



Microsoft®
System Center

Microsoft System Center Virtual Machine Manager 2008

General overview white paper

*Microsoft Corporation
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Executive Summary

Server virtualization promises to revolutionize the way IT administrators provision and manage their server infrastructure. The Microsoft® System Center family of products is a comprehensive solution optimized for the management of Microsoft Windows Server® operating systems running in the virtual data center. System Center Virtual Machine Manager 2008 provides centralized administration of virtual machine infrastructure, helps increase physical server utilization, and enables rapid provisioning of new virtual machines by the administrator and authorized end users.

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Introduction

In today's business climate, IT environments are becoming more complex, and the people who manage them are often asked to lower costs and improve operational efficiency. With greater demand on IT to solve business challenges, data centers quickly fill to capacity, and each new server purchase increases capital and operating expenditures as well as power and cooling costs. At the same time, servers are underutilized; on average, only 5 percent of a typical server's capacity is actually used.

Provisioning new machines is a lengthy process measured in days and months, making it difficult for IT to keep pace with the rate of business growth and change. In addition, managing servers can be labor-intensive, and the need to provision and tear-down test and development environments can consume valuable resources and time.

Virtual machine technology has great potential to change the cost of IT. Many IT organizations view virtualization as the disruptive yet promising technology that will help them get more from their servers and create a more adaptable and agile data center.

Virtualization at a Glance

Traditionally, applications are closely associated with the physical servers they run on. Virtual machine technology creates an abstraction layer between the physical hardware and software, so that IT administrators can run multiple virtual machines on a single physical server. This approach offers a host of benefits:

- Increased asset utilization – Servers running virtual machines can operate at 60 percent utilization or greater, depending on the availability requirements of their workloads.
- Lower power, space, and cooling costs – Data center operations are more efficient with more applications on fewer physical machines.
- Faster response to business needs – Instead of having to manually set up a new physical machine, IT administrators can easily provision new virtual machines for development teams and business units.

Virtualization Issues

Although virtual machine technology offers compelling benefits, it also presents challenges unique to a virtual data center. Before engaging in a virtualization project and while evaluating virtualization technologies, IT organizations need to carefully consider the following issues, among others:

- How to integrate virtual machine management into other data center management solutions.
- How to make use of current investments in Microsoft® Windows Server technologies.
- How to ensure efficient, unified management of both virtual and physical data center assets.
- How to reduce the risk of operating in a new virtual environment.

Microsoft System Center

For IT professionals responsible for managing their virtual infrastructure, Microsoft® System Center—the Microsoft family of system management products—is a comprehensive solution optimized for the management of Microsoft Windows Server operating systems running in the virtualized data center.

- System Center Virtual Machine Manager 2008 (VMM) - Delivers simple and complete support for consolidating multiple physical servers within a virtual infrastructure, thereby helping to increase overall utilization of physical servers. Virtual Machine Manager 2008 (VMM) also enables administrators and authorized users to rapidly provision virtual machines.
- System Center Data Protection Manager 2007 - Provides continuous data protection on physical and virtual machines for backup and business continuity.
- System Center Operations Manager 2007 - Provides a sophisticated solution for unified health monitoring of physical and virtual machines.

- System Center Configuration Manager provides a comprehensive solution for change and configuration management.

Together, the System Center family of products provides the best solution for using existing IT administrative skills with physical servers.

This white paper provides a general overview of System Center Virtual Machine Manager 2008 and explains how VMM addresses the key issues related to consolidating assets and managing a virtualized environment.

Virtual Machine Manager Architecture

VMM is an enterprise-ready management solution for virtual data centers that uses an organization's existing expertise and investments in Microsoft Windows Server® technology.

Components

Figure 1 illustrates the elements of the VMM architecture.

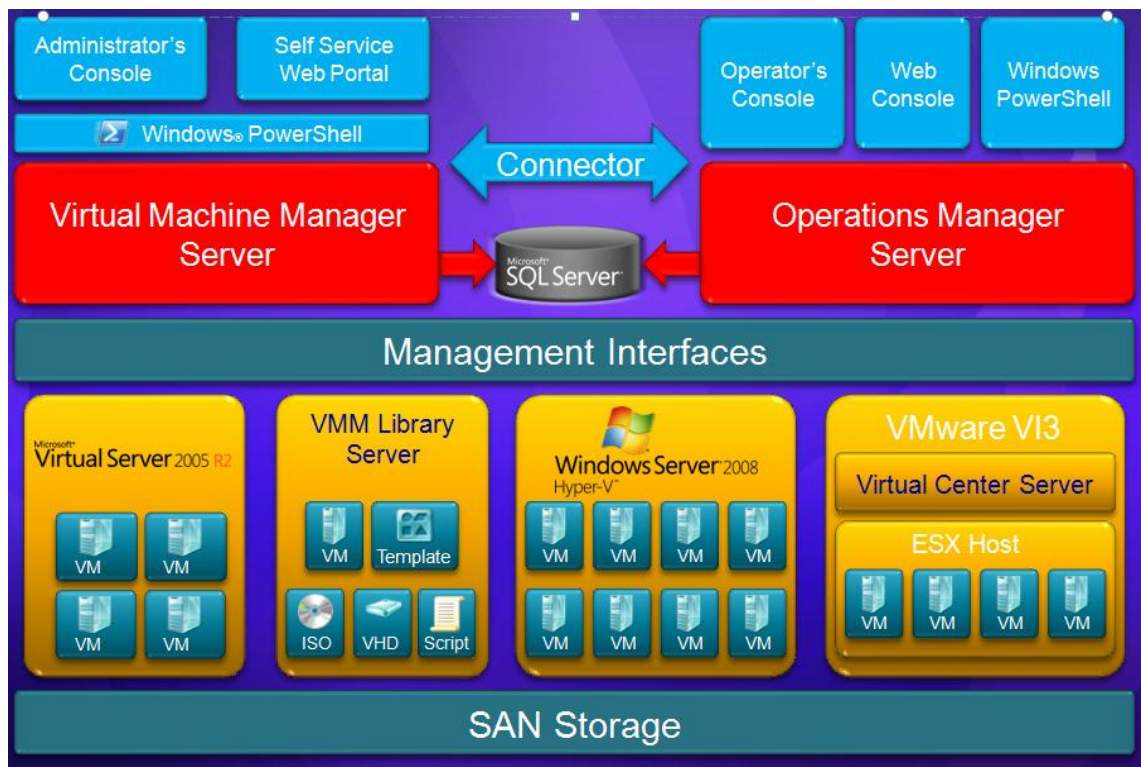


Figure 1 - VMM architecture

Virtual Machine Manager Server

The Virtual Machine Manager Server is the core process that communicates with the virtual machine hosts and maintains the system information in a Microsoft SQL Server™ 2005 database. The VMM Server runs on either the 64-bit version of Windows Server 2008. The VMM Server can scale to manage hundreds of Virtual Machine Hosts running thousands of virtual machines, all concurrently. The SQL Server database can be hosted on all versions of SQL Server 2005 from Microsoft SQL Server 2005 Express to Microsoft SQL Server 2005 Enterprise Edition for larger deployments. The VMM Server can be accessed through the System Center Virtual Machine Manager 2008 Administrator Console, Windows PowerShell™ command line, or through the Delegated Management and Provisioning portal. A connector provides a near real-time

connectivity with System Center Operations Manager 2007 if it is present, enabling the integrated management of both physical and virtual hosts.

Administrator Console

The graphical user-interface (GUI) allows administrators to effectively manage an environment of hundreds of virtual machines. The Virtual Machine Manager Administrator Console is built on the familiar System Center framework user interface so that administrators can quickly and easily become proficient at managing their virtual machines. Figure 2 shows the key features of the Administrator Console user interface. The VMM Administrator Console is designed to manage large deployments with easy sorting, categorization, search, and navigation features. The Administrator Console is built upon a Windows PowerShell command-line interface. Any action in the Administrator Console can be done through the Windows PowerShell command-line and each wizard in the user interface can show the associated command-line actions. In addition, the Administrator Console integrates with System Center Operations Manager 2007 to provide insight into the physical environment as well as the virtual environment. With the ability to map the relationship of virtual and physical assets, IT administrators can more effectively plan hardware maintenance, for example.

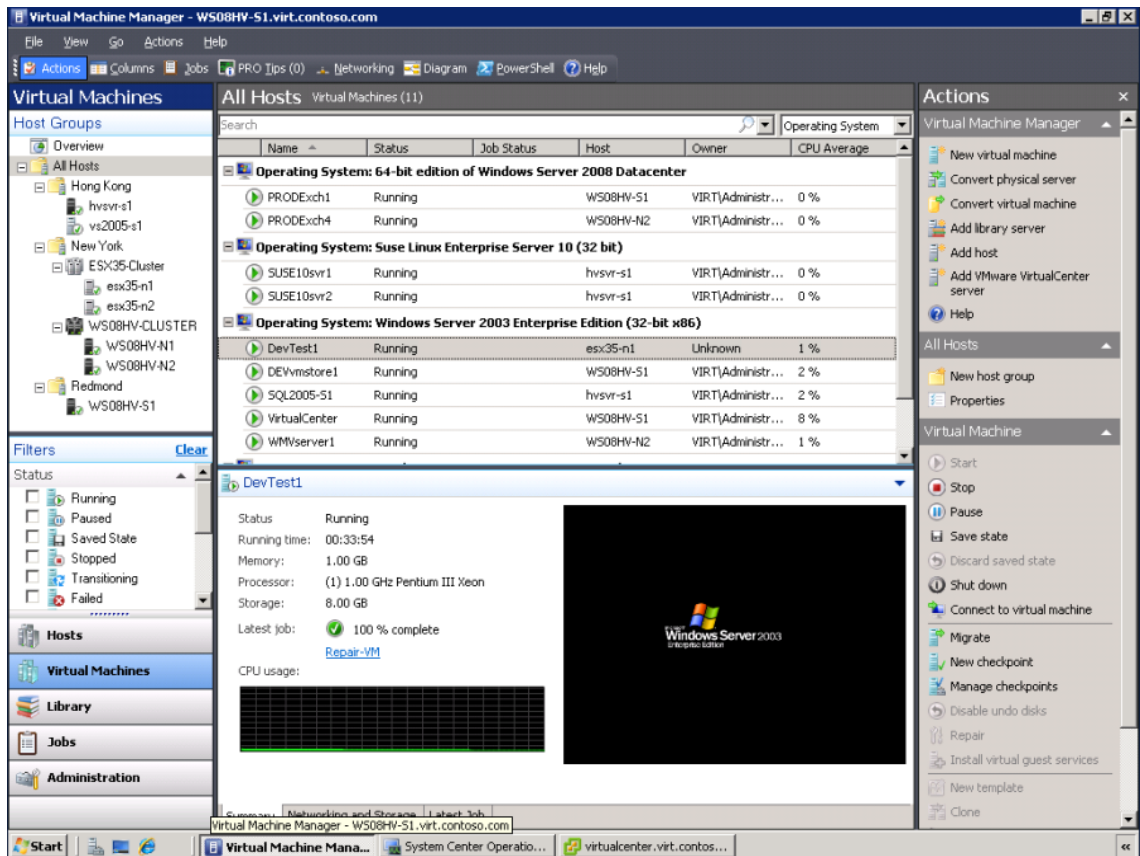


Figure 2 - The VMM Administrator Console

Windows PowerShell Command-Line Interface

The new Windows PowerShell command line shell and scripting language helps IT administrators more easily control systems and accelerate automation. Windows PowerShell offers more than 170 standard command-line tools, and consistent syntax and utilities, and is easy to adopt, learn, and use because it works with your existing IT infrastructure and script investments. Each VMM operation is directly mapped to a Windows PowerShell cmdlet, allowing for easy command-line actions.

Delegated Management and Provisioning Web Portal

In addition to using the GUI administrator console and the Windows PowerShell command-line interface, administrator-designated end-users and others can access VMM by way of a Web portal designed for user self-service, shown in Figure 3. This portal enables test and development users to quickly provision new virtual machines for themselves, according to controls set by the administrator.

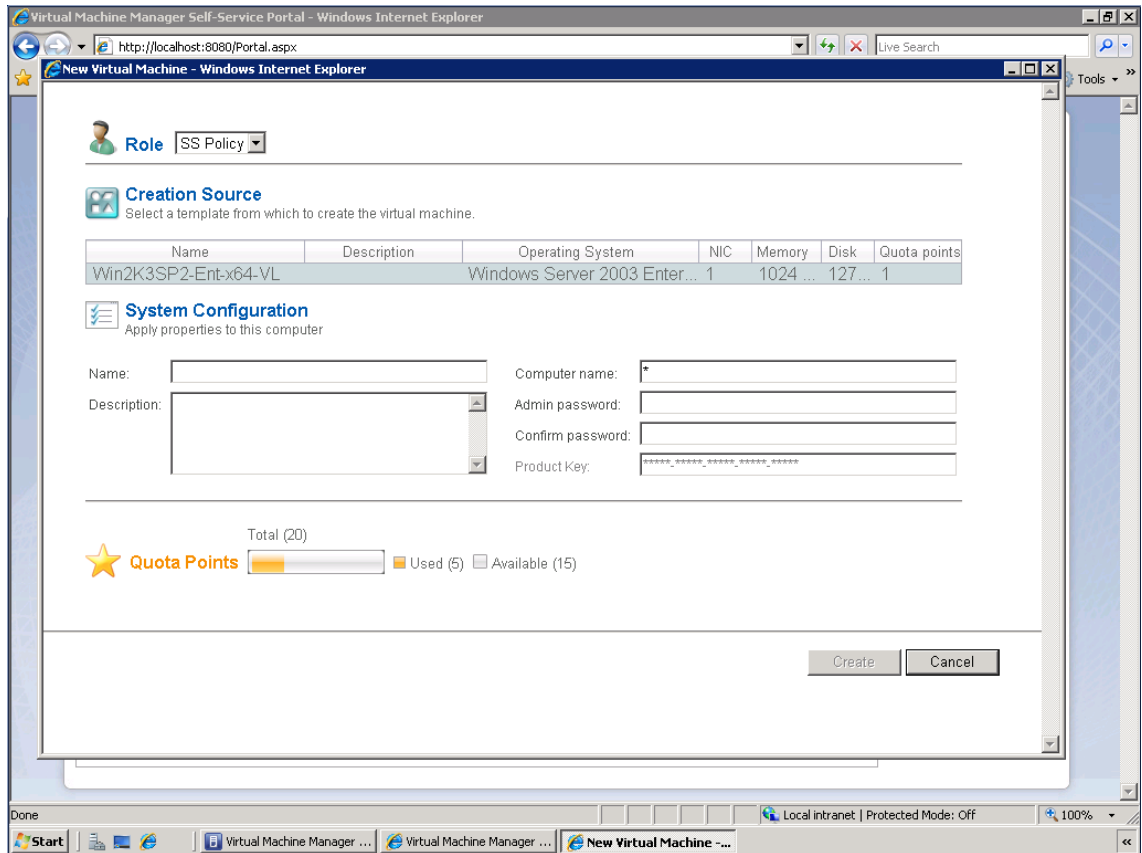


Figure 3 - The VMM Delegated Management and Provisioning Web Portal

Microsoft SQL Server Database

VMM stores performance and configuration data, virtual machine settings, and other virtual machine metadata in a local SQL Server 2005 database. For reporting, Virtual Machine Manager takes advantage of SQL Server 2005 Reporting Services through Operations Manager. Larger organizations can also configure VMM to work with a remote clustered SQL Server database and a storage-area network (SAN) or network-attached storage (NAS) system, if needed.

Virtual Machine Hosts

VMM manages virtual machine hosts, which are physical servers running the following virtualization software:

- Microsoft Virtual Server 2005 R2 - Virtual Server 2005 R2 is a hosted server virtualization technology engineered for the Windows Server 2003 platform, and runs most major x86-based operating systems in a guest environment. Virtual Server 2005 R2 runs on both 32-bit x86 and 64-bit x64 hosts. It provides support for 32-bit virtual machine guests.
- Microsoft Windows Server 2008 Hyper-V - Hyper-V is a hypervisor-based virtualization platform that Microsoft has included with Windows Server 2008. Unlike Virtual Server 2005 R2 which is a hosted technology running on top of the Windows Server 2003 operating system, Hyper-V is a

hypervisor based technology and it runs directly on the system hardware. Hyper-V can run on a full Windows Server 2008 installation or it can run on a minimal Server Core installation for maximum performance with minimal overhead. Hyper-V requires a 64-bit x64 host and provides support for 32-bit and 64-bit guest virtual machines.

- Microsoft Hyper-V Server is a standalone offering that allows customers to consolidate Windows or Linux workloads onto a single physical server without the need to acquire a Windows Server license. It also is hypervisor based technology that runs directly on the system hardware.
- VMware ESX - In addition to managing the two Microsoft virtualization products System Center Virtual Machine Manager 2008 is also able to interact with VMware's Virtual Infrastructure 3 (VI3) enabling the management of VMware virtual machines running on ESX. VMware's VirtualCenter for VMware Server is required for the management of VMware hosts.

Microsoft Windows hosts must have the VMM agent software installed. Communications between the software agent and the VMM server are encrypted and packaged according to the Web Services for Management (WS-MAN) protocol.

VMM Library Servers

The virtualized data center relies on the ability to find and maintain very large image files for virtual machines (known as virtual hard drives, or VHD files). Unlike a physical server, these virtual hard drives can be unintentionally lost or duplicated.

VMM provides a complete library to help administrators quickly create new virtual machines. The library organizes and manages all the "building blocks" of the virtual data center in a single interface, including:

- Stored virtual machines
- Virtual hard disks
- CD/DVD software images, also called ISO files
- Post-deployment customization scripts
- Hardware configurations
- PowerShell Scripts
- Templates

For geographically disperse operations, distributed VMM library servers facilitate the quick transmission of assets to physical hosts at the edge of the organization, enabling rapid creation and deployment of virtual machines in branch offices.

Topologies

VMM is suitable for a range of virtual environments ranging from single machine installation to a corporate data center to a distributed enterprise environment.

Stand-alone Topology

In a single machine installation, VMM runs on the same physical hardware as the Windows virtual machine server. This configuration is ideal for small development teams that need to rapidly build virtual machines for test purposes. A local SQL Server database hosts library files.

Corporate Topology

For standard data center environments, VMM offers a management solution that monitors and controls virtual machines running on co-located servers. In these scenarios, VMM is most advantageously paired with other System Center products, such as System Center Data Protection Manager, System Center Configuration Manager, and System Center Operations Manager.

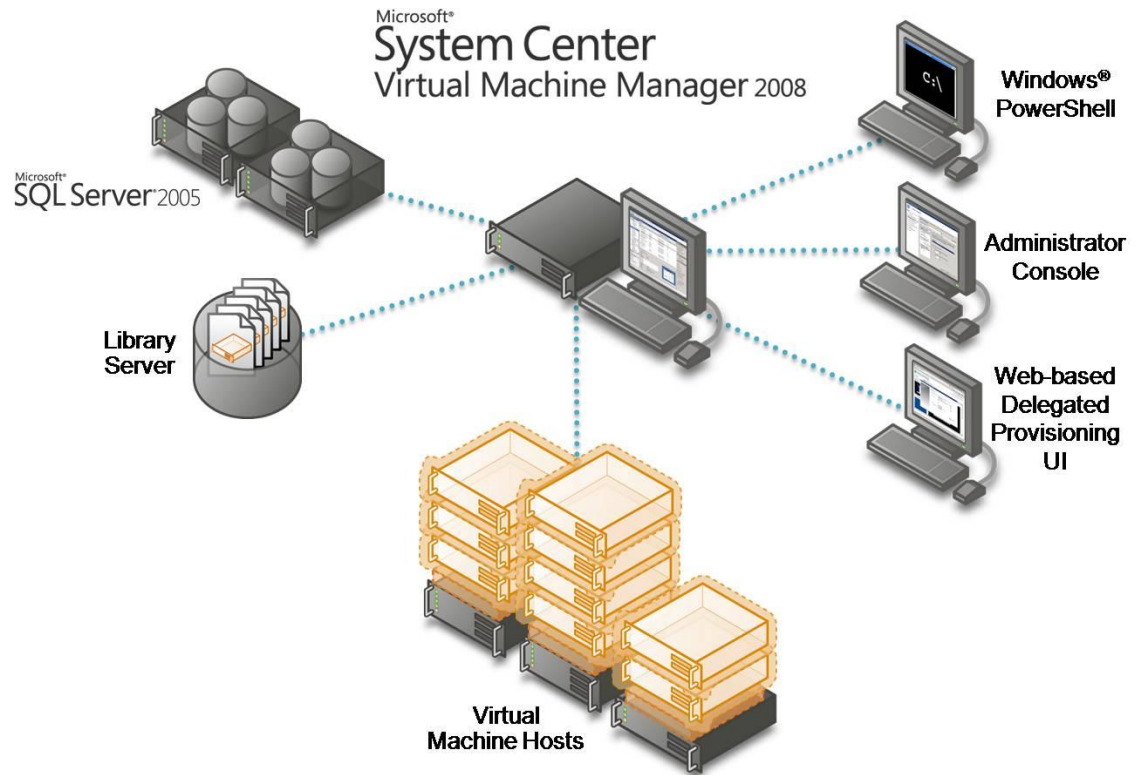


Figure 5 - Corporate data center topology

Enterprise Topology

VMM is enterprise-ready, offering enterprise-class features, especially the ability to manage thousands of both Microsoft and VMware virtual machines distributed across various network environments. VMM supports management of hosts on a perimeter network (also known as DMZ, demilitarized zone, and screened subnet) and also the utilization of a remote clustered SQL Server database.

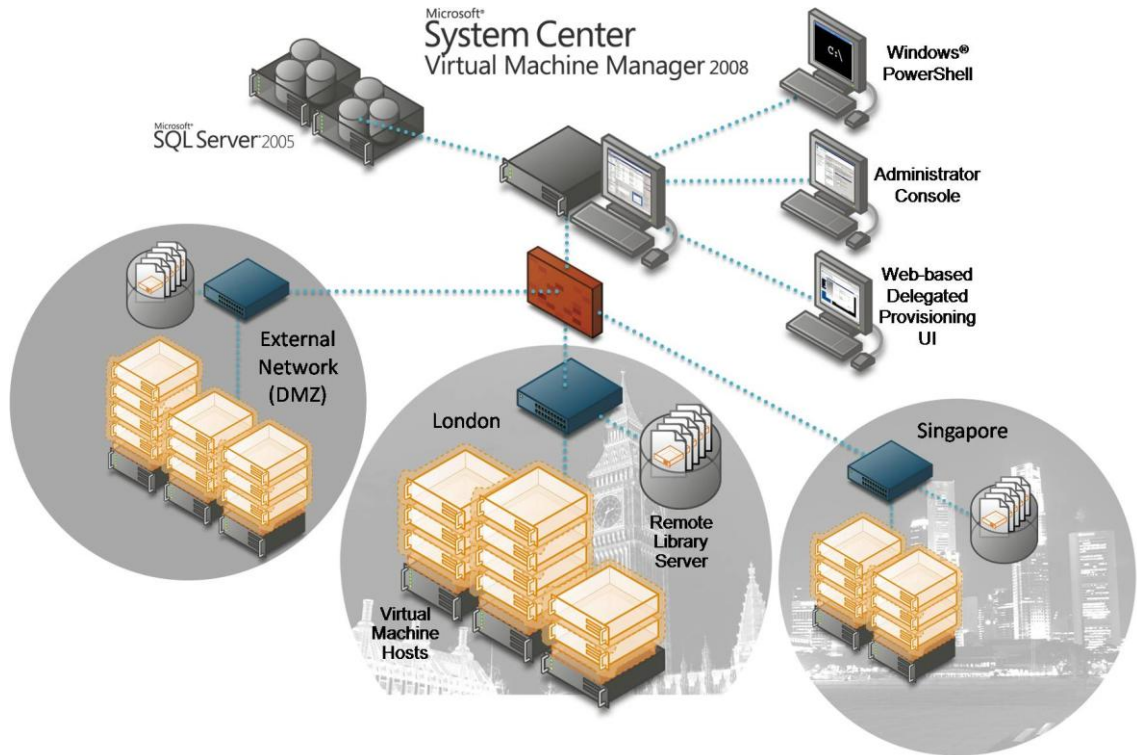


Figure 6 - Enterprise topology with remote server environments

Key Scenarios

VMM was built to specifically enhance the productivity of IT administrators when planning, deploying, maintaining, and optimizing the virtual data center. The sections below describe how VMM helps administrators tackle the challenges of consolidating the physical environment and provisioning virtual machines.

Consolidation

By consolidating their physical servers, organizations realize two significant business benefits: power savings and increased asset utilization. Organizations can either take an incremental or “all-at-once” approach to consolidation. The conservative, incremental approach means new applications are added to the virtual infrastructure while old applications remain on dedicated physical assets until retired. A more aggressive approach takes the form of a consolidation project where the IT group identifies candidate applications for virtualization and migrates those workloads to appropriate physical resources.

Identification of Consolidation Candidates

Whether the IT group chooses an incremental approach or an active consolidation project, VMM provides tools to simplify the process and improve results. For example, the first step in migrating from a physical data center, in which every workload exists on its own physical server, is to identify appropriate physical workloads for consolidation into the virtual server infrastructure.

VMM helps administrators identify the right physical servers for consolidation based on direct analysis of the performance counters of the target machine or if it is available, historical performance data stored in the Microsoft System Center Operations Manager database. The VMM consolidation candidates report provides an easy-to-understand summary of an application’s long-term performance. By using this view, administrators can ensure applications with seasonal surges in demand have adequate resources.

Physical-to-Virtual Conversion

- P2V is a core feature of System Center Virtual Machine Manager (VMM), no additional costs per conversion
- VMM P2V includes the ability to create images of physical hard disks, prepare them for use in a virtual machine, and create the final virtual machine for an end-to-end P2V solution
- Supports Microsoft Windows® 2000 Server, Windows Server 2003, Windows Server 2003 R2, Windows XP, Windows Vista, and Windows Server 2008
- Simple wizard integrated in the main VMM user interface is used to perform the conversions
- P2V process is also completely scriptable by way of Windows PowerShell and can be done in stages (imaging, fix-up, virtual machine creation)

Physical-to-Virtual Conversion

After identifying underutilized servers, IT administrators need to convert their physical machines to virtual ones, a process known as Physical to Virtual (P2V) conversion. This process can be unnecessarily slow and error-prone and conversions can fail or cause disruptions to important live applications. VMM mitigates these problems by integrating P2V conversions into the management application and providing time-saving tools.

Converting physical servers into virtual machines is easy with VMM, which provides a task-based wizard to guide the administrator through the process. VMM utilizes Windows Server Volume Shadow Copy Service to create virtual machines without having to interrupt the source physical server. Since the P2V process is completely

scriptable, large scale P2V conversions can quickly and easily be done through the Windows PowerShell command-line.

Virtual-to-Virtual Conversion

In addition to P2V conversions, VMM can also perform Virtual-to-Virtual (V2V) conversions for VMware virtual machines. V2V conversions can be run from either the administrative console or from the command line using VMM’s PowerShell commands. Like the P2V conversion, V2V utilizes a high performance block-based conversion process. The V2V conversion can convert either an entire VMware virtual machine or its

disk image file to Microsoft's virtual machine format. The V2V conversion process performs all required fix-ups to make the converted virtual machine bootable.

Intelligent Placement

One aspect where Virtual Machine Manager (VMM) outshines its competition is in helping administrators decide on which physical hosts to place virtual machines. VMM uses the performance data gathered from the Virtual Machine hosts. If data is available from System Center Operations Manager, VMM will also use that data for identifying potential candidate servers for consolidation to the virtual infrastructure.

Incorporating Historical Data

Companies who are also using System Center Operations Manager 2007 can take advantage of that solution's comprehensive database of operational performance statistics. By using this historical performance data, the VMM can take into account weekly, monthly, or seasonal patterns when analyzing potential consolidation candidates. This historical perspective is a unique advantage of System Center, and proves especially useful when considering how to place multiple virtual machines on multiple physical host candidates.

Load-Balancing or Resource-Maximization

Administrators use one of two default algorithms to tune the Intelligent Placement results. The load-balancing algorithm is meant for situations in which the administrator needs to equally distribute workloads across a set number of servers. For situations where the administrator wants to avoid adding servers, the resource-maximization algorithm helps ensure deployed servers are fully utilized.

system resources.

All actions performed through VMM are tracked with a complete audit history. This information includes what changes were made, which User ID performed the action, and when the action took place. This allows the administrator to have a complete history of actions taken with VMM.

Intelligent Placement

VMM assists IT administrators in the important task of placing virtual machines on appropriate physical server hosts. Selecting the appropriate virtual server host for a given workload is the key to maximizing the utilization of physical assets, whether your organization's goal is to balance loads among existing hosts or to maximize resource usage on each host. The process of selecting the best host for a given virtual machine is called Intelligent Placement. Intelligent placement can be used with both Microsoft and VMware servers.

When optimizing physical server hosts for virtual machines, IT administrators need to pay special attention to small details such as the processor and memory specifications. Additionally, the performance of servers is constantly fluctuating based on usage trends, so IT administrators need some way of tracking ongoing requirements and historical performance data. Consequently, Intelligent Placement is one of the most complicated aspects of virtualization. VMM provides administrators with a toolset to handle this task.

To help administrators make placement decisions, VMM uses a holistic approach to selecting appropriate hosts based on these four factors:

- The workload's resource consumption characteristics
- Minimum CPU, disk, RAM, and network capacity requirements
- Performance data from virtual machine hosts

VMM uses Intelligent Placement to provide administrators with a star-ranked list of hosts, showing the most appropriate host for the given workload. Figure 7 shows the results of the Intelligent Placement process.

VMM incorporates these considerations into algorithms that IT administrators can fine tune to maximize resource utilization or balance workloads among hosts.

Also, after a virtual machine is deployed, System Center Operations Manager 2007 can be integrated with VMM, allowing administrators to continue to analyze performance data and resource requirements for both the workload and the host. Thus, administrators can monitor and manage the virtual machine's operations as well as further optimize their

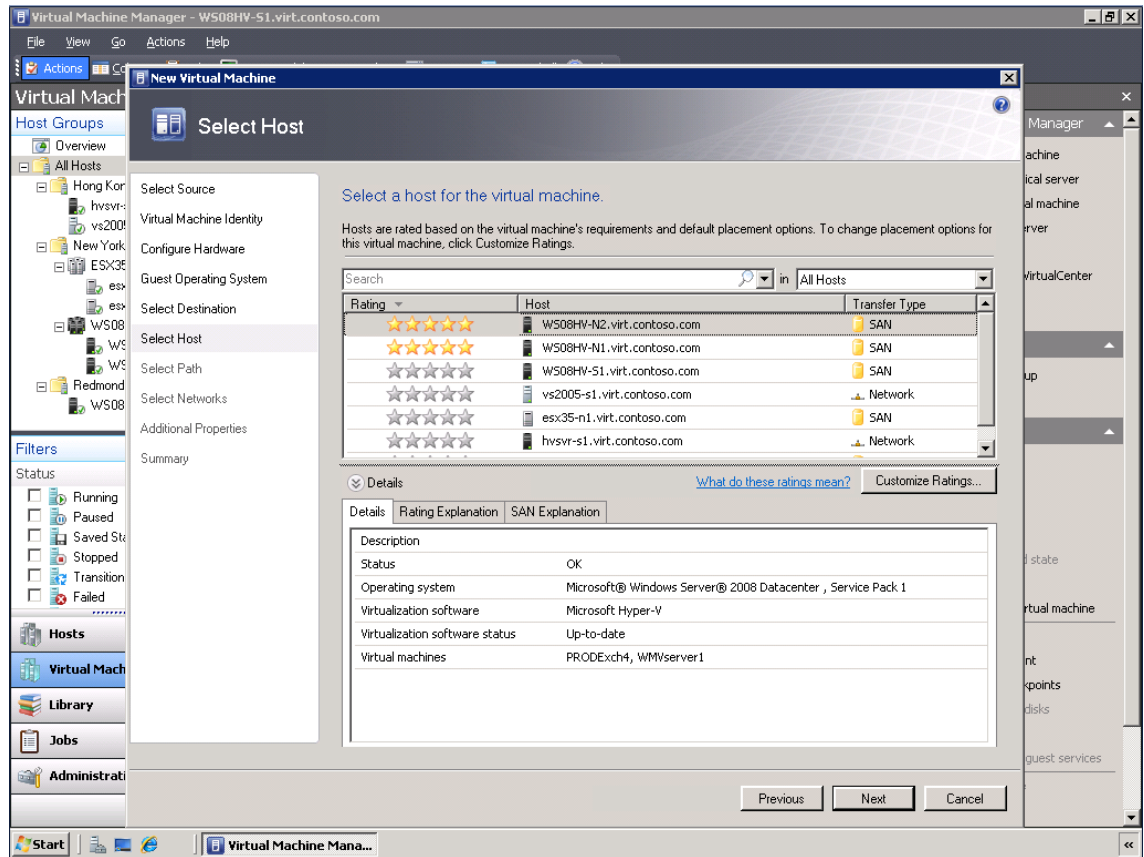


Figure 7- The Intelligent Placement report provides an easy-to-understand ranking of host candidates

Provisioning

Whereas consolidation provides compelling baseline benefits, virtualization with VMM also makes the IT group more responsive to business needs. The reason is quite simple—with virtualization, IT administrators no longer have to procure and configure physical servers for new applications, a task that normally takes weeks or months. Instead, IT administrators can provision new virtual machines in a matter of minutes using the VMM library and Administrator Console. Better yet, with VMM, administrators can delegate this provisioning role to authorized users and administrators can create delegated administrators for groups and departments while maintaining precise control over the management of virtual machines. Authorized users work from a simple Web page that enables provisioning of virtual machines within preset controls.

With VMM, IT administrators not only provision new server resources faster, they also maintain strict control over virtual assets. Unlike in a physical data center, where administrators seldom lose servers, it is unfortunately all too easy to lose track of analogous virtual assets. The VMM library serves as a centrally

Virtual Machine Manager Library

Just like in the physical data center, IT administrators rely on certain tools to help them manage the virtual data center. The VMM library stores, sorts, and catalogs all the important building blocks for the virtual data center.

Distributed Libraries

For geographically dispersed organizations, VMM supports the use of distributed libraries. If a New York-based company has branch offices in London and Tokyo, for instance, users in those locations could build virtual machines from local library resources instead of copying multi-gigabyte files over the Internet.

Library Creation

Creating VMM libraries is mostly an automated exercise. Administrators create a file share and then designate it as the library in VMM. VMM then detects, sorts, and catalogs all files in the share.

Library Management

The VMM library provides 10 free-form fields for entering metadata about library assets. Administrators can use these custom attributes to track order numbers, associated cost, or author—whatever information might aid management. In addition, the library automatically collects basic information about offline virtual machines, such as hard drive size and operating system version.

managed repository for templates and other building-block resources. This service helps keep important virtual assets from being duplicated, misfiled, or even deleted.

The VMM library stores virtual assets, including:

- **Offline virtual machines** – The ability to store and quickly re-provision virtual machines makes it more likely that users and administrators will take applications offline that are used episodically, such as applications used for demonstrations. This function saves resources that would otherwise be wasted.
- **Templates** – Wizard-based templates help speed the deployment of new machines, and help ensure that standard hardware and software configurations are used.
- **Software images** – IT administrators use these disc images as an alternative to physical media for software distribution. With these disc images, administrators can distribute software to remote sites using a wide-area network.
- **Post-deployment customization scripts** – After virtual machines are set up, scripts can be deployed to ensure updated security settings or take care of other administrator functions.
- **Physical hardware settings** – With common pre-set hardware settings readily available, IT administrators have control similar to that in a physical environment.

In addition, the VMM provisioning service automatically detects and utilizes existing SAN infrastructure where available. This capability,

coupled with VMM's distributed storage architecture, facilitates the movement of large virtual machine images at the fastest speeds possible.

Administrator Provisioning

Administrators can quickly build new virtual machines from the Administrator Console. This can be done through a variety of methods, including using templates and other resources found in the VMM library. For example, templates are essentially standard virtual machine configurations similar to the mini-setup and System Preparation Utility (Sysprep) commonly used in Windows® operating system deployments. These templates encapsulate best practices regarding hardware and guest operating system configuration, helping IT administrators manage their virtual infrastructure with confidence in the uniformity of the environment.

After selecting the appropriate template, the administrator follows a wizard-based flow that guides them through configuration then on through activating the virtual machine. At this stage, VMM collects performance data from potential hosts and suggests the optimal hosts for the new virtual machine based on a tailored algorithm. Finally, the virtual machine is placed on the physical host.

Delegated Administration

Administrators also have the ability to delegate administrative functions to other members of the organization for more efficient virtual machine management. This capability is particularly useful for branch and departmental deployments in which local personnel can be given rights to manage a scoped environment. Administrators can control delegated administration through policies which designate the capabilities of each delegated administrator.

End User VM Provisioning

One of the most commonly used virtualization scenarios is testing newly developed applications on a virtual infrastructure. In test and development environments, IT professionals are constantly provisioning and tearing down virtual machines. And while virtualization simplifies this task compared to provisioning physical hardware, IT administrators typically still play a role because the administrator is needed to create the virtual machines used in the organization's test environment.

Windows PowerShell

For even greater automation and control, VMM is fully scriptable using Windows PowerShell. With this tool, IT administrators can run remote scripted services against many virtual machines, thus avoiding labor-intensive manual processes. For example, IT administrators can write Windows PowerShell scripts to perform batch P2V conversions or batch Virtual 2 Virtual (V2V) conversions of virtual disks to the VHD format.

The Virtual Machine Manager (VMM) console interface is layered on top of the Windows PowerShell objects, so that every Wizard action can show the associated command-line script. Easy to adopt, learn, and use, the Windows PowerShell architecture enables IT administrators to quickly construct lightweight integration solutions, linking System Center and established data center tools and procedures. The VMM PowerShell snap-in provides 170+ cmdlets and all PowerShell operations are logged and audited.

VMM alleviates this administration burden with a simply designed self-service Web portal where authorized test and development staff can provision their own virtual machine resources under preset controls. Administrators control access to physical servers and can designate host groups for individuals and groups. Authorized users work from templates and manage only the virtual machines they, or their group, own. Additionally, administrators can set quotas on resources available to users. The delegated provisioning scenario is accessed using a web browser and doesn't require a client on the host. Large numbers of users can be given delegated-provisioning privileges.

Business Continuity

Enabling business continuity for virtual server hosts and their virtual machines is another key scenario for VMM. VMM works with Windows Server 2008's enhanced failover clustering to provide enhanced availability for virtual machine hosts and guests. VMM is cluster-aware and will automatically configure all of the required high

availability settings, adding Windows Server hosts that are part of a failover cluster. VMM performs virtual machine high availability configuration for discovered virtual machines. In addition, VMM will automatically perform complete cluster configuration for new virtual machines created in the failover cluster.

Performance and Resource Optimization

Performance and Resource Optimization (PRO) helps administrators ensure that virtual machine hosts and their virtual machine guests are operating in the most efficient possible manner. VMM's PRO leverages System Center Operations Manager 2007 to monitor a complete end-to-end IT infrastructure including hardware, host and guest operating systems, and applications. Further, PRO enables you to create operational policies and automatically take actions based on those policies. When an event occurs that triggers a policy, PRO can be configured to present the issues to the administrator along with recommended resolutions. PRO can also be configured to automatically implement the preconfigured corrective actions for lights-out operations.

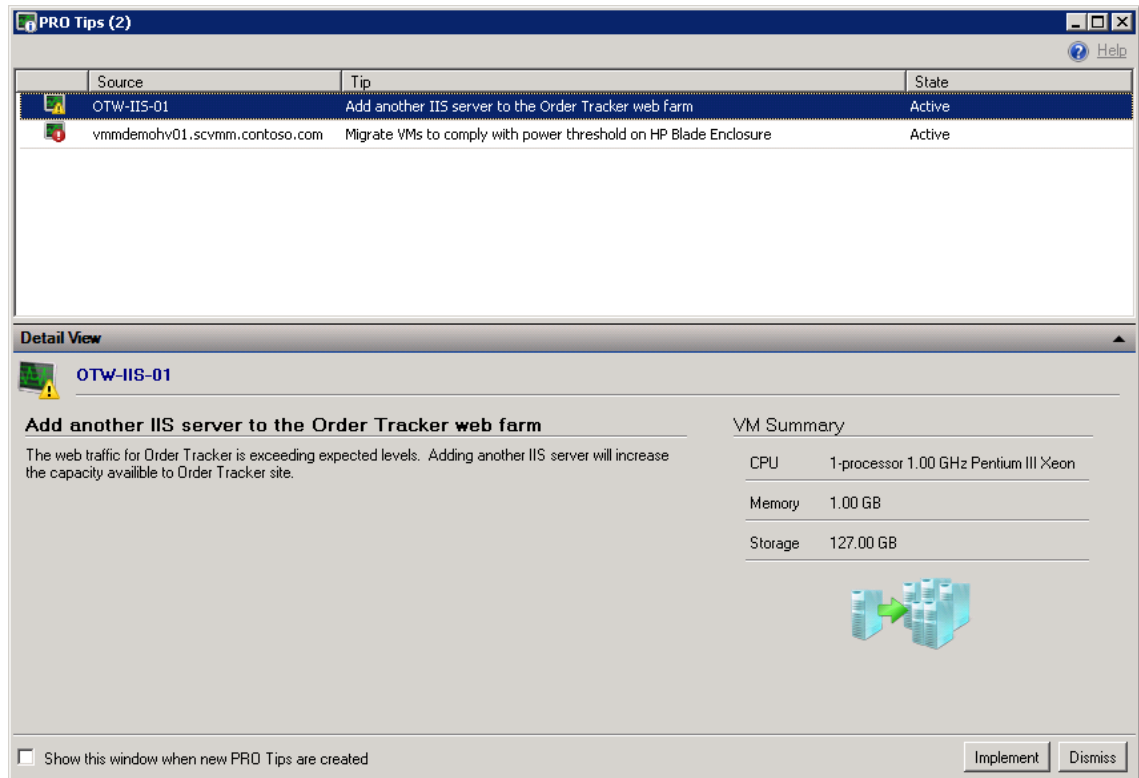


Figure 8 -PRO provides comprehensive end-to-end monitoring of VM hosts and guests

Because PRO is a part of System Center Virtual Machine Manager 2008 it can extend these automated management capabilities to both Microsoft and VMware hosts. When managing VMware hosts, PRO can take full advantage of VMware's VMotion capability to move virtual machines between hosts with no downtime. When managing Microsoft hosts, PRO is able to use Quick Migration to rapidly move virtual machines between hosts. PRO is built on an open and extensible framework allowing organizations and third-party developers to develop custom rules and actions for their own environments. These custom rules are known as PRO packs.

PRO provides an end-to-end management solution and is unique in that it is able to monitor virtual machine hosts and virtual machine guests, as well as the applications running in those guest operating systems. This monitoring provides a holistic picture of the health of an organization's IT infrastructure. PRO can notify administrators when predefined operational boundaries are exceeded, and can then automatically take corrective actions. For example, PRO can be configured to monitor the CPU utilization on a virtual machine host and if the utilization exceeds a predefined threshold PRO can initiate either manual or automatic corrective actions.

If PRO has been set up to use manual corrective actions a Tip detailing a reported problem and suggesting corrective actions will display in the VMM console. The administrator can then implement the corrective actions by clicking a button in the VMM console. The specific corrective actions are set up by the organization, but can entail using VMM's Intelligent Placement and Quick Migration capabilities to move a VM to a more suitable host, thereby reducing the virtualization host's CPU utilization.

Another scenario could be monitoring web application usage and automatically adding web server capacity. In this scenario, PRO and System Center Operations Manager 2007 can be used to set up a rule that monitors the transaction volume of the organization's web farm. If the transaction level exceeds the specified threshold then PRO can be configured to raise a Tip in the VMM console. The administrator can then implement the Tip and automatically provision a new VM to add to the web farm that contains the

organization's LOB web application. Bringing the new web server online would then drop the transaction levels down into the acceptable range.

Conclusion

VMM provides end-to-end management capabilities for planning, deploying, managing, and optimizing virtual infrastructures. The capabilities range from helping identify prime consolidation candidates to improving the placement process with sophisticated algorithms. Designed for today's heterogeneous environments, System Center Virtual Machine Manager 2008 provides the capability for managing both Microsoft and VMware hosts. It also helps improve the most vital tasks associated with consolidating physical servers through Intelligent Placement and PV2 and V2V migration.

VMM's new PRO functionality enables complete end-to-end management of virtual machines, hosts, guests, and even the applications running on those virtual machine guests. This gives an administrator a complete picture of the health of the IT infrastructure and the tools to dynamically manage that infrastructure. When it comes to ongoing management of the virtual data center, VMM provides IT administrators productivity-boosting tools such as Windows PowerShell scripting, Administrator Console, a centralized library of virtual machine assets, and self-service provisioning.

The System Center family of products is a comprehensive solution optimized for the management of both Microsoft and VMware virtual machines running in the virtualized data center. VMM, in conjunction with System Center Data Protection Manager 2007, System Center Operations Manager 2007, and System Center Configuration Manager 2007, offers a comprehensive solution for change and configuration management. Together, the System Center family of products provides the best solution for using existing IT administrative skills with physical servers.

For More Information

To find out more about Virtual Machine Manager, please visit:
www.microsoft.com/systemcenter/scvmm/default.mspx

For information about the Microsoft System Center family of system management products, visit:
www.microsoft.com/systemcenter/default.aspx

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