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<tbody>
<tr>
<td>1/31/2013</td>
<td>1.0</td>
<td>Marty Glaser</td>
<td>Initial release</td>
</tr>
</tbody>
</table>
1 Preface

1.1 Audience

This document is highly technical and is intended for storage, systems, and cloud administrators interested in learning more about how Microsoft System Center Virtual Machine Manager (SCVMM) 2012 SP1 integrates via SMI-S with the Dell Compellent Storage Center for provisioning and managing Hyper-V host and guest VMs. This includes the creation of SAN copy-capable templates for rapid-provisioning of new guest VMs. Readers should have a good working knowledge of SCVMM 2012 SP1, Microsoft Server 2012 Hyper-V and the Dell Compellent Storage Center.

1.2 Purpose

This document provides best practices recommendations for how to do the following:

- Configure the Dell Compellent SMI-S provider (version 1.5, included for free with Enterprise manager 6.3) for SCVMM 2012 SP1
- Use SCVMM 2012 SP1 (via SMI-S) to discover, classify, and manage Dell Compellent SAN storage
- Configure the SCVMM 2012 SP1 fabric
- Use SCVMM 2012 SP1 to create OS and hardware profiles, templates, user roles, and private clouds on Dell Compellent storage
- Create SAN copy-capable templates to facilitate rapid-provisioning of space-efficient Hyper-V guest VMs on managed Dell Compellent SAN storage

1.2.1 Environments Running the Prior Release of SCVMM 2012 with EM 5.5

When SCVMM 2012 (prior to SP1) was first released in early 2012, it was supported on Server 2008 R2 only. Two best practices guides are available on the Dell Compellent Knowledge Center for the initial release of SCVMM 2012 (prior to SP1) as follows:

- Best Practices for Configuring the Dell Compellent SMI-S provider for Microsoft SCVMM 2012 (prior to the release of SP1)

For environments that are running the prior release of SCVMM 2012 (not SP1) on Server 2008 R2, or that are running Enterprise Manager 5.5 (which includes version 1.4 of the SMI-S provider), please refer to the above two documents.

1.2.2 Environments Running SCVMM 2012 SP1 and EM 6.3

Because of the many improvements and changes introduced with SCVMM 2012 SP1 and Enterprise Manager 6.3, this new best practices guide was created. The most significant change with SCVMM 2012 SP1 and Enterprise Manager 6.3 is full support for Server 2012.
1.2.3 Disclaimer

Please note that the information contained within this best practices document is to provide general recommendations only. Configurations may need to vary in customer environments for many reasons, such as individual circumstances, budget constraints, service level agreements, applicable industry-specific regulations, and other business needs.

1.3 Customer Support

Dell Compellent provides live support at 1-866-EZSTORE (866.397.8673), 24 hours a day, 7 days a week, 365 days a year. For additional support, email Dell Compellent at support@compellent.com. Dell Compellent responds to emails during normal business hours.
2 Introduction

2.1 Dell Compellent Storage Center Overview
The Dell Compellent Storage Center is an enterprise-class storage area network (SAN) that significantly lowers capital expenditures, reduces storage management and administration time, provides continuous data availability and enables storage virtualization. Storage Center’s Fluid Data Architecture manages data dynamically at the block-level, maximizing utilization, automating tiered storage, simplifying replication and speeding data recovery.

2.2 Dell Compellent SMI-S Provider 1.5
The Storage Management Initiative Specification (SMI-S) is a standard interface specification developed by the Storage Networking Industry Association (SNIA). Based on the Common Information Model (CIM) and Web-Based Enterprise Management (WBEM) standards, SMI-S defines common protocols and data models that enable interoperability between storage vendor software and hardware.

The Dell Compellent SMI-S Provider version 1.5 works with the open source OpenPegasus CIM Server, which is bundled with the Enterprise Manager Data Collector version 6.3. SMI-S can be configured during initial Data Collector installation or post-installation by modifying the Data Collector Manager properties. When SMI-S is enabled and configured, the Data Collector automatically installs and manages the Dell Compellent SMI-S Provider and the OpenPegasus CIM Server; no additional installation is required.

For more information about the Dell Compellent SMI-S 1.5 provider, please refer to the Dell Compellent Enterprise Manager 6.3 User Guide as found on the Knowledge Center.

2.3 Microsoft SCVMM 2012 SP1
Microsoft System Center 2012 SP1 is a cloud and datacenter management solution that provides a common management toolset for public and private cloud services and applications. SP1 includes support for Server 2012.

Virtual Machine Manager 2012 SP1 (as a component of the Microsoft System Center 2012 cloud and datacenter management suite) allows administrators to:

- Deliver Infrastructure as a Service (IaaS). Datacenter resources such as processing, networking, and storage can be pooled and virtualized and made available via self-service role-based user access.
- Apply cloud principles to provisioning and servicing datacenter applications with techniques like service modeling, service configuration and image based management.
- Server application virtualization allows applications and services to be managed independently from the underlying infrastructure.
• Optimize and manage multi-hypervisor environments such as Hyper-V, Xen and VMware.
• Dynamic optimization of datacenter resources based on workload demands.

A typical deployment of SCVMM 2012 SP1 includes the following components, which may be installed on the same server in smaller environments, or different servers in larger environments:

• SCVMM 2012 SP1 server (the database component – using SQL 2012)
• SCVMM 2012 SP1 Manager console (the management GUI)
• SCVMM 2012 SP1 library server
• SCVMM command shell

2.3.1 Access SCVMM 2012 SP1

The primary user interface for accessing SCVMM 2012 SP1 is the SCVMM Manager console. The SCVMM Manager console is a client-based GUI that is installed by default on the SCVMM 2012 SP1 server. The SCVMM Manager console client can also be installed on other servers or workstations that have a supported OS. Both administrators and self-service users can use the SCVMM 2012 SP1 Manager console.

Note: The SCVMM Self-Service Portal (SPP), which is a web-based portal for self-service users to access SCVMM, is no longer supported with SCVMM 2012 SP1. Self-service users can instead use the enhanced functionality now included in the SCVMM 2012 SP1 Manager console, or (if installed) the 2012 SP1 version of Microsoft System Center App Controller.

2.3.2 Private Clouds

A new feature that was introduced with SCVMM 2012 continues to be a core element with SCVMM 2012 SP1 – the ability for administrators to create private clouds. A private cloud is a logical grouping of SCVMM 2012 SP1 fabric components that provides a self-contained environment for administrators and self-service users to create and manage their own Hyper-V hosts and guest VMs based on hardware profiles, OS profiles and VM templates.

When deploying Hyper-V guests to a private cloud, a self-service user does not have to:
• Wait for the SAN storage administrator to provision LUNs
• Ask the network administrator to allocate static IPs
• Check with the systems administrator to figure out which physical hypervisor hosts have capacity for their guest VMs

All of these hardware parameters and capacities are defined and allocated in advance as part of creating a private cloud environment. The advantages of leveraging private clouds become readily apparent from both an administrator and end-user standpoint – and go well beyond just the time savings realized. The steps to create a private cloud based on Dell Compellent storage will be demonstrated later in this document.
2.4 Microsoft Hyper-V

Hyper-V is a layer of software that sits between the physical server’s hardware layer and the Hyper-V guest virtual machines (VMs). Hyper-V presents hardware resources in a virtualized manner from the host server to the guest VMs. Hyper-V hosts (also referred to as nodes or virtualization servers) can host multiple Hyper-V guest VMs, which are isolated from each other but share the same underlying hardware resources (e.g. processors, memory, networking, and other I/O devices).

Consolidating many traditional physical servers to virtual servers on a single host server has many advantages: increased agility, better resource utilization, increased power efficiency and reduced operational and maintenance costs. In addition, Hyper-V guest VMs and the associated management tools offer greater flexibility for managing resources, balancing load, provisioning systems, and ensuring quick recovery.

2.4.1 Hyper-V Version and Feature Comparison

As shown in in the table below, Hyper-V was first introduced with the Server 2008. Server 2012 incorporates the 3rd generation of Hyper-V, which includes many new enhancements and features. Server 2012 Hyper-V is now fully supported on SCVMM 2012 SP1.

Table 1. Hyper-V version comparison

<table>
<thead>
<tr>
<th>Windows Server Version</th>
<th>Hyper-V Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server 2008 Hyper-V</td>
<td>1</td>
</tr>
<tr>
<td>Server 2008 R2 Hyper-V</td>
<td>2</td>
</tr>
<tr>
<td>Server 2012 Hyper-V</td>
<td>3</td>
</tr>
</tbody>
</table>

For a complete list of new Hyper-V features included with Server 2012, please refer to the references listed at the end of this document under Additional Resources.
# 3 Prerequisite Steps Checklist

This best practices guide assumes that the following steps have been completed. Verify that the steps in the table below have been completed before proceeding with the rest of this guide. Please refer to the Enterprise Manager 6.3 Users Guide as found on the Dell Compellent Knowledge Center for additional information.

Table 2: Prerequisite steps

<table>
<thead>
<tr>
<th>Step</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 □</td>
<td>Verify that the Dell Compellent Enterprise Manager (EM) Data Collector server (version 6.3) has been installed on a server. The Data Collector server and the SCVMM 2012 SP1 server must be installed on separate physical or virtual servers that are members of the same Active Directory domain.</td>
</tr>
</tbody>
</table>
| 2 □ | If the Windows firewall is enabled on the Data Collector server, then create firewall exceptions to allow the following TCP ports inbound. In the example, a single Inbound Rule was created to allow these 5 TCP ports:  
  - **TCP:3033** inbound (allows the Enterprise Manager Client Install to run from a different server)  
  - **TCP:8080** inbound (web service port)  
  - **TCP:7342** inbound (allows the Enterprise Manager Client (if installed on a different server) to communicate with the Data Collector server)  
  - **TCP:5988** inbound (allows SCVMM 2012 SP1 to communicate with the Data Collector server via SMI-S using http)  
  - **TCP:5989** inbound (allows SCVMM 2012 SP1 to communicate with the Data Collector server via SMI-S using https) |
| 3 □ | Verify that an instance of version 6.3 of the Enterprise Manager Client has been installed. The Client can be installed on the Enterprise Manager Data Collector server or a different server by running the installer. To run the installer, open a web browser and go to [https://<IP_Address>:3033](https://<IP_Address>:3033) (where "IP_Address" is the IP address of the Data Collector server). |
| 4 □ | Verify that PowerShell has been installed on the Data Collector server. PowerShell is installed by default on Windows Server 2008 and above. |
### Table 2: Prerequisite steps (Continued...)

<table>
<thead>
<tr>
<th>Step</th>
<th>Details</th>
</tr>
</thead>
</table>
| 5 | Verify that the **LocalMachine** PowerShell **ExecutionPolicy** on the Data Collector server is set to something other than **Undefined** or **Restricted**. To verify the policy settings, open a PowerShell window with elevated (administrator) privileges and type:  

```powershell
Get-ExecutionPolicy -list <enter>
```

In the example below, **AllSigned** is set as the **LocalMachine** Policy.

```powershell
Set-ExecutionPolicy <policy> <enter>
```

<table>
<thead>
<tr>
<th></th>
<th><img src="image1.png" alt="PowerShell screenshot" /></th>
</tr>
</thead>
</table>

| | ![PowerShell screenshot](image2.png) |

| 6 | Verify that the **.NET 3.5** feature is installed on the Data Collector server.  

![Add Roles and Features Wizard](image3.png)  
**Select features**

- **Before You Begin**
- **Installation Type**
- **Server Selection**
- **Server Roles**

**Features**

- **.NET Framework 3.5 Features** (Installed)
- **.NET Framework 4.5.2 Features** (Installed)
- **.NET Framework 4.5 Features** (Installed)
- **Background Intelligent Transfer Service (BITS) (Install)**
- **BitLocker Drive Encryption**

**Description**: .NET Framework 3.5 combines the power of the .NET Framework 2.0 APIs with new technologies for building applications that offer appealing user interfaces, protect your customers' personal identity information, enable seamless and secure communication, and provide the ability to model a range of business process.  

Note: To avoid installing unnecessary IIS components, expand the feature and check the sub-component as shown above. |

| 7 | Verify that Microsoft SCVMM 2012 SP1 has been installed according to Microsoft best practices (see the [Microsoft TechNet Library](https://technet.microsoft.com) for more information). The SCVMM 2102 SP1 server must be installed on a separate physical or virtual server than the Data Collector server, and both servers must be members of the same Active Directory domain. |
### Table 2: Prerequisite steps (Continued...)

<table>
<thead>
<tr>
<th>Step</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>An SCVMM 2012 library server has been configured with adequate space for library files. In this example, the library server was installed on the same server as the SCVMM 2012 SP1 server (which is the default configuration when installing SCVMM 2012 SP1). In larger environments it may be necessary to install the library server on a separate server for performance reasons per Microsoft best practices.</td>
</tr>
<tr>
<td>9</td>
<td>Some SAN management functions in SCVMM 2012 SP1 that are associated with creating SAN copy-capable VM templates for rapid-provisioning of VMs require that the SCVMM 2012 SP1 Library Server be installed on a physical server with the Hyper-V role installed. For more information, review the rapid-provisioning prerequisites for SCVMM 2012 SP1 as found on <a href="https://technet.microsoft.com">Microsoft TechNet</a>. This best practices guide assumes that the Library Server is on a physical Hyper-V host that is managed by SCVMM 2012 SP1.</td>
</tr>
<tr>
<td>10</td>
<td>One or more physical Hyper-V host servers must be available to be managed by SCVMM 2012 SP1 (standalone and/or clustered).</td>
</tr>
<tr>
<td>11</td>
<td>Decide on a common transport to use for your SCVMM 2012 SP1 environment. The SCVMM 2012 SP1 Server, Library Server, managed Hyper-V Hosts/Clusters, and managed Dell Compellent Storage Center storage pools must all use a common transport (e.g. fiber channel or iSCSI). Mixing different transports between these elements in the same SCVMM 2012 SP1 environment is not supported.</td>
</tr>
</tbody>
</table>

Once all the prerequisite steps above are verified, then please proceed to the next section.
4 Enable Dell Compellent SMI-S Server

4.1 Enable SMI-S in Enterprise Manager

To enable the Dell Compellent SMI-S Server, complete the following steps:

1) Log in to the Dell Compellent Enterprise Manager Data Collector GUI as an administrator.

![Enable Dell Compellent SMI-S Server](image)

**Figure 1: Enable the Dell Compellent SMI-S Server**

2) Click on SMI-S in the left pane, and under the SMI-S Server Properties, do the following:
   a) Check the Enabled box.
   b) If SMI-S communication via HTTPS is desired (recommended), check the corresponding Enabled box.
   c) If the ports 5988 and/or 5989 are changed from the defaults, then make any necessary adjustments to allow these ports through the Windows firewall on the Data Collector server (see Table 2: Prerequisite Steps above for more information about Windows firewall settings).
3) When finished, click on **Apply Changes** in the lower right corner of the Data Collector GUI. If prompted, click **Yes** to restart the Data Collector service.

### 4.2 Configure Dell Compellent SMI-S User Settings

#### 4.2.1 Overview

Before SCVMM 2012 SP1 can access Dell Compellent Storage via the Data Collector Server, a user account with the same name has to be configured in four places.

**Note:** In this document, this user will be named "SMIS". While using SMIS for this user name is not required, it is recommended.

![Diagram showing user configurations](image)

**Figure 2: Configure SMI-S users**

As shown in the figure above, these four user instances are:

1) Local Windows user account on the Data Collector 6.3 server. This user must be a member of the local administrators group and be granted the "log on as a service" right.
2) OpenPegasus "SMI-S" user. The creation of this user is automated by a step-by-step PowerShell script that is included with Enterprise Manager.
3) Enterprise Manager Client 6.3 user.
4) An SCVMM 2012 SP1 "run as" account (created using the SCVMM 2012 SP1 Server Manager Console).
Table 3: SMI-S user password requirements

<table>
<thead>
<tr>
<th>User Instance</th>
<th>User Name</th>
<th>Description</th>
<th>Password length restriction?</th>
<th>Passwords must match other instances of the SMIS user?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SMIS</td>
<td>Local User account on the Data Collector 6.3 server</td>
<td>Determined by the server’s local password policy</td>
<td>No This password can be unique, or it can be the same as instances 2, 3, and 4, assuming the password meets the server’s local password policy</td>
</tr>
<tr>
<td>2</td>
<td>SMIS</td>
<td>OpenPegasus SMI-S user</td>
<td>Yes (8 characters or less)</td>
<td>Yes Instances 2, 3, and 4 of the SMIS user must all have matching passwords</td>
</tr>
<tr>
<td>3</td>
<td>SMIS</td>
<td>Enterprise Manager 6.3 Client user</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>SMIS</td>
<td>“run as” account on the SCVMM 2012 SP1 server</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As shown in the table above, there are some password requirements to be aware of for the four instances of the SMIS user account.

Below are the step-by-step instructions to create and configure these four user instances.
4.2.2 Create Enterprise Manager 6.3 Client User

![Image of Enterprise Manager GUI]

**Figure 3: Create SMIS User for Enterprise Manager**

1) Log in to the Data Collector Manager GUI as an administrator and in the left navigation pane, click on **Users and User Groups**. Click on **Create User**. For the user name, type **SMIS**, set the Privilege field to **Administrator**, and provide a password that is 8 characters or less, as shown above. Then click on **Next**.

**Note:** The password chosen for the SMIS user must be 8 characters or less (please refer to Table 3). Record this password in a secure location and keep it available as it will be needed when adding other instances of the SMI-S user below.

![Image of User Management GUI]

**Figure 4: Verify the EM SMIS user has administrator privileges**
2) Verify that the SMIS user is now listed with administrator privileges as shown in the figure above. Leave the GUI open for now and proceed to the next step.

![Enterprise Manager Client Login](image)

**Figure 5: Log on to Enterprise Manager as the SMIS user**

3) Start the Enterprise Manager Client and log on as the new SMIS user created above.
   a) For User Name, type **SMIS**.
   b) Provide the **Password** (must be 8 characters or less).
   c) Provide the **Host/IP** of the data collector server.
   d) Click on **Log In**.

![Enterprise Manager Client](image)

**Figure 6: Add a Storage Center for the SMIS user**

4) To add one or more Dell Compellent Storage Centers to be managed by SCVMM 2012 SP1, click on **Add Storage Center**.
Figure 7: Storage Center added

5) If the desired Storage Center is already listed (as in this example), select it and click on Next. If the desired Storage Center is not listed, click on Add a new Storage Center to the Data Collector to add it. In this example, Storage Center 18 (SC 18) is selected.

Figure 8: Provide a Storage Center administrator user name and password

6) Provide a Storage Center user name and password. This Storage Center user must have administrator privileges on the Storage Center. When finished, close out of the Enterprise Manager client.

Figure 9: Verify SMIS user access to a Storage Center

7) Return to the Data Collector Manager GUI. Refresh the view, and verify that the SMIS user now has access to the desired Storage Center (SC 18 in this example). Close out
of Data Collector Manager GUI.

**Note:** It is possible to make additional Storage Centers available to the SMIS user later on if that becomes necessary. To do so, simply log in to the Enterprise Manager client as the SMIS user and add additional Storage Centers by repeating steps 4 – 7 above. They will then become available to SCVMM 2012 SP1 after refreshing the Storage Provider in SCVMM.

### 4.2.3 Run SMI-S User Configuration PowerShell Script

The **Launch SMIS User Configuration Script via PowerShell** script does two things:

- Creates the Dell Compellent SMI-S OpenPegaus user
- Automates the process of creating a matching local Windows user account on the Data Collector server, adding it to the local administrators group, and assigning it the log-on-as-a-service right (this user can also be created manually before or after running the PowerShell script if desired)

**Note:** If creating the local SMIS user account on the Data Collector server is done manually, then it is recommended that this be done before running the PowerShell script. Make sure the SMIS user is added to the local Administrators group and that it is granted the log-on-as-a-service right as shown in the two figures below.

![Fig 10](image10.png)

**Figure 10: Create local SMIS user manually**
To run the PowerShell script, complete the following steps:

1) On the Data Collector server, go to **Start** ➔ **All programs** (or **All apps** ➔ **Dell Compellent** ➔ **Launch SMIS User Configuration Script via PowerShell**).

**Note:** If the PowerShell script fails to launch, verify that the PowerShell **Local Machine Execution Policy** is set correctly. For more information on how to verify and set the Local Machine Execution Policy, see **Table 2** for prerequisite steps.
Figure 13: PowerShell script security prompt

2) Depending on the LocalMachine Execution Policy for PowerShell on the Data Collector server, a security prompt may appear as shown above. Type R or A and press Enter to continue.

Note: If a .Net v3.5 warning message appears, press Enter to exit the script. Install .Net 3.5, and then restart the PowerShell script. For more information on prerequisite steps, please see Table 2.

Figure 14: PowerShell Script main menu

3) The PowerShell script main menu will then be displayed as shown above.
Figure 15: PowerShell Script details

Referring to the figure above, complete the steps 4 – 14 below:

4) At the Main Menu, type U to manage users and press Enter.
5) Under Manage Users, type A and press Enter to add an SMI-S User.
6) Select the number of the Enterprise Manager (EM) user, which in this example is 2 (for the user SMIS) and press Enter.
7) Enter the EM SMIS user password and press Enter.

**Note:** This password must match the password that was used to create the SMIS Enterprise Manager SMIS user (see Table 3 for more information on password requirements).

8) Enter the password a second time to confirm it, and press Enter.
9) If a corresponding local Windows user does not exist, the script will prompt to create this user. Type O and press Enter to allow the script create this user.
10) Type Y to use the same password, or N to enter a different password. Using the same password is possible only if it meets the minimum complexity requirements for the Windows environment.
11) To grant the local Windows user the logon-as-a-service right, type O and press Enter.
12) To set the password to never expire (recommended), type Y and press Enter.
13) To verify the creation of these user accounts, use the List menu options in the script (if desired).
14) When finished, Type X and press Enter to return to the PowerShell script main menu.

![Data Collector Manager](image)

**Figure 16: Verify HTTPS settings**

15) If SMI-S was configured to use HTTPS, then an SSL certificate needs to be associated with the SMI-S user. To verify, view the SMI-S Server Properties in the Data Collector Manager GUI as shown above.

16) If HTTPS is enabled as shown, then continue with the steps 17 – 23 below to have the PowerShell Script to assign an SSL certificate to the SMIS user. Otherwise, exit from the PowerShell script at this point and go to the next section.
17) To add an SSL certificate and associate it with the SMI-S user, from the PowerShell Script main menu, type **C** and press **Enter** to manage certificates.

18) From the Manage Certificates menu, type **A** and press **Enter** to add an SSL certificate to the SMI-S trust store.

19) When prompted to associate a user, select the desired SMI-S user (the user “SMIS” in this example). Type the number for that user and press **Enter** to select the user.

20) The PowerShell script will return the result **Certificate Added Successfully** and then return to the Manage Certificates menu.

21) Type **L** and press **Enter** to verify the certificate details.

22) Type **X** and press **Enter** to return to the main menu.

23) Type **X** and press **Enter** twice to close out of the PowerShell command window.
5 Configure the SCVMM 2012 SP1 Fabric

5.1 Fabric Overview

Central to the functionality of SCVMM 2012 and 2012 SP1 is the configuration of the SCVMM fabric. In SCVMM, the fabric includes all the underlying hardware components and other resources that are required for administrators and self-service role users to create and manage Hyper-V hosts and guest VMs.

Configuring the basic elements of the fabric is necessary before being able to deploy guests or create a private cloud. The following components are part of the basic fabric configuration:

- **SAN Storage**: Add one or more Dell Compellent Storage Centers to SCVMM 2012 SP1 via SMI-S (SMI-S was configured in the previous section)
- **Host Group**: a logical grouping of one more clustered or standalone physical hypervisor host servers
- **Library Server**: contains a catalog of files, scripts, installers, IOSs, VHDs, hardware profiles, OS profiles, and guest VM templates used for deploying host and guest servers
- **Physical Hypervisor Hosts**: VMware ESX, XenServer and Hyper-V are supported (this guide will focus on Hyper-V)
- **Networking Components**: logical IP networks, static IP pools, MAC address pools and load balancers

The configuration of each of these fabric components will be described below.

5.2 Configure SAN Storage

Now that the SMI-S user settings along with the SMI-S Server configuration have been set up correctly on the Data Collector server, Microsoft SCVMM 2012 SP1 can now be configured to use the Dell Compellent SMI-S Provider to manage Dell Compellent storage.

**Note**: The Data Collector server and the SCVMM 2012 SP1 server must be members of the same Active Directory domain but reside on separate physical or virtual servers.
5.2.1 Add a Storage Device to SCVMM 2012 SP1

![Add Storage Device to SCVMM 2012 SP1](image)

**Figure 18: SCVMM 2012 SP1 fabric workspace**

1) On the server hosting Microsoft SCVMM 2012 SP1, log in to the SCVMM 2012 SP1 Manager console. Under the **Home** tab, select the **Fabric** workspace as shown above.

**Figure 19: Add storage device**

2) Expand **Storage**, right click on **Arrays** and choose **Add Storage Devices** from the drop down list. The Add Storage Devices Wizard will start.
3) Select the option to Add a storage device that is managed by an SMI-S provider and click on Next.

4) For the discovery scope, set the protocol to SMI-S CIMXML, enter the IP address or the FQDN of the Enterprise Manager Data Collector Server, and check the box to use SSL if HTTPS was selected when creating the SMI-S user on the Data Collector server.

5) Click on the Browse button, and then on the Create Run As Account button to create a new Run As account user.
Figure 22: Create run-as account

6) Provide a name, description, user name, and password for the Run As account as shown in the figure above. Click on OK when finished.

Figure 23: Verify run-as account creation

7) Verify that the new Run As account shows in the list of Run As users. Click on it to select it and then click on OK.
Figure 24: SMIS user specified in the discovery scope

8) The Run As account field should now be populated with this SMIS user. Click on Next.

Figure 25: Discovering and importing storage progress bar

9) The wizard will now discover and import the Dell Compellent storage. As shown above, the wizard will display a progress bar as it begins to import the storage device information. The import process may require several minutes to complete.
10) If using SSL (HTTPS) SCVMM 2012 SP1 will need to import the SSL certificate. Click on the Import button as shown above if prompted. If not using SSL, this prompt will not occur.

**Figure 26: Import Certificate prompt**

**Figure 27: Edit registry to allow certificate import**

**Note:** If using SSL (HTTPS) it may be necessary to address an authentication failure caused by the Microsoft Security Update KB2585542. If the error above experienced, follow the instructions at [http://support.microsoft.com/kb/2643584](http://support.microsoft.com/kb/2643584) to modify the system registry to add a new DWORD (32-bit) value `SendExtraRecord` set to a value of 2 to `HKLM\System\CurrentControlSet\Control\SecurityProviders\SCHANNEL` as shown in above.
11) Once the import process has finished, the Dell Compellent Storage Center will be displayed as shown in the example above. In this example, one Storage Center has been discovered and imported. Click on Next.

12) On the next screen, check the box for the discovered Storage Center and then click on the Create Classification button to create a new classification for this Storage Center. A “classification” is meant to describe the capabilities of the selected storage pool. Because Dell Compellent Storage Centers typically feature automated disk tiering within a single disk pool, the description might include a summary of the types of disk and tiers in the array, or other attributes, such as the array’s primary use or location.

13) Once a name and description have been provided for the new storage classification, then click on the Add button.
14) Repeat steps 12 and 13 to create additional storage classifications if necessary. For example, if multiple Storage Centers were discovered, then a unique storage classification can be created in SCVMM 2012 SP1 for each Storage Center.

![Table showing storage device details](image)

**Figure 30: Select storage classification**

15) Now that one or more classifications have been defined, click on the drop down arrow under the Classification column and choose the desired storage classification as shown in the figure above. Then click on the **Next** button.

**Note:** Assign storage classifications to Storage Centers one at a time. Allow the job to finish, and then assign a classification to the next Storage Center. Assigning classifications to multiple Storage Centers at the same time may result in storage discovery failures with SCVMM 2012 SP1.

![Summary screen](image)

**Figure 31: Summary screen**

16) A summary screen will display the details for the managed storage pool. Click on **Finish** to complete the wizard.
The Jobs status window will display the **Sets Storage Array** job with a progress bar under the Status column. If the Jobs window is not set to display automatically, then job history and status can be viewed by clicking on **Jobs** in the left navigation pane of the SCVMM 2012 SP1 Manager console.

18) The Duration line will indicate the Job’s run time. Refresh the screen to update the run time.

**Note:** If a Storage Center has a large number of volumes, initial discovery will require extra time to complete.
When the Sets Storage Array job finishes, the **Status** column will display a status of **Completed**. Note that the job in this example took just over a minute to complete. Close out of the Jobs window.

20) Under Classifications and Pools, verify that the Storage Center volumes are now listed under the associated Storage Classification, **(SC 18 all tiers in this example)**. This Storage Center array can now be managed by SCVMM 2012 SP1.

21) Right click on **Assigned** and choose **Properties**. It is recommended that **Assigned** be changed to something more descriptive, especially if multiple classifications will be created and associated with different storage pools. In this example, **Assigned** is changed to **SC18** as shown below.
5.2.2 Add Additional Dell Compellent Storage Centers to SCVMM 2012 SP1

To add an additional Dell Compellent Storage Center to SCVMM 2012 SP1, complete the following steps:

1) Log in to the Enterprise Manager Client as the SMIS user and select Add Storage Center from toolbar.

2) Provide the information for the Storage Center, along with an administrator user account. In this example, Storage Center 12 (SC12) is being added. Then click on Finish.

3) Close out of the Enterprise Manager client.
4) Return the SCVMM 2012 SP1 Manager console and in the fabric workspace, expand **Storage**, and click on **Providers**. Right click on the **Provider** (e.g. the IP of the Data Collector server) and select Rescan.

5) Monitor the **Reads Storage Provider** job until it completes successfully.

6) Once the additional Storage Center (SC12 in the example) has been discovered, it will be displayed as shown in the figure above. Right click on the new Storage Center array and select **Properties**.
7) In the Properties window, click on **Storage Pools**.

8) On the Managed Storage Pools screen, check the box in front of **Assigned**. If necessary, create a new classification by clicking on the **Create Classification** button, or if the desired one already exists, choose it from the Classification drop-down list. In this example, a new Classification for Storage Center 12 was created and selected as shown in the figure above. Then click on **OK**.
Figure 41: Monitor the job

9) Verify that the Sets Storage Array job completes with a status of 100%.

Figure 42: Verify the addition of the new Storage Center

10) Once the job has completed, go to Fabric→Storage→Classifications and Pools. The newly added storage array (Storage Center 12 in this example) should now be listed with an assigned Classification.
Figure 43: Modify the storage pool name

For ease of management, if multiple Dell Compellent Storage Centers are managed as separate storage pools in SCVMM, then it is recommended that the Assigned object for each storage pool be renamed. To do so, right click on Assigned and edit the Name field under Properties. In the example shown above, each instance of Assigned was changed to reflect the name of the associated Storage Center.

Note: Multiple Dell Compellent Storage Centers can be discovered by SCVMM 2012 SP1 at the same time. However, assigning a classification to a discovered Storage Center should be done one at a time.

5.3 Define a Host Group Structure

A host group allows administrators to group physical host servers logically according to such identifiers as location, level of redundancy, type of hosted application, type of hypervisor, or business unit.

In the below example, a host group called Test Host Group 1 will be created.

1) Launch the SCVMM 2012 SP1 Manager console and log in as an administrator.
Figure 44: Create a host group

2) In the left pane, click on the Fabric workspace as shown above, then expand Servers, right click on All Hosts, select Create Host Group, provide a name for the host group, and then press Enter.

3) The new host group folder should now be listed under the All Hosts folder. The physical Hyper-V host servers will be assigned to this host group folder below in Section 5.5.

5.4 Configure a Library Server

A library server provides a way to define a catalog of resources that are available for deploying and configuring both host and guest VM servers. Many kinds of common file types (as well as custom install packages) and templates can be added to a library server.
### Table 4: Library Server resources

<table>
<thead>
<tr>
<th>Types of Library Server Resources</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>File-based</td>
<td>Automatically-indexed file types. These files are indexed and added automatically during library server refreshes in SCVMM 2012 SP1. Includes many common file types such as virtual hard disks (VHDs), ISOs, PowerShell scripts, and driver files.</td>
</tr>
<tr>
<td>Custom file types (folders with .CR extension)</td>
<td>Might include a custom installation package.</td>
</tr>
<tr>
<td>Non file-based</td>
<td>Templates and profiles (stored in the SCVMM 2012 SP1 database) that are used to standardize host and guest installations.</td>
</tr>
</tbody>
</table>

As shown in the table above, many types of resources can be added to a library server. By default, the SCVMM 2012 server installation will create a local instance of a library server on the same server. For larger environments, this can be changed so that the library server is on a separate server. SCVMM 2012 SP1 also supports multiple library servers.

The default location for the library server resources (which is a shared folder) is:

```
C:\ProgramData\Virtual Machine Manager Library Files
```

The best practices recommendation is to change this path to a data volume during the installation so that the library server share it is not located on the OS drive. In the examples shown in this document, the path is set to the D drive.

**5.4.1 Copy Resources to a Library Server**

If the default share path is chosen during the library server installation, because the `C:\ProgramData` folder is a hidden folder by default, it is not possible to use Windows explorer to navigate directly to the share location without first removing the hidden attribute on the ProgramData folder (not recommended). The suggested way to copy resources to the library server share is to access the folder by its share name:

![Library server share path](image)

**Figure 45: Library server share path**
1) Click on **Start**→ **Run**.

2) Type the following path and press **Enter**:

   `\localhost\MSSCSCVMMLibrary`

**Note:** If the library server is on another server, then substitute that server’s name or IP address for “localhost”.

Figure 46: ISO files copied to the Library

3) Files and other resources must be copied to the library server’s share manually outside of SCVMM 2012 SP1. As shown in the example above, create one more folders under this share and copy file resources to them. In this example, a folder called **ISOs** was created as a place to contain the ISO files to be made available to SCVMM 2012 SP1 users, and a SQL ISO and two server OS installer ISO files were copied there.
4) Once resources have been copied to subfolders under the library server’s share, either allow time for SCVMM 2012 SP1 to refresh the library server’s contents, or manually refresh it. An automatic refresh happens every hour by default. During a refresh, the new folders and file resources will be automatically discovered. Once discovered, these resources will be visible from within SCVMM 2012 SP1. To view these resources, click on the **Library** workspace in the left pane, then expand **Library Servers** as shown above.

5) To force a refresh of the library server, right click on the library server object in SCVMM 2012 SP1 and click on **Refresh** as shown above.
5.4.2 Assign a Library Server to a Host Group

After a library server has been configured, it needs to be assigned to a server host group. This will allow the physical Hyper-V host servers in the host group to access to the library server’s resources.

Figure 49: Assign a Library server to a host group

1) To assign a library server to host group, highlight the library server, right click on it, and select Properties as shown above.

2) In this example, the library server is assigned to the host group named Test Host Group 1.

5.5 Add Physical Hyper-V Host Servers to SCVMM 2012 SP1

5.5.1 Verify Consistent and Intuitive Naming for Virtual Switches

Before adding existing physical Hyper-V host servers to SCVMM 2012, it is best practices to ensure that consistent and intuitive naming is in place for all the virtual switch and network connection components on each Hyper-V host server. This is especially important for Hyper-V failover clusters or standalone Hyper-V hosts that may be clustered later. This will:

- Minimize confusion and help prevent networking configuration errors later when managing these Hyper-V network components in SCVMM 2012 SP1
- Allow these Hyper-V network components to be considered as “highly available” by SCVMM 2012 SP1 for Hyper-V failover clusters
- Make it easier to add standalone Hyper-V servers to a failover cluster using SCVMM 2012 SP1
Figure 50: Verify virtual switches

1) When the Hyper-V Manager role is installed on a Hyper-V host server, one or more Virtual Switches (called Virtual Networks on Server 2008 R2) are created for use by Hyper-V guest VMs. In the example shown above (on a Server 2012 Hyper-V host), two virtual switches have been defined by an administrator for Hyper-V guest use: virtual switches 1 and 2. An intuitive identifier (in parenthesis) has been appended to each virtual switch name (e.g. External LAN) to make it easier to identify the role of each virtual switch.

Caution: Changes to settings in Hyper-V’s Virtual Switch Manager, such as adding or deleting virtual switches, may cause brief interruptions to network connectivity for both Hyper-V host and guest servers. To avoid service interruptions, add or remove Hyper-V virtual switches during a maintenance window. Simply renaming existing virtual switch or network objects will not cause interruptions to network connectivity.

Note: The figures in this document demonstrate how to configure Hyper-V settings on Server 2012 Hyper-V servers. To view examples for how to configure Hyper-V settings on Server 2008 R2 server, please refer to the previous version of the SCVMM 2012 Best Practices Guide found on the Dell Compellent Knowledge Center.
2) Once one or more virtual switches have been created by using Hyper-V Manager, those virtual switches will also show up as virtual switches inside of **Network Connections**.

3) To make it easier to correctly identify the roles of each NIC and virtual switch connection, rename each physical NIC and virtual switch with a consistent and intuitive name as shown in the right window of the figure above.

4) Use Device Manager to disable any unused NICs so they will not be visible when managed by SCVMM 2012 SP1 (makes for a cleaner and easier-to-manage configuration in SCVMM 2012 SP1).

5) For Hyper-V hosts in a failover cluster, and for standalone hosts, it is important, as a minimum, that the virtual switches are all named the same before adding them to SCVMM 2012 SP1.
   - Consistent virtual switch naming is required in order for nodes in a cluster to be considered “highly available” by SCVMM 2012 SP1
   - Allows a standalone host to easily be added to a cluster in SCVMM 2012 SP1 and be made highly available when the virtual switches are all named consistently.
Figure 53: Verify naming of cluster networks

6) Additionally, in Failover Cluster Manager, each Cluster Network can be renamed to add descriptive identifiers (e.g. "(LAN)" and "(iSCSI)") to more clearly identify their purpose.

5.5.2 Add Hyper-V Hosts and Clusters

The steps below will demonstrate how to add existing physical Hyper-V servers to the SCVMM 2012 SP1 fabric. In this example, a Server 2012 Hyper-V failover cluster consisting of two nodes and three standalone Server 2012 Hyper-V hosts will be added to the SCVMM 2012 SP1 fabric and assigned to the Test Host Group 1 hosts group.
Per the table below, SCVMM 2012 SP1 supports the management of Hyper-V hosts and failover clusters in a variety of AD and network environments.

Table 5: SCVMM host management options

<table>
<thead>
<tr>
<th>Type of existing Windows host server</th>
<th>In relation to the SCVMM 2012 server, the Windows host is on the following type of domain or network</th>
<th>Can it be managed by SCVMM 2012?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standalone Hyper-V host</td>
<td>Trusted AD Domain</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Untrusted AD Domain</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Disjointed Namespace</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Perimeter network/Screened Subnet/DMZ</td>
<td>Yes</td>
</tr>
<tr>
<td>Hyper-V Failover Cluster</td>
<td>Trusted Domain</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Disjointed Namespace</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Untrusted Domain</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Perimeter network/Screened Subnet/DMZ</td>
<td>No</td>
</tr>
</tbody>
</table>

**Note:** To ensure full management capability, it is best practices to locate your SCVMM 2012 SP1 server and your managed Hyper-V hosts (standalone or clustered) on the same AD domain, or on a trusted domain with a two-way trust. While SCVMM 2012 SP1 can manage Hyper-V hosts and nodes on other types of networks as shown in the table above, some management options (such as running Cluster Validation) may not be available.

In this example, five physical Hyper-V servers (two nodes that are clustered and three hosts that are standalone) will be added to SCVMM 2012. The SCVMM 2012 SP1 server and all five Hyper-V servers are members of the same Active Directory domain.

**Note:** For more information on how to add physical Hyper-V hosts or nodes that are on other types of networks, please refer to the Microsoft SCVMM 2012 SP1 documentation found in the Microsoft TechNet library.
Figure 54: Create a Trusted Hosts user account

1) As shown in the figure above, create an Active Directory service account user on the domain controller. In this example, the user was named **TrustedHosts**.
   - Grant this user domain administrator rights
   - Assign a password that meets minimum complexity requirements, and record it in a secure place for future reference
   - Because this user account will be a service account that will not be used by actual users, the recommendation is to set this password to never expire to prevent service interruptions
Figure 55: Create Trusted Hosts Run-as account in SCVMM

2) As shown in the figure above, use SCVMM 2012 SP1 to create a matching “run as” account.
   a. From the Settings workspace, expand Security→ Run As Accounts.
   b. Click on Create Run As Account under the Home tab.
   c. Provide a descriptive name for the Run As account and provide a description (if desired).
   d. For User Name, enter it in `<domain_name>\<user_name>` format as shown above, and provide the password. The domain name, user name and password entered here must match the domain name, user name, and password used to create the domain user service account in step 1 above.
   e. Click on OK to create the user.
3) To add physical Hyper-V host servers to SCVMM 2012 SP1, from the Fabric workspace, go to Servers->Add Resources->Hyper-V Hosts and Clusters to launch the Add Resource Wizard.

4) For Resource Location, select the location of the Hyper-V resource to be added (in this example, a trusted domain).
5) Click on the **Browse** button and select the appropriate SCVMM 2012 "run as" account. In this example, the **Trusted Hosts** run as account is selected. Then click on **Next**.

![Figure 58: Specify credentials](image)

6) Specify the IP address or fully qualified domain name (FQDN) for the Hyper-V host server to be managed by SCVMM 2012 SP1. In this example, since a two-node Hyper-V failover cluster is being added, it is timesaving step to provide the FQDN of the failover cluster object, as shown in the figure above. This will allow SCVMM 2012 SP1 to discover and install the agent on all of the physical Hyper-V nodes in the cluster at the same time (TSSRV221 and TSSRV222 in this example). Then click on the **Next** button.

![Figure 59: Specify scope](image)

**Note:** Each host in the failover cluster can also be added individually to SCVMM 2012 SP1 by entering the IP address or the FQDN of each host one at a time. Other management functions, such as creating a failover cluster from individual Hyper-V Hosts are also possible from within SCVMM 2012 SP1. Some management functions, such as running cluster validation, are not possible from within SCVMM 2012 SP1 if the Hyper-V Hosts and the SCVMM 2012 server not on the same AD domain or a Trusted AD domain.
Figure 60: Specify target servers

7) Once SCVMM 2012 SP1 discovers the target resources, it will return a list of discovered computers. Note that in this example as shown above, since a failover cluster was added, both of the physical Hyper-V nodes in that cluster were discovered and listed under the cluster object automatically. Check the box for the cluster object and then click on Next.

Figure 61: Specify host group

8) On the Host Settings screen, click the drop down arrow and select the desired host group to assign the selected Hyper-V nodes or hosts to. In this example, Test Host Group 1 is selected as shown above. Click on Next to continue.
9) On the **Migration Settings** screen, change any settings as desired (the defaults are listed in the above figure), and click on **Next**.

10) On the **Summary screen**, review the settings, and then click on **Finish**.

11) Monitor the jobs associated with the addition of these resources and verify that they finish successfully.

12) Repeat the above steps, starting with Step 3 in this section, to add other physical Hyper-V nodes or host servers. In this example, the standalone Hyper-V host servers TSSRV223 and TSSRV232 were also added to the host group **Test Host Group 1**.

13) If the library server is a physical Hyper-V server (as in this example), then add it as well.

14) If adding a standalone Hyper-V host, once it has been added, right click on it and...
under Properties, go to the Placement screen and specify a location for guest VMs. In this example, the path E:\GuestVMs is specified.

![SCVMM Interface]

**Figure 64: Verify addition of servers**

15) To verify the addition of the Hyper-V failover clusters and standalone Hyper-V host servers to SCVMM 2012, click on the Fabric workspace, expand Servers, and under All Hosts, expand the desired host group (Test Host Group 1 in this example). As shown in the example above, the two-node Hyper-V cluster consisting of TSSRV221 and TSSRV222, the SCVMM/library server TSSRV220, and two standalone Hyper-V host servers (TSSRV223 and TSSRV232) are now listed, all with a status of OK.

### 5.5.3 Configure Networking

1) SCVMM 2012 SP1’s global network configuration settings are configured by default to automatically create and assign logical networks and network sites to new server hosts and guests when they are managed by SCVMM. This ensures basic functionality “out of the box” in cases where DHCP is in place and dynamically assigned IPs are allowable or desired for Hyper-V hosts or guests.

2) If desired, these default global networking configuration settings can be modified as needed, for example, to specify a smaller pool of static IPs within a subnet as a designated pool for SCVMM 2012 SP1 to pull from when new IPs are assigned to new guest VMs.
3) If IP pools are desired, then they can be easily defined and assigned to a logical network. Simply click on the desired logical network to highlight it, and then select the **Create IP Pool** option from the ribbon bar as shown in the above figure. This will launch the **Create Static IP Address Pool** Wizard.

4) Complete the wizard by specifying a name for the IP pool, along with parameters such as the starting and ending IP addresses for the pool, a default gateway, DNS servers, etc. Make sure that the IPs in this pool do not conflict with any other resources on the network.

5) In this example, two static IP pools (with 20 IPs each) were created for assignment to guest VMs as shown above.
6) Verify that each Hyper-V server in the host group has the correct NIC settings. To do so, right click on each Hyper-V server, click on Properties, then on Hardware. Verify that each physical network adapter is correctly associated with the desired logical network as shown in the example above. Note how the intuitive naming helps make it easier to associate a physical NIC with the correct logical network.
7) Finally, to verify network compliance, click on Logical Networks, then on the ribbon bar, click on Hosts. Verify that each host and associated virtual switch is Fully Compliant.

8) For more information on how to configure and manage networking and IP address pools, please refer to the Microsoft TechNet library.

5.6 Allocate a Storage Pool to a Host Group

The steps to allocate a Dell Compellent storage pool to a host group will be shown below.

Figure 69: Allocate storage to a host group

1) To allocate a storage pool to a host group, from the SCVMM 2012 SP1 Manager console, click on the Fabric workspace, click on Storage in the left pane, and then on Allocate Capacity on the ribbon bar as shown in the figure above.
2) Select the desired host group from the drop down list (Test Host Group 1 in this example). Then click on the **Allocate Storage Pools** button.
3) Click on the desired storage pool (SC18 in this example) and then click on the Add button as shown in the figure above. The storage pool will then be displayed under Allocated storage pools. Add other Dell Compellent Storage Centers as storage pools if desired.

4) Click on OK, and then on Close to return to the SCVMM 2012 SP1 Manager console.
6 Create a Private Cloud

Now that all the essential elements of the SCVMM 2012 SP1 fabric are in place, a private cloud can now be created from a host group and its associated fabric components.

6.1 Review Fabric Settings

Before creating a private cloud, ensure that the steps in the preceding sections of this document have been completed successfully to prepare the SCVMM 2012 SP1 fabric. As a quick review of the sections above, configuring the SCVMM 2012 SP1 fabric consisted of the following steps:

- Enabling SMI-S on the Dell Compellent Data Collector server, and then discovering Dell Compellent storage and assigning it to one or more storage pools in SCVMM 2012 SP1
- Defining a host group in SCVMM 2012 SP1 for physical Hyper-V servers
- Configuring a library server for SCVMM 2012 SP1
- Adding Hyper-V servers to SCVMM 2012 SP1 and assigning them to a host group
- Configuring networking, virtual switches and static IP pools for Hyper-V hosts and guest VMs to use

6.2 Configure Library Shares on the Library Server

6.2.1 Overview of the Default Library Server Share

Before adding new read/write library server shares, it is helpful to understand how the default library server share is configured.

![Image of default library server share configuration and permissions](image)

**Figure 72: Default Library server share configuration and permissions**

The default instance of the library server share (which is read-only) is shown in the figure above. The Windows folder is named **Virtual Machine Manager Library Files** and is shared as MSSCVMMLibrary. This folder appears in the SCVMM 2012 Manager console (under the library workspace) by its share name.
The view on the left is the folder location as viewed from Windows Explorer.

The view in the center is the corresponding library share object in SCVMM 2012 SP1.

The view on the right shows the permissions for the default library share. In addition to the default share permissions given to SYSTEM and to the host server (TSSRV220$ in this example), add other users or groups as desired to allow them the rights to manage files and other resources in the default library share location.

**Note:** by default, the SCVMM 12012 SP1 install places the default library server share on the C: \ drive under the hidden folder C:\ProgramData. In this example, it is on the D: \ drive because the default path was changed from C: \ to D: \ during the initial install of the SCVMM 2012 SP1 server. This was done (recommended) so that library share data would not be on the same drive as the operating system.

### 6.2.2 Add New Read/Write Library Shares

Before running the wizard to create a private cloud, a couple of new read/write library shares need be to be created for stored VMs and for user role shared data.

- **Data path for stored VMs:** When creating a private cloud, the wizard will prompt for a data path for Stored VMs. Since we want self-service SCVMM 2012 SP1 users to be able to store Hyper-V guest VMs, an additional library server share (named StoredVMs in this example) will need to be created ahead of time for this purpose. A separate library server share for stored VMs is required because it must be read/write (the default library server share is read-only).

- **Data Path for User Role Shared Data:** When creating a user role and assigning it to a private cloud, the wizard will prompt for a user role shared data path, which is a location where members of a user role can upload data to share with other role users. Since we want self-service role users to be able to upload and share data files, an additional library server share (named UserRoleSharedData in this example) will need to be created ahead of time for this purpose. This library share will also be read/write.

The example below will demonstrate how to complete the necessary steps to create the first of these two new read/write shares: StoredVMs. Once that share has been created, the same steps can be repeated to create the second read/write share for UserRoleSharedData.

To add a new read/write library share for stored VMs for your self-service role users, complete the following steps:
Figure 73: Create a share for stored VMs

1) Use Windows Explorer to create the folder structure in the desired location. In this example, a new folder was created under D:\ProgramData called StoredVMs.

2) Right-click on this folder and select Properties, click on the Sharing tab, click on the Advanced Sharing button, and check the box to Share this folder. Provide a desired share name or choose the default share name (as in this example).

3) Click on the Permissions button and remove the Everyone group and add SYSTEM with Full Control permissions as shown above. Adding SYSTEM is required as a minimum to allow SCVMM 2012 SP1 to view and manage this share.

4) Add other Windows users and groups as desired to allow administrators or other users to access to this location by its Windows share name. These permissions can be modified later as needed by an administrator.

Figure 74: Add a library share

5) Now that the new share location is in place, from the SCVMM 2012 Manager console, click on the Library workspace, expand Library Servers, right-click on the desired library server and select Add Library Shares as shown above.
Figure 75: Add the new share to SCVMM Library server

6) The Windows share is now visible (as StoredVMs in this example). Check the box in front of the share name and click on Next, verify the configuration on the Summary screen, and then click on the Add Library Shares button to complete the wizard.

Figure 76: Verify the addition of the new share

7) Verify that the Set Library Server job completes successfully in SCVMM 2012 SP1, and then the new library share should be visible under the library server as shown in the figure above.

Repeat steps 1 – 7 above to create the UserRolesSharedData library share. Once this additional share has been added to the library server, please continue with the steps below to create a private cloud.

6.3 Launch and Complete the Create Cloud Wizard

Figure 77: Create Cloud wizard

1) From the SCVMM 2012 SP1 Manager console, click on the VMs and Services workspace, and then under Home, click on Create Cloud on the ribbon bar to launch the Create Cloud Wizard as shown above.
Figure 78: Provide a name for the private cloud

2) On the General screen, enter a name for the private cloud (Test Private Cloud 1 in this example), a description if desired, and click on Next.

Figure 79: Assign a host group to the private cloud

3) Check the box for the desired host group (Test Host Group 1 in this example) as shown above, and click on Next.

Figure 80: Assign virtual switches

4) As shown above, check the boxes in front of the desired logical networks to be made available to this private cloud. Note how the previous intuitive naming provided for these objects makes it easy to quickly identify the role of each logical network.

5) On the Load Balancers screen, check the box in front of any desired load balancers. In this example, no load balancers are selected. Click on Next.

6) On the VIP (Virtual IP) Profiles Screen, select any desired VIP Profiles. In this
example, no VIP profiles are selected. Click on **Next**.

![Port Classifications](image1.png)

**Figure 81: Specify port classifications**

7) On the **Port Classifications** screen, check the box for any desired classifications to be made available to use for guest VMs deployed to this cloud. Then click on **Next**.

**Note:** The ability to specify port classifications is new with SCVMM 2012 SP1.

![Storage](image2.png)

**Figure 82: Select Storage for the private cloud**

8) On the **Storage** screen, select the desired storage classifications (the Dell Compellent Storage Center pools) to be made available to this private cloud. In this example, **Test Private Cloud 1** will be allowed to use Storage Center 18 (SC 18). Then click on **Next**.
9) On the Library screen, for the Stored VM path, click on the Browse button and select the library share for Stored VMs. In this example, this library share was created previously as a read/write location for cloud users to store VMs.  
10) For the Read-only library share, click on the Add button and select the MSSCVMMLibrary share, as shown above. Then click on Next.

**Note:** The Stored VM path and the Read-only library shares path cannot be set to the same location because the stored VM path must be read/write. This is the reason why the Stored VMs share was created (in this is example) prior to running the Create Cloud Wizard.

11) On the Capacity screen, adjust the capacities if desired for virtual CPUs, memory, storage, etc., and then click on Next. These capacities can be adjusted later if necessary by modifying the cloud properties.
12) On the Capability Profiles screen, check the box for **Hyper-V** (Since this private cloud will use Hyper-V hosts for its guest VMs) and click on **Next**.

13) On the **Summary** Screen, verify the settings summary and then click on **Finish**.

14) Verify that the **Create New Cloud** job completes successfully.

15) Click on the **VMs and Services** workspace, and the new private cloud (**Test Private Cloud 1** in this example) should be listed under **Clouds** as shown above.
Figure 87: Verify cloud details under cloud libraries

16) Under the **Library** Workspace, expand **Cloud Libraries** and the new cloud should be listed with its read-only library shares and the **Stored Virtual Machines and Services** object, as shown above.
6.4 Create Self-Service User Role

In this example, an SCVMM 2012 SP1 user role will be created, users will be added, and the user role will be assigned to the **Test Private Cloud 1** created above.

![Figure 88: Launch the Create User Role Wizard](image)

1) From the **Settings** workspace in the SCVMM 2012 SP1 Manager console, click on **Create User Role** under the **Home** tab on the ribbon bar to launch the **Create User Role Wizard** as shown above.

2) Provide a **Name** and **Description** for the User Role. This user role will be associated with the **Test Private Cloud 1** (created previously) in the steps below.

![Figure 89: Select a profile for a self-service user role](image)

3) On the **Profile** screen, select the option for **Self-Service User** and then click on **Next**.
Figure 90: Assign AD users/groups to SCVMM 2012 self-service user role

4) On the Members screen, click on the Add button and select the Active Directory users and/or groups that will belong to this self-service user role. From a management perspective it best practices to create and assign user groups as shown in this example, rather than assign individual users. Once the desired users and/or groups are listed, click on Next.

Figure 91: Specify a private cloud for the self-service user role

5) Check the box for the cloud for which this self-service user role will be able to perform actions. In the example shown above, Test Private Cloud 1 is the only cloud available. Click on Next.

6) On the Quotas screen, adjust the role and member level quotas as desired. In this example, the default values are left in place. Then click on Next.
Figure 92: Select VM networks

7) On the **Networking** screen, click on **Add**, and select the desired VM networks. In this example, the two virtual switches are added as shown above. Again, the intuitive naming for these objects makes it easy to understand their roles. Then click on **Next**.

**Figure 93: Assign resources and a data path to a user role**

8) On the **Resources** screen, add any existing hardware profiles, OS profiles or templates these self-service users can use for Hyper-V guest VM creation. Since no profiles or template are defined yet in this example, these will be added later after they have been created.

9) For the **Data path**, click on **Browse** and choose a unique read/write library server share location that members of this self-service user role can use to upload their data files and share them with each other. In this example, a new library share called **UserRoleSharedData** was created previously for this purpose.

10) Once a data path is specified, then click on **Next**.
Note: The Data path chosen for the user role data path must be unique and it must be read/write. It cannot be the same as the library share created previously for Stored VMs.

Figure 94: Select the permitted actions for the user role

11) On the Actions screen, select the actions this user role will be permitted on the private cloud. In this example, all available actions were selected by clicking on the Select All button. Then click on Next.

Figure 95: Add run-as accounts for self-service user role

12) Because the Author and Deploy actions were selected in the previous step, the wizard will prompt for the addition of any necessary SCVMM 2012 “run-as” accounts. Run-as accounts may be needed to allow self-service role users to create VMs from templates and profiles. In this example, the Trusted Hosts run-as account is added to allow self-service users to manage the trusted hosts assigned to this private cloud.
Add other run as accounts as needed, then click on **Next**.

13) Verify the settings on the **Summary** screen and then click on **Finish**. Verify that the self-service user role is now listed under **Settings ➔ Security ➔ User Roles**.

### 6.5 Log In to SCVMM 2012 SP1 as a Self-Service User

![SCVMM Manager console logon](image)

**Figure 96: SCVMM 2012 Manager console logon**

To access SCVMM 2012 as a self-service user by using the SCVMM 2012 SP1 Manager console, provide the self-service user credentials at the login screen as shown above.

#### 6.5.1 Launch another Instance of the SCVMM Manager Console

![Launch another instance of the SCVMM Manager console](image)

**Figure 97: Launch another instance of the SCVMM Manager console**

It is possible to launch an additional instance of the SCVMM 2012 Manager console by clicking on the down arrow in the upper left from any SCVMM 2012 workspace, and selecting **Open New Connection**. This makes it easy to log on as another user (or test other user login) without having to close out of the current SCVMM 2012 Manager console session.
6.5.2 Install the SCVMM 2012 SP1 Manager Console on Additional Computers

![Image of SCVMM 2012 SP1 Manager Console](image)

**Figure 98: Install the SCVMM 2012 SP1 Manager console on another computer**

The SCVMM 2012 SP1 Manager console GUI can be installed on additional servers or workstations by simply running the SCVMM 2012 setup and choosing to install just the VMM console as shown above.

**Note:** the VMM Self-Service Portal (SSP) install option is no longer available with SCVMM 2012 SP1.

See [Microsoft TechNet](https://technet.microsoft.com) for addition information on system requirements and compatibility for running the SCVMM 2012 Manager console.
7 Create SCVMM 2012 SP1 Profiles

7.1 Create a Hardware Profile

7.1.1 Overview

A hardware profile is a convenient way to specify consistent hardware parameters for guest VM creation, such as the number of virtual processors and the amount of virtual RAM. Different hardware profiles can be created based on the different types of guest VM configurations needed.

The availability of hardware profiles helps to greatly simplify the process of deploying guest VMs. In this example, a basic hardware profile will be created that will specify 4 processors and 4096 MB of RAM.

7.1.2 Steps to Create a Hardware Profile

Figure 99: Create a hardware profile

1) From the Library workspace in the SCVMM 2012 SP1 Manager console, click on Create on the ribbon bar under the Home tab, and choose Hardware Profile as shown above.
Figure 100: Provide a name and description for the new hardware profile

2) On the General screen of the New Hardware Profile wizard, provide an intuitive name and a description, similar to the example shown above. Provide a descriptive name to make it easier to select the desired hardware profile from the list of available profiles later on when creating guest VMs and templates.

3) Click on Hardware Profile to view the virtual hardware setting and options.

Figure 101: Set specific hardware parameters for a new hardware profile

4) Set the desired specifications for this new hardware profile. For this example, the hardware defaults will be used except for the following parameters:
   - Cloud Compatibility = Hyper-V
   - Processors = 4
   - Memory = Dynamic (with startup set to 1024 MB, Minimum set to 512 MB, and Maximum set to 4096 MB)
   - Network Adapter 1 = Virtual Switch 1, using a static IP pool, IPV4 only
   - Network Adapter 2 (added) = Virtual Switch 2, using a static IP pool, IPV4 only

5) Once the desired hardware settings are in place, click on OK to finish creating the hardware profile.
Note: If the Availability option for this hardware profile is set to High, it will limit where guest VMs using this hardware profile can be installed (to Hyper-V failover clusters only).

![New hardware profile](image1)

Figure 102: New hardware profile

6) Verify that the new hardware profile is displayed as shown above under Profiles→Hardware profiles.

7.1.3 Grant Access to a Hardware Profile

![Grant access](image2)

Figure 103: Grant access

To grant access to a hardware profile for a self-service user role, complete the following steps:

1) In SCVMM 2012 SP1, rights to hardware profiles must be explicitly granted to users before they are accessible to them. To grant rights to this hardware profile, right-click on it and select Properties.

2) On the Access screen, click on the Add button and select the desired users or roles.

3) In the example shown above, this hardware profile is shared with the Test SCVMM User Role 1 user role that was defined previously.

4) Then click on OK to save the settings.

7.2 Create a Guest Operating System Profile

7.2.1 Overview

Similar to hardware profiles, guest OS profiles are a convenient way to specify consistent OS parameters for guest VM creation, such as the type of OS, VM naming (when incorporating auto-generated names), admin passwords, product keys, roles, features, and domain membership. Answer files are also supported. As with hardware profiles, multiple guest OS profiles can be created based on the different types of guest VM configurations needed.
The availability of OS profiles streamlines VM provisioning and helps ensure fast, consistent, automated VM deployments. In this example, a basic OS profile for Server 2012 will be created.

### 7.2.2 Steps to Create a Guest OS Profile

1. From the Library workspace in the SCVMM 2012 Manager console, click on **Create** under the **Home** tab, and choose **Guest OS Profiles** as shown above.

2. On the **General** screen of the **New Guest OS Profile** configuration wizard, provide an intuitive name and a description, similar to the example shown above.

3. Click on **Guest OS Profile**.
Figure 106: Provide settings and configuration details for a guest OS profile

4) On the **Guest OS Profile** screen, adjust the options as desired. In this example, the defaults are used except as follows:

- **OS = 64-bit edition of Windows Server 2012 Datacenter**
- **Identity information = MG-Guest1###**
  - The # character acts as a wildcard for automatic guest VM numbering for new guest VMs
  - The first Hyper-V Guest created with this OS profile will be assigned the name **MG-Guest1001**, the second guest will be assigned the name **MG-Guest1002** and so forth
- **Admin Password = <password>**

5) After specifying the guest OS profile settings, click on **OK**.

Figure 107: Verify creation of the Guest OS profile

6) Verify that the new Guest OS profile is displayed as shown above.
7.2.3 Grant Access to a Guest OS Profile

To grant access to a guest OS profile for a self-service user role, complete the following steps:

1) In SCVMM 2012 SP1, rights to guest OS profiles must be explicitly granted to users before they are accessible. To grant rights to this guest OS profile, right-click on it and select Properties.

2) On the Access screen, click on the Add button and select the desired users or roles.

3) In the example shown above, this guest OS profile is shared with the Test SCVMM User Role 1 user role that was defined previously.

4) Then click on OK to save the settings.
8 Guest VM Templates

8.1 Overview
When provisioning a guest VM in SCVMM 2012 SP1, administrators and self-service users have many options for specifying source files, hardware and guest OS settings. While it is not a requirement to use hardware profiles, guest OS profiles, or templates, they are recommended because they insure consistency and save time.

In the previous section, a basic hardware profile and a basic guest OS profile were created. These profiles become the building blocks to create VM templates. A VM template is essentially a combination of the settings and parameters specified in a hardware profile and a guest OS profile, and they help automate and streamline the process of provisioning new guest VMs.

8.2 Network-copy and San Copy-capable VM Templates
With SCVMM 2012 (both 2012 and 2012 SP1), there are two kinds of VM templates that can be created:
- Network-copy templates
- SAN copy-capable templates
Each of these will be reviewed in more detail below.

8.2.1 Network copy Guest VM Templates
With a network copy VM template, the source file (a full copy of a sysprepped VHD/VHDX file on the library server) is deployed over the network, for each new VM guest provisioned. This results in few less desirable constraints.
- Copying large VHD/VHDX source files over the network can negatively impact network bandwidth and may limit when VMs can be deployed.
- Deploying VMs in his fashion can require significantly more time, depending on how long it takes to copy large VHD/VHDX files from the library server to the target Hyper-V host over the network, especially if there is a lower bandwidth connection between the library server and the target host.
- SAN space is wasted because duplicate copies of the source VHD/VHDX files are copied every time a new guest VM is deployed.

8.2.2 SAN Copy-capable Guest VM Templates
With SAN copy-capable guest VM templates, SCVMM 2012 leverages the Dell Compellent SMI-S provider to offload the provisioning of a guest VM’s VHD/VHDX file to the SAN through a process that is called rapid-provisioning.
SAN copy-capable templates are desirable for the following reasons:

- There is minimal impact to network bandwidth because copies of VHD/VHDX are not copied over the network when deploying a new guest VM. New guest VMs are provisioned from a gold image source volume on the SAN, and because this process occurs on the SAN, the network is not impacted.
- Deployment of new guest VMs is much quicker due to not having to wait for large VHD/VHDX files to deploy over the network (why it is called Rapid Provisioning).
- Due to leveraging a gold image source volume, no SAN space is wasted due to duplicate VHD/VHDX source files being copied every time a new guest VM is deployed.
- Many guest VMs can be provisioned from the same source (gold image) volume, resulting in significant savings on the SAN. Up to 100 guest VMs can be provisioned from each gold image. More details on SAN space savings when using Rapid Provisioning are included in Table 6 below.

For more information rapid-provisioning with SAN copy-capable templates, see Section 9 below.

### 8.3 Create a Network-Copy Guest VM Template

#### 8.3.1 Overview

In the following example, a new guest VM template will be created that will use the hardware and OS profiles created in the previous sections above.

This template will be a network-copy template, meaning that the source virtual hard disk file will be deployed over the network from the library server to the target Hyper-V host.

To create a SAN copy-capable template for rapid-provisioning of guest VMs, see Section 8.4 below.

#### 8.3.2 Copy a Source Virtual Hard Disk to the Library Server

1) When deploying a new guest VM, it is necessary to specify a source file. For network-copy templates, this is usually a sysprepped VHD or VHDX virtual hard disk file that is available from the library server. It is therefore necessary to copy one or more source VHD/VHDX files to the library server so they can be available for templates.

2) Using Windows Explorer, copy a sysprepped VHD or VHDX file to the VHDs folder on the SCVMM 2012 SP1 library server. For more information on how to do manage SCVMM library server shares, see Copy Resources to a Library Server as found above in this document.

3) In this example, a source VHDX file containing a sysprepped image of Server 2012 will be copied to the VHDs folder on the library server. In this example, there are several ways to access the share location:
4) Once the sysprepped VHD/VHDX file has been copied to the library server using Windows Explorer, refresh the library server in SCVMM 2012 SP1 and verify that the new VHD/VHDX file shows up under the VHDs folder as shown above.

Figure 109: Sysprepped VHD added to the library server

Figure 110: Define the operating system and virtualization platform for a VHD
5) The Operating System column for a newly-copied VHD/VHDX will initially display as Unknown. To associate an OS with this VHDX, right click on the VHDX object, select Properties, and under the General tab, set the operating system and the virtualization platforms as shown above.

8.3.3 Run the Create VM Template Wizard

Figure 111: Launch the Create VM Template Wizard

1) In the Library workspace, click on Create VM Template on the ribbon bar under the Home tab as shown in above.

Figure 112: Select a source for the new VM template

2) Select Use an Existing VM template or a virtual hard disk stored in the library, click on the Browse button and choose the desired source. In this example the sysprepped VHDX is selected that was just copied to the SCVMM library share as shown above. Then click on Next.
Figure 113: Provide a VM template name and description

3) For **VM Template name**, provide a descriptive name as shown above. Then click on **Next**.

Figure 114: Configure hardware settings for a new template

4) Under **Configure Hardware**, choose the desired hardware profile from the drop-down list. The template hardware settings will update to reflect the selected hardware profile’s settings. In this example, the hardware profile created previously (see Section 7.1) is selected from the drop down list. In addition, even if a hardware profile is chosen from the drop down list, individual hardware settings can still be modified if necessary before going to the next step.

5) Choose the desired Dell Compellent disk classification (in this example **SC18 (all tiers)**). Then click on **Next**.
6) Under **Configure Operating System**, choose the desired operating System profile from the drop down list. In this example, the guest OS profile that was created previously (see Section 7.2) was chosen. In addition, even if a guest OS profile is chosen from the drop down list, individual OS settings can still be modified if necessary before going to the next screen. Then click on **Next**.

7) On the **Configure Applications** and **Configure SQL Server** screens, define any desired settings and then click on **Next**. In this example, the settings are left at the defaults on these screens.

8) On the **Summary** screen, click on **Create** to finish the template wizard.

### 8.3.4 Grant Access to a VM Template

As with hardware and guest VM profiles, rights must be explicitly granted to a new guest VM template for it is accessible to users.

To grant access, complete the following steps:

1) From the **Library** work space, expand **Templates→VM Templates** and in the **Templates** window, right click on the new template and select **Properties**.
Figure 116: Grant access to a template

2) On the **Access** screen, click on the **Add** button. In this example, the **Test SCVMM User Role 1** user role is granted access to this template as shown above.

3) Click on **OK** to save the changes.

### 8.4 Create a SAN Copy Capable Template

#### 8.4.1 Overview

Creating a SAN copy-capable template is similar to creating a network-copy template but does involve a few additional steps. For the differences between a network-copy and a SAN copy-capable template, please review Section 8.2 above.

#### 8.4.2 Choose a Method for Creating a SAN Copy-capable Template

There are two options for creating a SAN copy-capable template.

- **Option 1**: Create from a new guest VM that is built using a blank virtual hard disk that is built from scratch, patched, customized, powered down, cloned, and then imported into the library server.

- **Option 2**: Create from an existing guest VM on a managed Hyper-V host.

In the example below, a SAN copy-capable template will be created from a new guest VM using a blank virtual hard disk (Option 1).

#### 8.4.3 Add the Library Server to SCVMM 2012 SP1 as a Physical Hyper-V Host.

In order to create and manage SAN copy-capable templates, the library server component of SCVMM 2012 SP1 must be installed on a physical Hyper-V host server that is managed by SCVMM (e.g. the library server is added to a host group in SCVMM).

In this example, the SCVMM 2012 SP1 server and the library server component were installed
on a physical Hyper-V server (on server host TSSRV220).

To add a physical Hyper-V server to SCVMM 2012 SP1 and assign it to a host group, please refer to Section 5.5 above.

Figure 117: Verify the presence of the new host server in the host group

Once the library server has been added to a SCVMM 2012 host group, it will show in the list with the other servers, as shown above. Verify that Library is listed for this server under the Role column. In this example, TSSRV220 is a library server, a host server, and a VMM server.

8.4.4 Create a Logical Unit and Assign It to a Hyper-V Host.

The first step with creating a SAN copy-capable template (from a new guest VM) is to create a new logical unit (a volume or LUN) on the Dell Compellent SAN and map it to a Hyper-V host server. The guest VM that will serve as the source for this template will be staged to a new VHDX on this volume. Then, once one this volume has been imported to the library server, it will serve as a gold image source when rapid-provisioning new guest VMs.

1) Decide on which standalone Hyper-V host server to use. In this example, the standalone Hyper-V host TSSRV232 will be used to stage the new source VM.
2) Create and assign a new logical unit (Dell Compellent SAN volume) to this host server by completing the following steps
   a. Right click on the host (TSSRV232 in this example) and select Properties.
   b. Click on Storage.
   c. Click on the Add button, and select Add disk (fiber channel in this example).
   d. Click on the Create Logical Unit button.
   e. Select the desired Dell Compellent storage pool from the drop down list (SC18 in this example).
   f. Provide a descriptive Name and Description.
   g. Set a *Size in GB.
   h. Click on OK.

*Note: Specify a logical unit size with enough capacity for both the new virtual hard disk file and the installer ISO that will be used to stage the VM. For example:

Logical unit size calculator: (75 GB VHDX file) + (5 GB for the ISO) = (80 GB logical unit)
Figure 119: Specify new logical unit details and assign a drive letter

3) Configure the formatting options for this new logical unit as follows:
   a. The volume must be formatted **NTFS** (the default).
   b. Provide a descriptive **volume label** (if desired, as suggested above).
   c. Assign a free **drive letter** to the volume (mount points are not supported when creating a SAN copy-capable template). The G drive is used in this example.
   d. Click on **OK**.

In the **Jobs** workspace, monitor the **Change Properties of virtual machine host** job until it completes. This job will create the new logical unit, map it to the Hyper-V host (using fiber channel), format the volume, and assign it the drive letter G.
8.4.5 Create a New Virtual Machine on the Logical Unit

Now that the new logical unit is formatted and mapped to the host as the G drive, a Hyper-V guest VM can be staged to a new VHDX file on the G drive. The steps to do this are as follows:

1) From the VMs and Services work space, click on Create Virtual Machine on the ribbon bar under Home to launch the Create Virtual Machine Wizard.

2) On the Select Source screen, choose Create the new virtual machine with a blank virtual hard disk, and then click on Next.

3) As shown above, on the Specify Virtual Machine Identity screen, provide a descriptive name for the new guest VM and click on Next. Since this guest will serve...
as a SAN copy-capable gold image for rapid-provisioning new guest VMs, it is recommended that "gold image" be included in the name of this VM.

Figure 122: Configure hardware settings for the gold image VM guest

4) On the **Configure Hardware** screen, choose an existing hardware profile from the drop down or specify the desired hardware settings. In this example, an existing hardware profile, created earlier in this document (see **Section 7.1**) was selected.

5) Select the option to **Create a new virtual hard disk**.

6) The preference is to leave the **Type** set to **Dynamic**, unless the little bit of extra performance gained by using a fixed VHDX is required.

7) In this example, the size of the VHDX is increased from 40 GB to 75 GB.
   - It is important to size this boot VHDX large enough so the OS it will not run out of space. Because Dell Compellent leverages Thin Provisioning (including virtual hard disk files), allowing a little overhead when sizing a VHDX will not consume extra SAN space.
   - Since the logical unit size is 80 GB, this allows for an extra 5 GB on the logical unit (as temporary space) for the installer ISO file. See **Section 8.4.4** above for more information on logical unit sizing.

8) Adjust the virtual hard disk file name if desired. In this example, **boot** is added to the name of the file.
Figure 123: Attach an ISO file to the new guest VM for staging the OS

9) Under **Bus Configuration**, click on the virtual DVD drive.
10) Under **Media**, select the option to use an **Existing ISO image file**.
11) Click on the **Browse** button and select (from the library server) an ISO with the desired OS installer (Server 2012 in this example).
12) Leave the **Share image file instead of copying it** box unchecked. Although sharing the ISO is possible (e.g. the OS would be installed over the network), it requires extra configuration before it will work. And, it is generally preferable to perform a new server OS install from an ISO file (or other media) that is located locally on the host server. In the preceding steps, the destination volume on the host was allowed enough temporary space for this ISO file to be copied locally. The ISO file will be removed (deleted from the host) after the new guest VM has been staged, and before the guest VM is converted to a SAN copy-capable template.
13) Click on **Next** when finished with the **Configure Hardware** settings.

**Figure 124:** Select placement of the new virtual machine on a host

14) On the **Select Destination** screen, choose **Place the virtual machine on a host** and click on **Next**.

**Figure 125:** Select a host server for the new guest VM

15) The wizard will display a list of available hosts on the **Select a Host** screen. Choose the host server from the list that has the new logical unit for rapid-provisioning. In this example, the logical unit was assigned to **TSSRV232** as the G drive, so that server is chosen above.

16) Click on **Next**.
Figure 126: Select the host drive letter for the new guest VM

17) On the **Configure Settings** screen, set the following:

a) Under **Locations**→**Virtual Machine Locations**, click on the **Browse** button and choose the destination drive (the root of the G drive in this example).

b) Make sure to set the path to the root of this drive as shown in this example.

c) Verify that the wizard indicates that the drive is **Migration Capable** (as is true for the G drive in this example).
Figure 127: Verify machine resources settings for the new VM guest

18) Under Machine Resources, click on Virtual hard disk.
19) Ensure that the option Create a blank virtual hard disk is selected.
20) Click on the Browse button and set the path to the root of the same drive as selected in Step 17a above (the G drive in this example).
21) Then click on Next.
22) If not previously defined as part of choosing the hardware profile, on the Select Networks screen, select the desired network options for this new guest VM. In this example, since a hardware profile was chosen that defines the network settings, the Select Networks screen is not presented at this stage of the wizard. Click on Next.
23) On the Add Properties screen, configure as desired, and then click on Next. In this example the default settings are used.
24) On the Summary screen, review the settings and then click on the Create button to launch the Create virtual Machine job.
Figure 128: ISO deploys over the network

25) Monitor the progress of the **Create virtual machine** job from the Jobs workspace until it completes. Note that one of the job steps is to copy the ISO file over the network from the library server to the target host server, as shown above. This ISO file will be deleted after the guest VM has been staged.

Figure 129: New VM guest successfully created

26) Once the **Create virtual Machine** job completes, verify that the new guest VM is displayed under the target host in the **VMs and Services** workspace. In this example, the new guest is listed under the host server **TSSRV232** as shown above.

27) Boot the new guest and complete the following:
   - Install the OS
   - Install any desired features, roles or applications
   - Customize any settings
   - Patch to desired level

28) After the new guest has been fully staged, power it down.

**Caution:** do not sysprep this guest VM before powering it down. It will render the guest unusable as a source for the SAN copy-capable template. SCVMM 2012 SP1 will take care of...
sysprepping the guest VM’s OS automatically when it is imported to the library server.

Figure 130: Remove the mapping to the ISO file used to stage the VM guest’s OS

29) Remove the *ISO file that was used to stage the server OS.
   a) Under the VMs and Services workspace, right click on the new guest VM.
   b) Select Properties.
   c) On the Hardware Configuration screen, click on the Virtual DVD drive.
   d) Select the option No Media to remove the ISO image attached previously.
   e) After clicking on OK, SCVMM 2012 SP1 will automatically purge the ISO file from the logical unit (the G drive in this example) host server and recover the space.

*Note: If the ISO is not removed, then it will become part of the template, and this ISO will be copied over the LAN from the library server to the target host(s) for every new guest deployed from it. The result would be SAN space consumed unnecessarily, along with possible negative impact to network bandwidth.

8.4.6 Create a Clone of the Guest VM

Because the process of creating a SAN copy-capable template from a new guest VM destroys the guest when the guest is imported to the library server, it is best practices to make a copy of the guest first. Otherwise the guest has to be restaged from scratch if changes need to be made.
To create a clone of the guest VM, complete the following steps.

1) Make sure the guest VM is powered off.
2) Right click on the guest VM and select **Create ➔ Clone** as shown above.

3) On the **Specify Virtual Machine Identity** screen, provide a descriptive name for this clone. In this example, “Clone” is added to the name.
4) Click on **Next**.
5) On the **Hardware** screen, click on **Next** (don’t make any changes).
6) On the **Select Destination** screen, choose the **Store the virtual machine in the library** option and then click on **Next**.
7) On the **Select a Library Server** screen, click on the desired library server (**TSSRV220** in this example), and then click on **Next**.
Figure 133: Select a path for the cloned rapid-provision guest VM on the library server

8) On the Select a Path screen, click on the Browse button and select a share location on the library server for the cloned rapid-provision guest VM as shown above.

9) Click on Next.

Figure 134: Create virtual machine job status

10) On the Summary screen, click on Create to launch the Create virtual machine job. Monitor the job until it completes.
11) After the job finishes, from the Library view, expand Library Servers and verify the location of the cloned rapid-provision guest VM, similar to the example shown above.

12) Now that this cloned guest VM exists on the library server, it can be deployed to a host in the host group at a later time and updated, patched or changed as needed, and then used to create a new SAN copy-capable template, without having to stage a new guest VM from scratch. It can also be used to create variants of the original SAN copy-capable template to present users with multiple guest VM deployment options.

8.4.7 Create a SAN Copy-Capable Template from a Guest VM

Now that the new guest VM has been staged to the G drive on the host TSSRV232 according to the steps in the previous section above, this guest VM can now be imported into the library server as a SAN copy-capable template, and then use for rapid-provisioning new guest VMs.

The steps to do this are as follows:
1) From the **Library** workspace, expand **Templates**, and click on **VM Templates**.

2) Click on **Create VM Template** on the ribbon bar under the **Home** tab to launch the **Create VM Template Wizard**.

3) On the **Select Source** page, select the option **From an existing virtual machine that is deployed on a host** and click on the **Browse** button to display a list of available VM template sources. In this example, the **RapidProvisionGoldImage03** guest VM is selected as shown above. Then click on **Next**.

4) A warning message will appear. In this example, a clone of the VM was created in the previous section so this message can be ignored. Click on **Yes**.
5) On the **VM Template Identity** screen, provide a name (and description if desired) for the VM template. Then click on **Next**.

6) On the **Configure Hardware** screen, note that the settings here are inherited from the hardware profile that was chosen when the rapid-provision guest VM was staged. In
this example, since these hardware specifications are acceptable, no changes need to be made to the hardware settings on this screen. Note that the Classification listed here (SC18) for the Dell Compellent storage matches the classification chosen when the logical unit was created. When finished with the hardware settings, click on Next.

Figure 140: Provide OS settings for new SAN copy-capable guest VM template

7) On the Configure Operating System screen, select a guest OS profile from the drop-down list or modify the default settings. In this example, the guest OS profile that was created previously (see Section 7.2) is selected from the drop-down list. Then click on Next.

Figure 141: Select a library server that is SAN transfer capable

8) On the Select Library Server screen, select a library server with a Transfer Type of SAN (not Network) as indicated above. Then click on Next.
**Note:** the Transfer Type column must indicate SAN (not network) in order for this template to function correctly as a SAN copy-capable rapid-provision template.

**Figure 142:** Select a path on the library server for the SAN copy-capable VM template

9) On the Select Path screen, click on the Browse button and choose a destination on the library server for the rapid-provision guest VM template. In the example shown above, the default MSSCVMMMLibrary share path is selected. Make sure the box for Transfer over the network is left unchecked. Then click on Next.

**Figure 143:** SCVMM syspreps the VM

10) Review the Summary screen information and then click on Create. This will launch the Create template job. Monitor the progress in the Jobs workspace until it completes. One of the steps in the process includes sysprepping the source VM before it is imported to the library server, as shown above.
Figure 144: Verify availability of the new SAN copy-capable rapid-provision template

11) One the job has finished, from the Library workspace under VM Templates, verify that the new rapid-provision VM template is now available. Make sure that Yes is indicated in the San Copy Capable column for this template as shown above.

8.4.8 Make the SAN Copy-Capable Template Available to Users

Figure 145: Grant access to the new template

1) To make this template available to self-service users or roles, right click on it, select Properties, and click on Access.
2) On the Access screen, add any desired self-service users or roles.
3) In this example, the Test SCVMM User Role 1 user role is added.
8.4.9 Verify the Location of the Template on the Library Server

4) The library server will now list a new folder where the rapid-provision template (and its gold image VHDX) is stored, as shown above.

5) The SAN copy-capable rapid-provision template creation process is now complete. To thin-provision new guest VMs from this template, continue with the steps in the next section.
9 Rapid-Provisioning with SAN Copy-Capable Templates

9.1 Overview

Now that a SAN copy-capable template has been created from a gold image guest VM, thinly-provisioned guest VMs can now be deployed using Dell Compellent SAN Replays (snapshots). As was summarized in Section 8.2 above, there are many advantages to using SAN copy-capable templates as compared to copy-over-the-network templates. In the steps below, a new guest VM will be created from a SAN copy-capable template.

9.2 Run the Create Virtual Machine Wizard

1) From the VMs and Services workspace, click on Create Virtual Machine on the ribbon bar under the Home tab.

2) Select Use an existing virtual machine, VM template, or virtual hard disk, then click on the Browse button.

3) Choose a rapid-provision template (in this example, the one just created in the preceding section). Make sure the SAN Copy Capable column for the VM source template indicates Yes as shown above. Then click on Next.

Figure 147: Select the source for a new rapid-provisioned guest VM
Figure 148: Provide a name and description for a new rapid-provisioned guest

4) On the **Specify Virtual Machine Identity** screen, there are several options for providing the virtual machine’s computer name:

   a. If the template was configured to specify a pattern for the computer name with wildcard characters (#) for auto-numbering, then this field can be left blank (refer to the top screen in the figure above). In this example, the template includes a pattern of **MG-GuestVM1###** for the computer name. Therefore, the first guest provisioned will be named **MG-GuestVM1001**, the second as **MG-GuestVM1002**, etc.

     i. If a specific computer name is desired that is different than the pattern in the template, then auto-naming can be overridden by manually typing a computer name in this field.
     ii. In this example, the field will be left blank and the wizard will auto-generate the guest VM computer name based on the pattern specified.

   b. If the template was configured with an asterisk for the computer name, then the lower of the two screens above is presented (note the absence of the caption under the **virtual machine name** field).

     i. If the field is left blank, the wizard will configure the guest VM with a completely randomized name.
     ii. If a specific computer name is desired, manually enter it into the
Virtual machine name field.

5) Click on Next.

Figure 149: Configure the hardware settings or choose an existing hardware profile

6) On the Configure Hardware screen as shown above, note that the hardware settings are inherited from the hardware profile that was associated with the template when it was created (e.g. 4 CPUs, 4 GB of RAM, etc.). Therefore no changes need to be made in this example. Optionally, choose a different hardware profile from the drop-down list or change individual hardware settings as needed.

7) Set the Classification field to the desired Dell Compellent Storage Center (the one that was used to create the SAN copy-capable template) (SC18 (All Tiers) in this example). Then click on Next.
8) On the **Configure Operating System** screen as shown above, note that the guest OS settings are inherited from the guest OS profile that was associated with the template when it was created. Therefore no changes need to be made in this example. Optionally, choose a different guest OS profile from the drop-down list or change individual OS settings as needed. Click on **Next**.

9) On the **Select Destination** screen, choose the deployment location for the new rapid-provisioned guest (to a private cloud or to a specific host). In this example, **Deploy the virtual machine to a private cloud** is selected as shown above. Then click on **Next**.
Figure 152: Select the host server for the new rapid-provisioned guest VM

10) On the Select Cloud screen, a list of target clouds and associated hosts, each with a rating, will be displayed. In this example, there is only one cloud to choose from.

- When deploying to a Cloud, SCVMM will determine the best host (or cluster) in that cloud (based on the ratings) to deploy the guest VM to. Click on Next to continue.

- If a specific host is desired or required for this guest VM, click on the Previous button and select Place the virtual machine on a host. Then on the above screen, click on the desired host to highlight it, then click on Next.

Figure 153: Verify the computer name for the new rapid provisioned guest VM

11) On the Configure Settings screen as shown above, verify the Computer name, then click on Next. In this example, the computer name MG-GuestVM1001 was automatically populated in this field based on the pattern set previously in the guest
OS profile associated with the template. Override this name if desired by typing in another computer name.

12) On the Add Properties screen, make any desired changes and click on Next (no changes were made in this example).

13) Review the information on the Summary screen.

14) At this point, if monitoring the activity on the Dell Compellent Storage Center is desired (for example, to get a better understanding of what is going on behind-the-scenes with rapid-provisioning), then before clicking on Create, open the Storage Center Manager GUI per the steps in the following section to follow along as SCVMM 2012 SP1 leverages SMI-S to thinly provision the new volume and deploy the guest VM from a gold image.

15) If monitoring the progress on the Dell Compellent Storage Center is not desired, then click on Create, and the new guest VM will be provisioned.

16) Monitor the status of the Job in SCVMM 2012 SP1 until it completes successfully.

9.3 View the Creation of a Rapid-Provisioned Guest on Dell Compellent

The steps in this section are an optional continuation from Step 14 in the previous section.

Following the below steps will provide a much better understanding of what is happening on the Dell Compellent SAN when rapid-provisioning is used to deploy a new guest from a SAN copy-capable template, and why rapid-provisioning is so advantageous.

1) Log in to the Storage Center Manager GUI for the Dell Compellent Storage Center the rapid-provisioned volume will be created on (Storage Center 18 in this example).

![Figure 154: Gold image on Dell Compellent before creating a rapid-provisioned guest](image)

2) Once logged in to Storage Center Manager:
   - Expand Storage ➔ Volumes and click on the desired gold image volume to
Note: by default, when SCVMM 2012 leverages SMI-S to create a volume for the gold image, it is placed at the root of the Volumes folder. However, a SAN administrator can relocate the gold image volume to subfolder (if desired) for ease of management. Moving a gold image volume to a subfolder will have no adverse effects on SCVMM 2012 SP1 or SMI-S integration (e.g. it won’t break anything to move a gold image volume to a subfolder).

- Click on the Replays tab
- Click on Set Replay View and change it to Tree - the gold image volume in this example is shown in the figure above

3) From the SCVMM 2012 SP1 Create Virtual Machine Summary screen (this assumes a continuation from Step 14 in the previous section), click on Create to kick off the job to create the new rapid-provisioned guest VM.

<table>
<thead>
<tr>
<th>Step</th>
<th>Name</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Create virtual machine in cloud</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Update the placement settings of a VM deployment configuration</td>
<td>Completed</td>
</tr>
<tr>
<td>1.2</td>
<td>Create virtual machine</td>
<td></td>
</tr>
<tr>
<td>1.2.1</td>
<td>Rapid deploy using SAN copy</td>
<td></td>
</tr>
<tr>
<td>1.2.1.1</td>
<td>Parallel execution step</td>
<td></td>
</tr>
<tr>
<td>1.2.1.1</td>
<td>Creates new storage logical unit</td>
<td></td>
</tr>
<tr>
<td>1.2.1.2</td>
<td>Registers Storage Logical Unit to host</td>
<td>Not started</td>
</tr>
<tr>
<td>1.2.1.3</td>
<td>Parallel execution step</td>
<td>Not started</td>
</tr>
</tbody>
</table>

Figure 155: Monitor the creation of the new rapid-provisioned guest

4) Go to the Jobs workspace in SCVMM 2012 SP1 to monitor the progress as the new guest VM is created. One of the incremental steps associated with provisioning a new rapid-provisioned guest VM is the creation of a new storage logical unit (Dell Compellent SAN volume) as shown above.

<table>
<thead>
<tr>
<th>Step</th>
<th>Name</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Create virtual machine in cloud</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Update the placement settings of a VM deployment configuration</td>
<td>Completed</td>
</tr>
<tr>
<td>1.2</td>
<td>Create virtual machine</td>
<td></td>
</tr>
<tr>
<td>1.2.1</td>
<td>Rapid deploy using SAN copy</td>
<td>Completed</td>
</tr>
<tr>
<td>1.2.1.1</td>
<td>Parallel execution step</td>
<td>Completed</td>
</tr>
<tr>
<td>1.3.1.1</td>
<td>Creates new storage logical unit</td>
<td>Completed</td>
</tr>
<tr>
<td>1.2.1.2</td>
<td>Registers Storage Logical Unit to host TSSRV232.techno.local</td>
<td>Completed</td>
</tr>
</tbody>
</table>

Figure 156: SCVMM 2012 creates a new rapid provisioned logical unit

1) SCVMM 2012 leverages SMI-S to provision this logical unit in just a few seconds as a thinly provisioned SAN volume that initially consumes no space on the SAN. It is created from a Dell Compellent volume Replay of the gold image volume.
2) Once the **Creates new storage logical unit** sub-step in the SCVMM 2012 job completes, return to the Storage Center Manager GUI and refresh the view.

3) A new thinly provisioned volume, created from a Storage Center Replay of the gold image volume, will appear in the Replay tree view as shown above.

4) The SCVMM job will map this new logical unit (as **LU1** using fiber channel MPIO in this example) to the assigned Hyper-V host as a mount point as shown above. If the new rapid-provisioned guest VM were being created as a highly available (HA) guest on a Hyper-V cluster, then the SCVMM 2012 job would map the new logical unit to all
nodes of the Hyper-V cluster as a new cluster volume.

**Figure 159: SAN space used by the gold image SAN volume on Dell Compellent**

5) Highlight the gold image volume in Storage Center Manager and click on the Statistics tab. The gold image volume in this example is consuming 9.16 GB SAN space (not including RAID or Replay overhead). Most of the data is currently at Tier 1-RAID 5. Dell Compellent Data Progression will automatically move this data up or down between tiers and RAID levels to ensure optimal performance.

**Figure 160: Only new data is written to the rapid-provisioned SAN volume**

6) Click on the new rapid-provisioned volume in Storage Center Manager and click on the Statistics tab. As the job in SCVMM 2012 maps the new storage to the Hyper-V host and begins to boot the new rapid-provisioned guest VM, any new data is written at Tier 1-RAID 10 to this volume. In the above figure, the volume is only consuming 6 MB of space so far as it has just been created.

7) Monitor the Job in SCVMM 2012 until the new guest VM **MG-GuestVM1001** is fully provisioned.
8) Refresh the GUI in Storage Center Manager and compare the Statics for the source volume (the gold image volume) to the new rapid-provisioned volume for MG-GuestVM1001.

9) In this example, the new guest VM MG-GuestVM1001 has consumed a total of 840 MB of SAN space, representing only the new data blocks written as a part of provisioning this new guest VM from sysprepped gold image. For any unchanged data, the new guest VM accesses it from the frozen blocks on the gold image volume.

10) As can be seen in the figures above, rapid-provisioning this new guest resulted in a significant space saving (8.3 GB) on the Dell Compellent SAN. The guest is consuming only 9% of the space it would have consumed had it been deployed using a network-copy template.

11) The new data is also subject to Data Progression so although it was written at Tier 1-RAID 10 for maximum write performance, inactive data on this volume will eventually be moved down to Tier 3-RAID 6 to take advantage of more cost effective storage and the better read performance of RAID 6.

12) As an optional step, provision another new guest VM using the rapid-provision template in SCVMM 2012, following the steps in the previous section of this document.
Figure 162: Replay Tree view shows two rapid-provisioned volumes

13) After the guest VM has been provisioned (the SCVMM 2012 job completes), refresh the GUI in Storage Center Manager and using the Tree view under the Replays tab, observe how a second volume has now been thinly-provisioned for the second new guest **MG-GuestVM1002** as shown above.

14) Again, the guest is consuming only a fraction of the SAN space it would have, had it been deployed using a network-copy template (840 MB vs. 9.16 GB).

### 9.3.1 SAN Space Saved with Rapid-Provisioning

#### Table 6: SAN space usage comparison

<table>
<thead>
<tr>
<th>Source VHD/VHDX</th>
<th>Network-copy template (VHDs copied over the network)</th>
<th>SAN copy-capable template (rapid-provisioning)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Guest VM 1</td>
<td>9 GB</td>
<td>1 GB</td>
</tr>
<tr>
<td>New Guest VM 2</td>
<td>9 GB</td>
<td>1 GB</td>
</tr>
<tr>
<td>New Guest VM 3</td>
<td>9 GB</td>
<td>1 GB</td>
</tr>
<tr>
<td>New Guest VM 99</td>
<td>9 GB</td>
<td>1 GB</td>
</tr>
<tr>
<td>New Guest VM 100</td>
<td>9 GB</td>
<td>1 GB</td>
</tr>
<tr>
<td>Total SAN space consumed</td>
<td>909 GB</td>
<td>109 GB</td>
</tr>
<tr>
<td>Total SAN space saved</td>
<td>0 GB</td>
<td>800 GB</td>
</tr>
</tbody>
</table>

As shown in the table above, the SAN space savings can be significant when using rapid-provisioning. In this example, provisioning 100 guest VMs from the SAN copy-capable template would realize a space savings of 800 GB on the SAN (not factoring in RAID or Replay overhead).
While there are no Dell Compellent Storage Center or SCVMM 2012-imposed limits on the maximum number of guest VMs that can be rapid-provisioned from a single SAN copy-capable template, factors such as the IO demands of the guest VMs will result in a functional limit. As a best practices recommendation, plan for about 100 guest VMs per each rapid-provision template.
10 Conclusion

Hopefully this document has proved helpful and has accomplished its purpose by providing administrators with answers to commonly asked questions associated with configuring the Dell Compellent Storage Center and SCVMM 2012 to quickly and efficiently deploy new Hyper-V guests to a private cloud using SAN copy-capable templates and rapid-provisioning.
11   Additional Resources

Below are some links to additional resources:

Dell Compellent Documentation
- Enterprise Manager 6.3 User Guides
- Storage Center 6.3 Users Guides
- Best Practices for Hyper-V (includes Server 2008 and Server 2012)
- Hyper-V Disaster Recovery Best Practices Guide
http://kc.compellent.com

Microsoft System Center Technical Documentation Library

Microsoft SCVMM 2012 Technical Documentation Library

Microsoft Hyper-V (Server 2008) Planning and Deployment Guide:

Microsoft TechNet Hyper-V (Server 2008) document collection:

Microsoft Technet Hyper-V (Server 2012) document collection:

Feature Comparison – Windows Server 2008 R2 Hyper-V and Server 2012 Hyper-V
http://download.microsoft.com/download/2/C/A/2CA38362-37ED-4112-86A8-FDF14D5D4C9B/WS%202012%20Feature%20Comparison_Hyper-V.pdf


Offloaded Data Transfers (ODX)