Dell Storage with Microsoft Storage Spaces Deployment Guide

Notes, cautions, and warnings

NOTE: A NOTE indicates important information that helps you make better use of your computer.

CAUTION: A CAUTION indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

WARNING: A WARNING indicates a potential for property damage, personal injury, or death.

Contents

Overview

This document describes how to deploy the Dell Storage with Microsoft Storage Spaces (DSMS) solution to use as a Scale-Out File Server (SOFS) or Converged solution. These solutions use Dell PowerEdge servers in a failover cluster and provides shared storage by supporting up to four DSMS is used to configure and manage the storage. Storage Spaces is a software-defined storage (SDS) component in the Microsoft Windows Server 2012 R2 operating system (OS).

This document is intended to support DSMS configurations, which have unique solution SKUs called Solution IDs. These DSMS solution IDs are required when ordering a DSMS configuration, and to access the benefits such as performance and sizing, optimized server and storage components, single-payload updates, and solution-level technical support. If you are in a geographical area outside of the US, the solution IDs are not available at this time. However, you may reference the configuration name instead. For the complete list of configuration solution IDs, see Dell Storage with Microsoft Storage Spaces Configurations and Solution IDs available at Dell Tech Center.
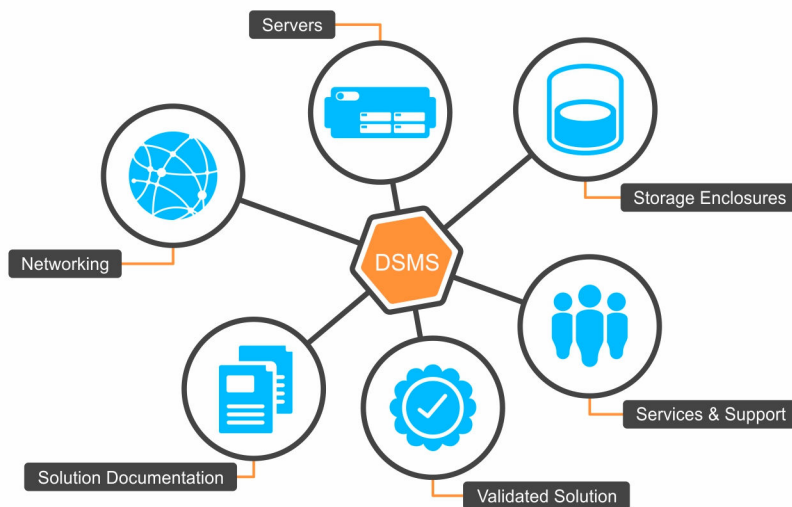
Figure 1. The correct solution ID connects you to all the solution has to offer, including Dell Services and Support.

Documentation Matrix

⚠ **WARNING: See the safety and regulatory information that shipped with your system. Warranty information may be included within this document or as a separate document.**

✎ **NOTE:** Any specific statement of support within the DSMS documents supersedes any support statement within referenced product documentation.

NOTE: The manuals listed here indicate the products that have different model number; however, the content is relevant to the DSMS solution.

- *Rack Installation Instructions* guide describes about how to install your system into a rack. This document is also shipped with your system.
- *Dell PowerEdge R630 or R730 Getting Started Guide* provides an overview of setting up Dell PowerEdge R630 or R730 rack servers. This document is available at **Dell.com/dsmsmanuals**.
- *Dell PowerVault MD3060e or Dell Storage MD1400 Series Getting Started Guide* provides an overview of setting up the Dell PowerVault MD3060e or Dell Storage MD1400 series enclosures. This document is available at **Dell.com/dsmsmanuals**.
- *Dell Storage MD1400 Series Owner's Manual* provides information about system hardware features and describes how to troubleshoot the system and install or replace system components. This document is available at **Dell.com/dsmsmanuals**.
- *Dell PowerVault MD3060e Owner's Manual* provides information about system hardware features and describes how to troubleshoot the system and install or replace system components. This document is available at **Dell.com/dsmsmanuals**.
- *Dell PowerEdge R630 or R730 Owner's Manual* provides information about system hardware features and describes how to troubleshoot the system and install or replace system components. This document is available at **Dell.com/dsmsmanuals**.
- *Dell Storage with Microsoft Storage Spaces Support Matrix* provides information about the software and hardware compatibility for Dell Storage with Microsoft Storage Spaces solution. This document is available at **Dell.com/dsmsmanuals**.
- *Dell Storage with Microsoft Storage Spaces Cabling Guide* provides guidance and cabling diagrams for supported Dell Storage with Microsoft Storage Spaces configurations. This document is available at **Dell.com/dsmsmanuals**.
- *Dell Storage PowerTools Server Hardware Manager Administrator's Guide* provides information about how to configure, manage, and update your Dell Storage enclosure. This document is available at **Dell.com/dsmsmanuals**.

    NOTE: This administrator guide does not mention the DSMS solution; however, the guide provides information about configuring DSMS. Use this document along with the DSMS solution documents. For more information about the DSMS Support Matrix, refer to *Dell Storage with Microsoft Storage Spaces Support Matrix* available at **Dell.com/dsmsmanuals**

- *Dell Storage with Microsoft Storage Spaces Best Practices Guide* provides information about the best practices for the DSMS solution. This document is available at **Dell.com/dsmsmanuals** .

Any media that ships with your system that provides documentation and tools for configuring and managing your system, including those pertaining to the operating system, system management software, system updates, and system components that you purchased with your system.

For the full name of an abbreviation or acronym used in this document, see the Glossary available at **Dell.com/dsmsmanuals**.

NOTE: Always check for updates at **Dell.com/dsmsmanuals** and read through the updates first because they often supersede information in other documents.

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Configuration prerequisites

To deploy your storage solution, you must ensure that the physical requirements and network requirements of the installation environment are fulfilled prior to installing and configuring the solution. The following sections describe the prerequisites of the deployment infrastructure.

Rack space

This solution requires a minimum amount of rack space for the servers and storage enclosures. The following table lists the amount of contiguous rack space required based on your solution.

Table 1. Required rack space for SOFS configurations

Server or storage solution	2x1	2x2	2x3	2x4	3x3	3x4	4x4
DSMS 630 with DSMS 14x0 series	4U	6U	8U	10U	9U	11U	12U
DSMS 630 with DSMS 3060e	6U	10U	14U	18U	15U	19U	20U
DSMS 730 with DSMS 14x0 series	6U	8U	10U	12U	12U	14U	16U
DSMS 730 with DSMS 1420 (All Flash Array)	6U	8U	N/A	N/A	N/A	N/A	N/A
DSMS 730 with DSMS 3060e	8U	12U	16U	20U	18U	22U	24U

Table 2. Required rack space for converged configurations

Server or storage solution	2x1	2x2	2x3	2x4	3x3	3x4	4x3	4x4
DSMS 630 with DSMS 14x0 series	4U	6U	8U	10U	9U	11U	12U	N/A
DSMS 630 with DSMS 3060e	6U	10U	14U	18U	15U	19U	N/A	20U
DSMS 730 with DSMS 14x0 series	6U	8U	10U	12U	12U	14U	14U	16U
DSMS 730 with DSMS 1420 (All Flash Array)	6U	8U	N/A	N/A	N/A	N/A	N/A	N/A

Server or storage solution	2x1	2x2	2x3	2x4	3x3	3x4	4x3	4x4
DSMS 730 with DSMS 3060e	8U	12U	16U	20U	18U	22U	N/A	24U

> **NOTE:** You may have to consider additional rack space for switches, SMB client servers, and other requirements for your environment.

Internet connectivity

If you are using Windows Update for OS updates and fixes, each server node requires internet access.

DNS

Server nodes in the cluster must use Domain Name System (DNS) for name resolution. Also, the server nodes can use DNS Dynamic update protocol.

Domain role

When you create a server node for a cluster, each server node must be in the same Active Directory (AD) Domain and you must specify their role as "member server."

Administrator account for the cluster

To create a cluster, you must have an account to the domain that has administrator rights and permissions on all server nodes in the cluster.

Network infrastructure requirements for Converged

Converged network configurations will vary depending on the workload being deployed on the solution. The following is a list of the different types of network traffic to consider when planning the deployment.

Table 3. Type of network traffic for Converged

Type of Network	Description
iDRAC server management	Network used to manage the physical server. It provides functionality that helps you deploy, update, monitor and maintain Dell PowerEdge servers with or without a systems management software agent.
Management	Network used to manage physical server such as Active Directory and Domain Name System integration.
Storage	Network used for storage traffic and I/O redirection.
External communication	Network used for communication to applications running on the solution such as Hyper-V, SQL, etc.
Cluster	Network used for the failover cluster which provides communication for the heartbeat in addition to inter-node communication, such as CSV redirection and Hyper-V live Migration.

Network infrastructure requirements for SOFS

Dell recommends that you use five distinct subnets for Scale-Out File Server configurations. The first subnet is used for cluster management and AD integration. This subnet can leverage an existing network infrastructure. Two high-speed storage networks are used for external client communication (Layer 3-routable). Other two subnets are used for intra-cluster communication (does not require Layer 3 routing).

You must have each redundant pair of subnets routed through two physically separate switches.

Network settings and IP addresses

On the basis of your network infrastructure, you must know the following information to associate with the network setup of each NIC:

• IP address
• Gateway IP address
• Subnet mask
• Static DNS server address

NOTE: A set of the following IP addresses are required for each server node in the cluster.

A summary of the seven IP addresses required for configuring the NICs on each node in the following table.

Table 4. Node IP address summary

	Static or DHCP address	Subnet mask	Gateway	DNS	Network
iDRAC Server Management	Either	X	X	X	Subnet 1 or existing network (Layer 3-routable)
Cluster- or Server Management	Either	X	X	X	Subnet 1 or existing network (Layer 3-routable)
	Either	X	X	X	Subnet 1 or existing customer network (Layer 3-routable)
External communication to SMB clients	Static	X	X	X	Subnet 2 (Layer 3-routable)
	Static	X	X	X	Subnet 3 (Layer 3-routable)
Internal communication between server cluster nodes	Static	X			Subnet 4
	Static	X			Subnet 5

Switch requirements

The SOFS solution requires a minimum of two physically separate switches to provide resilient connectivity between the storage nodes and clients. Divide each of the two switches to accommodate at

least four subnets for external and internal cluster communication. You may require additional switches for cluster management. These requirements do not apply to the Converged solution.

Table 5. Switch ports required for each subnet

Subnets	Number of ports for each server	Description
Subnet 1 — Management	2 ports (Management) 1 port (iDRAC)	Typically routed through separate switches. Use existing network if necessary.
Subnet 2 — External communication to SMB clients	1 port on Switch 1	Subnet 2 and Subnet 3 are resilient paths through separate switches.
Subnet 3 — External communication to SMB clients	1 port on Switch 2	
Subnet 4 — Internal communication between cluster nodes	1 port on Switch 1	Subnet 4 and Subnet 5 are resilient paths through separate switches.
Subnet 5 — Internal communication between cluster nodes	1 port on Switch 2	

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Hardware installation

This section provides a general overview about deploying the DSMS solution. For more information about hardware cabling of a specific DSMS solution, see the *Dell Storage with Microsoft Storage Spaces Cabling Guide* available at **Dell.com/dsmsmanuals**. For more information about the specific storage enclosures and servers, see the *Owner's Manual* available at **Dell.com/dsmsmanuals**.

Installing the storage enclosures into the rack space

NOTE: For weight stability, always load the rack by using a bottom-up approach.

Before you begin, read through the following documentation:

- *Rack installation instructions* shipped with your storage enclosure.
- *Dell PowerVault MD3060e or Dell Storage MD1400 Series Getting Started Guide*
- *Dell PowerVault MD3060e or Dell Storage MD1400 Series Owner's Manual*

1. Ensure that there is enough contiguous available rack space in the rack for your solution. For information about required rack space, see the required rack space matrix in [Rack space](#).
2. Install the storage enclosures into the rack one on top of the other. Ensure that you follow the *Rack installation instructions* shipped with your storage enclosure.
3. Connect and secure the power cables to each storage enclosure following guidance from the *Getting Started Guide* or *Setup Guide* for your storage enclosures.
4. To ensure each storage enclosure has a redundant power source, power cables in each storage enclosure must be plugged into a separate power source such as an uninterruptible power supply (UPS) or a power distribution unit (PDU).

    NOTE: Do not turn on the storage enclosures at this time. The storage enclosure will be turned on at a later stage in the deployment process.

Installing the servers into the rack space

After you install the storage enclosures, install the servers.

Before you begin, ensure that you have access to the following documents:

- *Rack installation instructions* shipped with your storage enclosure.
- *Dell PowerEdge R630 or R730 Getting Started Guide*

- *Dell PowerEdge R630 or R730 Owner's Manual*

1. Ensure that there is enough contiguous available rack space on top of the storage enclosures installed in the rack. For details about require rack space, see the required rack space matrix in <u>Rack space</u>.
2. Install the servers into the rack. Ensure you follow the *Rack installation instructions* shipped with your storage enclosure.
3. Ensure that each server has the required number of SAS HBAs installed. For more information about the supported HBAs for your solution, see the *Dell Storage with Microsoft Storage Spaces Support Matrix* available at **Dell.com/dsmsmanuals**.
4. If the HBAs are not installed, install the HBAs following the slot priority matrix listed in <u>Card installation guidelines</u>.

    📝 **NOTE:** The slot priority list for DSMS supersedes the Dell PowerEdge R630 or R730 Owner's Manual. DSMS does not support HBAs placed in slot 5 and 7.

5. If your solution uses remote direct memory access (RDMA), ensure that each server has one supported RDMA adapter installed. If you have not installed the RDMA adapter, install it following the slot priority matrix listed in <u>Card installation guidelines</u>. For more information about the supported RDMA adapters, see the *Dell Storage with Microsoft Storage Spaces Support Matrix* available at **Dell.com/dsmsmanuals**.
6. Connect and secure the power cables to each server following guidance from the *Dell PowerEdge R630 or R730 Getting Started Guide* available at **Dell.com/dsmsmanuals**.
7. To ensure that each server has a redundant power source, power cables in each server must be plugged into a separate power source such as an UPS or a PDU.

    📝 **NOTE:** Do not turn on the servers at this time. Servers will be turned on in the later step in the deployment process.

Installing the hard drives (DSMS 3060e)

📝 **NOTE:** If your solution uses the DSMS 1400 series storage enclosures, the hard drives are shipped installed in the enclosure. This section and the following subsections apply only to solutions that use the DSMS 3060e storage enclosures.

While loading hard drives into the storage enclosures, complete the task as described in the Physical Disk Installation Guidelines section in the *Dell PowerVault MD3060e Owner's Manual* available at **Dell.com/dsmsmanuals**.

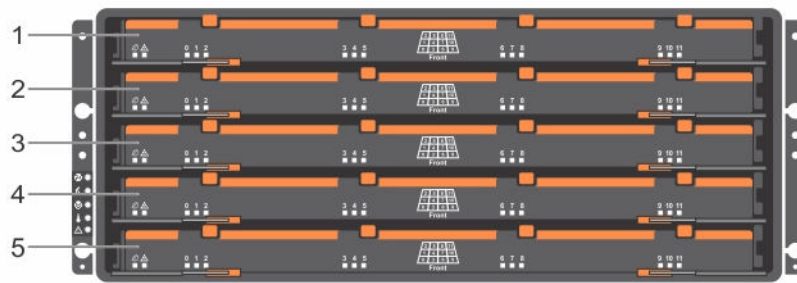**Figure 2. DSMS 3060e drive drawer numbering**

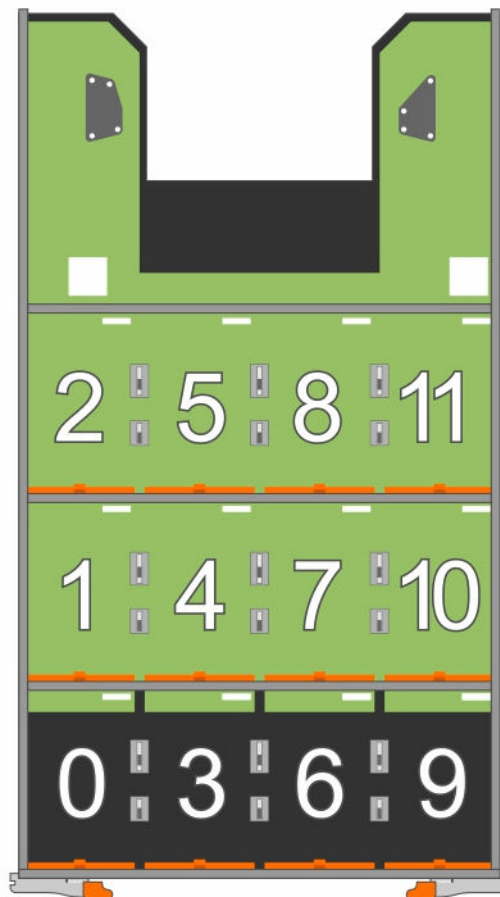|			
1.	Drawer 0	2.	Drawer 1
3.	Drawer 2	4.	Drawer 3
5.	Drawer 4		

Figure 3. Drive slot numbering for the drive drawers in each DSMS 3060e storage enclosure

Loading the SSDs

1. Ensure the solid state drives (SSDs) are installed in 2.5" drive carriers.
2. Load the SSDs into the front row slots (slots 0, 3, 6, 9) of drive drawers 0, 1, and 2 with the SDDs in each storage enclosure.

   ✎ NOTE: Dell recommends distributing the SSDs across the first three drive drawers evenly based on the number of SSDs available.

Loading the HDDs

1. Ensure the hard disk drives (HDDs) are installed in 3.5" drive carriers.
2. Load the HDDs into the remaining open slots in each storage enclosure.

   ✎ NOTE: The HDDs must be evenly distributed across the remaining drive drawers to allow for distributed airflow.

   ⚠ WARNING: Do not try to remove more than one drawer at a time. Ensure that you insert the drive drawer that is out completely before pulling out another drive drawer.

Card installation guidelines

Table 6. Slot priority matrix

Card priority	Card type	Slot priority	Maximum allowed
1	12 Gb SAS (low profile)	2, 3, 1	2
2	12 Gb SAS (full height)	4, 6	2
3	6 Gb SAS (low profile)	2, 3, 1	2
4	6 Gb SAS (full height)	4, 6	2
5	10/40 GbE NIC (low profile)	1, 2, 3	1

Cabling servers to storage enclosures

After you have securely installed all the enclosures and servers for your solution into the rack, cable the servers to the storage enclosures on the basis of your solution. For more information about the supported DSMS configurations and cabling guidance, see the *Dell Storage with Microsoft Storage Spaces Cabling Guide* available at **Dell.com/dsmsmanuals**.

Cabling the network connections

Connect the servers to your network by following the tasks described in the Network infrastructure requirements for Converged . The figures here provide an example of how subnets are distributed in both SOFS and Compute Converged solutions.
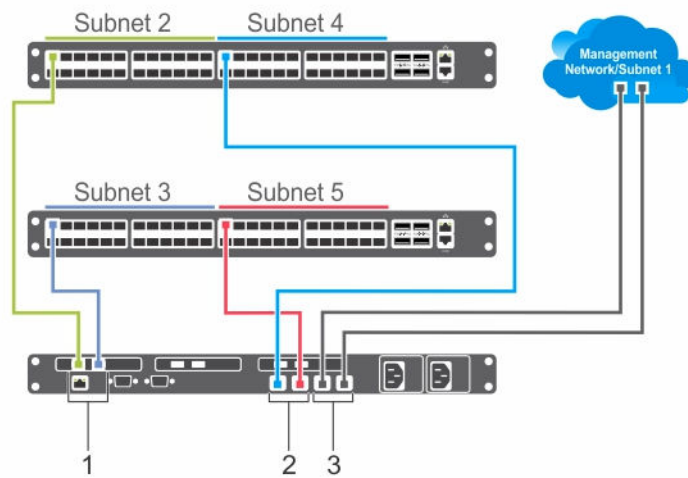
Figure 4. Connecting servers ports to subnets (SOFS solution)

1.　External Communication　　　　　　　2.　Intra-node Communication
3.　Management
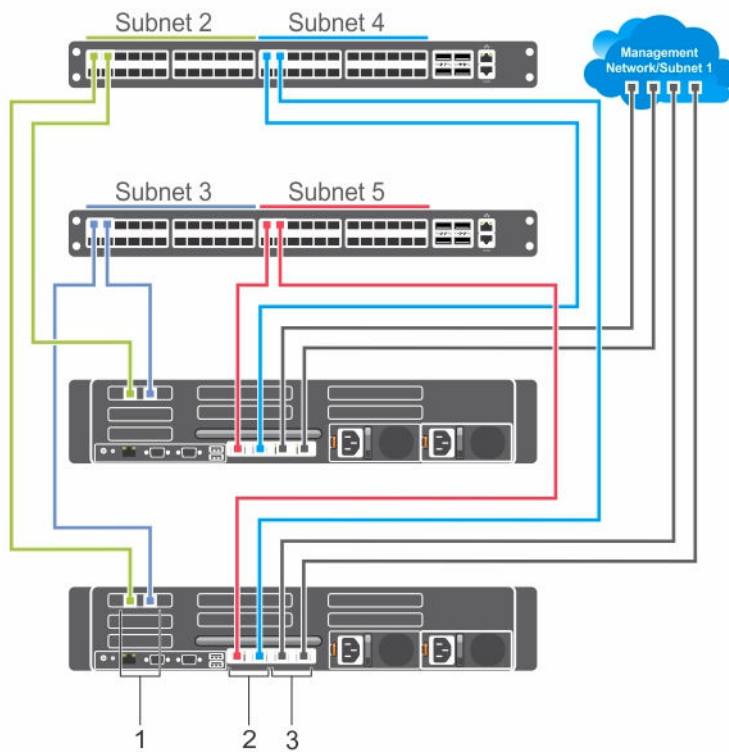
Figure 5. Connecting servers ports to subnets (Converged solution)

1.　Intra-node Communication　　　　　　2.　External Communication
3.　Management
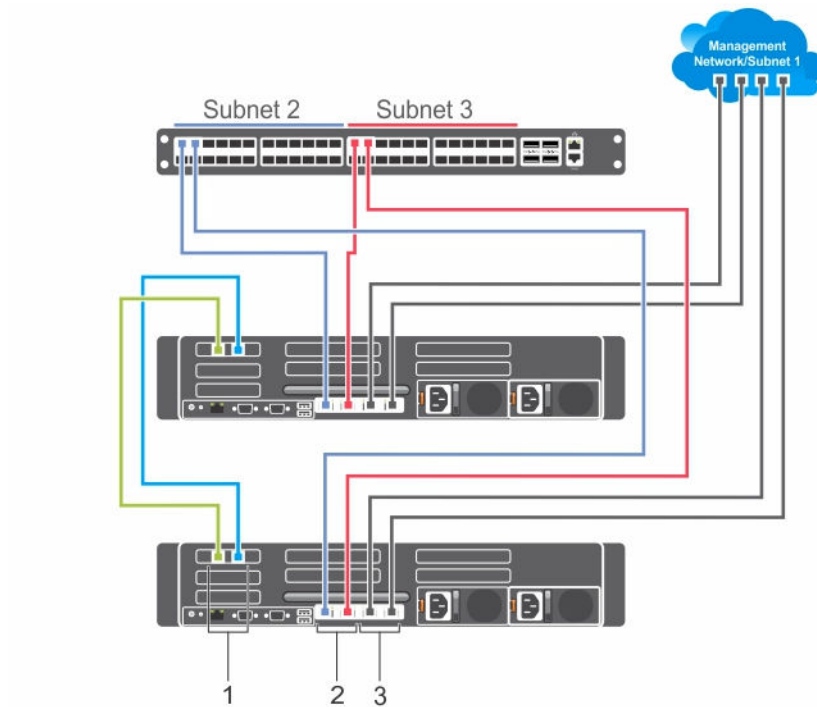
Figure 6. Connecting servers ports to subnets (Converged solution-2 Node Direct Connect Configurations)

1.	Intra-node Communication	2.	External Communication
3.	Management		

Turning on the servers
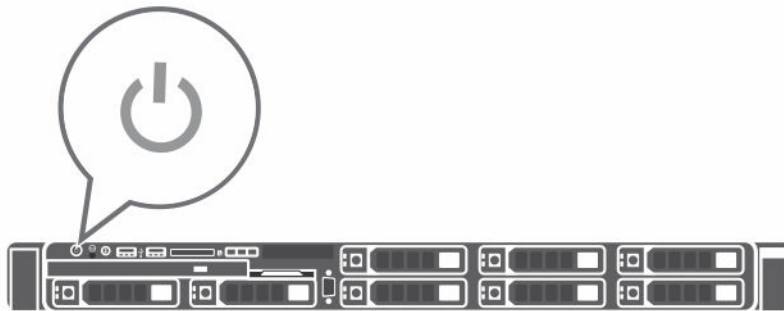
Figure 7. Turning on the server power

Press the Power button on the system. The power indicator must glow.

NOTE: Do not turn on the storage enclosures at this time. The storage enclosure will be turned on at a later stage in the deployment process.

Securing the bezels on each storage enclosure
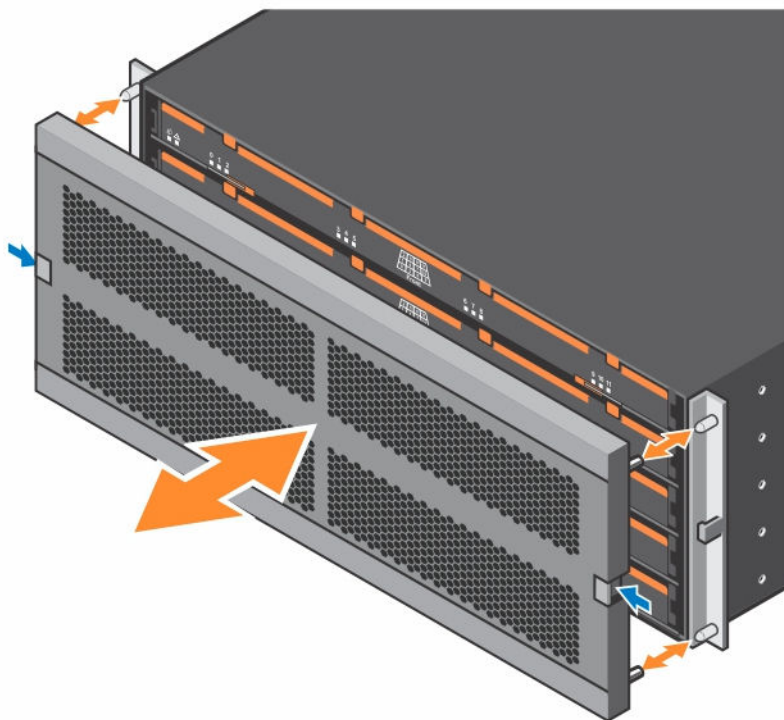
Figure 8. Installing the DSMS 3060e storage enclosure bezel
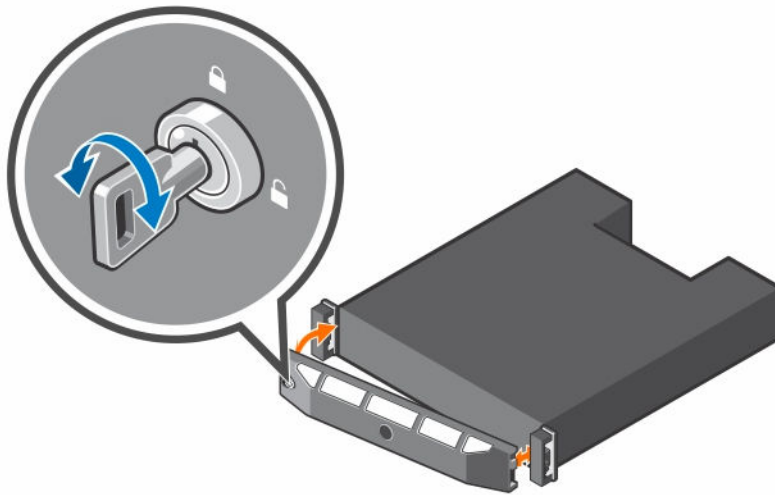
Figure 9. Installing the DSMS 1400 series storage enclosure bezel

Installing the optional server bezel
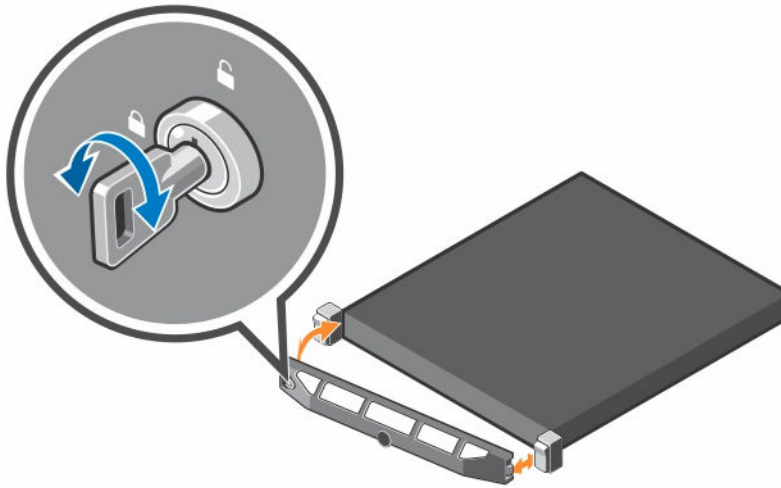
Figure 10. Installing the server bezel

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Windows configuration

Windows Server 2012 R2 Standard Edition or Datacenter Edition is installed on your server depending on your solution. Alternatively, if you are using a volume license, ensure that the OS is properly installed, all hardware has the necessary firmware and drivers, and continue to follow the deployment steps below.

After turning on each server, configure iDRAC to enable remote management of the server outside the OS. After the system starts, you must accept the end user license agreement (EULA), enter a local administrator password, and then activate the OS by using the license key provided with each server.

NOTE: Repeat all the tasks in this section on each server node.

CAUTION: When using a volume license, ensure that the correct drivers and firmware are available before proceeding with the deployment. After reinstalling your OS certain components like the Chipset driver must be downloaded.

Configuring dedicated iDRAC port for remote access

iDRAC provides remote access to the server, which allows initial server configuration outside of the OS and additional management applications. For more information about the enabling and configuring iDRAC for your server, see the *DSMS R630 or R730 Owner's Manual* available at **Dell.com/dsmsmanuals**.

Logging in to Dell iDRAC

This procedure requires that you have a Java Runtime Environment (JRE) installed on the system you are using to manage the connected Dell servers.

1. To log in to iDRAC, open a web browser on a management station, and then type the iDRAC IP address in the address bar.
2. On the **iDRAC Login** page, type the default log in credentials:
   a. In the **Username** box, type `root`.
   b. In the **Password** box, type `calvin`.
3. On the **System Summary** page, in the **Properties** tab, under the **Virtual Console** section, click **Launch**.

Logging in to the server

Logging in to your system as an administrator provides the user rights required to continue to the deployment procedure.

1. When the server starts for the first time, specify the language, and then accept the Microsoft EULA.
2. Set the password for the Administrator account for the server.

3. Log in to your server with the credentials provided in the previous step.

Configuring network interfaces for SOFS

Dell requires associating an IP address with each of the six network interface ports in each server.

- Two static or dynamic IP addresses for management
- Two static IP addresses for external communication to SMB clients
- Two static IP addresses for internal communication between server cluster nodes

Also, a gateway IP address, a subnet mask, and a DNS server address are required.

> **NOTE:** iDRAC, which is a dedicated network interface port for remote access, is distinct from the six ports you configure. iDRAC is configured separately outside the Windows OS.

Identifying the network ports

You must identify the network ports attached to management, external client communication, and for internal cluster communication networks. Also, Dell recommends renaming the NICs to indicate to which network the port is connected.

Identifying specific NICs

Table 7. Identifying specific NICs

Network description	Naming convention for ports	Typical NIC function	NIC type	Static or DHCP IP address to assign
Server management	Manage1 Manage2	Host management (remote desktop or System Center)	Two 1 GbE NIC ports Ports on the network daughter card (NDC) in the server.	Static or DHCP
External communication to SMB clients	External1 External2	Communication with SMB client computers to provide access to SMB shares	10/40 GbE NIC ports Typically the highest performance NICS, such as the RDMA ports available with Chelsio or Mellanox network adapters.	Static

Network description	Naming convention for ports	Typical NIC function	NIC type	Static or DHCP IP address to assign
Internal communication between server cluster nodes	Internal1 Internal2	Intra-cluster communication between nodes	10/40 GbE NIC ports Ports on the NDC in the server.	Static

To configure the NICs, complete the following task:

1. Go to **Control Panel → Network and Sharing Center**.
2. In the left pane, click **Change Adapter Settings**.
3. Based on the descriptions listed for each NIC, identify the following NICs:
   - Two network ports for management
   - Two network ports for internal communication
   - Two network ports used for external client communication
4. Rename the NICs to indicate the network to which each NICs are associated by using the naming convention listed in the Identifying specific NICs table.
5. To change the name of a NIC, right-click the NIC, and then select **Rename**.

Specifying the TCP/IP configuration

To specify the TCP/IP configuration for each of the connected NIC ports, complete the following task:

1. From the **Network Connections** drop-down menu, right-click a NIC, and then click **Properties**.
2. In the **Properties** dialog box, select **Internet Protocol Version 4 (TCP/IPv4)**, and then click **Properties**.
3. In the **Internet Protocol Version 4 (TCP/IPv4) Properties** dialog box, do the following:
   a. In the **IP address** box, type the IP address, if applicable.
   b. In the **Subnet mask** box, type the subnet mask.
   c. In the **Default gateway** box, type the gateway IP address.
   d. In the **Preferred DNS server** box, type the DNS IP address.
   e. Click **OK**.

Enabling jumbo frames on NICs

Configure NICs on all SMB clients and storage nodes for jumbo frames with the MTU frame size set to 9216 Bytes. Also, ensure that the flow control is enabled on every NIC.

Specifying the binding order

Specifying the binding order determines how network connections are accessed by network services. To specify the binding order, complete the following task:

1. Start a Windows PowerShell with administrative privileges.
2. Run the following command: `ncpa.cpl`
3. On the **Network Connections** page, press Alt to display the menu.
4. Click **Advanced**, and then select **Advanced Settings**.
5. In the **Advanced Settings** dialog box, select **External1** and **External2**, and then move them to the top of the binding order.

6. Move **Internal1** and **Internal2** below External1 and External2 in the list.
7. Ensure the manage ports are at the bottom of the list.
8. Click **OK**.
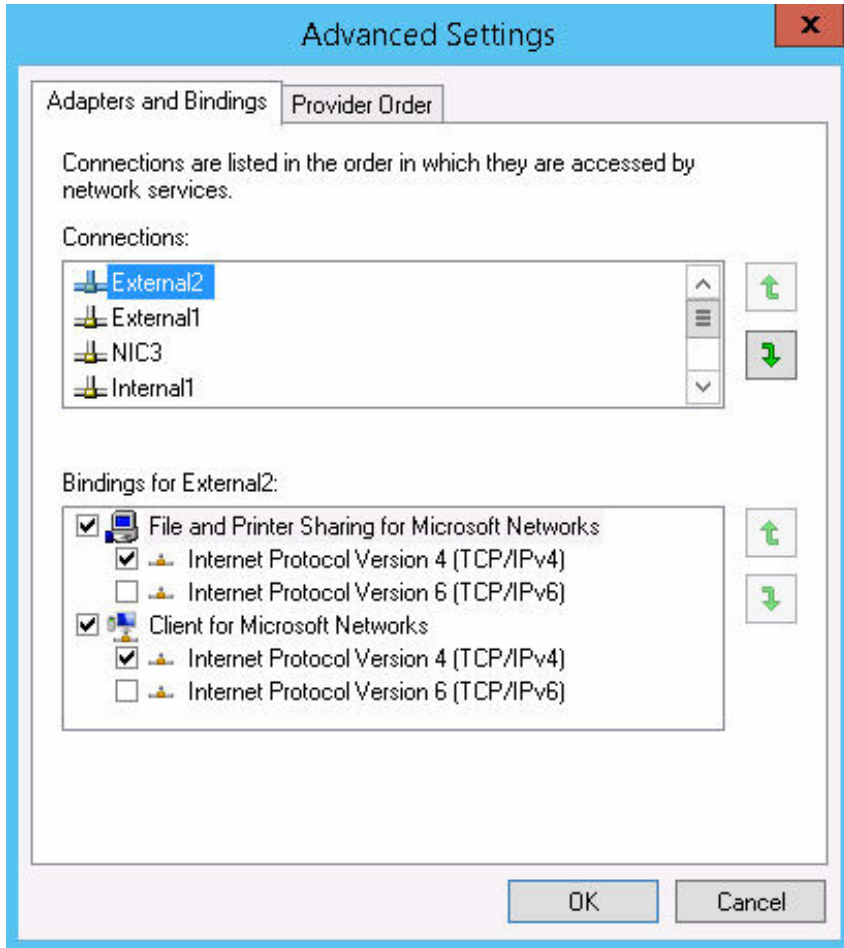
Figure 11. Setting the NIC binding order

Verifying network interface configurations

1. Start a Windows PowerShell instance with Administrative privileges.
2. For each NIC port, ensure that the port is attached to the expected network by running the following PowerShell command for each entry:

   ```
   Ping –S <string1> <string2>
   ```

   Where `<string1>` is the IP address of the source port (for example, External1) and `<string2>` is the IP address of the DNS server.

Renaming the computer and joining a domain

Each server node in the cluster must be a member server of the same domain. The account used to build and create the cluster must have full administrative user rights on the cluster server nodes. You can use a

domain user account, but it must have create computer objects and read all properties rights on the domain.

1. In the **Server Manager** graphical user interface (GUI), select **Local Server**.
2. Select the computer name displayed in blue. For example, figure here shows the computer name as "**WIN-9I4698IC3RR**".
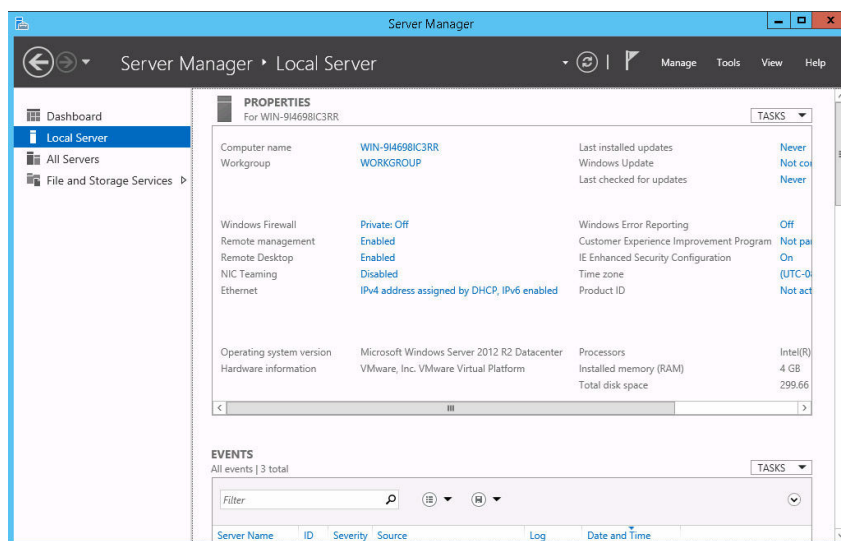
Figure 12. Renaming the computer

3. In the **Systems Properties** dialog box, click **Change**.
4. In the **Computer Name/Domain Changes** dialog box, complete the following task:
   a. In the **Computer Name** box, type the new computer name.
   b. Under **Member of**, select **Domain**, and then type the domain name in the box.
   c. Click **OK**.
   d. When prompted, restart the computer.
5. Make a note of the new computer name, because you require this information when selecting servers to join the cluster as nodes.

Installing the Dell Storage PowerTools Server Hardware Manager

The Dell Storage PowerTools Server Hardware Manager allows you to manage, monitor, and update the DSMS 3060e, DSMS 1400, and DSMS 1420 storage enclosures. This software is required for validating the installation of hardware and verifying firmware versions of the drives and storage enclosures.

Follow the procedure for installing the Dell Storage PowerTools Server Hardware Manager in the *Dell Storage PowerTools Server Hardware Manager Administrator's Guide* available at **Dell.com/dsmsmanuals**.

To download the software at **Dell.com/dsmsmanuals**, click **Servers, Storage & Networking** → **Engineered Solutions** → **Dell Storage with Microsoft Storage Spaces**. Select the storage enclosure model based on your solution, and then click **Drivers & Downloads**.

1. Download the latest version of the Dell Storage PowerTools Server Hardware Manager software located under the **Enterprise HDD/SSD** subsection.
2. Install the Dell Storage PowerTools Server Hardware Manager on each server.
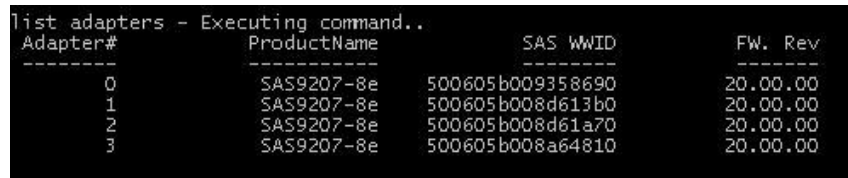
Ensuring HBAs are installed and updated

SAS Host Bus Adapters (HBAs) are required to connect the storage enclosures to each host. To ensure that the SAS HBAs listed and the firmware versions are the same based on the supported HBA for your solution, complete the following task:

1. Log in to each host server with the local Administrator privilege.
2. Start an elevated Administrator CLI, and then run the following command:

    ```
    shmcli list adapters
    ```

    The output should look similar to the example screenshot given here.


```
list adapters - Executing command..
Adapter#          ProductName          SAS WWID          FW. Rev
--------          -----------          --------          -------
       0           SAS9207-8e     500605b009358690       20.00.00
       1           SAS9207-8e     500605b008d613b0       20.00.00
       2           SAS9207-8e     500605b008d61a70       20.00.00
       3           SAS9207-8e     500605b008a64810       20.00.00
```

Figure 13. Output from the list adapters command

> **NOTE:** Ensure the SAS HBAs listed and the firmware versions are the same based on the supported HBA for your solution. For more information about minimum firmware versions for the HBA for your solution, see the *Dell Storage with Microsoft Storage Spaces Support Matrix* available at **Dell.com/dsmsmanuals**.

Configuring Windows roles and features

1. Start PowerShell as an administrator, and then run the following list of commands.

    a. To add roles and features to the server, run the following commands:

    ```
    Install-WindowsFeature Failover-Clustering -IncludeManagementTools
    Install-WindowsFeature RSAT-Clustering -IncludeAllSubFeature
    Install-WindowsFeature RSAT-ADDS-Tools
    ```

    b. To enable the default MPIO settings, run the following commands:

    ```
    Install-WindowsFeature Multipath-IO -IncludeManagementTools
    Enable-MSDSMAutomaticClaim -BusType SAS
    ```

    For more information about advanced MPIO settings, see the *Dell Storage with Microsoft Storage Spaces Best Practices Guide* available at **Dell.com/dsmsmanuals** .

    c. To restart the server, run the following commands:

    ```
    Restart-computer -confirm:$false
    ```

2. After the computer restarts, log in by using the domain account with administrative privileges. If you are unable to install these features prevents the storage solution from functioning properly. If you do not enable automatic updates on the server, appropriate messages are displayed.

Turning on the storage enclosure
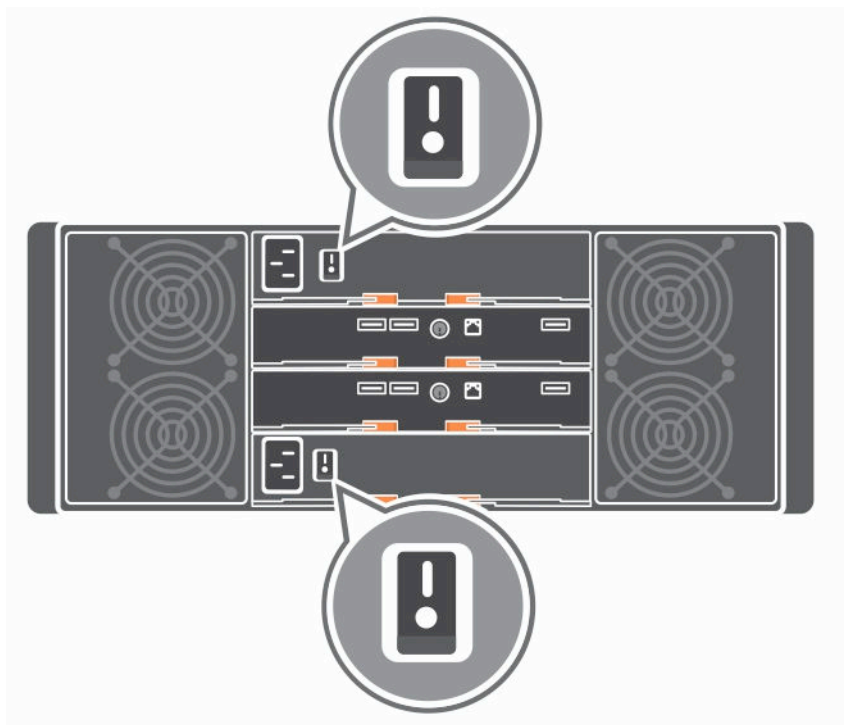

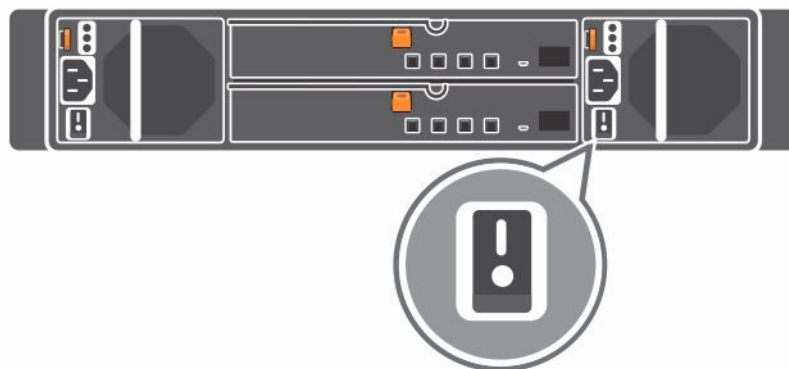**Figure 14. Turning on the DSMS 3060e storage enclosure**

Figure 15. Turning on the DSMS 1400 series storage enclosure

Turn on the power switches available at the back panel of the storage enclosure. The power LEDs glow.

7

Verifying installed roles and features

NOTE: Repeat all the tasks in this section on each storage node.

1. Log in to each server by using the domain account with administrative privileges.
2. To list features and roles installed, start a Windows PowerShell as an administrator, and then run the following command.

   `Get-Windowsfeature | Where Installed`
3. Ensure the list of features and roles listed here are installed. The role names are listed under the **Display Name** header.
   a. Multipath I/O
   b. Failover Clustering
   c. Remote Server Administration Tools

   NOTE: Ensure Failover Clustering Management tools and Failover Cluster Module for Windows PowerShell are installed within the Remote Server Administration tools.

8

Enabling Windows Update

Dell recommends you to enable Windows automatic updates to keep your software and hardware components of your storage solution up to date. Also, there are mandatory knowledge base articles required for your system to ensure your storage solution functions properly. For more information about required knowledge base articles for your solution, see the *Dell Storage with Microsoft Storage Spaces Support Matrix* available at **Dell.com/dsmsmanuals**.

To enable Windows Automatic Update, complete the following task:

1. Click **Control Panel → Windows Update**.
2. Click **Turn on automatic updates**.

    > NOTE: If you have deployed Windows Server Update Services (WSUS) as part of your data center infrastructure, this can also be used to manage updates for the servers in the solution.

Configuring MPIO policies

Configuring Multipath I/O (MPIO) on each server enables Windows server to use alternate paths to hard drive in the event of a failure and provides load balancing. When properly cabled and when using dual-port SAS physical disks, each server has two physical paths to each physical disk.

> NOTE: The recommended global MPIO load balancing policy for this solution is Least Blocks (LB).

Complete the following task before disks are added to a pool.

1. To enable MPIO automatic claim for SAS drives, run the following command:
    ```
    Enable-MSDSMAutomaticClaim -BusType SAS
    ```
2. To set the global default policy to LB, run the following command:
    ```
    Set-MSDSMGlobalDefaultLoadBalancePolicy -Policy LB
    ```

    This sets the global value to LB. Any new drive added to the solution will be automatically configured as LB. Dell recommends using Least Blocks (LB) for SSDs and LB for hard drives for optimal performance in most applications.

To configure a different load balance policy for different groups of drives please run the following code. Use the drive model identifier in order to make quick changes. If you have a combination of HDDs and SSDs then you have to configure manually.

1. To know the **Target H/W Identifier** value, run the following command:
    ```
    mpclaim -e
    ```
2. To set MPIO policy for the specified H/W Identifier (you MUST include all trailing spaces), run the following command:
    ```
    mpclaim -l -t "Target H/W Identifier" Policy Number
    ```

Policy Number options:

0 = Clear the policy
1 = Fail-Over policy
2 = Round Robin
6 = Least Blocks

You must run this command for every different drive model type. There are other load-balancing policies available but these are the only ones Dell supports.

3. To display the current target-wide MPIO policies, run the following command:

```
mpclaim -s -t
```

9

Configuring the failover cluster

You can perform these tasks on any one of the storage node servers that are in the cluster. You must perform the tasks described in this section only once. Before proceeding, ensure you are logged in with a domain account with administrative privileges.

NOTE: You must know the name of each storage node to include in the cluster.

Running a cluster test

1. Click **Server Manager** → **Tools** → **Failover Cluster Manager**.
   In the **Failover Cluster Manager** window, select **Validate Configuration**.
2. In the **Validate a Configuration Wizard** window, add the names of the servers to be added in the **Validate a Configuration Wizard** window.
3. Select **Run All tests**, and then click **Next**.
4. Allow the test to run. This procedure may take more than an hour to complete.
5. If any messages indicating warnings or failures are displayed, click **View Report**, and resolve the issues before configuring the cluster.
6. If there are no failures, select the **Create the cluster now using the validated nodes** check box.
7. To begin creating a cluster, click **Finish**.
   The **Create Cluster Wizard** window is displayed.

Creating a cluster

1. In the **Create Cluster Wizard** window, type the name of the cluster access point. Click **Next**.
2. When prompted, clear the **Add all available storage to cluster** check box.

   NOTE: Adding all available storage to cluster at this time prevents the usage and management of Clustered Storage Spaces from the Failover Cluster Manager.

3. In the **Summary** window, ignore any warnings regarding configuring a disk witness.

   NOTE: While creating a cluster, a disk witness is also created. However, the process of creating a disk witness is not described here because it is outside the scope of this document. For more information about configuring a disk witness, see the *Dell Storage with Microsoft Storage Spaces Best Practices Guide* available at **Dell.com/dsmsmanuals**.

Cluster network resources

Dell recommends you to configure your cluster with a network reserved static IP address specified in the DNS server.

Configuring the cluster IP address

1. Start **Failover Cluster Manager**. In the left pane, click the cluster that you want to configure.
2. Right-click a cluster core network resource, and then select **Properties**.
3. In the **General** tab, click **Add**.
4. In the **IP Address** dialog box, select **Use Static**, and then in the **Address** box, type the static IP address.

Renaming cluster networks

1. Go to **Failover Cluster Manager**, and then in the left pane, click **Networks**.
2. Select a network, and then in the **Networks Connections** tab, verify the names of the network adapters for each node.
3. Right-click a network and rename the network as Internal, External, or Management on the basis of adapters in the **Network Connections** tab. Expanding each network item shows information about that adapter.

Specifying the cluster network roles

This task configures the cluster role for the cluster network. You can define the cluster network based on the type of communication performed.

1. Start PowerShell as an administrator.
2. Configure **Cluster Network Roles** for using the following Windows PowerShell commands where:

   0 – Cluster network not used for cluster communication.

   1 – Cluster network used only for intra-cluster communication.

   3 – Cluster network used for client and intra-cluster communication.

   ```
   (Get-ClusterNetwork "Management").Role = 0
   (Get-ClusterNetwork "Internal").Role = 1
   (Get-ClusterNetwork "External").Role = 3
   ```

Setting CSV cache size

For more information about setting the CSV cache size, see the *Dell Storage with Microsoft Storage Spaces Best Practices Guide* available at **Dell.com/dsmsmanuals**.

> NOTE: The CSV cache is not used with tiered storage spaces.

10

Verifying and updating physical disks and EMMs

This section verifies the firmware version of the EMMs and physical disks. Also, this section provides guidance in updating the storage components, if required. You must have installed the Storage Hardware Manager CLI utility described in [Installing the Dell Storage PowerTools Server Hardware Manager](#) to perform the following tasks. For more information about using the Installing the Dell Storage PowerTools Server Hardware Manager, see the *Dell Storage PowerTools Server Hardware Manager Administrator's Guide* available at **Dell.com/dsmsmanuals**.

Verifying the EMM firmware version

1. Start an elevated Administrator CLI.
2. Run the following command.

   ```
   shmcli list emms —a=<Adapter Index>
   ```

   The output should look similar to the example screenshot given here.

```
list emms - Executing command..
EMM Slot#              Encl WWN       Name      Vendor      Status      Rev
---------        ---------        ----      ------      ------      ---
        1      50080e5204ea3000    MD3060e      DELL         OK       0399
        1      50080e520545d000    MD3060e      DELL         OK       0399

list emms - Command execution complete.
```

Figure 16. Verifying the EMM firmware version

Updating EMMs (if necessary)

If the firmware versions of the EMMs are not updated, complete the following task:

1. Start an Administrator CLI.
2. For each EMM that you must update, run the following command.

   ```
   shmcli update emm —a=<Adpater Index> —enc=<Encl WWN> —emm=<WWN> —file
   =<firmware file path >
   ```

   The EMM automatically restarts for the firmware to take effect. Ensure the EMM that was updated comes back online before updating the next one. For more information about updating the EMMs, see the *Dell Storage PowerTools Server Hardware Manager Administrator's Guide* available at **Dell.com/dsmsmanuals**.

Verifying hard drive firmware version

1. Start an elevated PowerShell Administrator CLI.
2. Run the following command.

   ```
   shmcli list drives –a=0
   ```
3. Ensure that the storage devices used are of the same type: SSDs or HDDs. The firmware must also be of the same versions. For more information about compatible firmware versions, see the *Dell Storage with Microsoft Storage Spaces Support Matrix* available at **Dell.com/dsmsmanuals**.

Updating physical disks

If any of the physical disks do not have appropriate firmware versions, update the physical disks firmware. To update the physical disk firmware, complete the following task:

1. Start a PowerShell Administrator CLI.
2. To update each hard drive, run the following command.

   ```
   shmcli update drive –d=<WWN> –file = <Path to firmware file>
   ```

   For more information about updating drives including updating more than one drive in an enclosure, forcing updates, and multi-threaded updates, see the *Dell Storage PowerTools Server Hardware Manager Administrator's Guide* available at **Dell.com/dsmsmanuals**.

11

Getting help

Contacting Dell

Dell provides several online and telephone-based support and service options. If you do not have an active internet connection, you can find contact information about your purchase invoice, packing slip, bill, or Dell product catalog. Availability varies by country and product, and some services may not be available in your area. To contact Dell for sales, technical assistance, or customer-service issues:

1. Go to **Dell.com/support**.
2. Select your country from the drop-down menu on the lower right corner of the page.
3. For customized support:
   a. Enter your system Service Tag in the **Enter your Service Tag** field.
   b. Click **Submit**.
      The support page that lists the various support categories is displayed.
4. For general support:
   a. Select your product category.
   b. Select your product segment.
   c. Select your product.
      The support page that lists the various support categories is displayed.
5. For contact details of Dell Global Technical Support:
   a. Click [Global Technical Support](#).
   b. The **Contact Technical Support** page is displayed with details to call, chat, or e-mail the Dell Global Technical Support team.

Locating your Dell system Service Tag

Your hardware is identified by a unique Express Service Code and Service Tag number. The Express Service Code and Service Tag are found on the front of the system by pulling out the information tag.

Alternatively, the information may be on a sticker on the chassis of the system. This information is used by Dell to route support calls to the appropriate personnel.

Quick Resource Locator

Use the Quick Resource Locator (QRL) to get immediate access to DSMS Solution information. This information provides access to reference documentation, a link to the Dell support page, and links to hardware-specific QRL pages, which include how-to videos. You can access this information by visiting **www.dell.com/QRL** or by using your smartphone or tablet and scanning the QR code below.

Quick Resource Locator

Dell.com/QRL/Solutions/DSMSStorageSpaces

Configuring storage solution as a Scale-Out File Server

The section describes about converting a failover cluster solution into a Scale-Out File Server. Before proceeding, ensure that the system is deployed following the procedures described in the preceding sections of this document.

Adding File Server role to each cluster node

1. On each cluster node of the failover cluster, start a Windows PowerShell prompt as an Administrator, and then run the following command.

   ```
   Install-WindowsFeature File-Services -IncludeManagementTools
   ```

2. To verify that the role was added successfully, run the following command.

   ```
   Get-Windowsfeature | Where Installed
   ```

3. View the output list and ensure that the file server role was added.

Figure 17. View and verify file server role output was added

Adding Scale-Out File Server (SOFS) cluster role

1. On one of the cluster nodes, start **Failover Cluster Manager** and in the left pane, select the cluster.
2. In the working pane, click **Configure Role**.
3. Click **Next**.
4. In the **High Availability Wizard** dialog box, select **File Server**, and then click **Next**.
5. For the **File Server Type**, select **Scale-Out File Server for application data**, and then click **Next**.
6. When prompted, type the SMB name that you intend to use for the cluster. This name is used by client servers when accessing the file shares.
7. Click **Next**, the Scale-Out Filer Server is created.

Configuring storage solution as Converged solution

This section describes the conversion of a failover cluster solution in to a Hyper-V cluster solution. Before proceeding, ensure that the system is deployed by following the procedures described in the preceding sections of this document.

Adding Hyper-V role to each cluster node

1. On each cluster node of the failover cluster, start a Windows PowerShell prompt as an administrator, and then run the following command.

   ```
   Install-WindowsFeature Hyper-V -IncludeManagementTools
   ```
2. To verify that the role was added successfully, run the following command.

   ```
   Get-Windowsfeature | Where Installed
   ```
3. View the output list and ensure that the Hyper-V role was added.

Figure 18. View and verify file server role output was added

Creating a virtual machine

1. On the **Server Manager** page, click **Tools**, and then select **Failover Cluster Manager**.
2. On the **Failover Cluster Manager** page, in the right pane, click **Roles**. Under **Roles**, click **Virtual Machines**, and then click **New Virtual Machine**.
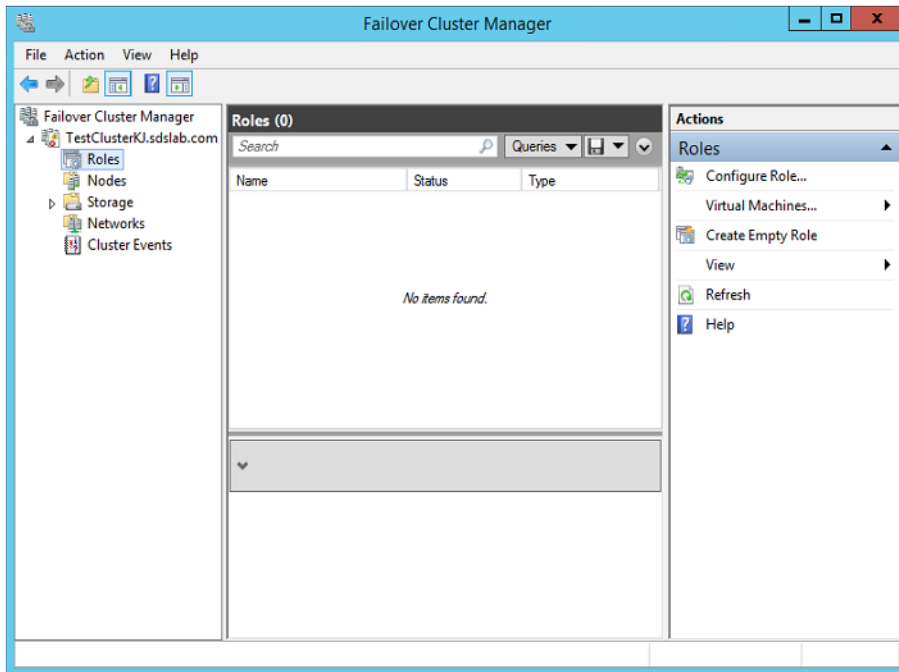
Figure 19. Creating New Virtual Machine in Failover Cluster Manager

3. In the **New Virtual Machine Wizard** dialog box, select the cluster node for virtual machine creation, and then click **Next**.

4. On the **Specify Name and Location** tab, select a name and location for the new virtual machine, and then click **Next**.
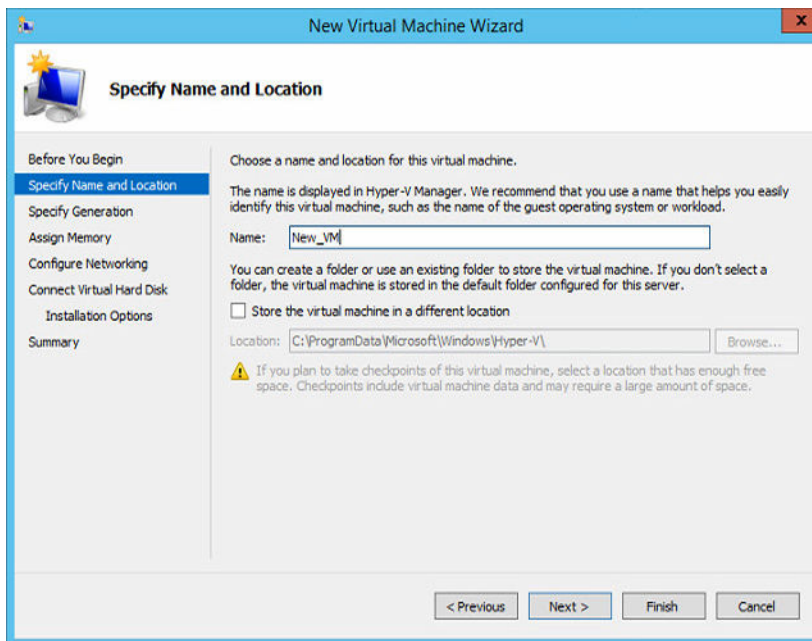

Figure 20. Specifying Name and Location for New Virtual Machine

5. On the **Specify Generation** tab, select **Generation 2**, and then click **Next**.

6. Assign the disk space to the virtual machine, and then click **Next**.
7. Configure the network adapter to use a virtual switch or remain disconnected, and then click **Next**.
8. Select to connect to a virtual hard disk, use an existing virtual hard disk, or attach a hard disk later. If you are creating a virtual hard disk, specify name and location, and then click **Next**.
9. On the **Installation Options** tab, select the **Install an operating system later** check box, and then click **Next**.
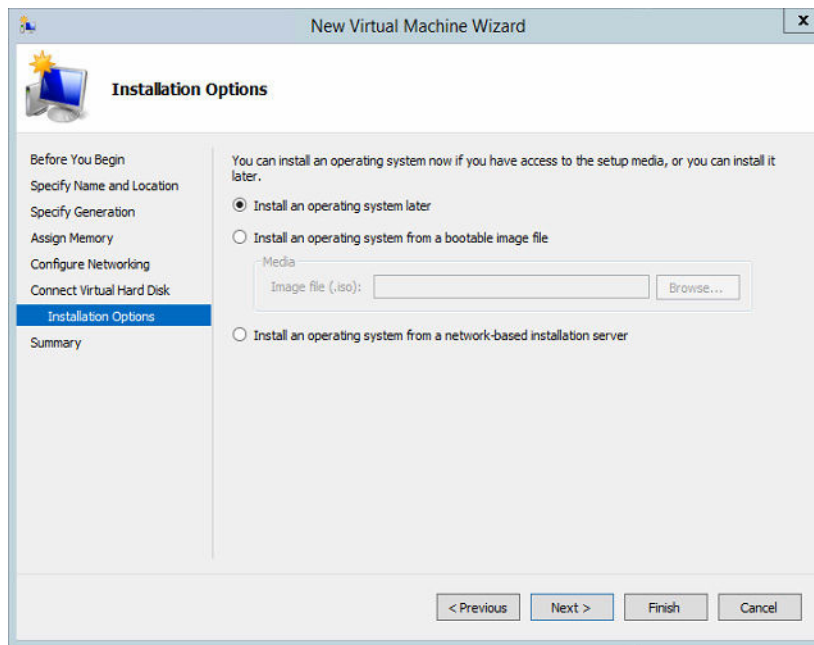

Figure 21. Installation Options for New Virtual Machine

10. On the **Summary** tab, click **Finish**.

Configuring RDMA Adapters

Ensuring RDMA adapters are installed

The DSMS solution allows for the following network adapters:

- Chelsio T520-CR
- Mellanox ConnectX-3
- Mellanox ConnectX-3 Pro

These network adapters are required to use RDMA and leverage SMB direct. The following two sections cover configuring the Chelsio T520-CR adapter. If these adapters were not ordered as a part of your solution, you can skip this section. For more information about deploying Mellanox ConnectX-3/ConnectX-3 Pro RDMA adapters, see Mellanox ConnectX-3/ConnectX-3 Pro configuration.

> **NOTE:** You must repeat this task on each storage node.

1. Log in to each host server with the local Administrator privilege.
2. Click **Control Panel** → **Device Manager**.
3. Ensure that the Chelsio NIC card is displayed in the Device Manager. It is displayed as two separate Chelsio Network Adapters.
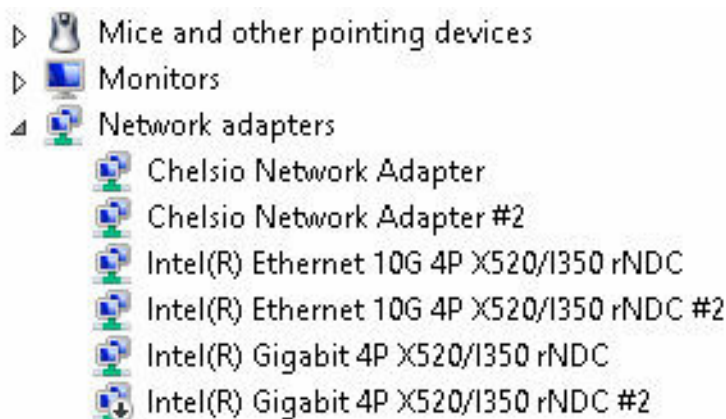
Figure 22. Identifying Chelsio RDMA adapters

4. To verify the driver version of the adapter, right-click one of the Chelsio Network Adapters, and then select **Properties**.
5. In the **Driver** tab, view **Driver Version**. Ensure that this driver is up-to-date based on the *Dell Storage with Microsoft Storage Spaces Support Matrix* available at **Dell.com/dsmsmanuals**.

Configuring Chelsio card (if applicable)

This task configures the Chelsio RDMA network adapter. As described in previous task, you must have labeled the Chelsio RDMA NICs as External1 and External2. However, you can verify the correct NIC in the

Network Connections control panel. The description under the NIC name or in the Adapter Properties is displayed as **Chelsio Network Adapter**.
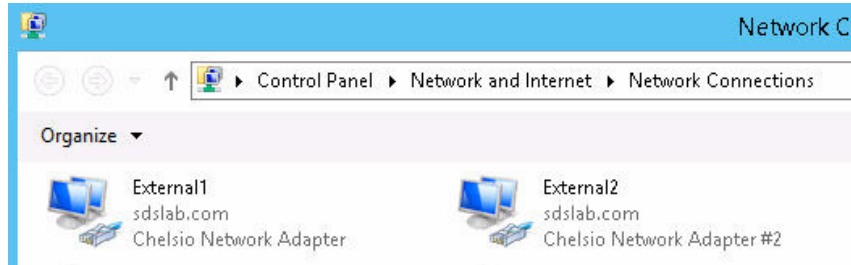

Figure 23. Viewing the Chelsio network adapter

Configuring the firewall for the Chelsio adapters

Chelsio adapters use iWARP RDMA technology that use TCP/IP for communications. To facilitate TCP/IP communications, add a firewall rule to the SMB server to allow incoming network traffic from the server message block (SMB) Direct clients. In Windows Server 2012 R2, SMB Direct with iWARP uses TCP port 5445 and the traditional 445 port used for SMB.

1. Start a Windows PowerShell instance with Administrative privileges.
2. To enable the incoming firewall rule to allow access by the client servers at the CLI, enter the following command.

   `Enable-NetFirewallRule FPSSMBD-iWARP-In-TCP`

   The `FPSSMBD-iWARP-In-TCP` command allows incoming network traffic on port 5445.

Jumbo frames for Chelsio adapter

Ensure that the MTU size is set to 9 KB on the Chelsio adapter. Also, ensure that the flow control is enabled.

Enabling SMB Direct

An advantage of iWARP RDMA technology is that you can route it across different subnets. While the common setup is a single subnet, the Chelsio RDMA adapter can connect servers across subnets; but this capability is disabled by default on Windows Server 2012 R2.

To enable SMB Direct for operation with a Chelsio adapter, you must configure every server (SMB Servers and SMB Clients) to allow routing RDMA across subnets. SMB client configuration is not described in this document and you must configure it separately.

1. Start a Windows PowerShell instance with Administrative privileges.
2. Run the following PowerShell `cmdlet` to enable SMB routing.

   `Set-NetOffloadGlobalSetting -NetworkDirectAcrossIPSubnets Allowed`
3. Disabling and reenabling the interface makes the settings change effective without a restart. Run the following commands at the PowerShell prompt, where *<string>* is the name of the NIC (External1, External2).

   ```
   Disable-NetAdapter -InterfaceAlias <string>
   Enable-NetAdapter -InterfaceAlias <string>
   ```

Updating the SMB connections

If you make any major network configuration changes, the SMB client system reevaluates its connections when new interfaces are detected after every 10 minutes. Also, you can force SMB to update its connections immediately by using the following PowerShell cmdlet on the SMB client servers.

```
Update-SmbMultichannelConnection
```

Mellanox ConnectX-3/ConnectX-3 Pro configuration

DSMS supports SMB Direct by using Mellanox ConnectX-3/ConnectX-3 Pro adapters. However, for optimal performance, you must understand the benefits and limitations of leveraging your DSMS solution in a Mellanox environment. For more information and guidance about configuring and deploying Mellanox ConnectX-3/ConnectX-3 adapters, from installing Windows drivers to configuring Priority Flow Control (PFC), see the supporting documentation available at **https://community.mellanox.com/docs/doc-2142**.

Clustered Storage Spaces overview

This section describes the basic tasks to create Storage Spaces in the storage solution. The procedures described assume the failover cluster is created and validated. For best practice recommendations and advanced PowerShell commands to configure Storage Spaces for your solution, see the *Dell Storage with Microsoft Storage Spaces Best Practice Guide* available at **Dell.com/dsmsmanuals**. For Storage Spaces configuration rules, see the *Dell Storage with Microsoft Storage Spaces Support Matrix* available at **Dell.com/dsmsmanuals**.

Creating a storage pool

1. In the left pane of the Failover Cluster Manager, expand the cluster name, and then go to the **Storage** folder.
2. Right-click **Pools**, and then click **New Storage Pool**.
3. In **New Storage Pool Wizard**, click **Next**.
4. On the **Specify a storage pool name and subsystem** page, in the **Name** box, type the name of the storage pool, and then select the group of primordial disks available to the cluster from which to create the pool.
5. Click **Next**.
6. Select the disks you want to be a part of the storage pool, and then click **Next**.
7. Confirm the pool details, and then click **Create**.

Creating a clustered shared volume

1. In the left pane of the **Failover Cluster Manager**, expand the cluster name, and then go to the **Storage** folder.
2. Click **Pools**. The cluster pools are displayed.
3. Right-click a storage pool, and then click **New Virtual Disk**.
4. The **New Virtual Disk Wizard** window opens. Click **Next**.
5. Select the storage pool in which to create the Storage Space, and then click **Next**.
6. Specify the name of the Storage Space (Virtual Disk), and then click **Next**.

   If the storage pool contains SSDs, the option to create storage tiers in the Storage Space is available. Select the **Create storage tiers on this virtual disk** check box to create storage tiers.
7. Specify the resiliency setting, and then click **Next**.

   > NOTE: Storage tiers are only supported on simple or mirror spaces.

8. Specify the size of the Storage Space or storage tiers of the Storage Space, if applicable, and then click **Next**.
9. Confirm the setting of the Storage Space, and then click **Create**.
10. After you create the Storage Space, ensure the **Create a volume when this wizard closes** check box is selected, and then click **Close**.
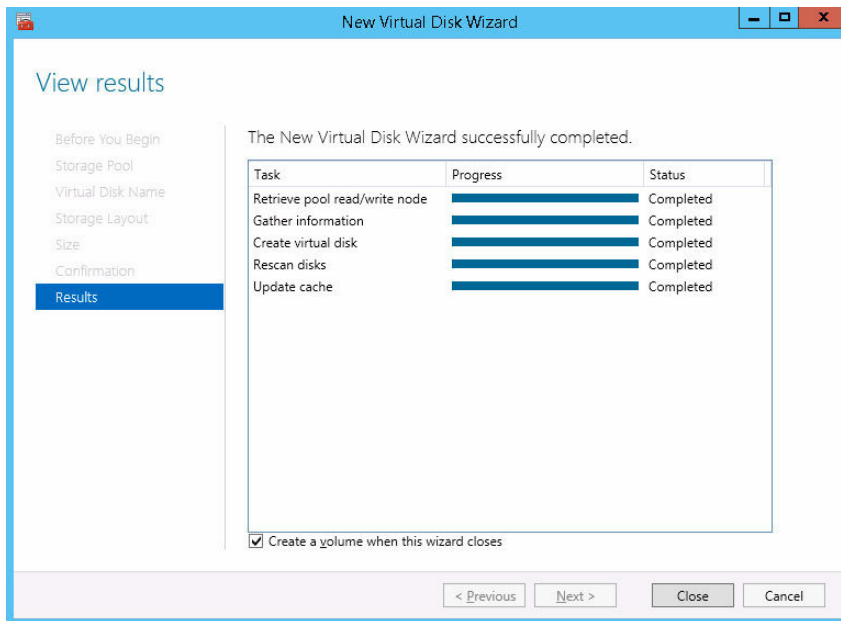
Figure 24. Creating a Virtual Disk

> **NOTE:** If the **Create a volume when this wizard closes** check box is not selected, you must use Server Manager to create the volume on the Storage Space.

11. In the **New Volume Wizard** window, click **Next**.
12. On the **Select the server and disk** page, select the failover cluster and the Storage Space (Virtual Disk) to create the volume, and then click **Next**.
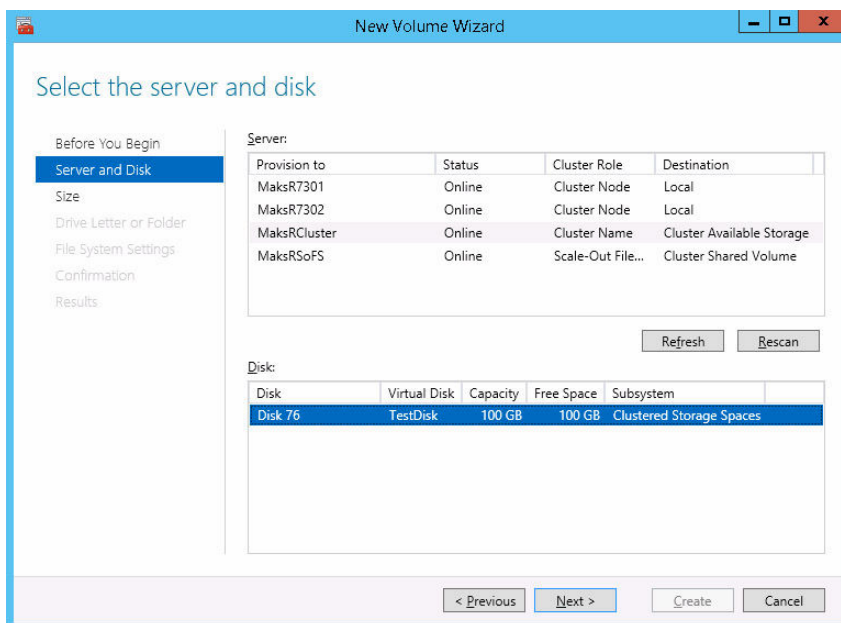

Figure 25. Creating a volume on Cluster Shared Storage

13. Type the size of the volume, and then click **Next**.

14. Assign a drive letter to the Storage Space (optional).
15. Click **Next**.
16. Specify **NTFS** as the file system, and then specify the volume label.

    NOTE: NTFS is required for using this solution.

17. Confirm the settings of the volume, and then click **Create**.
18. In the left pane of the **Failover Cluster Manager**, in the **Storage** folder, click **Disks**.
19. Right-click the cluster virtual disk with the newly created volume, and then select **Add to Clustered Share Volumes**.

Step-by-step expansion for Dell Storage with Microsoft Storage Spaces

As your system performance and disk space capacity needs grow, the DSMS solution can be expanded to add new physical disks, storage enclosures, and servers to fulfill these needs. There are three different types of expansions to an existing DSMS solution:

1. Adding new physical disks to existing storage enclosures to increase the usable capacity or performance of the solution.
2. Adding a new storage enclosure to increase the usable capacity or performance of the solution.
3. Adding a new server to provide additional scale-out capability for new file shares (Scale-Out File Server solutions) or provide additional compute capacity (Converged solutions).

These step-by-step instructions provide a method to expand the capacity in each of these three scenarios. Each of these expansion scenarios can be completed while the existing cluster and storage remains online, when data paths remain available to all enclosures throughout the procedure.

> **NOTE:** If you want to perform an offline upgrade during any of these procedures, you must turn off an existing storage enclosure with virtual disks. Prior to turning off the enclosure, set the **RetireMissingPhysicalDisksPolicy** to **Never** for the affected storage pools. Ensure that you set it to the original setting after the procedure is complete and the enclosure is turned on.

Dell recommends that, when expanding a storage pool, you must add physical disks in a quantity equal to the column count of the largest virtual disk multiplied by the number of data copies, plus any additional physical disks required for automatic rebuilds. For example, for a two-way mirror virtual disk, if the column count is four, you must add a minimum of eight physical disks to the pool to expand the virtual disk.

When expanding existing or creating new virtual disks that have enclosure awareness enabled, there are additional considerations that must be taken into account. Enclosure awareness spreads the data copies of virtual disks across three or more storage enclosures. However, when you are adding new physical disks or storage enclosures, on the basis of existing virtual disk layout, virtual disks created on the newly added physical disk space may not be enclosure aware. This can occur if there is not sufficient free disk space, or if the physical disks are not distributed properly to spread the new data copies in a method, which satisfies the enclosure awareness requirements.

> **NOTE:** All the documents referred in the following tasks are available at **Dell.com/dsmsmanuals**.

Adding new physical disks to existing storage enclosures

1. Ensure that the physical disks added are supported by reading through the *Dell Storage with Microsoft Storage Spaces Support Matrix*.
2. Install the physical disks into the storage enclosure following the guidelines in the storage enclosure owner's manual. If the physical disks are going to be used with the Storage Spaces enclosure awareness feature, the physical disks must be allocated across the existing storage enclosures.

3. Ensure that the newly added physical disks have been detected by the Windows Server operating system and the cluster.

4. Update the firmware on the new physical disks to the latest supported versions listed in the *Dell Storage with Microsoft Storage Spaces Support Matrix*.

5. Add the new physical disks to a storage pool by following the best practices in the *Dell Storage with Microsoft Storage Spaces Best Practices Guide*. By using the newly added disk space, either resize an existing virtual disk by running the command `Resize-VirtualDisk` for virtual disks without storage tiers; `Resize-StorageTier` for virtual disks with storage tiers; or create new virtual disks.

6. If an existing virtual disk is resized, the volume on the disk must be resized by running the command `Resize-Partition`.

Adding new storage enclosures to an existing cluster

1. Ensure that the storage enclosure being added is supported by reading through the *Dell Storage with Microsoft Storage Spaces Support Matrix*.

2. Ensure that adding the new storage enclosure results in a valid and supported configuration by reading through the supported configurations in the *Dell Storage with Microsoft Storage Spaces Support Matrix*.

3. Install the storage enclosure into the rack following the guidelines in the storage enclosure owner's manual.

4. Read through the *Dell Storage with Microsoft Storage Spaces Cabling Guide* to determine the quantity of new SAS host bus adapters and SAS cables required.

5. Install the new SAS host bus adapters in the existing cluster nodes one node at a time. Pause cluster services on the node and take the node offline. Ensure to reassign the current vote to the other server in **Failover Cluster Manager**, prior to turning off the node. After installing the SAS host bus adapters, turn on the node and resume cluster services, by unpausing and reassigning the current vote back to the initial server node in **Failover Cluster Manager**.

6. Ensure that all roles and cluster resources have been distributed back to the original owning nodes.

7. Ensure that all the new and existing SAS host bus adapters are cabled according to the *Dell Storage with Microsoft Storage Spaces Cabling Guide*.

   NOTE: If this step is performed as an online expansion, when updating the existing cabling and to ensure data path availability to existing enclosures, always ensure there is at least one SAS path available to the existing storage enclosures.

8. Ensure that all SAS host bus adapters have been detected in each server in the cluster.

9. Turn on the newly added storage enclosure.

10. Ensure that the new storage enclosure and all of its physical disks are detected by all servers in the cluster.

11. Update the SAS host bus adapter firmware and drivers and physical disk firmware to the latest supported versions listed in the *Dell Storage with Microsoft Storage Spaces Support Matrix*.

12. Add the new physical disks to a storage pool following the best practices in the *Dell Storage with Microsoft Storage Spaces Cabling Guide*.

13. By using the newly added capacity, either resize an existing virtual disk by running the command `Resize-VirtualDisk` for virtual disks without storage tiers or `Resize-StorageTier` for virtual disks with storage tiers; or create new virtual disks.

14. If an existing virtual disk is resized, the volume on the disk must be resized by running the command `Resize-Partition`.

Adding new servers to an existing cluster

1. Ensure that the server being added is supported by reading through the *Dell Storage with Microsoft Storage Spaces Support Matrix*.
2. Ensure that adding the new server results in a valid and supported configuration by reading through the supported configurations in the *Dell Storage with Microsoft Storage Spaces Support Matrix*.
3. Install the server into the rack following the guidelines in the server owner's manual.
4. Read through the *Dell Storage with Microsoft Storage Spaces Cabling Guide* to determine the quantity of new SAS host bus adapters and SAS cables required.
5. Install the new SAS host bus adapters in the existing and new cluster servers. For existing nodes in the cluster, install the new SAS host bus adapters in one node at a time. Pause cluster services on the node and take the node offline. Ensure to reassign the current vote to the other server in **Failover Cluster Manager**, prior to turning off the node. After installing the SAS host bus adapters, turn on the node and resume cluster services, by unpausing and reassigning the current vote back to the initial server node **Failover Cluster Manager**, for the node.
6. Ensure all roles and cluster resources have been distributed to the original owning nodes.
7. Ensure all the new and existing SAS host bus adapters are cabled according to the *Dell Storage with Microsoft Storage Spaces Support Matrix*.

    NOTE: If this step is performed as an online expansion, when updating the existing cabling and to ensure data path availability to existing enclosures, always ensure that there is at least one SAS path available to the existing storage enclosures.

8. Cable the network interfaces, in the new server, according to the networking guidelines in the *Dell Storage with Microsoft Storage Spaces Deployment Guide*.
9. Turn on the new server and configure it following the steps described in the *Dell Storage with Microsoft Storage Spaces Deployment Guide*.
10. Update all component firmware and drivers in the new server to the latest supported versions listed in the *Dell Storage with Microsoft Storage Spaces Support Matrix*.
11. Add the new server to the existing cluster.
12. Ensure that the new server can see all attached storage enclosures and physical disks.
13. For Scale-Out File Server solutions, rebalance the ownership of existing cluster shared volumes so that they are distributed evenly across all nodes in the cluster.
14. For Converged solutions, rebalance the existing cluster shared volumes and virtual machines as required.

Cluster-Aware Updating overview

This section describes about basic tasks of configuring the Cluster-Aware Updating tool within Microsoft Windows Server to update the storage nodes of your DSMS configuration. The procedure described assumes that the failover cluster is both created and validated and the SOFS solution has an SMB share that all storage nodes can access.

Configuring Cluster-Aware Updating using GUI

1. Extract the **DSMS Update Package** to an SMB share that all storage nodes can access.

   📝 NOTE: The **DSMS Update Package** can be downloaded from the Dell Support Site from the Dell Storage with Microsoft Storage Spaces product page that corresponds to your system.

2. To create the configuration file, run the `BuildConfig.ps1` script, included in the DSMS Update Package by using PowerShell.

   📝 NOTE: The default file name for creation is `DefaultHotfixConfig.xml`. If you want to change the default file name, edit the `$configName` parameter in the `BuildConfig.ps1` script. If you edit the file name, ensure that you include option `HotfixConfigFileName = <NewFileName>.xml` in the **CauPluginArguments** box when you go to Step 9 to configure the advanced options.

3. Click **Server Manager → Tools**, and then click **Cluser-Aware Updating**.

4. In the **Cluster-Aware Updating** window, select the storage cluster from the **Connect to a failover cluster** drop-down menu, and then select **Connect**.

   📝 NOTE: Type the name of the cluster, if it is not displayed in the drop-down menu.

5. In the **Cluster-Aware Updating** window, select **Configure cluster self-updating options**.

6. In the **Configure Self-Updating Options** window, click **Next**.

7. On the **Add Clustered Role** page, select **Add the CAU clustered role, with self -updating mode enabled, to this cluster**, and then click **Next**.

8. On the **Self-updating schedule** page, select the appropriate schedule, and then click **Next**.

   📝 NOTE: You can disable the scheduled task by running the same wizard again, but this step is necessary to enable **Cluster-Aware Updating** on the target cluster.

9. On the **Advanced Options** page, scroll to the bottom of the page and ensure `CauPluginName` is set to **Microsoft.HotfixPlugin**, and then click **Next**.

   📝 NOTE: You can increase the default **RebootTimeoutMinutes** value on this page. If a node needs more time to reboot because the amount of component updates, input the number of minutes in the box allocated.

10. On the **Additional Options** page, set the **Hotfix root folder path** to the unpackaged DSMS Update Package from Step 1.

NOTE: Ensure that the SMB share that contains the **DSMS Update Package** has SMB Encryption enabled by running the following PowerShell command on the server hosting the SMB share.

```
Set-SmbShare –Name <ShareName> -EncryptData $True
```

11. Select the check boxes for both **SMB Encryption** and **Access check**, and then click **Next**.

12. On the **Confirmation** page, select **Apply** , and then click **Next**.

13. In the **Cluster-Aware Updating** window, select **Apply updates to this cluster**.

NOTE: You have options to manually change anything from steps 9–11 here, but do not change anything unless the location of the update package has changed. In this case, point to the new share location and ensure that SMB Encryption is enabled on this share.

14. On the **Confirmation** page, select **Update to start the updating process** on each node.

NOTE: On the **Confirmation** page, click **Preview the updates that will be assigned to the cluster nodes** to list all the updates that will be installed on the storage cluster.

Changing Windows Server GUI to Windows Core

The PowerShell command here converts Windows Server 2012 R2 from GUI to Server Core. Perform this task only if you intend to use Windows Core for your deployment.

```
Uninstall-WindowsFeature Server-GUI-Mgmt-Infra,Server-Gui-Shell –Remove –Restart
```

> **NOTE:** If you want to convert your server back to GUI after converting to Windows Server Core, see the Microsoft documentation for the procedure.