



Self-Service Provisioning and the Private Cloud

Using Microsoft Server Virtualization and Dell Compellent Storage Virtualization to Improve Delivery of Infrastructure as a Service

Solution Overview

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Abstract: This white paper outlines an approach to creating a private cloud computing environment that enables an organization to meet the needs of diverse constituents quickly and with high efficiency. At the heart of this approach lies an optimized self-service provisioning portal based on Microsoft virtualization technologies and the Dell™ Compellent® Storage Center SAN™ solution.

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Executive Summary

Organizations can gain greater efficiency and flexibility—even as they reduce costs—by using a combination of Windows Server 2008® R2 Hyper-V™ and Dell™ Compellent® Fluid Data™ storage to virtualize their IT infrastructures. Using a small number of robust physical servers, organizations can now provide an infrastructure supporting hundreds of virtual machines (VMs). And by using Microsoft System Center Virtual Machine Manager (VMM) and the System Center Virtual Machine Manager Self-Service Portal (VMMSSP) 2.0 or above to manage this small number of physical servers as a private cloud computing solution, an organization can take virtualization to the next level, giving IT teams the agility and scalability to adapt to constant change—quickly, efficiently and on demand.

With its Fluid Data architecture, Dell Compellent provides an ideal storage environment for organizations deploying a private cloud environment. Dell Compellent storage area networks (SANs) intelligently manage and migrate data at a very granular level. They offer powerful storage automation and management features, including thin provisioning, automated tiered storage, continuous snapshots, and much more.

How can an organization make the most of this combination of technologies? Microsoft offers powerful tools for managing the virtual machine space, and VMMSSP effectively enables business units and groups within an organization to self-provision virtual machines on-demand, without IT intervention. The problem for organizations, though, is that VMMSSP has no Microsoft Windows PowerShell™ cmdlets to facilitate the provisioning of storage in a virtual environment. Without a way to provision storage resources in an automated, programmatic manner, the efficiencies enabled by the self-service portal are compromised. The IT department must become involved and provision the entire virtual environment for the business unit that wants a solution.

Dell Compellent has met this challenge with a set of Storage Center PowerShell cmdlets that plug into VMMSSP version 2.0 and above. These cmdlets can be called by the provisioning scripts running within VMMSSP to automate and expedite not just the provisioning of new VMs but also the provisioning of the storage resources that these new VMs will need.

This white paper explores the business benefits that this combination of Dell Compellent and Microsoft technologies can deliver to organizations contemplating the deployment of a virtualized private cloud computing environment.

Using the Dell Compellent Solution Pack for SCVMM SSP 2.0, an organization can use Virtual Machine Manager Self-Service Portal 2.0 and higher to provision not just virtual machines but also the SAN resources that those VMs require—something that VMMSSP by itself does not do.

Introduction

Virtualization and the emergence of private cloud computing provide today's organizations with powerful new ways to provide business groups with the computing and infrastructure resources they need—more quickly and cost-effectively than ever before. For many business groups, virtual machines (VMs) can provide precisely the resources they require without those groups having to jump through the hoops associated with gaining access to the same resources delivered through a physical infrastructure. Both the IT team and the business organization benefit from the absence of physical infrastructure, the elimination of long approval and purchasing cycles, and the speed with which virtual resources can be brought online and into service for the business group.

Yet managing these virtual resources presents new challenges for today's IT departments. The IT organization must manage incoming requests for services. VMs must be properly provisioned and managed, and meeting these challenges efficiently and cost-effectively requires new tools and new approaches.

Dell Compellent and Microsoft have developed a set of tools that can simplify and streamline the task of provisioning and managing the virtualized resources supporting a private cloud environment. These tools can help you respond more rapidly to your organization's needs through the deployment of a powerful self-service portal, even as they enable you to manage and deliver services more efficiently and cost-effectively.

Microsoft and Dell Compellent have developed a set of tools that can simplify and streamline the task of provisioning and managing the virtualized resources supporting a private cloud environment.

The Challenges Facing Organizations Today

Hardware and software resources have been moving closer and closer to individual business units for several years. A human resources organization, for example, requests a dedicated, externally-facing website upon which to post job openings; it also requests a database in which to maintain candidate job applications and a conduit that will enable it to move information from an application into its HR line of business applications seamlessly.

Similar requests come in from business and operations groups throughout an organization. The specifics of the requests may differ, but they all have several things in common:

- Each group wants infrastructure resources to support their businesses.
- Each group wants those resources at their disposal quickly.
- And each group wants assurances of reliability, availability, and more—all the “-ilities” one has come to associate with a true business system.

IT organizations around the world have struggled to meet these demands for years. The realities of capital equipment approval and procurement cycles make it nearly impossible to acquire new hardware quickly. Typically, procuring new hardware takes

several weeks—which means several weeks before the hardware is even in place to meet the needs of the business unit that has requested support.

The pace of hardware acquisition is not the only challenge. Even before an organization orders new hardware, the hardware must be configured—and right-sizing hardware to meet the needs of growing business units can pose its own challenges. How much memory and storage are needed? What kind of CPU is appropriate? At what point will the resource needs of the business unit outstrip the capacity of this new hardware?

And then there are the administrative challenges: ensuring that there are enough IT professionals to administer and maintain the hardware and software that the business units require, ensuring that the hardware and software is up to date, ensuring that problems are found and fixed before they become disruptive. In short, as much as organizations want to push computing resources out into the hands of the business units, the traditional approach to delivering computing resources does not lend itself to meeting the needs of either the business units or the IT department.

Virtualization can provide a much more efficient and cost-effective way to deliver IT resources to your organization, yet managing those resources requires different tools and a new mindset.

Meeting Today's Challenges: The Private Cloud

To overcome these challenges, Microsoft and Dell Compellent offer virtualized private cloud solutions that enable an organization to respond quickly and cost-effectively to the needs of its constituents.

The Private Cloud Defined

First, what is a private cloud? Think of a private cloud as a set of dedicated computing, storage, and other infrastructure resources whose whereabouts are essentially immaterial. The physical servers and storage systems may sit in your corporate data center; they may also sit in a data center owned and managed by a third party (this is often called a *hosted* private cloud).

Regardless of the location of the data center, the resources in a private cloud *act* as though deployed locally and solely for a specific business unit. Again, the physical servers and storage systems may be in a data center in California, but they act as though they were located in a storage closet down the hallway. And while the HR group in the earlier example can interact with its own web server as though it were a dedicated machine serving no other organization, the resources that constitute that web server and its backend storage are actually pooled and shared across all business units using the private cloud infrastructure. This provides optimum efficiency and flexibility while cutting costs.

Virtualization and the Private Cloud

Virtualization takes this idea one step further. In a private cloud that uses virtual machines, the web server that the HR group has asked for is not even a distinct physical machine. It is a VM that exists as one of many VMs in a virtual data center—

which itself sits on hardware that resides somewhere on the network. Running Windows Server 2008 R2 Hyper-V, a small number of robust physical servers can support a virtual data center running hundreds of VMs.

In terms of delivering services and computing resources for that HR group, a VM acts the same way a physical machine does. The HR group interacts with it in just the same way it would interact with a physical machine. In short, VMs offer the features and benefits of physical machines without the overhead and challenges that accompany physical machines.

This ability to provide business groups with virtualized resources from the cloud makes all the difference for an organization striving to push computing resources closer to those groups. Once the physical infrastructure has been created to support the virtualized machine space, VMs can be created on demand. They require no lengthy procurement cycles. They require no human resources capable of racking and stacking.

In the Storage Center PowerShell cmdlets, Dell Compellent provides the missing links that facilitate end to end automation for provisioning VMs.

The Challenge of Managing and Provisioning the Private Cloud

The fact that VMs can be created on demand creates tremendous opportunities for organizations. But with those opportunities come new IT challenges: How do you manage these virtual machines? How do you provision them efficiently, consistently, and correctly? Moreover, how do you provision the storage and network resources that these VMs require?

Microsoft provides a management foundation through System Center Virtual Machine Manager 2008 (VMM), a member of the System Center family of systems management products and solutions. VMM provides a straightforward, cost-effective solution for unified management of physical and virtual machines. To facilitate the provisioning of virtual machines, organizations can use the Virtual Machine Manager Self-Service Portal (VMMSSP) 2.0 and above. By plugging this download into VMM, an organization gains a portal that business units can use to initiate the automated provisioning of VMs. Once a business unit selects a VM infrastructure template from a library of preconfigured images, VMMSSP sends a request for the deployment of the infrastructure to the virtualization administrator. Once the request is approved, the business unit can use VMMSSP to quickly provision VMs on demand using the template.

Provisioning Storage in the Private Cloud

Out of the box, VMMSSP can provision Hyper-V-based VMs. However, VMMSSP cannot provision the virtual storage resources that those VMs will use—at least, not out of the box. To use VMMSSP to configure storage resources, an organization must add to VMMSSP a solution developed by a storage system provider.

Dell Compellent has developed just such a solution: a set of Dell Compellent Storage Center PowerShell cmdlets for VMMSSP that an IT organization can use to automate the provisioning of Dell Compellent Storage Center SAN resources for VMs. By installing these Storage Center PowerShell cmdlets in VMMSSP, an IT organization eliminates the need to configure Dell Compellent Storage Center SAN resources individually for each

VM. The Storage Center PowerShell cmdlets interact with the VM provisioning cmdlets within VMMSSP to ensure the programmatic creation of VMs that take full advantage of the power and efficiencies afforded by Dell Compellent Storage Center SAN—including pointer-based snapshots, automated tiered storage, and thin provisioning. And because this provisioning activity is programmatic, the potential for configuration error is minimized, storage services can be provisioned consistently and according to established corporate policies, and the entire provisioning process can occur rapidly, efficiently, and transparently—even when initiated by people who are not IT professionals.

This approach also offers other benefits.

Traditionally, when data center administrators provision Hyper-V VMs using a template in VMM, the system creates the VMs within the virtualized environment by copying a virtual hard disk (VHD) from a repository on a local area network. The VHD volume is typically complete and ready for use, configured with an operating system image.

However, because each VM consumes just as much storage capacity as the base disk image—10 gigabytes (GB), for example—the provisioning uses significant network bandwidth, wastes disk space, and can take a long time. Creating just one VM with this approach can take 20 minutes or more and, in this case, consumes 10 GB of storage capacity.

Using the Dell Compellent Storage Center PowerShell cmdlets, though, an organization can deploy the same VM in just 20 to 30 seconds. Instead of creating full copies of the VHD by importing them over the LAN, the Storage Center PowerShell cmdlets use a gold disk image on the SAN as a Dell Compellent Replay (space-efficient snapshot). No network resources are involved at all. Moreover, each VM created through the Storage Center PowerShell cmdlets shares the same gold image, and the only storage capacity consumed beyond that base image is the negligible space required for the unique characteristics of each VM.

Dell Compellent provides a solution that organizations can plug into VMMSSP to automate the provisioning of Dell Compellent Storage Center SAN resources, eliminating the need to provision these resources manually each time a VM is created.

Constructing the Private Cloud for Automated Self-Provisioning

To create a private cloud environment as described in this paper, an organization needs a virtualization platform built on servers running Windows Server 2008 R2 Enterprise or Datacenter Edition, Hyper-V, and System Center Virtual Machine Manager Self-Service Portal 2.0 or above. Along with the dedicated servers supporting this virtualization platform, the organization needs at least one Dell Compellent Storage Center SAN.

Once the Hyper-V environment has been created and System Center Virtual Machine Manager Self-Service Portal 2.0 has been installed, someone responsible for managing data center resources can copy the Storage Center PowerShell cmdlets for VMMSSP directly from the Dell Compellent Knowledge Center and save them as Task Lock Scripts in VMMSSP. The Lock Scripts themselves will be called from within the body of the main VMMSSP PowerShell scripts when VMMSSP is used to provision the individual VMs.

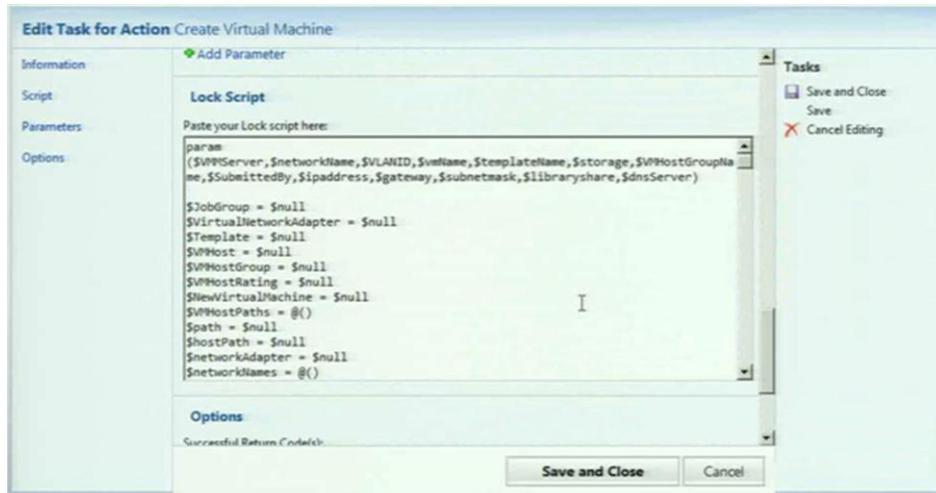


Figure 1: Deploying the Dell Compellent Storage Center PowerShell cmdlets is a matter of downloading the cmdlets from the Compellent Knowledge Center, pasting them into VMMSSP, and identifying the specific components in your environment.

Integrating the Dell Compellent Storage Center PowerShell cmdlets is a relatively straightforward task that is detailed in the documentation that accompanies the download. Using the Edit Task for Action pane within VMMSSP, the manager of the VM environment must identify the Dell Compellent Storage Center SAN resources to be allocated to VMs—and there may be different resources allocated to different VM disk images—but the task of configuring the Storage Center PowerShell cmdlets themselves may take only moments. Once appropriate parameters are incorporated into the Storage Center PowerShell cmdlets, they are ready for use through the VMMSSP.

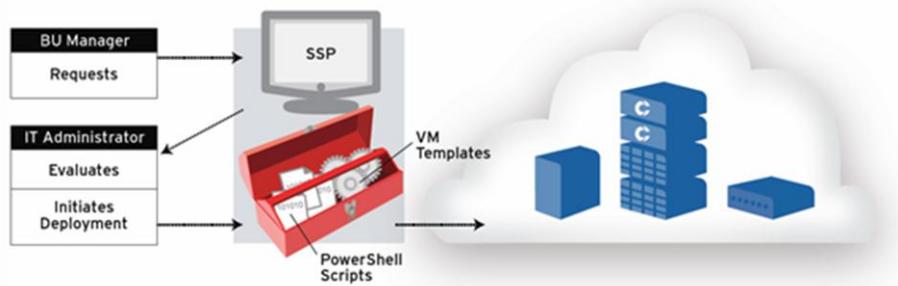


Figure 2: Because the Compellent Storage Center PowerShell cmdlets integrate easily with VMMSSP, business units can quickly and efficiently provision the IT resources they need.

The result? Once a request for new infrastructure is approved, VMMSSP performs all the tasks required to create the new virtual device—from selecting the Replay (snapshot) from which to deploy the VM to provisioning the storage itself. Without this automation, provisioning a complete VM might take 20 or 30 minutes at the hands of an experienced administrator. With the combination of VMMSSP and the Dell Compellent Storage Center PowerShell cmdlets, a complete machine, fully and properly configured, can be provisioned and made available to the business group requesting it in just a matter of seconds.

Conclusion

A virtualized private cloud environment offers unprecedented levels of flexibility and efficiency. Organizations can enable the use of IT resources more quickly and cost-effectively than ever before, ensuring that business units and programs throughout the organization have access to the resources they need when they need them.

Microsoft offers organizations powerful tools for hosting and managing a virtualized private cloud environment. Windows Server 2008 R2 Hyper-V builds on the resources most organizations already possess. Microsoft System Center, System Center Virtual Machine Manager, and Virtual Machine Manager extensions such as the Virtual Machine Manager Self-Service Portal 2.0 provide powerful tools for managing and automating large portions of this private cloud environment.

These tools do not, however, automatically provision or manage the virtualized storage resources that a virtualized private cloud environment requires. For that reason, Dell Compellent has created a set of Storage Center PowerShell cmdlets that an organization can plug into the automated provisioning engine in VMMSSP. By calling these Storage Center PowerShell cmdlets in the course of provisioning a VM, the self-service portal can provision a complete VM automatically—in seconds, not minutes or hours.

By using the Microsoft and Dell Compellent provisioning cmdlets together, organizations can create a more efficient and streamlined environment in which to take advantage of the benefits offered by a virtualized private cloud. They help lower operating costs, free up IT personnel to perform other value-added tasks within the enterprise, and facilitate the delivery of properly configured computing resources to the business units that can use them to advance the mission of the organization.

Additional Information

About Dell Compellent

To learn more about Dell Compellent, please visit <http://www.compellent.com>.

About Microsoft Virtualization Solutions

Microsoft provides a complete suite of technologies to enable an integrated, end-to-end, virtualized infrastructure. Using products that span the desktop to the data center, Microsoft technologies bring capacities online in real-time, as needed, streamline and provision applications, services and data on-demand, accelerate backup and recovery, and enhance availability to protect against system failure and service interruptions. Microsoft's extensive partner ecosystem complements and extends the Microsoft virtualization toolset with products for desktops, servers, applications, storage, and networks. Together with our partners, we deliver the most robust, complete solutions for the virtualized infrastructure. For more information about Microsoft Joint Virtualization Solutions, visit <http://www.microsoft.com/virtualization/partners.mspx>.

For more information, please see:

Go Virtual with Dell Compellent and Microsoft:

<http://connect.compellent.com/?elqPURLPage=92>

Storage Center SAN Overview:

<http://www.compellent.com/Products.aspx>

The Dell Compellent/Microsoft Alliance Web site:

<http://www.compellent.com/Microsoft>

Microsoft Virtualization Solutions:

<http://www.microsoft.com/virtualization/solutions>

Microsoft Virtualization Partners:

<http://www.microsoft.com/virtualization/en/us/partner-profile-compellent.aspx>

Microsoft Private Cloud Overview:

<http://www.microsoft.com/privatecloud>

System Center Virtual Machine Manager Self-Service Portal Overview:

<http://www.microsoft.com/ssp>

When ready to take the next step, please contact Dell Compellent sales at sales@compellent.com or contact by phone at (877) 715-3300.