

**MIGRATING LEGACY PHYSICAL
SERVERS TO HYPER-V VIRTUAL
MACHINES ON DELL POWEREDGE
M610 BLADE SERVERS FEATURING
THE INTEL® XEON® PROCESSOR 5500
SERIES**



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Introduction

Virtualization and consolidation overview



Dell PowerEdge M610 blade server featuring Intel Xeon Processor 5500 series



Dell EqualLogic PS5000XV iSCSI SAN

This Guide shows the ease and cost benefit of consolidating multiple legacy physical servers onto a single Windows Server® 2008 R2 server system using Microsoft's Hyper-V™. In this Guide, we use the Dell™ PowerEdge™ M610 blade server featuring the Intel® Xeon® Processor 5500 series, paired with the Dell™ EqualLogic™ PS5000XV iSCSI SAN storage system. We provide concepts and procedures that will help you perform this consolidation and migration, using Microsoft's Hyper-V™ and System Center Virtual Machine Manager 2008 R2 (SCVMM).

Principled Technologies (PT) has performed hands-on testing and research and drawn on real-world experiences to document best practices and help systems administrators and virtualization administrators simplify operations and take advantage of the features of Hyper-V to consolidate multiple physical systems onto a single virtualization platform.

This document covers the key overall concepts and procedures you need to consolidate your legacy physical servers to a virtualized Hyper-V R2 platform. It reviews in detail the approach that PT and Dell recommend for a tested and validated consolidation of legacy physical systems running Windows Server® 2003 to a virtualized platform, running Windows Server 2008 R2 with Hyper-V. We use SCVMM to perform our physical to virtual (P2V) migration and keep the legacy software, including the operating system, as is. Organizations sometimes wish to reap the benefits of virtualization without incurring the maintenance and redesign costs that sometimes accompany an operating system or application upgrade; the P2V process allows for this. The organization can then upgrade individual virtual machines as time and resources allow.

As we note above, we use the Dell PowerEdge M610 blade server and the Dell EqualLogic PS5000XV iSCSI SAN as our virtualization hardware platform in this Guide. We cover configuration of the storage, installation of the host operating system and virtualization tools, and the P2V migration itself.

What is virtualization? How can I use it to consolidate, and what are the benefits?

Generally speaking, *virtualization* is the ability to run multiple operating system environments or machine environments on one physical system. There are two basic types of virtualization. Type 2 virtualization is a hosted solution, where the virtual machines run inside another operating system, and thus are several layers above the hardware. Type 1 virtualization products, such as Microsoft's Hyper-V, run much closer to the "bare metal" of the server and interact with hardware directly through a control program known as the hypervisor. By working closer to the hardware, Type 1 products can typically provide better performance than Type 2 offerings.

Generally speaking, *consolidation* refers to the process of combining multiple items to make a single, more effective unit. In this Guide, we discuss combining the concepts of virtualization and consolidation to achieve your overall goals. In an IT context, you can consolidate several types of items, including the following:

Physical servers. In this Guide, consolidation typically means consolidating servers. After a successful consolidation, all applications should run on fewer servers than before, and those applications should run at least as well as they did previously.

Storage. As you follow the procedures in this Guide, you will consolidate storage by moving software and data from a number of servers to a larger, more modern storage area network (SAN), in our case a Dell EqualLogic PS5000XV.

Locations. As you consolidate servers through virtualization, you may reduce the number of locations you need for servers. Planning for consolidating geographic locations is beyond the scope of this Guide.

Why consolidate?

Done well, consolidation yields a more economical environment with more consistent management practices, better use of hardware, and all applications performing at least as well as they did previously. An effective consolidation effort improves reliability and security while bringing significant savings to the organization. Some of the ways consolidation can stretch your technology budget include the following:

Hardware savings. Buying, powering, and supporting fewer servers brings obvious savings to an organization. Less obvious are the other significant cost savings that fewer servers mean over time, such as fewer hardware replacement purchases as these consolidated servers age out. In other words, your future purchase growth rate may decrease. Other potential hardware cost savings areas may include racks and network switches; as the number of servers decreases, these costs decrease as well.

Software license savings. Like traditional consolidation, Hyper-V virtualization technology can let organizations reap significant software licensing savings. While licensing structures and fees vary by product, the following example using Microsoft® SQL Server® illustrates the possibilities.

Windows Server 2008 Enterprise Edition limits the number of guest OS instances to four, so this pricing example uses Windows Server 2008 Datacenter Edition (unlimited guest OS instances) and the per-processor licensing model of SQL Server. (Details on licensing Windows Server 2008 are available [for download here](#) and details on licensing SQL Server are available [for download here](#).)

Our Dell PowerEdge M610 blade server has two physical sockets, each socket populated with an Intel® Xeon® Processor X5570. Licensing Windows Server 2008 Datacenter Edition with SQL Server Enterprise Edition lets us create an unlimited number of virtual environments, all running SQL Server. Figure 1 shows a possible configuration.

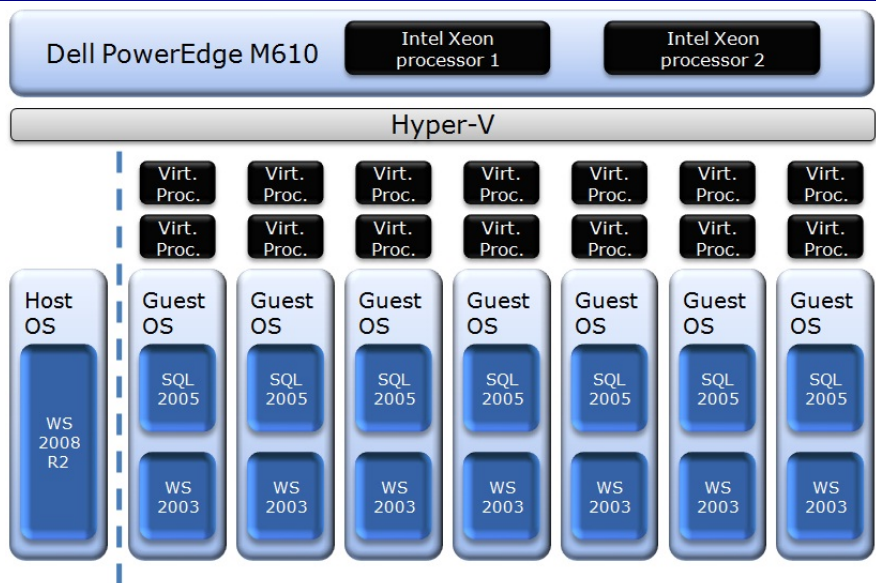


Figure 1. Sample configuration of seven virtual machines running on the Dell PowerEdge M610, each with two virtual processors.

In our performance report

<http://www.principledtechnologies.com/clients/reports/Dell/35DL385onto5PEM610.pdf>, we determine that, with virtualization, we can consolidate 35 identical workloads onto five Dell PowerEdge M610 blade servers with Dell EqualLogic PS5000XV storage and get even better performance than having 35 separate physical systems. Each of the 35 virtualized workloads on the Dell PowerEdge M610 servers exceeded the performance of the workload on the 35 physical HP ProLiant DL385 servers in our performance report. Since we consolidated 35 HP ProLiant DL385 servers to 5 Dell PowerEdge M610 servers, we use seven as a reasonable consolidation estimate in the example below.

In our cost example, we migrate our seven physical SQL Server environments to seven virtualized SQL Server environments running on a single server and allocate two virtual processors to each of the seven virtualized environments. That is a total of 14 virtual processors, but our new two-socket host machine has eight cores with Hyper-Threading technology, providing 16 logical processing threads. This usage is not a problem, however, because Hyper-V handles the sharing of resources among the virtual machines. In this example, because we have purchased the Datacenter Edition of Windows Server 2008 and licensed SQL Server Enterprise Edition using the per processor model, we can create an unlimited number of virtual environments.



NOTE: The cost analysis below shows only licensing savings related to SQL Server. Windows Server licensing is independent of SQL Server, so check with your Microsoft sales representative about complete costs of both products.

Figures 2 and 3 present a brief cost analysis showing SQL Server cost savings based on the configuration in Figure 1. The non-consolidated environment assumes seven Enterprise Edition SQL Server instances, each running on a dedicated two-socket server, and they use list prices. The virtualized environment assumes a quad-core two-socket machine running SQL Server Enterprise Edition on each VM. Because Microsoft counts each socket as a processor for licensing purposes, the virtualized environment requires only 14 percent of the licensing cost as compared to the non-consolidated environment, yielding considerable savings.

	Non-consolidated environment	Consolidated Hyper-V environment
Description	7 two-socket dual-core servers, each running SQL Server enterprise	1 two-socket quad-core server, running Hyper-V R2 and SQL Server Enterprise in each VM; licenses purchased for 2 physical processors
Cost	2 sockets x \$25,000 per-processor retail enterprise license x 7 servers = \$350,000 in SQL Server licensing; \$50,000 per SQL instance	2 sockets x \$25,000 per-processor retail enterprise license x 1 server = \$50,000 in SQL Server licensing; \$7,142 per SQL instance

Figure 2. Comparing SQL Server list licensing costs: seven non-virtualized two-socket servers versus a single two-socket server running seven dual-processor virtual machines. For licensing purposes, Microsoft counts one socket as a processor.

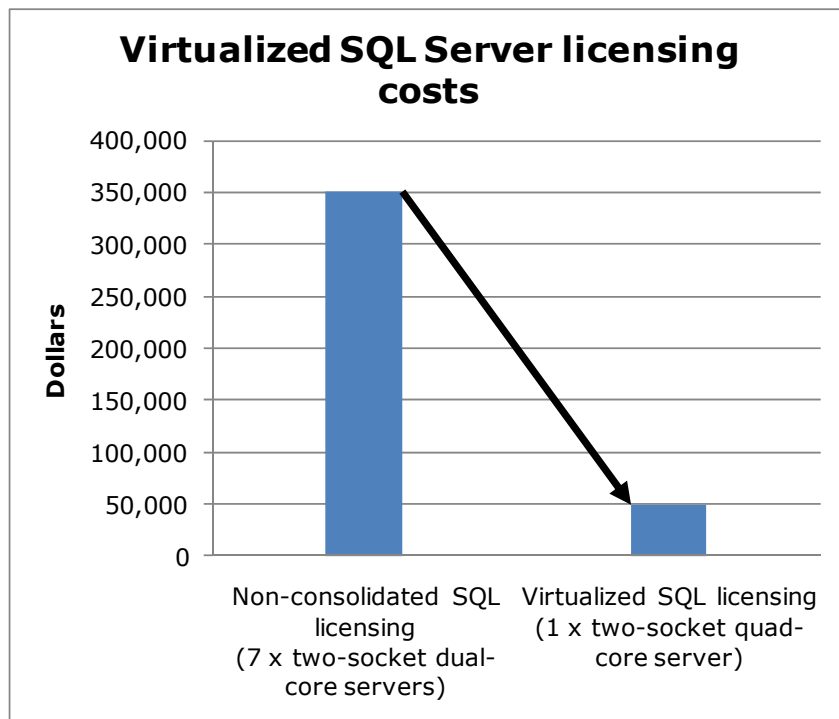


Figure 3. Example of SQL Server licensing savings when consolidating from seven two-socket servers to a single two-socket server running Hyper-V R2. For licensing purposes, Microsoft counts one socket as a processor. Windows Server Datacenter Edition and SQL Server Enterprise Edition are required to run unlimited virtual SQL Server environments.

Maintenance and staff savings. A consolidated and virtualized infrastructure offers many opportunities for staffing, support, and maintenance cost savings. Less hardware and associated equipment means fewer servers that require security patches and monitoring.

Reduced staffing requirements. Regardless of your server-to-full-time-employee (FTE) administrator ratio, fewer servers mean fewer system administrators. Also, consolidation efforts often improve standardization across servers, simplifying administration for the Windows® system administrator, network engineer, and database administrator (DBA). Virtualization and consolidation can also provide greater opportunities for automation, further reducing the FTE requirements. Because the growth in the number of servers can slow when you consolidate, these savings can compound over time.

Reduced support costs. The cost of a given level of support is usually proportional to the size of the installation. By reducing the number of servers, the costs of your support agreements go down as well.

Power and cooling savings. Consolidating servers saves power in several ways:

- **Fewer servers.** Obviously, fewer servers consume less power. In our performance testing, we found that a consolidation ratio of 7 to 1 yielded power savings of up to 70 percent.
- **More efficient servers.** Modern servers are typically more efficient than those of a few years ago, so you are likely to use less power per server.
- **Less cooling.** Fewer, more efficient servers produce less heat. Moreover, you can house them in a smaller space, thus reducing cooling costs even further.

Rent savings. Consolidation via virtualization reduces the floor space IT requires. By reducing the number of servers, you reduce the physical space required to hold the racks and the associated space necessary for servicing and airflow. You require less cooling, and so save on the space the air conditioners would require. Finally, consolidation may allow you to reclaim space, make more efficient use of the space you have, and thus delay expansion.

Regulatory compliance savings. With fewer physical devices storing data and more uniform management, a consolidated

environment can make the process of complying with regulatory requirements such as Sarbanes-Oxley and the Health Insurance Portability and Accountability Act (HIPAA) less expensive, easier, and more secure.

Sizing and baseline performance. Sizing is one key to a successful consolidation. The process of sizing involves gathering different performance baselines so you have at least an approximate set of requirements the new consolidated servers must meet. You do this by looking at the performance characteristics of existing hardware during normal business operations, and then applying growth and scalability estimates. The performance baselines you gather are useful when setting the configuration options on your Hyper-V virtual machines when it comes to the number of virtual processors and the amount of memory.

Among the characteristics to examine on each server are the following:

- Processor utilization
- Memory requirements of the OS and applications
- Disk layout
- Database or file size
- Maximum concurrent users
- Types and rates of storage utilization, such as large sequential writes, random reads, etc.

The server you choose for virtualization and consolidation must do more than match the combined capacity of all the other current servers today. It must have enough excess capacity to still perform well at the end of its expected life span. Fortunately, given the improvements we note below, finding such servers is entirely possible. Also, given the flexibility and portability that virtualization provides, future hardware upgrades are easier; you can move virtual machines from host to host and migrate them to other equipment if need be.

In recent years, server capabilities have greatly increased. Here are some of the improvements that make it possible to consolidate multiple servers into a single system:

- **More processors.** Modern quad-core processors double or even quadruple the number of processing cores available without increasing the physical size of the server. Some

applications benefit even further by increased number of threads made available in the processing core. For example, Intel Hyper-Threading technology allows two threads per processor core.

- **More processing power per core.** While clock speeds have changed little, processors have undergone a generational shift. Industry-standard benchmarks, such as SPECint, show today's processors are much faster than their counterparts of 3 to 5 years ago. According to Intel, the Intel Xeon processor 5500 series shipping today, for example, performs up to nine times faster than the single core processor, the Intel Xeon processor 5100 series, which shipped in 2005.
- **64-bit address space.** The advantages of the vastly greater address space on a 64-bit environment are widely documented. Five years ago, many processors did not support 64-bit addressing.
- **Faster memory.** The memory in a modern system is two to three times as fast as that in a 3- to 5-year-old system. This is achieved not only with the improved memory module performance, but also with the significant increase in memory bandwidth now available between the processors and memory modules.
- **Faster storage.** Disk transfer rates have improved substantially. Some performance critical workloads now have the option to use Solid State Disk (SSD) technology in place of conventional Hard Disk Drive (HDD) technology.
- **Cheaper storage and greater capacity.** Disk capacity has greatly increased, while the cost per GB has decreased.

We further discuss sizing at a conceptual level in the Getting ready section.

Windows Server 2008 R2 and Hyper-V overview

Microsoft includes its hypervisor, Hyper-V, in the Standard, Datacenter, and Enterprise editions of Windows Server 2008 R2. Generally speaking, a hypervisor is a Type 1 virtualization product: a thin layer of software enabling virtual machines to run on one physical machine and allowing direct access to most hardware.

Requirements for running Hyper-V R2

The Dell PowerEdge M610 supports the features Hyper-V requires, which include the following:

- A compatible 64-bit processor

- Hardware Data Execution Protection (DEP) enabled
- Hardware-assisted virtualization, specifically processors that include the Intel-VT or AMD-V features. Figure 4 shows the virtualization feature enabled on our Dell PowerEdge M610. Note that the BIOS uses the term Virtualization Technology.



Figure 4. Example BIOS configuration for the Dell PowerEdge M610 showing virtualization technology enabled.

Features of Hyper-V R2

With the release of Windows Server 2008 R2, Hyper-V includes some improved and enhanced features. Below, we list some of Hyper-V's noteworthy new features.

- **Live migration.** In Hyper-V R2, you can now migrate running virtual machines with no downtime. This provides organizations with a powerful tool to utilize physical resources more efficiently, transparently migrating VMs and workloads from host to host for power savings reasons, heavy workload periods, and so on. It also provides system administrators flexibility to implement system maintenance as needed on physical hosts, with no interruptions to client services.
- **Processor compatibility mode.** When implementing live migration, migrating VMs across different CPU versions becomes seamless with processor compatibility mode. This allows an administrator to migrate VMs from host to host as long as the hosts' processors are within the same family.

- **Cluster Shared Volumes.** Hyper-V R2 leverages Cluster Shared Volumes (CSV) to make storage more flexible, especially as it relates to clusters. Using CSV, multiple servers can access the same LUNs on SAN storage, enhancing the speed of live migration.
- **Hot add storage.** You can now add storage in the form of both virtual hard drives (VHDs) and pass-through disks while a VM is up and running. With this enhanced feature, virtualization managers can work with storage administrators to quickly provision new storage based on application and business need, with no interruption of service.
- **More efficient use of power.** With the core parking features of Windows Server 2008 R2 and the support of Second Level Address Translation (SLAT), Hyper-V R2 allows organizations to save power.

Resource allocation in Hyper-V

Consolidation using Hyper-V allows an organization to save money on hardware. Consolidation brings competition for physical resources, such as CPU cycles, RAM, and NIC bandwidth. The Hyper-V manager allows system administrators to allocate resources as they see fit, based on expected virtual machine workloads.

- **Memory allocation.** Hyper-V manager allows you to adjust the memory allocated to virtual machines. On our Dell PowerEdge M610 with 72 GB, we could assign from 8 MB to nearly 72 GB of memory to a virtual machine.
- **CPU allocation.** You can assign one or more virtual processors to a virtual machine and then use more granular resource controls to allocate and balance CPU resources amongst multiple VMs. Figure 5 shows the Hyper-V manager settings for the virtual CPUs. You can set the number of virtual CPUs. Additionally, you can reserve a percentage of the physical CPU by setting the VM reserve percentage (minimum). You can also cap the amount of CPU available to the VM by setting the VM limit percentage (maximum). Lastly, you can use the relative weight value to prioritize certain VMs over others.



NOTE: You can assign a maximum of four virtual CPUs to a VM. However, not all guest OSs support four virtual CPUs.

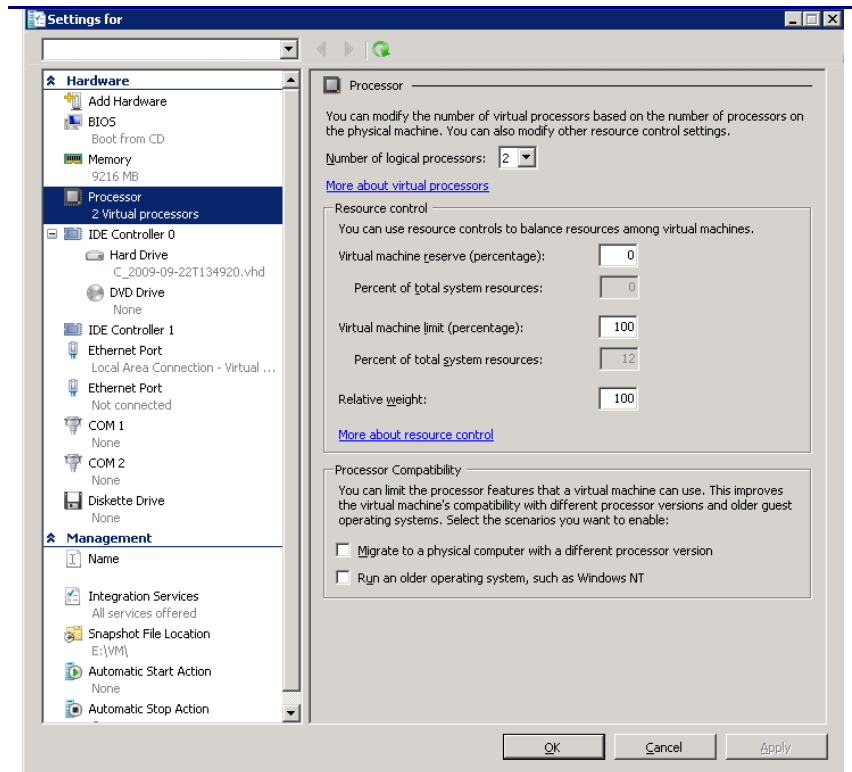


Figure 5. CPU settings for a sample virtual machine in Hyper-V Manager.

Monitoring and tuning Hyper-V

When you install the Hyper-V role in Windows Server 2008 R2, the installation automatically creates Hyper-V-specific performance monitor counters at the same time. You can use these performance counters to monitor your VM resource utilization, and then adjust your resource controls as necessary.

Two sample counter sets are as follows:

- **Hyper-V Hypervisor Logical Processor counters.** This set of counters contains information regarding the logical processors in your system. For our systems, the number of logical processors is equal to the number of processor cores. Because we are using dual, Quad-Core Intel Xeon Processor X5570s with Hyper-Threading, we have 16 logical processors.
- **Hyper-V Hypervisor Virtual Processor counters.** This set of counters contains information regarding the virtual processors specific to each virtual machine in your system.

Regarding storage, Microsoft Windows Server 2008 R2 now improves fixed-size virtual hard disk (VHD) performance to be

equal to that of pass-through disks. However, VHD storage provides the most flexibility when migrating from host to host and working with both live migration and SCVMM. Choose your storage layout carefully when designing your new virtualized environment, as this can directly affect performance and future flexibility.

Getting ready

Evaluating your servers for virtualization and consolidation

Gather baseline performance data

During your research phase, you should use Performance Monitor or other tools to gather data on the typical workload and performance statistics on the server you are considering moving to a virtual environment. This practice serves two purposes. First, it provides a prime opportunity to identify potential problems before you move to a Hyper-V based solution. Second, you can use the information you gather to map out your resource allocation needs, which you can then use to configure your Hyper-V virtual machine memory and processor settings.

Poor candidates for P2V conversion

Not every server is a good candidate for P2V conversion. Here, we present a few examples of servers that you should consider carefully before transitioning to virtual environments via P2V.

Active Directory domain controllers. Converting Active Domain controllers will require special planning, as Microsoft recommends the offline conversion mode for converting domain controllers. Also, you should enable the network device on the new VM only after the P2V conversion is successful and you have tested the VM. Finally, you must immediately turn off the original physical source domain controller server upon successful conversion, or at a minimum remove it from the network.

Servers with critical performance requirements. If your server has stringent performance requirements, it may be best to leave it on a dedicated non-virtualized server. On a dedicated server, it is much easier to find any bottlenecks that might occur. It is also much simpler to address any problems when you need not worry about disrupting other work on the same server.

Servers with specialized requirements. Some servers may have requirements you cannot fulfill in a virtualized environment, such as applications that depend on highly specialized file layouts or direct access to specific hardware. If you do choose to convert

those servers, you may wish to uninstall the hardware-specific applications, such as RAID utilities, networking applications, or other management tools that were specific to the original physical source machine.

Preparing your server and storage

Defining our environment

We used a Windows domain containing a Dell PowerEdge M610 with Intel Xeon processor X5570 running Windows Server 2008 R2 server with the Hyper-V role, an Active Directory® server, a legacy HP ProLiant DL385 physical server, and a server running System Center Virtual Machine Manager.



NOTE: For best results, ensure all machines are member servers in a domain, or, if in separate domains, ensure that the domains are trusted.

To be specific, our example Hyper-V server was a Dell PowerEdge M610 running Windows Server 2008 R2 Datacenter Edition with the Hyper-V role installed. We connected a Dell EqualLogic PS5000XV iSCSI SAN to the Dell PowerEdge M610 via a Dell™ PowerConnect™ 6248 switch. Our Active Directory server was a Dell™ PowerEdge™ 1950 running Windows Server® 2003 R2 Enterprise Edition SP2, while our SCVMM server was a Dell™ PowerEdge 2950™ running Windows Server 2008 R2. We connected all components via a gigabit Ethernet switch. Per best practices from Dell EqualLogic, we isolated the iSCSI network traffic onto its own physical network, separate from any other network communication. Also as a best practice, we configured jumbo frames at all layers of our iSCSI network stack. Figure 6 illustrates our setup.

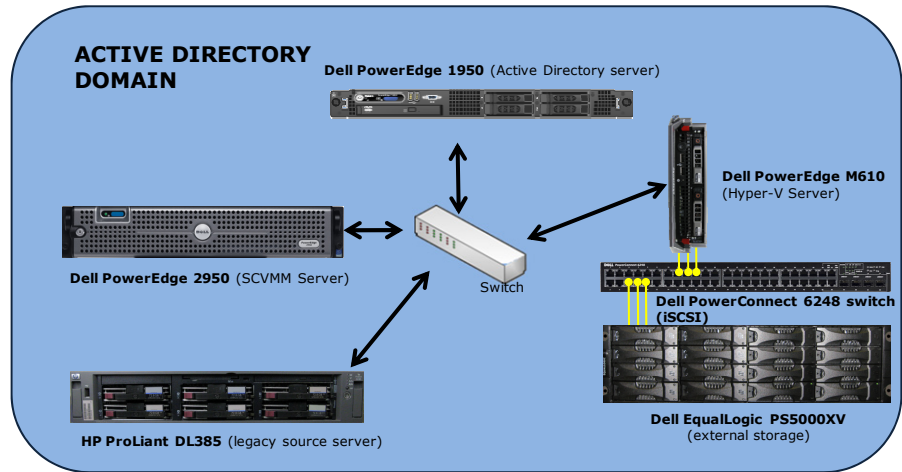


Figure 6. The setup we used in our hands-on testing and research for this Guide.

Figures 7 and 8 present the hardware and software we used to simulate an Active Directory domain and Hyper-V consolidation server. Figure 9 shows storage system specifications.

Server	Processor	Memory	Disk drives
Dell PowerEdge M610 (Hyper-V server)	2 x Intel® Xeon® Processor X5570 (2.93 GHz)	72 GB	2 x SAS, 15K RPM, 73 GB
Dell PowerEdge 1950 (Active Directory server)	2 x Quad-Core Intel® Xeon® Processor E5440 (2.83 GHz)	16 GB	2 x SAS, 15K RPM, 146 GB
Dell PowerEdge 2950 (SCVMM server)	2 x Intel® Xeon® Processor E5440 (2.83 GHz)	32 GB	4 x SAS, 15K RPM, 73 GB
HP ProLiant DL385 (legacy source server)	2 x AMD® Opteron® 254 (2.8 GHz)	4 GB	2 x SCSI, 15K RPM, 73 GB

Figure 7. Servers we used in our hands-on testing and research for this Guide.

Server	Operating system
Dell PowerEdge M610 (Hyper-V server)	Host operating system: Windows Server 2008 R2 Datacenter Edition Guest operating system: Windows Server 2003 R2 Enterprise Edition SP2 x64
Dell PowerEdge 1950 (Active Directory server)	Windows Server 2003 R2 Enterprise Edition SP2 x86
Dell PowerEdge 2950 (SCVMM server)	Windows Server 2008 R2 Enterprise Edition
HP ProLiant DL385 (legacy source server)	Windows Server 2003 R2 Enterprise Edition SP2 x64

Figure 8. Software we used in our hands-on testing and research for this Guide.


Hardware	Specifications
Dell EqualLogic PS5000XV	16 x SAS, 15K RPM, 146GB disk drives; 3 active 1Gb network ports; 1GB cache
Dell PowerConnect 6248 Switch	48 port switch for dedicated iSCSI use

Figure 9. Storage system specifications.

Configuring the storage


Overview

In this section, we discuss the setup of our Dell EqualLogic PS5000XV storage, from initial configuration through LUN creation. Following best practices from Dell EqualLogic, we isolated our storage network onto its own Dell PowerConnect 6248 switch, enabled jumbo frames at all levels of the iSCSI network stack, and used multiple network connections from our server to take advantage of the Multipathing I/O (MPIO) capabilities provided by the EqualLogic Host Integration Toolkit.

 **NOTE:** Plan on at least 30 minutes for drive configuration on the server and storage.

A note on virtualized storage

In a Hyper-V environment, three options are available for storage: pass-through disks, fixed-size VHDs, and dynamically sized VHDs. Both pass-through disks and fixed-size VHDs perform at near bare metal speeds in Windows Server 2008 R2. If you have storage management software that needs to access the disks directly, pass-through disks may be the best option. However, pass-through disks require you to allocate a dedicated disk to a virtual machine, making pass-through disks less flexible. VHDs are more flexible when working with other features such as live migration and do not require dedicating a complete LUN to a VM.

 **NOTE:** Hyper-V requires that the operating system VHD be on the virtual IDE controller.

We installed a mezzanine Ethernet network card into our Dell PowerEdge M610 to double our number of NICs to four. Using four pass-through Ethernet modules in our blade chassis, we then cabled three of our four NICs to the Dell PowerEdge 6248 switch. If you have multiple trays of Dell EqualLogic storage broken into several groups, you may find it necessary to use virtual LAN (VLAN) functionality on your switch. Here, we assume only one tray and one server.

Below, we illustrate the exact storage layout we used. (See Figure 10.) For detailed instructions on how we configured the Dell EqualLogic storage, see [Appendix A](#).

Disk Configuration Dell PowerEdge M610 with Dell EqualLogic PS5000XV

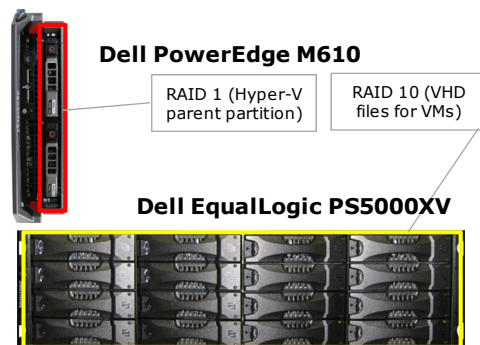


Figure 10. The physical storage configuration we used in the virtualization consolidated server in our hands-on testing and research for this Guide.

Internal disk drives

Our Dell PowerEdge M610 server contained two drives. We configured the drives using RAID 1 for the host operating system.

Storage Switch

Our Dell PowerConnect switch had 48 ports, and we configured them to use maximum transmission unit (MTU) sizes of 9,216, the maximum, for jumbo frames. For this Guide, we used only six ports, three for the server, and three for the storage.

SAN drives

The Dell EqualLogic PS5000XV contained 16 drives, with 2 drives in spare mode, creating a total of 14 active drives. We reset the array, and created a storage group with one member and one storage pool. We set this member to have a RAID 10 policy, and, for this Guide, we did not use any snapshot reserve allocations on our LUN. Finally, we created a large external LUN that we then revealed at the host operating system for guest operating system VHDs.

Below, we provide an overview of setting up storage on both the internal disks in the Dell PowerEdge M610 and the Dell EqualLogic PS5000XV array. We include approximate wait times for each step. ([Appendix A](#) provides complete, detailed installation instructions.)

- 1.** Press Ctrl+R to enter the Dell PowerEdge Raid Controller utility on boot. Configure the internal drives as a RAID 1 volume and initialize the volume. (10 minutes)
- 2.** Configure the Dell EqualLogic storage group, connecting to the storage array via a serial cable. Specify the group IP address, subnet mask, and group credentials. (10 minutes)
- 3.** Cable the remaining NICs on the Dell EqualLogic PS5000XV to the storage switch. Using the Dell EqualLogic web interface, modify the IP settings for the remaining two NICs, and enable them. Configure the LUNs via the Dell EqualLogic web interface. (10 minutes)

Installing Windows Server 2008 R2

Hyper-V requires some form of Windows Server 2008 R2 to be running in the parent partition—either the full installation or the core installation. For simplicity and ease of installation, we chose to install the full version of Windows Server 2008 R2.

This section provides an overview of the Windows Server 2008 R2 installation process on the Dell PowerEdge M610. We include approximate wait times for each step. ([Appendix B](#) provides complete, detailed installation instructions.)



NOTE: Plan on at least 25 minutes for installing Windows Server 2008 R2 Datacenter Edition on the Dell PowerEdge M610 server. Each step below takes at least 1 minute. We provide the approximate amount of time each step takes in parentheses. These times exclude data entry time. The time to install updates—none in our setup—will increase over time as Microsoft releases OS updates for Windows Server 2008 R2.

1. Insert the Microsoft Windows Server 2008 R2 Datacenter Edition DVD into the DVD drive and reboot the system. If a message appears telling you to press any key to boot from CD or DVD, do so. During the boot, a message that Windows is loading files appears, followed by a Windows booting loading bar. (3 minutes)
2. For Hyper-V, you must install Standard, Datacenter, or Enterprise Edition. We chose Datacenter Edition. Accept the license terms, proceed with the installation, and enter the information the installation software requires. (14 minutes, during which Windows restarts the server)
3. Set your password; enter configuration information, including the public IP address and domain information; and reboot the system. (8 minutes)
4. Download and install updates. As of the writing of this Guide, no updates existed yet for Windows Server 2008 R2. (Download times will vary based on number and size of updates.)

Configuring iSCSI inside the host

This section provides an overview of the iSCSI configuration at the host operating system level. To connect to the iSCSI storage and configure MPIO, you must configure your additional NICs and install the Host Integration Toolkit from Dell EqualLogic. ([Appendix C](#) provides complete, detailed installation instructions.)



NOTE: Plan on at least 15 minutes for configuring iSCSI in the host operating system on the Dell PowerEdge M610 blade server. Each step below takes at least 1 minute. We provide the approximate amount of time each step takes in parentheses. These times exclude data entry time.

1. Configure the remaining NICs in your server that you will use for iSCSI network traffic. Assign the appropriate IP addresses and subnet mask information. (3 minutes)
2. Install the Host Integration Toolkit available from Dell EqualLogic. This installation will require a reboot. (5 minutes)
3. Connect to the iSCSI LUNs using the iSCSI software initiator tool and enable MPIO upon connection. Optionally, add the LUNs to the favorite targets list. (See Figure 11.) (3 minutes)

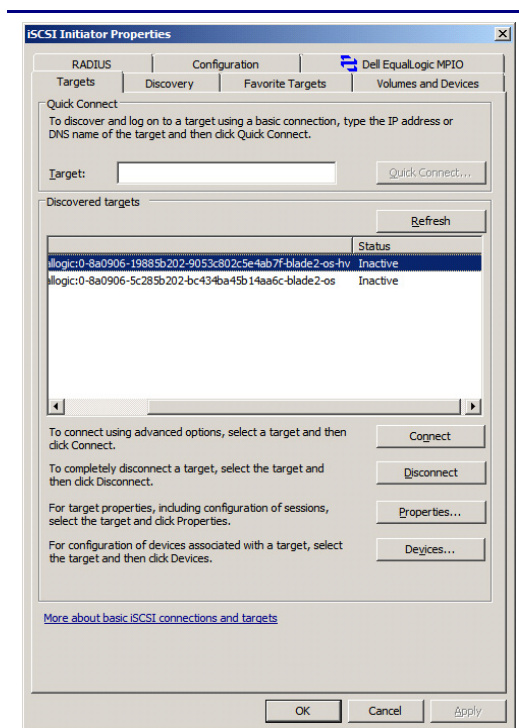


Figure 11. The iSCSI initiator properties in Windows Server 2008 R2.

4. Configure the external LUNs in Disk Management. Assign a drive letter, format the

disk, and create the necessary folders. (3 minutes)

Installing the Hyper-V role

Enabling Hyper-V on your Windows Server 2008 R2 installation is very straightforward, requiring just a few short steps. We provide detailed instructions in [Appendix D](#).



NOTE: Plan on at least 7 minutes for installing the Hyper-V role on your Dell PowerEdge server. Each step below takes at least 1 minute. We provide the approximate amount of time each step takes in parentheses. These times exclude data entry time.

1. Click Start, click Server Manager. Click Roles, and choose Add Roles.
2. Click Hyper-V. (See Figure 12.) Configure your networking as you desire, and proceed to install the Hyper-V role. (1 minute)
3. The installation requires two reboots upon completion, after which the Hyper-V role finishes installing. (6 minutes, including the reboots)

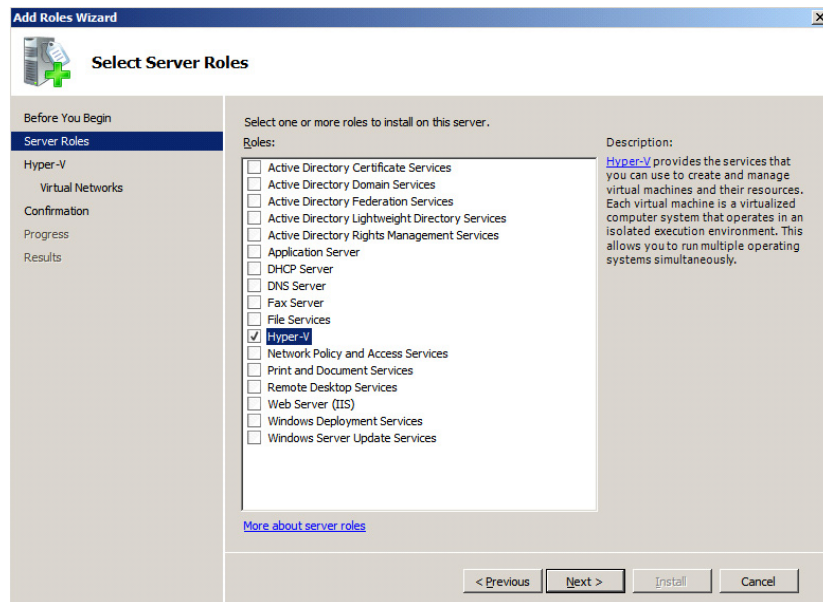


Figure 12. Installing the Hyper-V role in Windows Server 2008 R2.

Installing and configuring System Center Virtual Machine Manager 2008 R2 (SCVMM)

SCVMM 2008 R2 overview

System Center Virtual Machine Manager (SCVMM) is Microsoft's enterprise-level offering in the virtual machine management space. SCVMM lets administrators manage virtual machines and hosts across the enterprise, including previous-generation Microsoft Virtual Server products and VMware vSphere™ products. Along with the P2V features we explore in this Guide, SCVMM has many other features that help organizations in their consolidation efforts, such as rich Windows PowerShell™ capabilities, host analysis prior to VM provisioning, P2V and virtual to virtual (V2V) conversions, and integration with Microsoft System Center Operations Manager for resource optimization and management.

All SCVMM implementations, no matter how simple or complex, require the following components: VMM server and default library server, VMM database running on SQL Server 2005 or 2008, VMM Administrator Console, and the virtual machine host. In this Guide, we installed all VMM components on our Dell PowerEdge 2950 server, and our virtual machine host was the Dell PowerEdge M610 server. In your situation, you may find that you should scale out the components of SCVMM to fit your infrastructure. For example, you may already have an existing SQL Server instance, so you could choose to place your VMM database on that machine. For simplicity we chose a "stand-alone" configuration.

SCVMM 2008 R2 prerequisites

SCVMM requires multiple prerequisites for proper operation. In this section, we discuss the steps necessary to install and configure these prerequisites so that P2V conversions are possible. We discuss the detailed steps for setting up SCVMM prerequisites in [Appendix E](#).



NOTE: Plan on at least 45 minutes for configuring prerequisites for the SCVMM server. Each step below takes at least 1 minute. We provide the approximate amount of time each step takes in parentheses. These times exclude data entry time.

1. Install Windows Server 2008 R2 on the SCVMM server and run Windows update to get all current updates. (25 minutes)

2. Join the SCVMM server to your domain. Consult your domain administrator for appropriate credentials. Restart the server when the application prompts you to do so. (6 minutes)
3. Configure the roles and services on your server to match the requirements published in the SCVMM documentation. These include some IIS requirements and some .NET components. (5 minutes)
4. Obtain your SQL Server connection information and permissions on the particular SQL Server instance you choose to use.



NOTE: Either install SQL Server (2005 or 2008) on the SCVMM server, or obtain SQL Server connection information and permissions from your database administrator to store the SCVMM database on. For a complete stand-alone configuration, install SQL Server 2005 or 2008 on the SCVMM server. If you wish to not incur licensing costs, the installation includes SQL Server Express Edition. Microsoft recommends using a separate database instance when managing more than 150 hosts.

5. Run the Virtual Machine Manager Configuration Analyzer (VMMCA) to ensure your server meets all prerequisite requirements, both hardware and software. (10 minutes)

Installing SCVMM 2008 R2

After you have installed all prerequisites, you may proceed with the installation of SCVMM. For this Guide, we used SCVMM 2008 R2 in our configuration. While it is possible to configure a more complex SCVMM implementation with multiple servers involved hosting multiple components, we chose to implement a stand-alone configuration. For complete details of the installation of SCVMM, see [Appendix E](#).



NOTE: We installed SCVMM 2008 R2 from the download available at <http://www.microsoft.com/systemcenter/virtualmachinemanager/en/us/default.aspx>.

You must download the file and then unpack it. Plan on at least 25 minutes for installing the SCVMM server software. Each step below takes at least 1 minute. We provide the approximate amount of

time each step takes in parentheses. These times exclude data entry time.

1. Accept the license terms and enter installation information. Next, complete the prerequisites check. (2 minutes)
2. Configure the SQL Server connection information as requested by the installation wizard. As we noted above, you may use a local or remote instance of SQL Server, or you may choose to simply install SQL Server Express Edition. (1 minute)



NOTE: The SCVMM software will attempt to create a database on the SQL Server instance you connect to. Ensure you have appropriate credentials and permissions on the SQL Server instance or your installation may fail. Also, be aware if you configure a remote database connection, there are additional steps required. You can view these configuration options here:

<http://technet.microsoft.com/en-us/library/cc764295.aspx>.

3. Configure your default library share, where SCVMM will store ISO images, VHD files, and other files for use by SCVMM. Be aware that you cannot change or remove this location once you have specified it in the installation. (1 minute)
4. Proceed with the SCVMM installation. (15 minutes)
5. Install the SCVMM Administrator console on the SCVMM server for managing SCVMM. (3 minutes)



NOTE: In order for SCVMM to manage your Hyper-V host, you must explicitly add the Hyper-V host to SCVMM. In our case, this was the Dell PowerEdge M610 server.

6. Open the SCVMM Administrator Console and connect to your SCVMM server.
7. Click Add Host, and configure the connection credentials. (See Figure 13.)

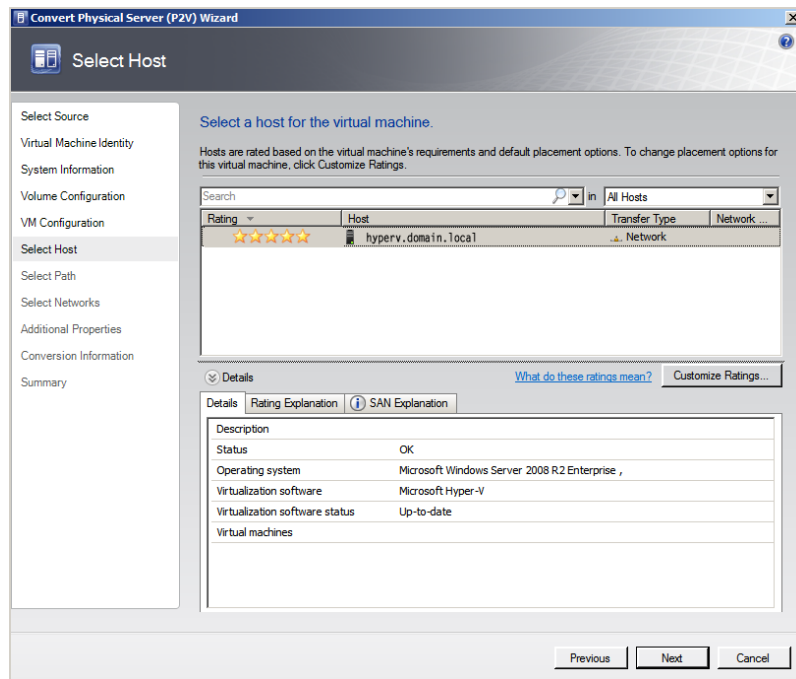


Figure 13. Adding the host in SCVMM.

8. Finalize the host addition, and wait for the job to complete. (3 minutes)

Performing the P2V operation

In this section, we review the process of performing a P2V conversion. In our example, we convert a legacy HP ProLiant DL385 running Windows Server 2003 x64 R2 Enterprise Edition to a guest on our Hyper-V host, the Dell PowerEdge M610 with Dell EqualLogic storage. You can choose to perform either online P2V conversions or offline P2V conversions. In an online conversion, SCVMM uses the Volume Shadow Copy Service (VSS) to create an image of the physical machine's data and then creates a corresponding virtual machine. The offline conversion method, however, may provide more reliable data integrity since the source machine is not in use during the conversion. Also, under special circumstances, such as converting Active Directory domain controllers and dealing with non-NTFS volumes, you are required to use the offline conversion method.

Below, we give overview steps on performing your P2V conversion. Our P2V conversion of our legacy HP ProLiant DL385 with a 30GB operating system volume took approximately 22 minutes, and the

system spent the majority of this time creating the VHD and copying the drive's data. Your time will vary based on size and type of data transmitted. For complete details of the P2V process, see [Appendix F](#).

1. Open the SCVMM Administrator Console and connect to your SCVMM server. Choose to convert a physical server.
2. Enter the appropriate connection information, scan the target system, and configure your VHD for your new destination VM. (2 minutes)



NOTE: The VHD for the destination VM cannot be smaller than the original volume on the source machine.

3. Configure VM specific information, such as memory, number of processors, and virtual network.
4. Finalize your configuration of the new VM, and click Create to perform the P2V operation. (See Figure 14.) (18 minutes with our 30GB OS volume; times will vary based on drive sizes)

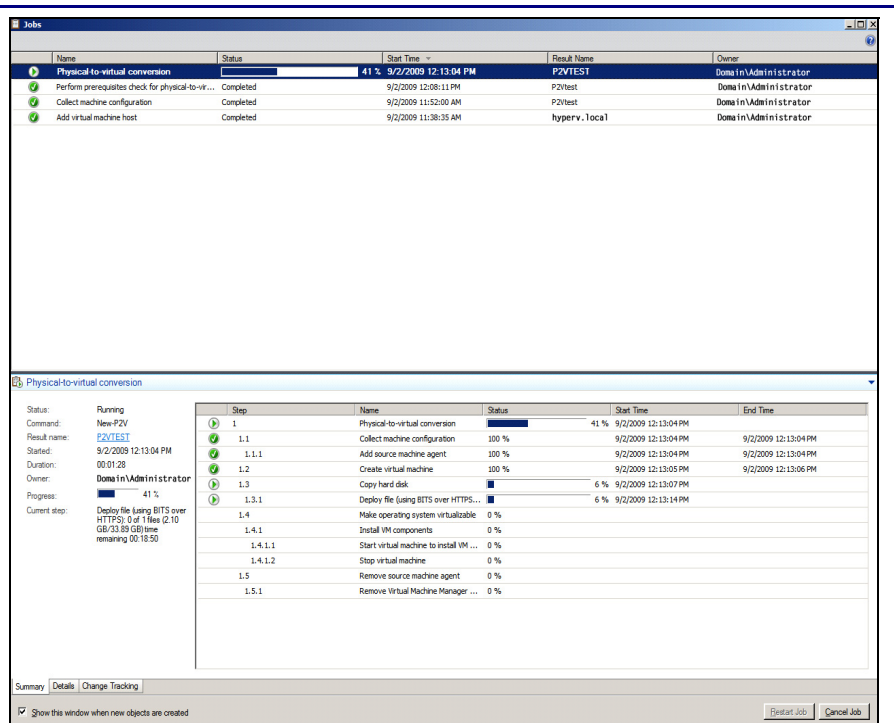


Figure 14. Performing the P2V operation in SCVMM.

Performing post-P2V tasks

After your P2V conversion is complete, take precautionary steps to ensure all applications, service, network configuration, and any other configurations are complete and operable. Things you may want to verify include the following:

- **Security identifiers (SIDs).** Because the new VM is completely identical to the source machine, you will have conflicts on your network and domain if both the source physical machine and the new virtual machine are both powered on, since both machines will have identical SIDs (unique identifiers assigned to every machine in a Windows domain). The P2V process we outline here assumes immediate reprovisioning of the legacy server, or at a minimum, removal from the network.
- **MAC addresses, DNS, and other networking issues.** If your application uses machine specific MAC address information, you may experience issues, as Hyper-V assigns MAC addresses to guests as they come online. Also, you should verify your IP addresses on your new VM.
- **Hyper-V Integration Services.** Ensure the SCVMM P2V conversion wizard installed the Hyper-V Integration Services. In the Device Manager of the new VM, you should see references to Microsoft VMBus Network Adapter, Video Adapter, and HID Miniport. If your devices are running in Emulated mode, you may experience sluggish performance. If you are unsure, simply reinstall Integration Services on the Hyper-V virtual machine.
- **Storage addition.** Take advantage of the Windows Server 2008 R2 Hyper-V feature of hot-add storage. Your legacy application and database servers may have long since needed upgrades to their storage subsystems. Now virtualized, you can quickly and easily add storage at will, with no downtime.

Summing up

As this Guide has explained, the process of consolidating your servers to a virtual environment on a Dell PowerEdge M610 Server with Intel Xeon processor 5500 series running Hyper-V is relatively straightforward; you can perform a basic installation and convert physical machines to virtual in a couple of hours. We still recommend, however, that you first invest ample time in the pre-conversion planning phase. Doing so can help you avoid potential problems and help ensure a smooth conversion.

Appendix A. Configuring the storage

Configure your internal storage on the Dell PowerEdge M610 and the external storage iSCSI group on the Dell EqualLogic storage array by following these steps.

To complete the configuration of the internal storage, iSCSI storage, and switch, allow 35 minutes.

Configuring the internal storage

Perform the initial configuration of the internal storage on the Dell PowerEdge M610 server by following these steps. Allow approximately 10 minutes for configuring the internal storage.

1. Turn on the server.
2. During the boot sequence, you will see the message "Press <Ctrl><R> to Run Configuration Utility." Press <Ctrl><R>.



NOTE: You have only a few seconds to complete Step 2.

3. Configure the RAID 1 for the host OS. Select the controller for the internal drives, which is the PERC 6/i, and press Enter.
4. While Controller 0 is highlighted, press F2, and select Create New VD.
5. With the RAID level field highlighted, press Enter to open the drop-down list, and select RAID 1.
6. Using the Tab key to navigate, move to the Physical Disks section, and use the space bar to select the two internal drives (Drives 0 and 1). Then tab to highlight OK, and press Enter.
7. A message box appears telling you that initializing the RAID is highly recommended, but destructive. Press Enter to clear the message.
8. Highlight Virtual Disk 0, and press F2.
9. Select Initialization, press Enter, and select Start Init. When the system prompts you with any warnings, highlight OK, and press Enter.
10. Wait for the initialization to complete, exit the RAID utility, and reboot the server. (10 minutes)

Configuring the Dell EqualLogic PS5000XV and Dell PowerConnect 6248 switch

Perform the initial configuration on the Dell EqualLogic PS5000XV by following these steps. Allow approximately 15 minutes for configuring the Dell EqualLogic PS5000XV and 10 minutes for configuring the Dell PowerConnect 6248 switch.

- 1.** Connect a serial cable from a workstation to the Dell EqualLogic storage. Configure your serial client (e.g., PuTTY <http://www.putty.org>) to use the COM port designated by your machine.
- 2.** Cable eth0 on the Dell EqualLogic PS5000XV to the switch.
- 3.** Power on the storage array.
- 4.** When the application prompts you if you would like to configure the array, choose Yes.
- 5.** When the application prompts you for an IP address for eth0, enter a valid IP address.
- 6.** When the application prompts you for a subnet mask for eth0, enter a valid subnet mask.
- 7.** When the application prompts you if you want to configure a new group, select Yes.
- 8.** Enter the group IP address and the group name.
- 9.** Enter password information as requested by the configuration wizard.
- 10.** When the configuration is complete, disconnect the serial cable.
- 11.** Connect an Ethernet cable from the workstation to the switch, and configure the workstation IP address to be on the same subnet as the storage array.
- 12.** Open Internet Explorer and browse to the group IP address you designated in Step 8.
- 13.** Enter the user and password.
- 14.** Click the member, accept the warnings about the member not being configured, and choose to configure it.
- 15.** Choose RAID 10 as the raid policy, and leave the default storage pool.
- 16.** Click the member once more, and click the Network tab.
- 17.** Set the IP address for the remaining two NICs.
- 18.** Right-click each offline NIC, and bring each online.

- 19.** Right-click volumes, and choose new volume.
- 20.** Enter details about the volume, such as size, snapshot reserve, and so on. Click No access, and enable multiple initiators connection on the final configuration screen.
- 21.** Click the volume, and choose the Access tab.
- 22.** Click Add, and click OK to add access for the host operating system.
- 23.** Follow the steps specified by Dell support to enable maximum frame size above 9000 for jumbo frames on the Dell PowerConnect switch: <http://support.dell.com/support/edocs/network/pc62xx/en/UG/HTML/configud.htm#wp1309021>.
- 24.** Open the Port Configuration page.
- 25.** Click Show All. The Port Configuration Table appears.
- 26.** Specify the Unit and Port you are copying from in Copy Parameters From.
- 27.** Click Copy To for each Port to receive these parameters.
- 28.** Click Apply Changes. The Port Configuration settings are copied, and the device is updated.
- 29.** Copy the running configuration to the startup configuration by choosing the Copy Files page.
- 30.** Select Copy Configuration.
- 31.** Choose Running Configuration as the Source and Startup Configuration as the Destination.
- 32.** Click Apply Changes. Now your switch settings will persist on reboots.

Appendix B. Installing Windows Server 2008 R2 as the host operating system

Install Microsoft Windows Server 2008 Datacenter Edition R2 by following these steps. We provide approximate times for each group of steps in the first step of that group.

To complete the installation of Windows Server 2008 R2, allow 25 minutes on the Dell PowerEdge M610.

- 1.** Insert the Microsoft Windows Server 2008 R2 DVD into an external DVD drive, connect the DVD drive to the system, and reboot the system.
- 2.** During the boot, press F2 to enter setup.
- 3.** In setup, scroll down to CPU Information, and press Enter.
- 4.** Enable Virtualization Technology, if necessary.
- 5.** After you have checked the BIOS settings, press Escape to continue the boot. (2 minutes)
- 6.** During the boot, a Windows is loading files message appears, followed by a Windows booting loading bar. (1 minute)
- 7.** At the Install Windows Server 2008 screen, accept the defaults of English language, English time and currency format, and US keyboard or input method by clicking Next.
- 8.** Click Install now. (Less than 1 minute)
- 9.** At the Select the edition of Windows that you purchased screen, click Windows Server 2008 Datacenter Edition (Full Installation), and click Next.
- 10.** At the Please read the license terms screen, check the I accept the license terms checkbox, and click Next.
- 11.** At the Which type of installation do you want? screen, for Type of install, click Custom (Advanced).
- 12.** In the Where do you want to install Windows? screen, click Drive options (Advanced).
- 13.** Delete any existing partitions, recreate a partition, and format it. Highlight the partition, and click Next to start the installation. (12 minutes, during which Windows restarts)

- 14.**When the system indicates that you must change the user's password before you log on the first time, click OK.
- 15.**Enter a strong password in both the New password and Confirm password fields, and click the arrow.
- 16.**At the Your password has been changed prompt, click OK. Windows then prepares the desktop.
- 17.**Set the time zone.
- 18.**Set the IP address, subnet mask, and domain information as per the steps in the next section.
- 19.**Install Windows updates if applicable. At the time of this writing, there were no updates available yet for Windows Server 2008 R2. (download times will vary based on number and size of updates)
- 20.**Reboot the server after any updates install. (3 minutes)

Setting IP address, subnet mask, and domain information

After rebooting, set the static IP addresses and subnet mask using the following process:

- 1.** Click Start.
- 2.** Right-click Network, and select Properties.
- 3.** In the Network Sharing Center, click Manage network adapters.
- 4.** Right-click the Local Area Connection, and select Properties.
- 5.** In the Local Area Connection Properties dialog, highlight Internet Protocol Version 4 (TCP/IPv4), and click Properties.
- 6.** Click the radio button next to Use the following IP address.
- 7.** Enter the IP address you want the server to have, enter the Subnet mask, and enter the Preferred DNS server. Click OK.
- 8.** Close the Network Connections window.
- 9.** From the Start menu, right-click Computer, select Properties, and then select Change settings.
- 10.**Select the Computer Name tab.
- 11.**Click Change.
- 12.**Enter the server name.

- 13.** Click the Member of Domain radio button.
- 14.** Enter the domain name.
- 15.** Enter the user name and password when the system prompts you to do so. (less than 1 minute)
- 16.** When the Computer Name/Domain Changes window appears, click OK to close it.
- 17.** Click OK to go past the warning to restart.
- 18.** Click Restart Now to reboot the server. (3 minutes)

Appendix C. Configuring iSCSI in the host operating system

Configure iSCSI in the host operating system by following these steps. We provide approximate times for each step where the times are greater than 1 minute.

To complete the configuration of iSCSI in Windows Server 2008 R2, allow 15 minutes.

- 1.** Download the EqualLogic Host Integration Toolkit.
- 2.** Start the Host Integration Toolkit installation. Click Next on the welcome screen. Accept the license agreement, and click Next.
- 3.** Choose the typical installation, and click Next.
- 4.** You may receive an information message regarding the iSCSI Initiator service not running. Click Yes to enable the service and allow firewall rules to be created.
- 5.** Click Yes to allow the iSCSI service to start upon each reboot of the machine.
- 6.** Click Yes to enable echo requests through the firewall.
- 7.** Click Yes to install the Microsoft Multipath I/O automatically.
- 8.** Complete the install (5 minutes).
- 9.** Click Start, Administrative Tools, iSCSI Initiator. Navigate to the Discovery tab, and click Discover Portal to enter the EqualLogic group IP address.
- 10.** Enter the EqualLogic group IP address, and click OK.
- 11.** Select the appropriate LUN on the external storage, and click Connect.
- 12.** Ensure both checkboxes are enabled on the Connect to Target screen, so that this target is connected on each reboot, and also so that multipath will be enabled for this target.
- 13.** Configure the external LUN. Click Start.
- 14.** Expand Administrative Tools, and click Server Manager.
- 15.** In the left panel, expand Storage, and select Disk Management.
- 16.** Right-click the external LUN, and choose Online.
- 17.** Right-click the external LUN, choose Initialize Disk, and click OK.

- 18.** Right-click the unallocated disk, and select New Simple Volume.
- 19.** On the Welcome to the New Simple Volume Wizard screen, click Next.
- 20.** Leave the volume size at the default, and click Next.
- 21.** Leave the drive letter at the default, and click Next.
- 22.** On the Format Partition screen, do the following:
 - a. Leave the File System as NTFS.
 - b. Leave the Allocation Unit size at the default value.
 - c. Enter a volume name if you want the disk to have one.
 - d. Optionally, select the quick format checkbox.
- 23.** Click Next.

Appendix D. Installing the Hyper-V role

Follow the steps below to install Hyper-V on Windows Server 2008 R2. We provide approximate times for each step where the times are greater than one minute.

Allow at least 7 minutes for adding the Hyper-V role.

- 1.** Click Start.
- 2.** Expand Administrative Tools, and click Server Manager.
- 3.** Right-click Roles, and select Add Roles.
- 4.** On the Before You Begin page, click Next.
- 5.** On the Select Server Roles page, select Hyper-V, and click Next.
- 6.** On the Hyper-V page, click Next.
- 7.** On the Create Virtual Networks page, select the appropriate Local Area Connection, and click Next.
- 8.** On the Confirm Installation Selections page, click Install. (1 minute)
- 9.** On the Installation results screen, click Close.
- 10.** Click Yes when Windows prompts you to reboot the server. The server will reboot twice. (6 minutes)
- 11.** When you see the Installation Results page, click Close.

Appendix E. Installing System Center Virtual Machine Manager 2008 R2

Follow the steps below to install System Center Virtual Machine Manager on a separate system. We assume that you have installed Windows Server 2008 R2 and joined this system your Windows domain. We provide approximate times for each step where the times are greater than one minute.

Allow at least 60 minutes for installing SCVMM. Note: Installation times will vary based on the hardware of the SCVMM server, and also based on if you install SQL Server locally or remotely.

Configuring SCVMM 2008 R2 prerequisites

The prerequisites for SCVMM 2008 R2 include various IIS components, .NET 3.5 framework, and a SQL Server instance, either remote or local. For this prerequisites procedure, we assume that you have installed Windows Server 2008 R2.

1. Click Start, Administrative Tools, then Server Manager.
2. Click Roles, and choose to Add a Role.
3. Choose Web Server (IIS), and click Next twice.
4. Uncheck all default selections, and select the following Role services:
 - IIS 6 Metabase Compatibility
 - IIS 6 WMI Compatibility
 - Static Content
 - Default Document
 - Directory Browsing
 - HTTP Errors
 - ASP.NET
 - .NET Extensibility
 - ISAPI Extensions
 - ISAPI Filters
 - Request Filtering



NOTE: The application will prompt you to Add Required Role Services for ASP.NET.

5. Click Next, and click Install.
6. When the installation completes successfully, click Close.
7. In the Sever Manager window, click Features, and choose to Add a Feature.
8. Select .NET Framework 3.5.1, and click Next.

- 9.** Click Install.
- 10.** When you finish the installation successfully, click Close.

Installing SQL Server 2008

Follow the steps below to install SQL Server 2008 and SQL Server 2008 SP1. This assumes that SCVMM will use a local instance of SQL Server 2008. If you already have another SQL Server instance available for use by SCVMM, then this step is not necessary. Also, if you choose to simply install SQL Server Express Edition, this step is not necessary. Allow approximately 25 minutes for the installation of SQL Server 2008. Installation times may vary based on machine.

- 1.** Insert a SQL Server 2008 DVD into the disk drive, and click SETUP.EXE when the autoplay menu appears.
- 2.** If you receive a warning regarding compatibility issues with Windows Server 2008 R2, then click Run Program. You will fix this issue by installing SP1.
- 3.** Click OK to install any remaining prerequisites SQL Server 2008 requires.
- 4.** When the SQL Server Installation Center window appears, click Installation, and click New SQL Server stand-alone installation.
- 5.** Click Run program.
- 6.** After the Rule check completes with no errors, click OK.
- 7.** Enter the product key for your copy of SQL Server 2008, and click Next.
- 8.** Check the box beside I accept the license terms, and click Next.
- 9.** Click Install to install Setup Support Files.
- 10.** Once the Setup Support Files finish installing, SQL Server 2008 Setup will open a new window.
- 11.** SQL Server 2008 will then run a check of the Setup Support Rules.
- 12.** Once it is finished with no errors, click Next.
- 13.** At the Feature Selection screen, check the box beside the following features:
 - Database Engine Services
 - Client Tools Connectivity
 - Management Tools – Basic
 - Management Tools – Complete

- 14.** Click Next.
- 15.** At the Instance Configuration screen, accept the defaults, and click Next.
- 16.** Ensure that you have the required disk space to install, and click Next.
- 17.** At the Server Configuration screen, enter the proper credentials for SQL Server Agent and SQL Server Database Engine.
- 18.** Click Next.
- 19.** Select Mixed Mode (SQL Server authentication and Windows authentication).
- 20.** Enter a password for the Built-in SQL Server system administrator account.
- 21.** Click Add Current User, and click Next three times.
- 22.** Once the Installation Rules check is complete, click Next, and click Install to complete the installation.
- 23.** When the installation is complete, click Next, and click Close.
- 24.** Download SQL Server 2008 SP1 from <http://www.microsoft.com/downloads/details.aspx?FamilyID=66ab3dbb-bf3e-4f46-9559-ccc6a4f9dc19&displaylang=en>.
- 25.** Once the download completes, run SQLServer2008SP1-KB968369-x64-ENU.exe.
- 26.** Once the prerequisite check is complete, click Next.
- 27.** Check the box beside I accept the license terms, and click Next.
- 28.** Select the appropriate instances of SQL Server to update, and click Next.
- 29.** After the installer finishes checking files in use, click Next, and click Update.
- 30.** Click Next when the installer finishes updating the selected instances of SQL Server.
- 31.** Click Close.

Installing SCVMM 2008 R2

Note that we installed SCVMM 2008 R2 from the evaluation download, which required unpacking. You should allow for approximately 15 minutes for the installation of SCVMM 2008 R2.

- 1.** Launch setup.exe located in the CDLayout.EVAL folder once the RAR files are unpacked.
- 2.** Under the Setup heading, click VMM Server.
- 3.** Accept the license terms, and click Next.
- 4.** Choose whether or not to use Microsoft Update, and click Next.
- 5.** At the Customer Experience Improvement Program screen, make your selection, and click Next.
- 6.** At the Product Registration screen, enter your User name and Company, and click Next.
- 7.** After setup completes the prerequisites check with no errors, click Next.
- 8.** Accept the default location for the installation, and click Next.
- 9.** At the SQL Server Settings screen, select Use a supported version of SQL Server.
- 10.** Enter the Server name, and check the box next to Use the following credentials.
- 11.** Enter the appropriate User name, Domain, and Password.
- 12.** Select an existing instance of SQL Server, check the box next to Create a new database, and click Next. We used a local instance of SQL Server.
- 13.** Accept the default Library Share Setting, and click Next.
- 14.** Accept the port and VMM service account settings, and click Next.
- 15.** Click Install.
- 16.** Once the installation is complete, uncheck the box beside Check for the latest Virtual Machine Manager updates, and click Close.
- 17.** Return to the Microsoft System Center Virtual Machine Manager setup screen.
- 18.** Under the Setup heading, click VMM Administrator Console.
- 19.** Accept the License Terms, and click Next.

- 20.** Make your choices regarding Microsoft Update and the Customer Experience Improvement Program, and click Next.
- 21.** After setup completes the prerequisites check with no errors, click Next.
- 22.** Accept the default location for the installation, and click Next.
- 23.** Accept the default Port Assignment, and click Next.
- 24.** Click Install.
- 25.** Once the installation is complete, uncheck the box beside Check for the latest Virtual Machine Manager updates, and click Close.
- 26.** To add a Hyper-V host for P2V conversion, in SCVMM, open the System Center Virtual Machine Manager Admin Console via the shortcut on the desktop.
- 27.** At the Connect to Server prompt, enter the appropriate server name, and click Connect.
- 28.** Once the Virtual Machine Manager finishes loading, click Add Host on the right-hand side of the screen.
- 29.** Select the host location, and enter the appropriate credentials.
- 30.** Click Next.
- 31.** Enter the computer name of the host.
- 32.** Check the box beside Skip Active Directory name verification, and click Add.
- 33.** Select the host in the Selected servers list, and click Next.
- 34.** At the Configuration Settings screen, click Next.
- 35.** At the Host Properties screen, enter the desired path for new VMs, click Add, and click Next.
- 36.** The Jobs window will appear, showing the current progress of the Add virtual machine host task.
- 37.** Once the job receives a status of Completed, close the Jobs window.

Appendix F. Performing the physical to virtual (P2V) conversion

Follow the steps below to perform the P2V conversion for your legacy system to your new Hyper-V host using SCVMM 2008 R2. We provide approximate times for each step where the times are greater than one minute.

Allow at least 20 minutes for performing the P2V conversion. Note that your conversion time may be much longer if your source machine has large partitions that you are transferring.

1. In the Virtual Machine Manager Admin Console, click Convert physical server.
2. Enter the appropriate server name or IP address of the server you wish to convert as well as the appropriate credentials.
3. Click Next.
4. Enter the desired Virtual machine name, owner, and description.
5. Click Next.
6. At the System Information screen, click Scan System.
7. Once the System Scan is complete, click Next.
8. At the Volume Configuration screen, enter the desired VHD settings, and click Next.



NOTE: You cannot set the VHD size to a smaller amount than the physical volume size; you can only increase it.

9. Enter the desired number of processors and memory size, and click Next.
10. Select the desired host for the virtual machine, and click Next.
11. Enter the desired virtual machine path, and click Next.
12. If there is an existing virtual network you want to connect the new virtual machine to, select it from the drop down list, and click Next.
13. Select the desired actions for when the physical server starts and stops, and click Next. The Convert Physical Server (P2V) Wizard will check for any issues that need to be resolved before continuing with the conversion.
14. Once all issues are resolved and the message No issues detected appears, click Next.

- 15.**At the Summary screen, ensure that all properties have the desired value, and click Create.
- 16.**The Jobs window will appear, showing the current progress of the Physical-to-virtual conversion task.
- 17.**Once the job receives a status of Completed, close the Jobs window.

About Principled Technologies

We provide industry-leading technology assessment and fact-based marketing services. We bring to every assignment extensive experience with and expertise in all aspects of technology testing and analysis, from researching new technologies, to developing new methodologies, to testing with existing and new tools.

When the assessment is complete, we know how to present the results to a broad range of target audiences. We provide our clients with the materials they need, from market-focused data to use in their own collateral to custom sales aids, such as test reports, performance assessments, and white papers. Every document reflects the results of our trusted independent analysis.

We provide customized services that focus on our clients' individual requirements. Whether the technology involves hardware, software, Web sites, or services, we offer the experience, expertise, and tools to help you assess how it will fare against its competition, its performance, whether it's ready to go to market, and its quality and reliability.

Our founders, Mark L. Van Name and Bill Catchings, have worked together in technology assessment for over 20 years. As journalists, they published over a thousand articles on a wide array of technology subjects. They created and led the Ziff-Davis Benchmark Operation, which developed such industry-standard benchmarks as Ziff Davis Media's Winstone and WebBench. They founded and led eTesting Labs, and after the acquisition of that company by Lionbridge Technologies were the head and CTO of VeriTest.



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