers and needed help along the way. With Hyper-V, we felt that there were no limits to how many servers we could virtualize.”

DHMC joined the Microsoft Virtualization Rapid Deployment Program and worked with Microsoft Services to deploy and test Windows Server 2008 Datacenter, Hyper-V, and System Center Virtual Machine Manager 2008. DHMC used the Microsoft Assessment and Planning (MAP) Toolkit to assist with physical-to-virtual (P2V) server migration. “It was great to be able to use the MAP Toolkit to quickly grab a chunk of performance data from systems we were thinking of migrating,” McShinsky says. “It saved us a full week of manual work that we otherwise would have spent to set up the performance monitoring of server workloads.”

DHMC installed the new software on two HP ProLiant DL585 G2 servers with four AMD Dual-Core Opteron processors with AMD-V technology and 64 gigabytes of RAM. On those two host servers, DHMC created 30 virtual machines. “The AMD-based HP servers gave us great price for performance,” McShinsky says. “The equivalent with competitive processors cost \$6,000 more per server for the same horsepower. An added bonus of AMD processors was their greater energy efficiency, which was important to us as we were trying to reduce power consumption and avoid expensive power infrastructure upgrades in our data center.”

DHMC plans to migrate nine Virtual Server 2005 host servers (running 150 virtual machines) to Hyper-V. DHMC has created a tiered virtual machine structure that allows it to rate CPU, memory, storage, and network requirements for each application and assign

the application to a three-tiered virtual infrastructure, from tier A to tier C. Tier C, for example, is reserved for servers that exceed the hospital’s predefined resource consumption levels, run medium transactional databases, and require longer qualification processes.

DHMC runs both Windows Server 2008 and Windows Server 2003 as guest operating systems under Hyper-V, as well as Red Hat Linux. To date, DHMC has virtualized Web servers, sites on Microsoft Office SharePoint® Server 2007, reporting servers, medical applications, domain controllers, file and print servers, Citrix servers, and more.

DHMC was interested in moving to Windows Server 2008 for features other than Hyper-V. “We have experience with the failover clustering feature in Windows Server 2008, which is much easier to use than the previous feature in Windows Server 2003,” McShinsky says. “That will be a big benefit to us down the road in providing high-availability services. We’re also moving to Windows Server 2008 for its Read-Only Domain Controller and Server Core features, which will help us better secure the operating system against a variety of users in a variety of locations. We’re only waiting for our third-party software vendors to support Windows Server 2008 before moving into more widespread deployment.”

### Benefits

By moving its virtualization infrastructure to Windows Server 2008 and Hyper-V, DHMC expects to reduce its total server holdings by 75 percent and save U.S.\$4,300 per server in hardware, maintenance, electrical, and real-estate costs. The center has also virtualized its most demanding applications, achieved higher application availability for patient-critical applications, simplified server

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management, and created more stable backup processes.

#### **Servers Reduced by 75 Percent**

DHMC previously consolidated 75 servers with Virtual Server 2005 and will soon migrate all those virtual machines to Windows Server 2008 and Hyper-V. “We expect to consolidate an additional 75 servers using Hyper-V, which will lead to a cost savings of more than \$325,000 annually,” McShinsky says. This savings comes from a per-server savings of \$4,300: \$1,400 from lower maintenance costs; \$1,600 from reductions in data center power, cooling, and space; and \$1,300 from hardware savings. “By the time we hit our fifth virtual machine, we’ve usually paid for the host,” McShinsky says. “Long term, we will be able to reduce our total data center holdings by 75 percent—from nearly 400 servers to fewer than 100 servers.” DHMC will also reduce the expense of extended warranty contracts, since server consolidation has left it with many spares.

#### **Ability to Virtualize Demanding Applications**

With the outstanding performance of Hyper-V, DHMC can now move its most demanding applications—such as Microsoft SQL Server® 2005 transactional databases—to a virtual environment. “With Hyper-V, we can assign multiple processors to applications that previously were not candidates for virtualization—currently about 45 systems,” McShinsky says. “All our line-of-business applications have worked just great on Hyper-V.”

#### **High Availability to Meet Service Levels**

Hyper-V supports the clustering capabilities of Windows Server 2008 Enterprise and Datacenter, and with the addition of System Center Virtual Machine Manager 2008, highly available virtual machines becomes possible. Using the Hyper-V Snapshot feature, DHMC

can quickly capture the state of a running virtual machine so that it can rapidly and easily restore that virtual machine to a previous state. “Doing this on physical hardware takes a couple of hours; with virtual machines, it takes minutes,” McShinsky says.

When needing to perform maintenance on host servers, DHMC can use the Quick Migration feature in Virtual Machine Manager 2008 to move the affected applications to any available host so that the applications continue to run. “Moving to Hyper-V has given us the clustering capabilities that we need to deliver higher service levels,” says McShinsky. “We won’t have to design applications to be cluster-aware or run in a physical clustered environment.” The clustering capabilities also enable DHMC to provide better disaster recovery capabilities of patient-critical applications across all the virtual machines.

For example, DHMC can provide higher availability for high-demand applications, such as Internet and intranet portals, Citrix lab systems, the hospital’s scheduling application, and operating room monitoring systems. “We used to accept a certain amount of downtime for these critical servers and manually intervene to redirect applications to different systems if a server fails,” McShinsky says. “It now takes about an hour to bring them back up. With Hyper-V, we can move affected applications to new servers without users even knowing, completely eliminating downtime.”

#### **Easier Server Management**

Using System Center Virtual Machine Manager 2008, DHMC expects to save 30 hours a month in server troubleshooting and management, which is worth about \$15,000 a year. The center has also been able to keep staffing levels constant, despite a 33 percent increase in the number of servers managed.

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“The Administrator Console in System Center Virtual Machine Manager 2008 gives us a central work area for managing all our physical and virtual servers,” McShinsky says. “The ability to find virtual servers is a huge timesaver. When we had just four or five virtual host systems, we could use a Web console to locate virtual machines. But with more than 13 host systems, it’s difficult to figure out which guest lives on which host.”

The DHMC IT staff uses the P2V tool in System Center Virtual Machine Manager 2008 to convert physical servers to virtual servers in minutes. “I’ve done over 50 migrations with the Virtual Server Migration Toolkit, and the integrated P2V tool in System Center Virtual Machine Manager 2008 is amazing,” McShinsky says. “We’ve reduced time spent on P2V migrations from all night to an hour or two. Creating a brand-new virtual machine takes less than 30 minutes; it’s a simple file copy. The wizard in System Center Virtual Machine Manager 2008 tells you exactly what to do.” DHMC also uses the Performance and Resource Optimization (PRO) feature of System Center Virtual Machine Manager 2008 to tune its virtual machines to peak performance.

DHMC plans to link System Center Virtual Machine Manager 2008 with Microsoft System Center Operations Manager 2007 to provide better management of its virtualization environment. Working through PRO-enabled management packs for System Center Operations Manager 2007, the DHMC can use PRO to receive alerts about an unhealthy system or application. PRO will either propose a recommended corrective action or respond automatically based on thresholds.

#### **More Stable Backup Support**

DHMC is also looking at System Center Data Protection Manager 2007 to simplify and speed the backup process for a virtual

environment. Hyper-V uses the Windows Server 2008 Volume Shadow Copy Service to take point-in-time snapshots of active servers and back up those snapshots to remote tapes. This capability will save time and backup scheduling conflicts. “We’ll be able to eliminate our custom scripts, because System Center Data Protection Manager 2007 packages this capability in an industry-standard solution that will be easier to support,” McShinsky says. “We’ll also be able to back up online and do differential backups. It’s a more stable way to back up files.”

With Windows Server 2008, Hyper-V, and System Center solutions, McShinsky hopes to deliver more, and better, services to his constituents with fewer physical servers and less IT work. He also hopes to create a more dynamic IT environment that can respond to business needs with increased flexibility.

## For More Information

For more information about Microsoft products and services, call the Microsoft Sales Information Center at (800) 426-9400. In Canada, call the Microsoft Canada Information Centre at (877) 568-2495. Customers who are deaf or hard-of-hearing can reach Microsoft text telephone (TTY/TDD) services at (800) 892-5234 in the United States or (905) 568-9641 in Canada. Outside the 50 United States and Canada, please contact your local Microsoft subsidiary. To access information using the World Wide Web, go to:

[www.microsoft.com](http://www.microsoft.com)

For more information about Dartmouth-Hitchcock Medical Center services, visit the Web site at:

[www.hitchcock.org](http://www.hitchcock.org)

## Hyper-V and Microsoft System Center Virtual Machine Manager 2008

Together, Hyper-V technology - a key feature of the Windows Server 2008 operating system - and Microsoft System Center Virtual Machine Manager 2008 provide a reliable virtualization technology and comprehensive management solution that make it easier for customers to virtualize their IT infrastructure and reduce costs. With integrated administration, customers can use a single console to centralize management of a heterogeneous virtual machine infrastructure; increase physical server utilization; rapidly provision new virtual machines; and provide dynamic performance and resource optimization of hardware, operating systems, and applications. Both of these technologies easily plug into existing infrastructures, so companies can continue to use their current patching, provisioning, management, and support tools and processes. This combined virtualization technology and management solution also provides great value, because customers can make the most of their IT professionals' skill set, the breadth of solutions from Microsoft partners, and comprehensive support from Microsoft.

For more information, go to:

[www.microsoft.com/Hyper-V](http://www.microsoft.com/Hyper-V)

[www.microsoft.com/scvmm](http://www.microsoft.com/scvmm)

### Software and Services

- Microsoft Server Product Portfolio
  - Windows Server 2008 Datacenter
  - Windows Server 2008 Hyper-V
  - Microsoft System Center Virtual Machine Manager 2008
  - Microsoft Operations Manager 2005

### Hardware

- HP DL585 G2 servers with four AMD Dual-Core Opteron processors and 64 gigabytes of RAM