NEXSAN

HYPER–UNIFIED STORAGE

Nexsan Unity

Microsoft Best Practices Guide

Firmware version Unity v. 6.0
(HTML5 interface)

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Contents

About this document

This guide provides an overview of the best practices and troubleshooting guidelines for Microsoft use with Unity Storage Systems.

Audience

This guide has been prepared for the following audience:

- IT system administrators
- Engineers
- Technicians
- Any qualified NST/Unity administrator.

Conventions

Here is a list of text conventions used in this document:

Convention	Description
underlined blue	Cross-references, hyperlinks, URLs, and email addresses.
boldface	Text that refers to labels on the physical unit or interactive items in the graphical user interface (GUI).
`monospace`	Text that is displayed in the command-line interface (CLI) or text that refers to file or directory names.
`monospace bold`	Text strings that must be entered by the user in the command-line interface or in text fields in the graphical user interface (GUI).
italics	System messages and non-interactive items in the graphical user interface (GUI) References to Software User Guides

Notes, Tips, Cautions, and Warnings

Note Notes contain important information, present alternative procedures, or call attention to certain items.

Tip Tips contain handy information for end-users, such as other ways to perform an action.

> **CAUTION:** In hardware manuals, cautions alert the user to items or situations which may cause damage to the unit or result in mild injury to the user, or both. In software manuals, cautions alert the user to situations which may cause data corruption or data loss.

> **WARNING: Warnings alert the user to items or situations which may result in severe injury or death to the user.**

Contacting Nexsan

For questions about Nexsan products, please visit the Nexsan support Web page, and the Nexsan Unity Documents & Online Help page. If you are unable to find the answer to your question there, please see our contact information below.

Service and support

Nexsan's Technical Services Group provides worldwide assistance with installation, configuration, software support, warranty, and repair for all Nexsan products. A variety of service and support programs are available to provide you with the level of coverage and availability your operation requires.

Nexsan Unity Documentation & Online Help page:
https://helper.nexsansupport.com/unt_downloads.html

Unity Online Help page:
https://helper.nexsansupport.com/unt_onlinehelp.html

Contact Nexsan Unity support:
https://helper.nexsansupport.com/unt_support

Worldwide Web site:
www.nexsan.com

Related documentation

The following Nexsan product manuals contain related information:

- Nexsan Unity Online Help
- *Nexsan Unity Hardware Reference Guide*
- *Nexsan Unity Hardware Maintenance Guide, Unity Next Generation*
- *Nexsan Unity Software User Guide*
- *Nexsan Unity nxadmin Command-line Interface Reference Guide*
- *Nexsan Unity nxcmd Command-line Interface Reference Guide*
- *Nexsan Unity Snapshots and Replication Guide*
- *Nexsan Unity Storage Expansion Reference Guide*
- *Nexsan Unity VMware Best Practices Guide*
- *Nexsan Unity NFS Interoperability*
- *Nexsan Unity Networking Best Practices Guide*
- *Nexsan Unity Performance Best Practices Guide*
- *Nexsan Unity Microsoft Best Practices Guide*

Chapter 1

Microsoft iSCSI

When a LUN is added to a storage pool on Unity, you can assign the LUN to an iSCSI target in the storage pool. The iSCSI target presents the LUN assigned to it to servers (initiators) on the network.

This section includes these topics:

1

Adding an iSCSI target

Unity provides the **Create an iSCSI Target** wizard to guide you through the process of adding a target to a storage pool.

Note If your environment is set up as a many-to-one configuration, iSCSI targets are managed per site. You must create the iSCSI targets that will be used for failover on the Disaster Recovery site and assign them to LUN masks.

► **To add an iSCSI target:**

1. On the **Unity navigation bar**, select **Storage > iSCSI targets**.

Figure 1-1: iSCSI targets panel
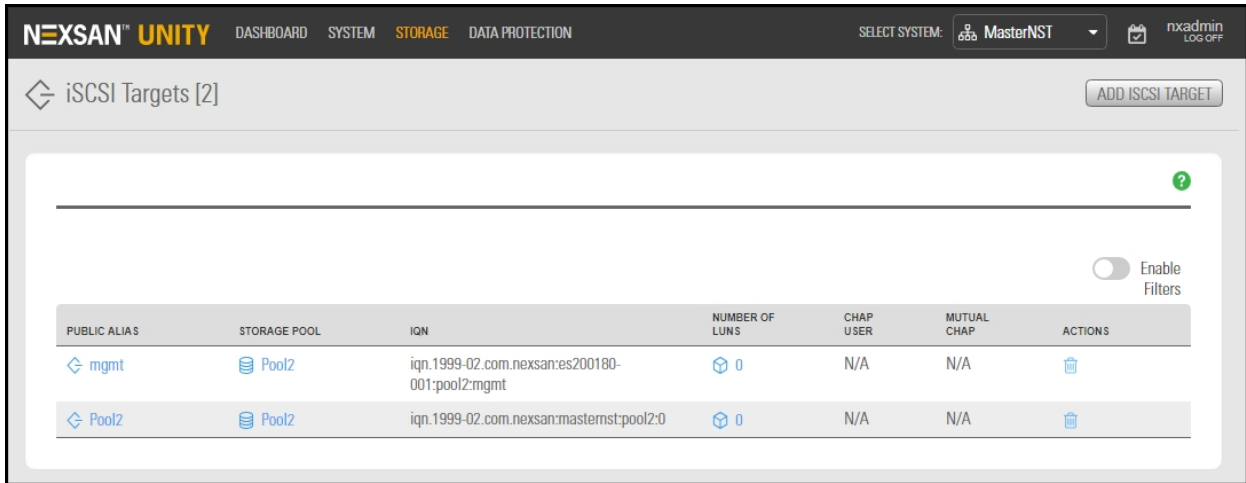
2. Click the **Add iSCSI Target** button.

The **Create an iSCSI Target** wizard guides you through the process of adding a target to a storage pool.

This section includes these steps:

Step 1: Setting iSCSI target properties below

Step 2: Verifying settings on the facing page

Step 3: Viewing results on page 14

Step 1: Setting iSCSI target properties

Step 1 of the **Create an iSCSI target** wizard prompts you to select a pool, public alias, and target IQN.

- IQN: an IQN (iSCSI qualified name) is the unique identifier of a device in an iSCSI network. iSCSI uses the form iqn.date.authority:uniqueid for IQNs. For example, Unity uses this IQN to identify iSCSI targets:

  `iqn.1999-02.com.nexsan:<site name>:<pool name>:<unique ID>`

  This name indicates that this is an iSCSI device from Nexsan, which was registered as a company in February of 1999. The naming authority is simply the DNS name of the company reversed; in this case, `com.nexsan`. Following this is the Unity Storage System (site) name, the storage pool name where the target exists, and a unique ID that you must specify to identify the target.

  Note IQN is always forced to lower case by Unity, in accordance with RSF conventions.

- Public alias: this is a symbolic name that you can assign to a target on the Unity. The public alias is seen by some iSCSI initiators; it can help you identify the target. You can change a target's public alias at any time.

Figure 1-2: Create an iSCSI target wizard, Step 1: Specifying properties

► **To specify the Storage Pool, IQN and public alias for the iSCSI target:**

1. Select an available pool from the **Storage Pool** list.

2. Type a public alias for the target in the **Public alias** text box. The public alias can contain up to a maximum of 16 characters, and it must start with an (upper-case or lower-case) alphabetic character; with the exception of the underscore (_), hyphen (-), and period (.), the public alias can only contain alphanumeric characters.

3. Type a unique ID in the text box next to the **IQN:** field. The ID must start with an (upper-case or lower-case) alphabetic or numeric character; spaces are not allowed.

4. Once you specify the IQN and public alias for the target, click **Next** to continue to Step 2: Verifying settings below to Step 3: Viewing results on the next page.

Step 2: Verifying settings

Step 2 of the **Create an iSCSI target** wizard prompts you to verify your settings before you create the target..

Figure 1-3: Create an iSCSI target wizard: Verifying Settings

▶ **To verify settings for the target:**

1. Review your settings from the wizard step 1.

2. Do one of the following:

    a. Click **Previous** to make changes.

    b. Click **Create** to begin the creation process. See Step 3: Viewing results below

Step 3: Viewing results

The last step of the **Create an iSCSI target** wizard displays progress as Unity creates the new iSCSI target.

▶ **To view more details for an error event:**

● Click the **View Error** link next to the error in the **Results** panel.

Figure 1-4: Create an iSCSI target wizard, Step 3: Viewing progress
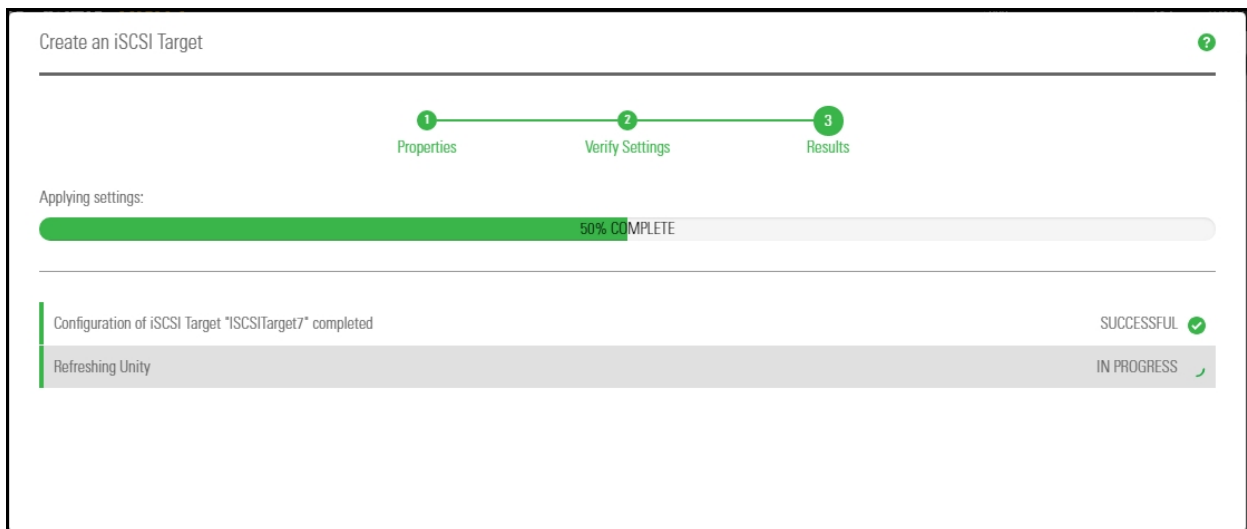
Unity informs you when it successfully creates the target. It also asks you if you want to create another target in the storage pool:
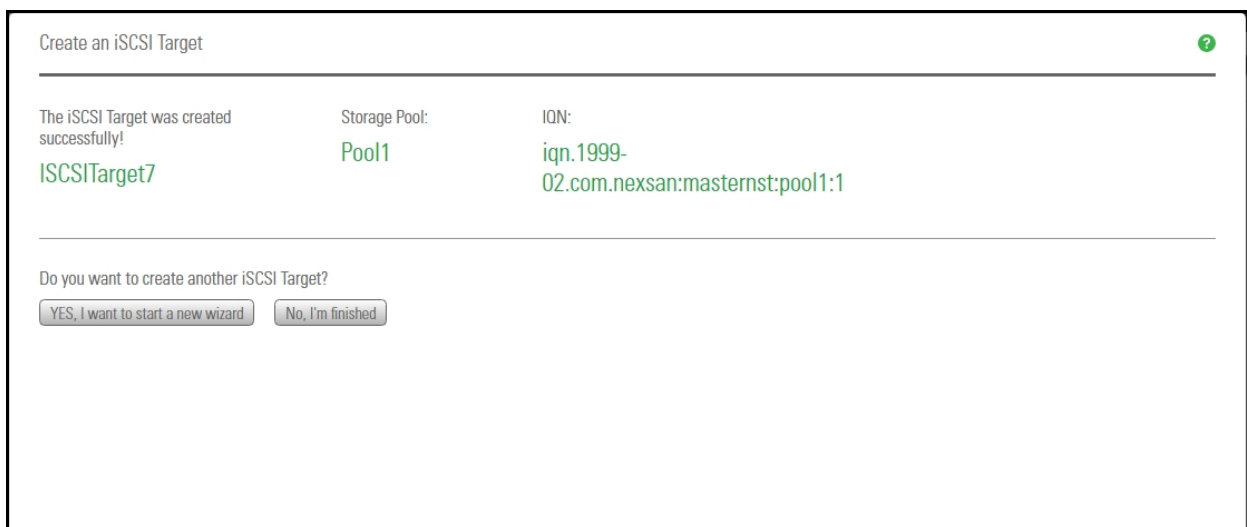
Connecting to an iSCSI LUN from Windows

Use this section for instructions about connecting to an iSCSI LUN from a Windows-based initiator.

Notes:

- The procedures provided here are specific to Microsoft Windows 7; the process for connecting to an iSCSI LUN on Unity may differ depending on the version of Windows you are initiating the connection from.

- In addition, some iterations of Microsoft Windows, such as Windows XP, do not come pre-installed with Microsoft's iSCSI Initiator. You may have to download Microsoft's iSCSI Initiator, and then install and configure it before connecting to an iSCSI LUN on Unity.

► **Step 1: Connect the iSCSI LUN from a Microsoft Windows-based initiator**

1. On the Windows system from where you want to connect to an iSCSI LUN on Unity, select **Start** > **Search**, and type **iSCSI**.

2. In **Programs**, click **iSCSI Initiator**.

3. If this is the first time you are launching Microsoft iSCSI Initiator, you receive a prompt that says the Microsoft iSCSI service is not running. Click **Yes** to start the service.

4. The Microsoft iSCSI Initiator Properties dialog box opens, and the **Targets** tab displays. Click the **Discovery** tab.

5. To add Unity as a target portal, click **Discover Portal**.

6. In the Discover Portal dialog box, type the virtual IP address of the Pool Resource Group where the LUN exists.

7. Select the discovered targets (LUNs) that you want to connect to and click **Connect**. The initiator adds the iSCSI LUN to Windows.

8. Click **Done**.

9. Click **OK** to close the Microsoft iSCSI Initiator Properties dialog box.

You must now initialize the LUN on the Windows system and add it as a disk volume to the system.

► **Step 2: Initialize the LUN**

1. Click **Start** > **Search**, type **Disk Management**

2. In **Programs**, click **Disk Management**.

3. *Disk Management* starts and informs you that a new disk has been found; it also instructs you to initialize the new disk before you use it. Click **OK** to initialize the new disk.

4. The new disk is displayed in Storage Manager as Disk 1 (although this designation may vary depending on the configuration of your system. The new disk is identified as **Online**, but **Unallocated**. To allocate the disk, right-click the disk and select **New Simple Volume**.

5. In the New Simple Volume wizard, you define how much disk space to allocate to the volume and you specify its drive letter.

6. Specify the disk space to allocate to the new simple volume, and then click **Next**.

7. Specify the drive letter to assign to the volume, and then click **Next**.

8. Format the volume using NTFS, and then click **Next**.

9. Disk Management prompts you to confirm the settings. Click **Finish** to continue.

1

10. Disk Management formats the volume and once the format process completes, it displays a new Healthy (Primary Partition) formatted with NTFS.

You can access the new volume as you would a hard disk attached locally to the system.

Discovering your LUNs with the Windows iSCSI Initiator

Before you can manage LUN snapshots using Unity's VSS Hardware Provider, you must discover the LUNs you created on Unity from the Windows Server host. These LUNs will appear as new disks in Windows *Disk Management* and *Explorer*.

The VSS Hardware Provider connects to a storage pool's Management target via iSCSI to view, create, and manage snapshots of all LUNs in the storage pool. To discover the Management target, you must first enable the VSS feature in Unity; see Enabling the Microsoft VSS client for LUNs on page 94.

You can discover Unity targets using the **Targets** tab or the **Discovery** tab of the Windows iSCSI Initiator Properties dialog box.

1

► **To discover the LUNs using the Targets tab:**

1. On the Windows server, select **Start > All Programs > iSCSI Initiator**.

2. In the **Target** field, type the Management virtual IP address of Unity.

Figure 1-5: iSCSI Initiator—Targets tab
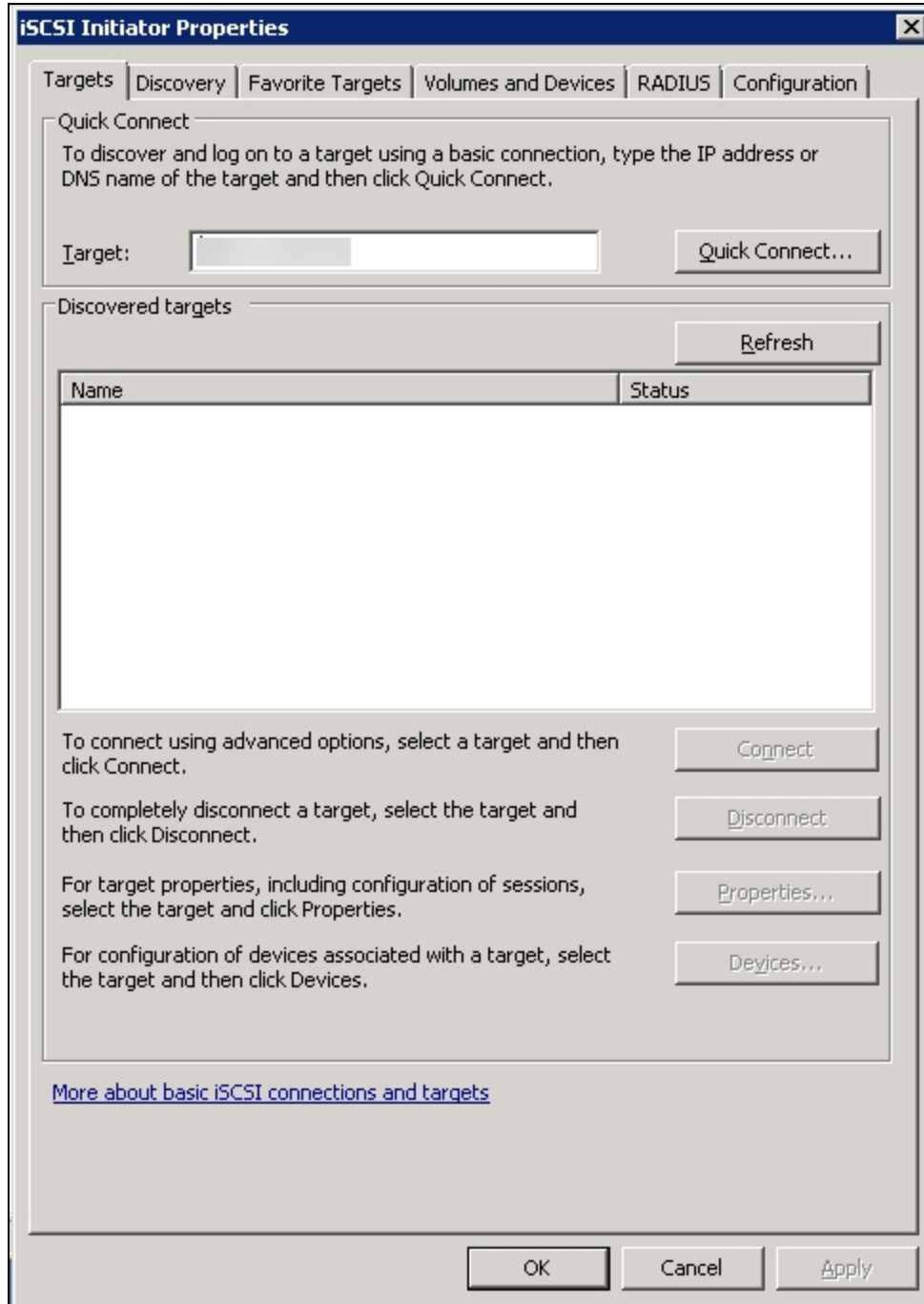
3. Click **Quick Connect**. The discovered targets appear in the list.

Figure 1-6: iSCSI Initiator—Targets tab: Discovering targets
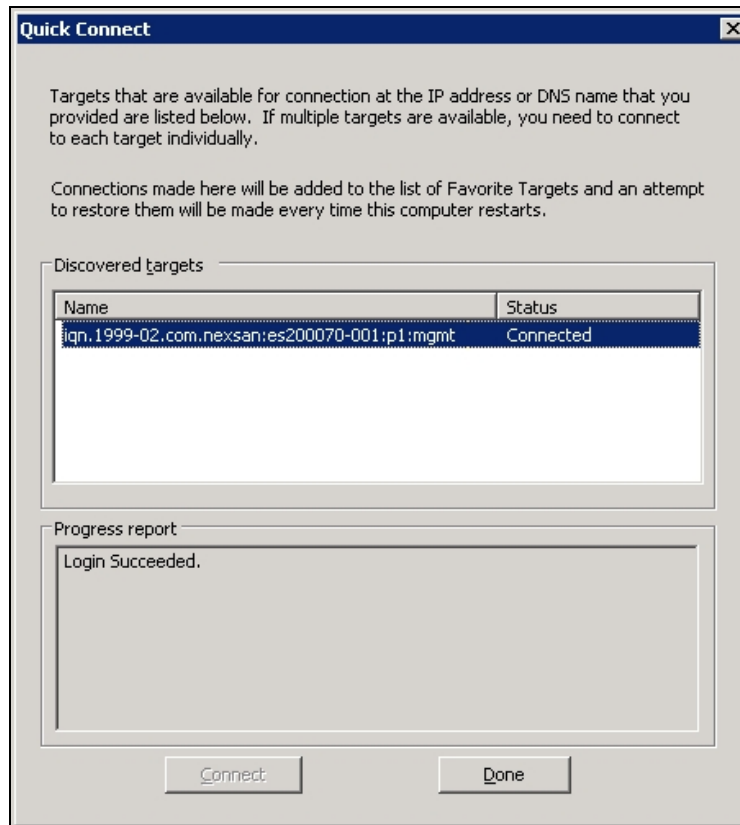
4. Click **Done** to close the Quick Connect dialog box.

5. The discovered target appears in the list. Click **OK** to exit the iSCSI Initiator.

► **To discover the LUNs using the Discovery tab:**

1. On the Windows server, select **Start > All Programs > iSCSI Initiator**.

2. Select the **Discovery** tab.

3. Click **Discover Portal**.

Figure 1-7: iSCSI Initiator—Discovery tab
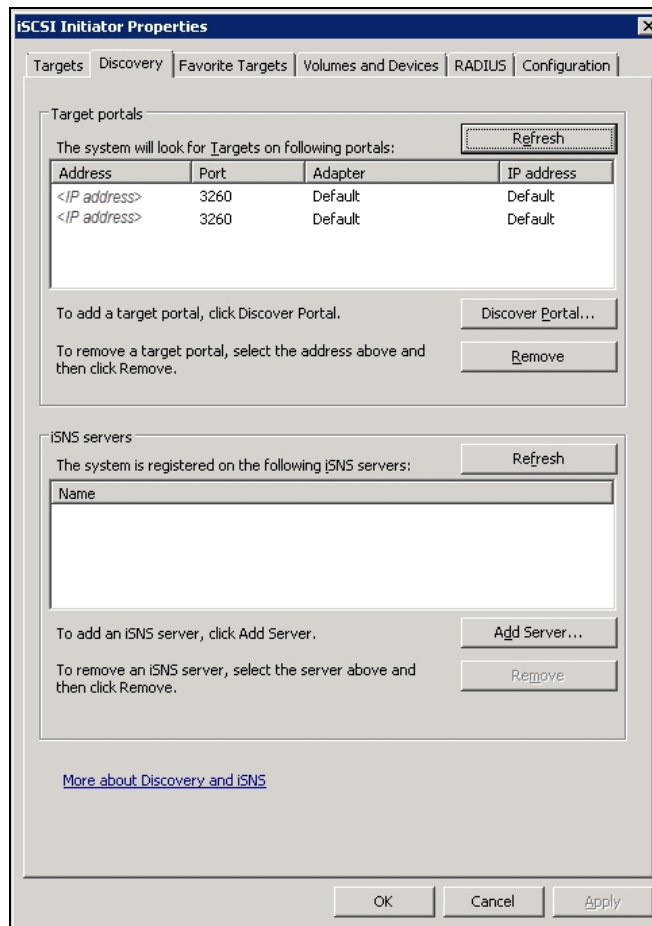
4. In the **IP Address or DNS Name** field, type the Management virtual IP address of Unity and click **OK**.

Figure 1-8: iSCSI Initiator—Discovery tab: Discovering targets
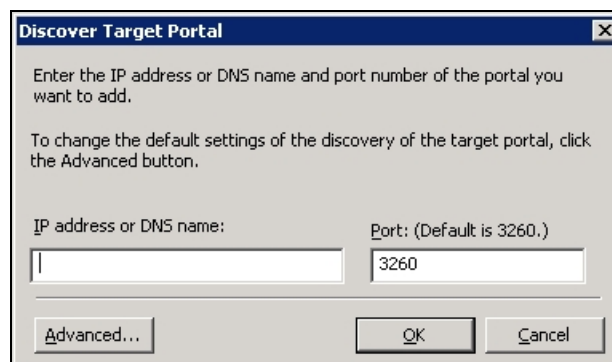
5. The discovered targets appears in the list. Click **OK** to exit the iSCSI Initiator.

► **Related topics:**

Configuring the LUNs in Disk Management on page 29

Adding a CHAP user to the Management target

When you add a storage pool to Unity, the system assigns the storage pool a Management (mgmt) target, by default.

Unity's VSS Hardware Provider connects to a storage pool's Management target via iSCSI to view, create, and manage snapshots of all LUNs in the storage pool. Unlike a non-management target, the properties for the Management target are read-only; you cannot change any of the system-assigned properties for this target. You can, however, set a CHAP user for the Management target, in order to restrict access to LUN snapshots in a storage pool to specific VSS hosts.

See Creating CHAP users in the *Unity Software User Guide* or *Unity Online Help*.

1

Configuring the LUNs in Disk Management

After discovering your LUNs with the Windows iSCSI Initiator, the LUNs appear as new disks, which you need to initialize and configure before you can use them.

► **To initialize and configure disks in *Disk Management*:**

1. Open *Disk Management*. The discovered targets appear as *Offline* and *Unallocated*.

   This example shows two new disks, *Disk 4* and *Disk 5*, that correspond to two LUNs using the same iSCSI target on Unity.

Figure 1-9: Discovered targets in Disk Management

2. Right-click a disk on the left-hand side and select **Online**. The status changes to *Not Initialized* and *Online*.

3. Right-click the same disk on the left-hand side and select **Initialize Disk**.

   ● For disks bigger than 2 TB, select **GPT (GUID Partition Table)**.

   ● For disks smaller than 2 TB, leave the default option set to **MBR (Master Boot Record)**.

   The status changes to *Basic*.

4. Right-click the initialized disk on the right-hand side. The context menu offers new options; select **New Simple Volume**.

5. Follow these steps in the New Simple Volume wizard:

   a. Assign a volume size.

   b. Assign a drive letter or mount the volume in an empty NTFS folder.

   c. Format the volume as NTFS.

   d. Give it a meaningful name.

   e. Perform a quick format.

6. The volume appears as *Healthy* and displays your configuration settings.

Figure 1-10: Configured volume in Disk Management
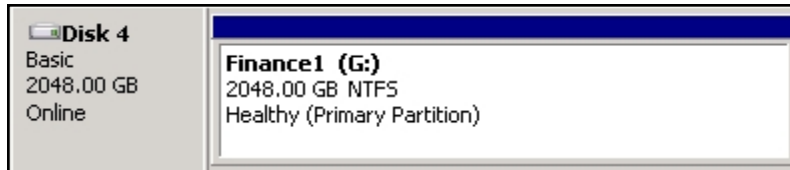
7. Repeat steps 2 to 5 for each discovered target disk.

8. Right-click a volume. The Properties dialog box displays a new tab called **Nexsan Unity** with the disk details, such as the pool name, Controller ID, and GUID.

    Note The Properties panel will also display the **Nexsan Unity** tab when opened from *Explorer*.

Figure 1-11: Disk Properties—Nexsan Unity tab
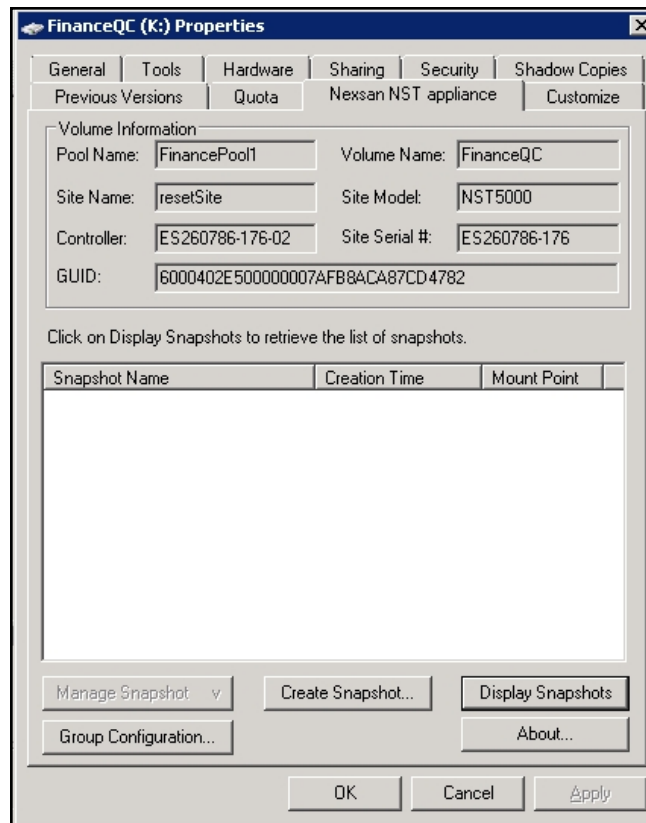
Fibre Channel recommendations

When using Fibre Channel LUNs with Unity you must set the MPIO settings.

Registry entry	Definition
PDORemovePeriod	This setting controls the amount of time (in seconds) that the multipath pseudo-LUN will continue to remain in system memory, even after losing all paths to the device.
	When this timer value is exceeded, pending I/O operations are failed. The failure is then exposed to the application, rather than attempting to continue to recover active paths.
PathRecoveryInterval	The PathRecoveryInterval setting specifies the amount of time (in seconds) the MPIO component waits before retrying a lost path.
UseCustomPathRecoveryInterval	The UseCustomPathRecoveryInterval setting allows the use of the PathRecoveryInterval if it is available and set to 1.

► **To configure the following Microsoft MPIO settings on the Hyper-V host server:**

1. Navigate to the following registry key:

   `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\mpio\Parameters`

2. Set these values to the following entries:
   - PDORemovePeriod to 90
   - PathRecoveryInterval to 40
   - UseCustomPathRecoveryInterval to 1

3. Reboot the server.

Note These are the recommended MPIO hotfixes for Windows Server 2012 (not R2 version) KB2867201, KB2889784, KB2869606, KB2779768.

Chapter 2

Configuring Multipathing

This section provides specific recommendations and instructions for configuring multipathing for a Windows host.

Multipath connectivity's main purpose is to provide redundant access to the storage devices, that is, to have access to the storage device when one or more of the components in a path fails. Another advantage of multipathing is the increased throughput by way of load balancing. This provides redundancy and maximum performance.

To allow multipathing for Unity LUNs on Windows hosts, you must first configure Unity in the MPIO Device Manager, and then discover your LUNs with the MPIO feature enabled.

Notes: Multipathing on Unity can only be done using MPIO. MSIO is not supported.

This section includes these topics:

2

Configuring MPIO Device manager

Note When connecting your LUNs to Windows hosts using the Multipathing I/O (MPIO) feature, you must enter the Unity Vendor and Product names for the LUN to be assigned as a multipath disk exactly as described in the procedure to configure MPIO.

► **To configure MPIO:**

1. From the Windows Server host, select **Start > MPIO Configuration**.

2. By default, the **MPIO Devices** tab is open. Click **Add**.

Figure 2-1: Starting the MPIO Device Manager
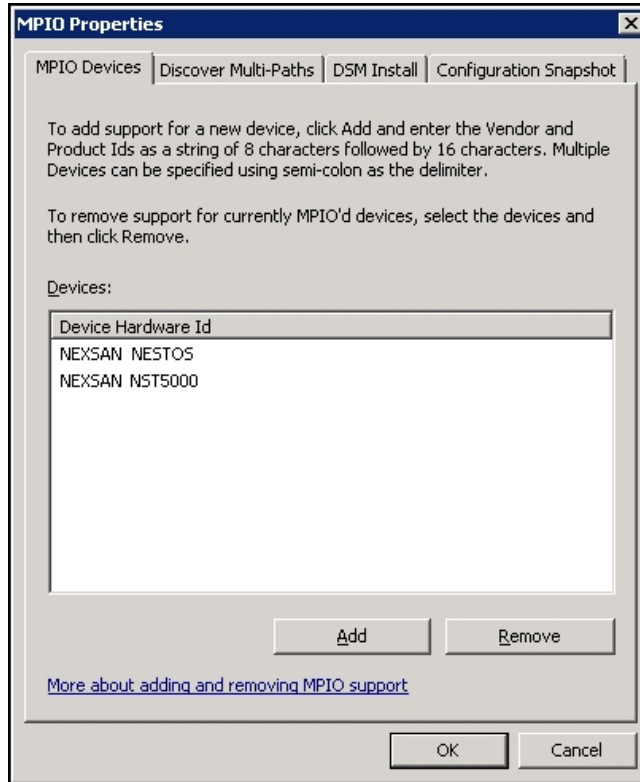
3. In the **Device Hardware ID** box:

    a. Enter the Unity Vendor and Product names for the LUN to be assigned as a multipath disk in this format:

- The Vendor format is "`Nexsan  `"
  - "Nexsan" followed by 2 spaces, for a total of 8 characters.
- The Product format for the [[[Undefined variable Unity.NST4000 short]]] is "`NestOS          `"
  - "NestOS" followed by 10 spaces, for a total of 16 characters.
- The Product format for the NST5000 is "`NST5000         `"
  - "NST5000" followed by 9 spaces, for a total of 16 characters.
- The Product format for the [[[Undefined variable Unity.NST6000 short]]] is "`NestOS          `"
  - "NestOS" followed by 10 spaces, for a total of 16 characters.

    Note The Vendor and Product names are case-sensitive.

    b. Click **OK**.

Figure 2-2: Adding a device to MPIO support
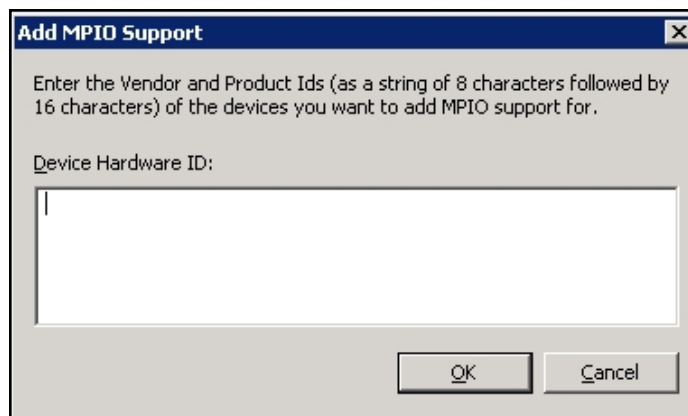
4. Reboot the windows machine.

► **To discover LUNs with MPIO enabled:**

1. On the Windows server, select **Start > All Programs > iSCSI Initiator**.

2. In the **Target** field, type the IP address of Unity.

3. Click **Connect**.

4. When the Connect To Target dialog box opens, select the **Enable multi-path** option and click **OK**.

    1. Figure 2-3: Enabling multipathing when discovering LUNs
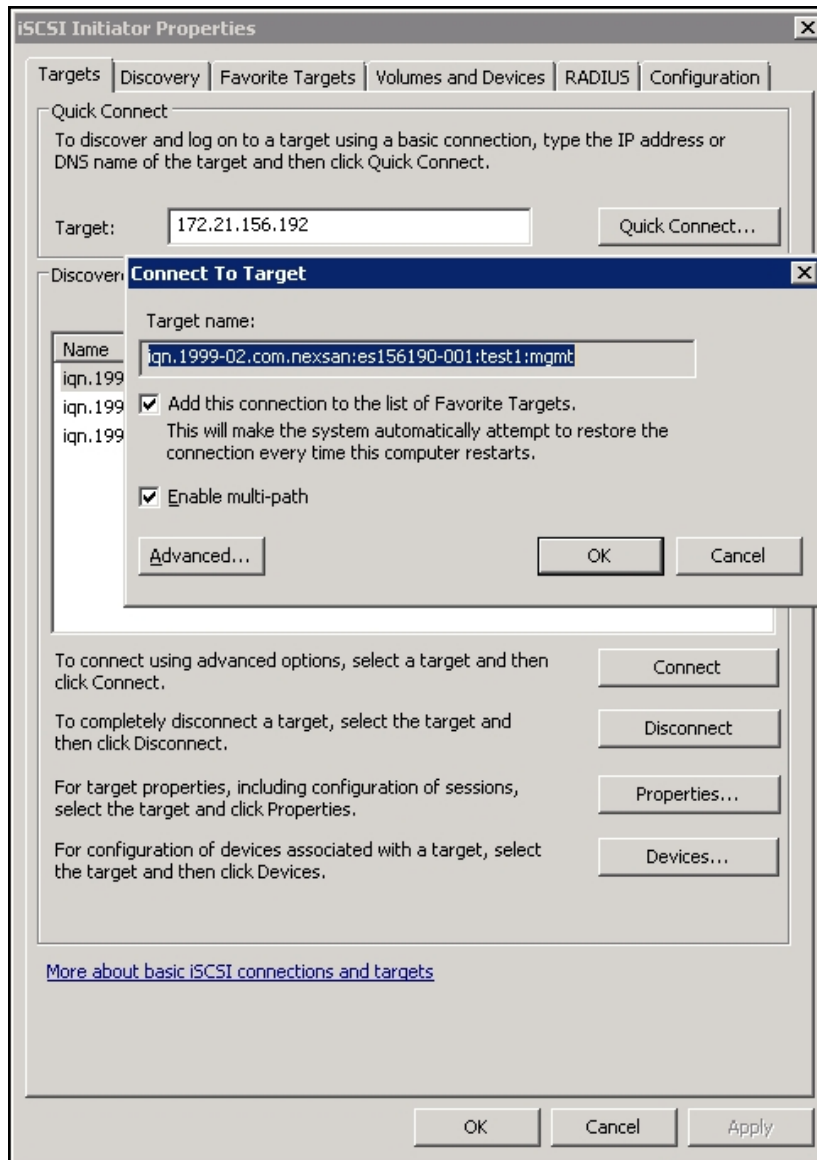
5. Click **OK** to exit the iSCSI Initiator.

6. Verify that both LUNs appear as disks on the Windows host; to configure the disks in *Disk Management*, see Configuring the LUNs in Disk Management on the facing page.

Configuring the LUNs in Disk Management

After discovering your LUNs with the Windows iSCSI Initiator, the LUNs appear as new disks, which you need to initialize and configure before you can use them.

► **To initialize and configure disks in *Disk Management*:**

1. Open *Disk Management*. The discovered targets appear as *Offline* and *Unallocated*.

   This example shows two new disks, *Disk 4* and *Disk 5*, that correspond to two LUNs using the same iSCSI target on Unity.

Figure 2-4: Discovered targets in Disk Management

2. Right-click a disk on the left-hand side and select **Online**. The status changes to *Not Initialized* and *Online*.

3. Right-click the same disk on the left-hand side and select **Initialize Disk**.

   ● For disks bigger than 2 TB, select **GPT (GUID Partition Table)**.

   ● For disks smaller than 2 TB, leave the default option set to **MBR (Master Boot Record)**.

   The status changes to *Basic*.

4. Right-click the initialized disk on the right-hand side. The context menu offers new options; select **New Simple Volume**.

5. Follow these steps in the New Simple Volume wizard:

   a. Assign a volume size.

   b. Assign a drive letter or mount the volume in an empty NTFS folder.

   c. Format the volume as NTFS.

   d. Give it a meaningful name.

   e. Perform a quick format.

6. The volume appears as *Healthy* and displays your configuration settings.

Figure 2-5: Configured volume in Disk Management
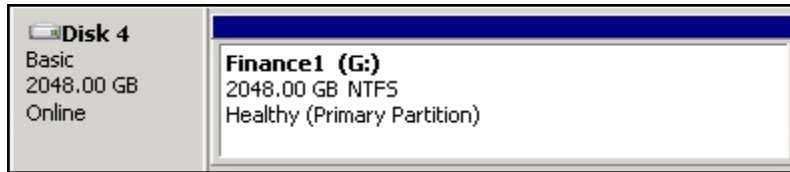
7. Repeat steps 2 to 5 for each discovered target disk.

8. Right-click a volume. The Properties dialog box displays a new tab called **Nexsan Unity** with the disk details, such as the pool name, Controller ID, and GUID.

   Note The Properties panel will also display the **Nexsan Unity** tab when opened from *Explorer*.

Figure 2-6: Disk Properties—Nexsan Unity tab
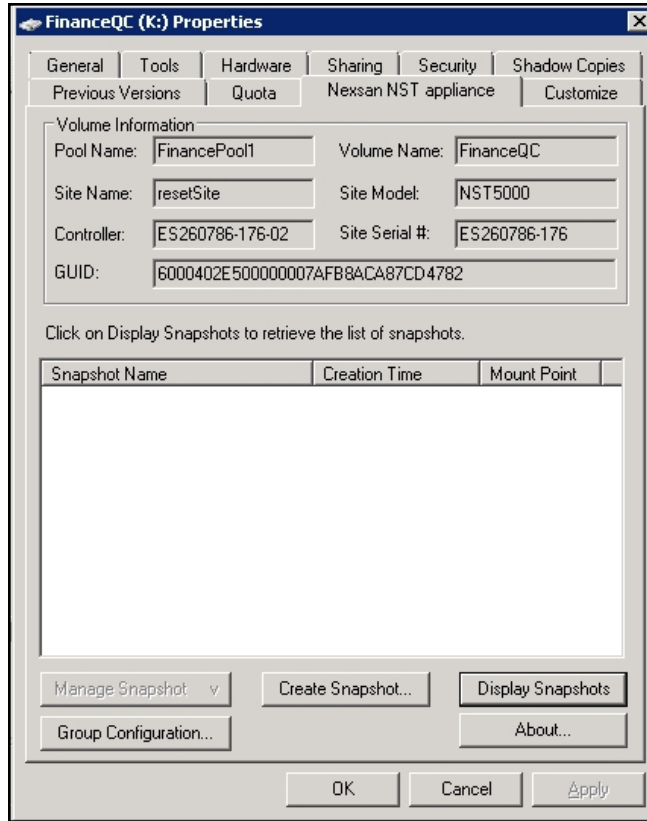
Configuring Windows iSCSI Initiator settings

In firmware releases prior to 2.2, with multiple iSCSI LUNs connected to a single Microsoft Cluster host, deleting a large VHD (Virtual Hard Disk) from the host system may cause it to lose connection to iSCSI LUNs on the corresponding Unity.

This issue is due to small time-out values for two Windows iSCSI Initiator registry parameters on the Microsoft Cluster host. We strongly recommend that you increase the time-out values for these parameters.

iSCSI LUNs

On the Microsoft Cluster host, modify Windows iSCSI Initiator settings in the system registry as described below.

► **To configure Windows iSCSI Initiator for iSCSI LUNs:**

1. Click **Start** and select **Run**.

2. In the Run dialog box, type `regedit`, and click **OK**.

3. Navigate to the following registry key:

   `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet`

4. With the `CurrentControlSet` key selected, open the **Edit** menu and select **Find**.

5. Type `MaxRequestHoldTime`, and click **Find**.

6. Set the `MaxRequestHoldTime` parameter to **300** seconds (5 minutes).

   This is the maximum time (in seconds) for which requests will be queued if connection to the target is lost and the connection is being retried. After this hold period, requests fail with an error and device (disk) will be removed from the system.
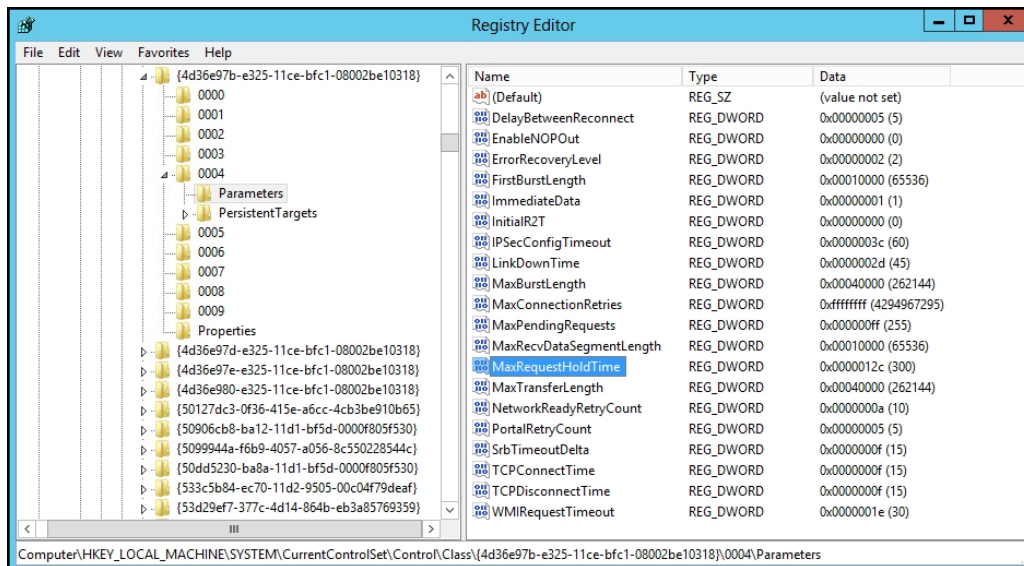
7. Set the `LinkDownTime` parameter to **35**. This value determines how long requests will be held in the device queue and retried if the connection to the target is lost.

Fibre Channel LUNs

For Windows hosts using MPIO (mostly for Fibre Channel LUNs), it is recommended to set these registry settings to the values mentioned below.

- PDORemovePeriod: This setting controls the amount of time (in seconds) that the multipath LUN will continue to remain in system memory, even after losing all paths to the device. When this timer value is exceeded, pending I/O operations will fail, and the failure is exposed to the application rather than attempting to continue to recover active paths.

- PathRecoveryInterval: This setting specifies how long (in seconds) the MPIO component waits before retrying a lost path.

- UseCustomPathRecoveryInterval: If this key exists and is set to 1, it allows the use of PathRecoveryInterval.

► **Recommended MPIO hot fixes for Windows Server:**

- Windows Server 2008 R2 SP1: KB2871163, KB2851144, KB2754704, KB2684681, KB2406705, KB2522766, KB2670762, KB2718576

- Windows Server 2012 R1: KB2867201, KB2889784, KB2869606, KB2779768

► **To configure Windows iSCSI Initiator for Fibre Channel LUNs:**

1. Start the registry editor by selecting **Start** > **Run** and typing `regedit`.

2. Navigate to the following registry key:

   `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\mpio\Parameters`

3. Set new values to these entries:

   a. Set the `PDORemovePeriod` parameter to **90**.

   b. Set the `PathRecoveryInterval` parameter to **30**.

   c. Set the `UseCustomPathRecoveryInterval` parameter to **1**.

2

Chapter 3

Setting up Hyper-V

This section provides specific recommendations and requirements to help you prepare for integrating Unity in a Microsoft Hyper-V 2012 R2 environment.

This section includes these topics:

3

Network recommendations

To ensure that the network configuration where the iSCSI traffic will run has been designed to achieve high availability and no single point of failure:

- Isolate the storage traffic from other networking traffic. You can configure this utilizing VLAN, network segmentation, or dedicated switches for iSCSI traffic only.

- On Unity, configure at least two physical 10GbE (dual-port) NICs per head, bundled into a single channel using the IEEE 802.3ad Link Aggregation Control Protocol (LACP) with a large maximum transmission unit (MTU) and jumbo frames (9000 bytes). If you are working with a cluster configuration, configure at least two 10GbE (dual-port) NICs per head, and also use an IP network multipathing (IPMP) configuration in combination with LACP.

- With IPMP configuration you will achieve network high availability, and with link aggregation you will obtain a better network performance. These two technologies complement each other and can be deployed together to provide benefits for network performance and availability for virtual environments.

- For picking an outbound port based on source and IP addresses, use LACP L3.

- For switch communication mode, use the LACP active mode, which will send and receive LACP messages to negotiate connections and monitor the link status.

IP network infrastructure

It is recommended to use 10GbE IP switches with all interfaces working in 10GbE speed in full duplex mode, with MTU (jumbo frame) and Link Aggregation Control Protocol (LACP).

Note Some Ethernet switches support a newer technology called virtual port-channel. This technology is a supported solution and also provides more redundancy of network paths as well as better performance and bandwidth for your virtualized environment.

IP network recommendations:

- On the Microsoft Hyper-V hosts, ensure that there is at least one dual 10GbE NIC working with 9000 MTU jumbo frame.

- Use at least two physical IP network switches.

- Ensure that there is, at minimum, a link aggregation of two or more 10GbE NICs attached with a physical IP network switch, configured and working with port-channel group or virtual port-channel technologies.

- Ensure that the 10GbE IP network is properly configured and working with high availability and load balancing (without point of failure).

- Ensure that the physical IP switches or routers are not congested or saturated.

- Ensure that the storage network provides adequate throughout as well as low latency between initiators and targets.

- Isolate the traffic through different VLANs or even network segmentation.

Storage configuration recommendations

For the storage configuration, typically any virtualization application is sensitive to available IOPS from the storage system. Be sure to plan and configure Unity accordingly. Please refer to the *Unity Performance Best Practices Guide* for more detailed information about how to optimize Unity.

Block/record size requirements

LUNs have a default block size of 8 KB. This is the default choice for transactional workloads. Large-block streaming workloads require a higher block size, such as 128 KB, to obtain better streaming read performance. It is typically recommended to set the Unity LUN block size to match what your application uses.

Note LUN block size cannot be modified once a LUN is created.

File Systems have a default record size of 128 KB. However, this record size is somewhat dynamic and Unity will write in smaller blocks if the application would seem to benefit from it. It is not recommended to change the default record size of file systems except in very specific circumstances where the application is database-driven and the database record size is precisely known.

Note File system record size can be modified at any time.

When to disable Thin Provisioning

It is recommended to use fixed size VHDX disks type in a production environment to increase disk throughput. Differencing and Dynamic disks are not recommended for production, due to increased disk read/write latency times (differencing/dynamic disks).

It is recommended to set up Thick Provisioned LUNs on Unity to increase performance and limit increased fragmentation of the Hyper-V NTFS file system.

When to use Thin Provisioning

Using Thin Provisioning is recommended if your data is replicated on LUNs. Thin provisioning and dynamically expanding VHDX disks can offer significant disk capacity savings and can be used when performance is not critical. If you need to convert Thick Provisioned LUNs to use Thin Provisioning, contact Nexsan Technical Support for assistance.

Using Unity snapshots

For LUNs or file systems hosted on Hyper-V, you must perform specific steps when creating snapshots and rolling back data to these snapshots. Please refer to the *Unity User Guide* and *Unity Performance Best Practices Guide* for detailed information on snapshot procedures. If the procedures are not followed correctly, data loss may occur.

3

Enabling jumbo frames using the nxadmin CLI

Enabling jumbo frames on the Unity Storage System can significantly increase network throughput while consuming fewer CPU cycles on the system.

► **Before you begin:**

● You must make sure to enable jumbo frames on the switch(es) that the Unity Storage System is connected to, as well as on all client systems that access it.

● You must make sure that the 10 GigE interface is set as the primary interface (nx0) on the Unity Storage System (for example: ixgbe1, ixgbe2, etc.).

● Enabling jumbo frames over the network will cause disconnection. Perform these steps through a KVM or IPMI console. Client systems and applications on the network will temporarily lose connection to the Unity Storage System during the reboot and switchover operations. Make sure that client systems with an active connection to any file systems on the Unity Storage System are disconnected; also make sure to quiesce any applications with an active connection to the Unity Storage System.

● We recommend that IPMI settings be configured for the Unity Storage System if you are connected to the Unity Storage System with a system on a separate management network.

► **To enable jumbo frames on the Unity Storage System:**

1. Access the nxadmin CLI.

2. Type this command to set the MTU for the nx0 interface to 9000 bytes (jumbo frames) and press Enter:

   ```
   nic set-linkprop -p mtu=9000 nx0
   ```

3. Repeat these steps for any other network interfaces on the Unity Storage System (such as, nx1); for example:

   ```
   nic set-linkprop -p mtu=9000 nx1
   ```

4. Restart the system or the controller node:

   a. Type **menu** and press Enter.

   b. When the NestOS Admin Menu displays, type **2** (**Shutdown and Reboot Menu**), and press Enter.

   c. Type **1**, and press Enter. The system or controller node reboots; this process may take some time to complete.

5. Once the system or controller node reboots, test and confirm network connectivity to the Unity Storage System.

6. Repeat these steps on the second controller node after you transition cluster resources back to the node you finished configuring.

Troubleshooting LACP

► **To detect that LACP is enabled on the switches and not on the Unity Storage System:**

● Verify that LACP is enabled on the switches as passive or active; see Enabling LACP using the nxadmin CLI on page 53.

● Verify the Unity Storage System network interface LACP status.

► **To verify the network interface LACP status:**

1. At the command: prompt, type:

   ```
   nic show-aggr -L
   ```

2. Press Enter.

   You will see similar results as displayed below when the protocol is up.

   ```
   ES200100-001-02:P:/> nic show-aggr -L
   LINK       PORT          AGGREGATABLE SYNC COLL DIST DEFAULTED EXPIRED
   nx0        ixgbe2        yes          yes  yes  yes  no        no
   --         ixgbe3        yes          yes  yes  yes  no        no
   private0   ixgbe0        yes          yes  yes  yes  no        no
   --         ixgbe1        yes          yes  yes  yes  no        no
   nx99       igb0          yes          no   no   no   no        no
   ```

Microsoft Hyper-V 2012 R2 recommendations

The following requirements are specifically for use with Unity.
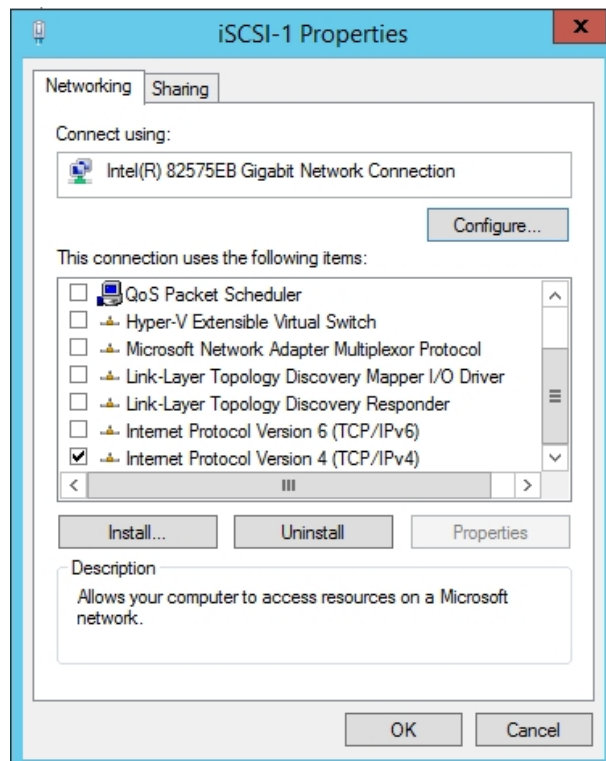
Network configurations

► **To set network protocols on the dedicated iSCSI storage network card:**

1. Open the Networking tab in the iSCSI properties dialog box. Uncheck all Networking protocols with the exception of:
   - Manufacturers protocol (if applicable)
   - Internet Protocol Version 4

2. Unbind other protocols.

Figure 3-1: Setting network protocols

► **To disable DNS Registration on the dedicated iSCSI storage network card:**

1. Open the Advanced TCP/IP Settings dialog box.

2. Uncheck the option Register this connection's addresses in DNS.

Figure 3-2: Disabling DNS registration
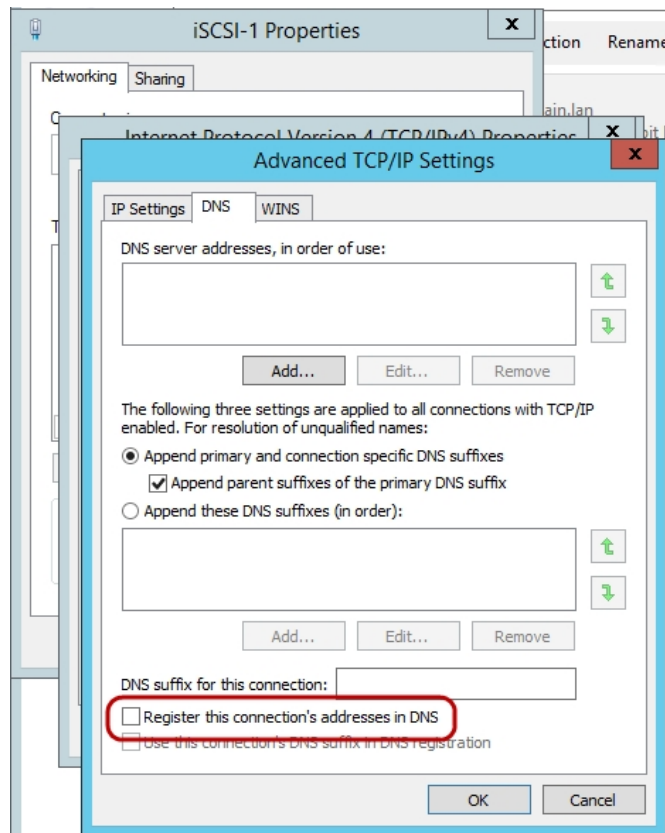
► **To set jumbo frames on the dedicated iSCSI storage network card:**

Note As network cards may vary, please refer to the network card manufacturer for details on setting up jumbo frames.

Below is an example of setting up jumbo frames in the Gigabit Network Connection Properties dialog box.

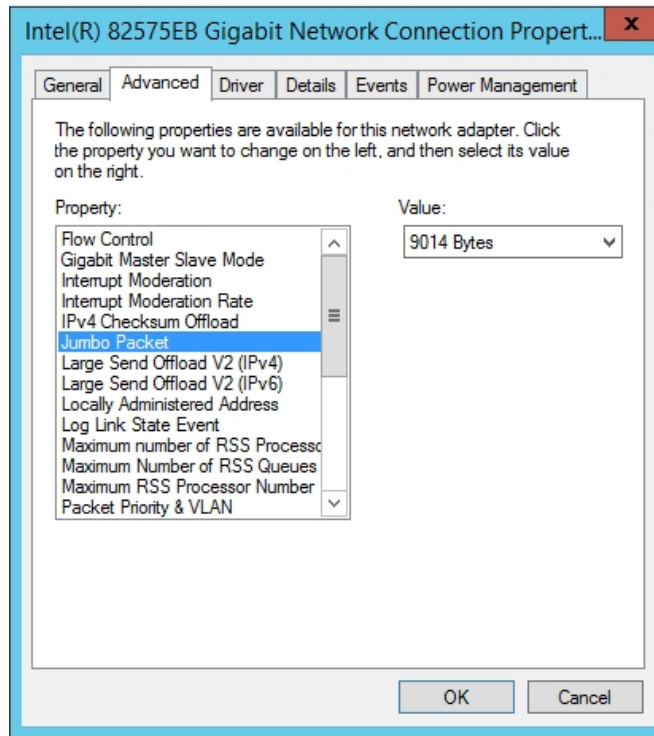Figure 3-3: Setting jumbo frames on the dedicated iSCSI storage network card

► **To set power management on the dedicated iSCSI storage network card:**

Note As network cards may vary, please refer to the network card manufacturer for details on configuring the Power Management settings.

1. In the Gigabit Network Connection Properties dialog box, uncheck the option Allow the computer to turn off this device to save power.

Figure 3-4: Setting power management
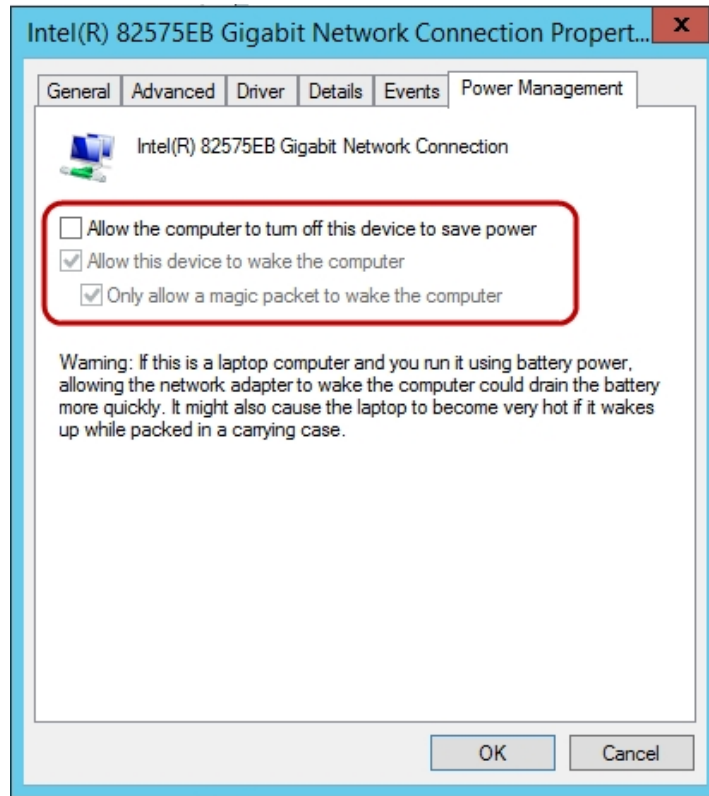
Modifying the Microsoft iSCSI Initiator settings:

This section provides information related to the following registry entries.

Registry entry	Definition
MaxRequestHoldTime	Maximum time (in seconds) for which requests will be queued if connection to the target is lost and the connection is being retried. After this hold period, request will be failed with "error no device" and device (disk) will be removed form the system.
LinkDownTime	This value determines how long requests will be held in the device queue and retried if the connection to the target is lost.

► **To configure the following settings on the Hyper-V host server:**

1. Navigate to the following registry key:

   HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet

2. With CurrentControlSet selected, click on the Edit menu and select Find.

3. Type in "MaxRequestHoldTime" and select Find.

4. Set **MaxRequestHoldTime** to 300 seconds (5 mins) (decimal).

5. Set **LinkDownTime** to 45 (decimal).

Tuning the TCPAckFrequency:

Modify the TCP/IP settings for the network interfaces carrying iSCSI traffic to immediately acknowledge income TCP segments.

Note These TCP/IP settings should not be modified for network interfaces not carrying iSCSI traffic as the increased acknowledgment traffic may negatively affect other applications.

► **To configure the following settings on the Hyper-V host server:**

1. Navigate to the following registry key:

   ```
   HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters
   \Interfaces\<InterfaceGUID>
   ```

2. Select the key of the dedicated iSCSI network interfaces(s).

3. Set TcpAckFrequency to 1 (decimal).

   - Default value: 200 (milliseconds)
   - Recommended value: 1 (millisecond)

4. Reboot the server.

3

Virtual disk recommendations

In this section:

3

Using VHDX for virtual disks

New disks should use the VHDX format. Disks created in earlier Hyper-V iterations should be converted to VHDX, unless there is a need to move the VHD back to a 2008 Hyper-V host.

The VHDX format offers:

- Virtual hard disk storage capacity of up to 64 TB.

- Improved protection against data corruption during power failures (by logging updates to the VHDX metadata structures).

- Improved alignment of the virtual hard disk format to work well on large sector disks.

Note Use of the VHDX format for virtual disks is the default for Microsoft 2012 R2.

► **To choose the VHDX disk format and type:**

1. Open the New Virtual Hard Disk wizard dialog box.

2. Continue to the Choose Disk Format page. Select the VHDX option.

Figure 3-5: VHDX format for virtual disks
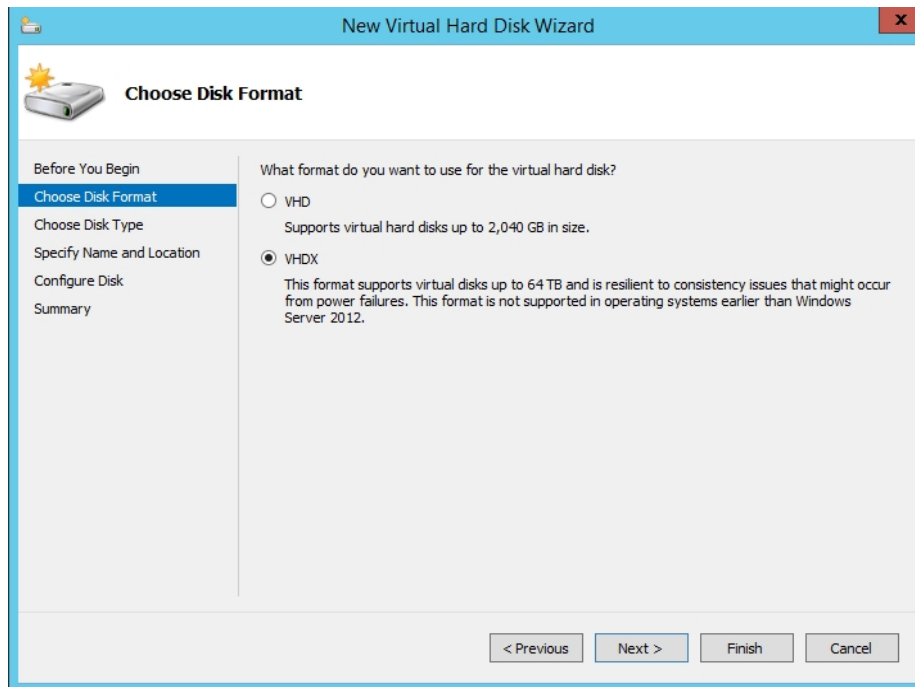
3. Continue to the Choose Disk Type page. Select the Fixed size option.

   Note Disks type should be fixed size in a production environment to increase disk throughput. Differencing and Dynamic disks are not recommended for production due to increased disk read/write latency times (differencing/dynamic disks).

Figure 3-6: Setting fixed size for virtual disks
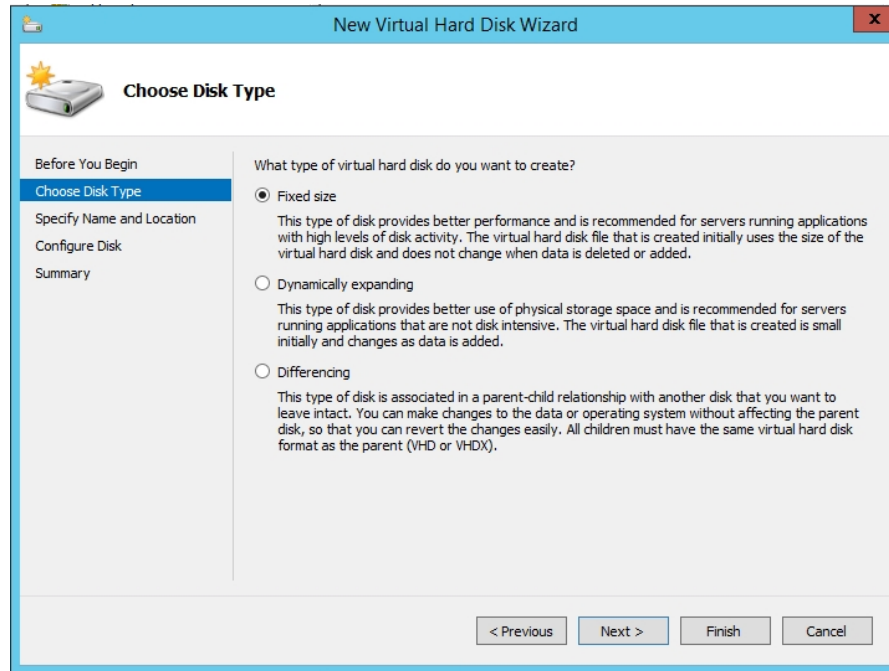
Using virtual disks for CSV

Disks used for CSV (Cluster Shared Volumes) must be partitioned with NTFS. Do not use a disk for a CSV that is formatted with FAT, FAT32, or Resilient File System (ReFS).

The recommended minimum free space on CSV volumes containing Hyper-V virtual machine VHD and/or VHDX files is:

- 15% free space, if the partition size is less than 1TB.
- 10% free space, if the partition size is between 1TB and 5TB.
- 5% free space, if the partition size is greater than 5TB.

Do not use a shared VHDX file for the operating system disk. Servers should have a unique VHDX (for the OS) that only they can access. Shared Virtual Hard Disks are better used as data disks and for the disk witness.

Note OFFLOADED DATA TRANSFER (ODX) is not currently supported on Unity.

Virtual Machine recommendations

In this section:

3

Specifying the generation of the virtual machine

Guest virtual machines (VMs) should be configured to use UEFI firmware at startup (Gen-2 guests), which offers better virtual driver support and performance than BIOS (Gen-1 guests) at startup.

► **To specify the VM generation:**

1. Open the New Virtual Machine wizard.

2. Continue to the Specify Generation page. Select the generation 2 option.

Figure 3-7: Specifying generation
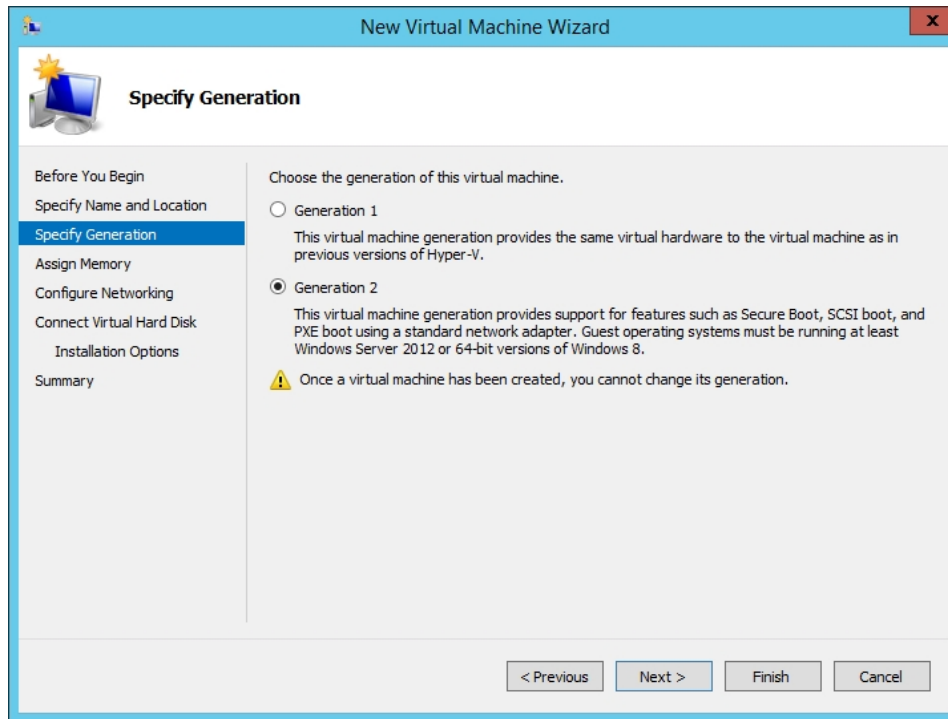
Ensuring the virtual machine has the correct partition alignment

● If the guest operating system is Windows Vista, Windows 7, Windows Server 2008 or Windows Server 2008 R2 and the partitions were created using one of these operating systems, they will be aligned.

● Partitions created with Windows Server 2003 and Windows XP will have the default starting offset 32,256 bytes (31.5 KB) and will be misaligned. Refer to Microsoft KB929491 to create aligned partitions.

Disabling File Last Access Time check

● On newer Windows clients (Vista and newer) and servers (2008 and newer) the "last-access" time updates is disabled by default.

● If running Windows 2003 or earlier guest operating systems on Hyper-V, it is recommended that file "last-accessed" be disabled to help optimize disk performance.

► **To disable file "last-access" time:**

1. Navigate to the following registry key:

   `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\FileSystem`

2. Create a new DWORD value in the right-hand pane named NtfsDisableLastAccessUpdate and give it a value of 1.

   - Default value: 0
   - Recommended value: 1

3. Reboot the virtual machine.

## *Optimizing OS performance with enlightened I/O guests*

The operating system kernel in Windows clients (Vista SP1 and newer) and Windows Server (2008 and newer) includes feature "enlightenments" that optimize OS performance when the OS is installed as a Hyper-V guest. An enlightened guest means that the OS is virtualization-aware to some degree. The enlightenments work by decreasing the amount of CPU overhead required when an OS is running as a Hyper-V guest VM. For optimal guest VM OS performance, Windows Server 2008 or newer is recommended.

Installing Integration Services on Microsoft Hyper-V VMs

The installation of Integration Services should be performed after the guest operating system loads for the first time.

1. Launch the Virtual Machine Connection application from within the Hyper-V Manager console to connect to the guest operating system. Log in with an account that has administrative privileges.

2. You can then select the Insert Integration Services Setup Disk option from the Action menu.

3

Figure 3-8: Installing Integration Services
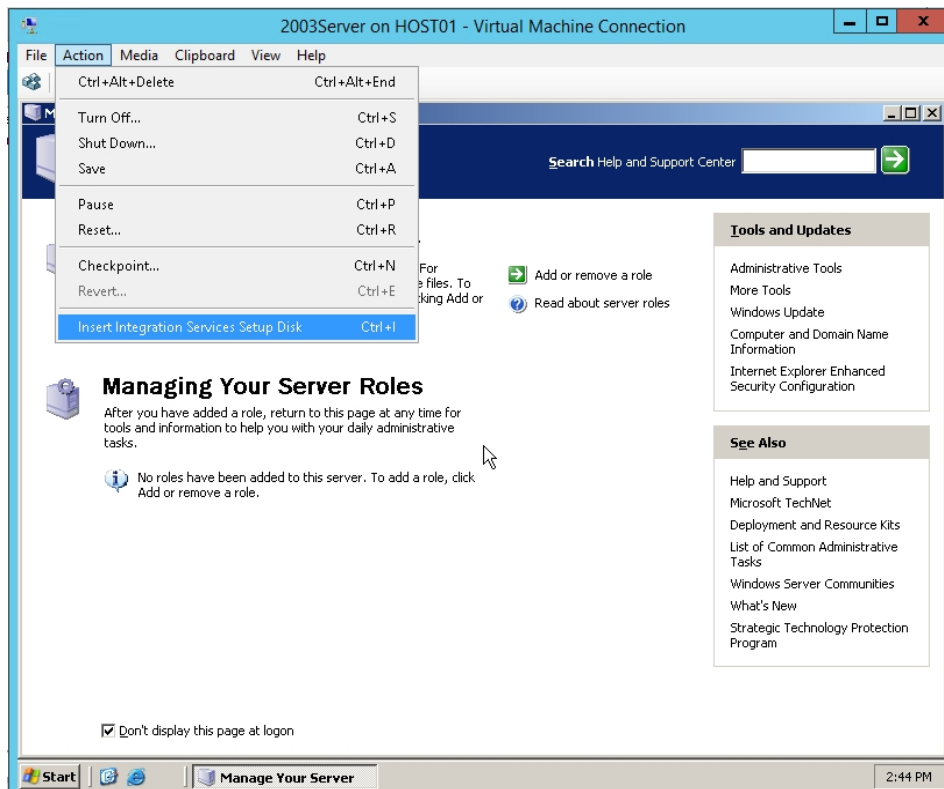
Configuring the virtual machine disks I/O timeout

Configuring the VM disks I/O timeout helps the guest operating system survive high latency, or temporary outage conditions such as path failover or network failure.

► **To configure I/O timeout with Microsoft OS:**

1. Navigate to the following registry key:

   `HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\Disk`

2. Create or modify the DWORD value in the right-hand pane named TimeOutValue and give it a value of 180.

   ● Default value: 60 (seconds)

   ● Recommended value: 180 (seconds)

3. Reboot the virtual machine.

► **To configure I/O timeout with Linux OS:**

1. cat /sys/block/<disk>/device/timeout

2. Set to 180

   ● Default value: 60 (seconds)

   ● Recommended value: 180 (seconds)

Setting up Unity for Hyper-V

Perform the following tasks to use Unity in a Hyper-V 2012 R2 environment. Be sure to review all Hyper-V recommendations and requirements prior to starting. See Microsoft Hyper-V 2012 R2 recommendations on page 39.

This section includes the following topics:

Enabling LACP

LACP (Link Aggregation Control Protocol) allows multiple individual Ethernet links to be aggregated together to form a single logical channel. LACP allows a network device to negotiate an automatic bundling of links by sending LACP packets to the peer (directly connected device that also implements LACP).

LACP is typically used for two purposes:

1. Load balancing: bundling two or more links together provides increased throughput and a level of load balancing for when the speed of individual Ethernet lines is limited.

2. Redundancy: links in a LACP aggregation provide an automatic fallback should one of the links fail, providing enhanced resilience. All traffic is routed from the failed link to the remaining links.

The Unity Storage System supports both active and passive LACP modes:

- Active mode: places a port into an active negotiating state in which the port initiates negotiations with other ports by sending LACP packets.

- Passive mode: places a port into a passive negotiating state in which the port responds to LACP packets that it receives but does not initiate LACP packet negotiation.

This section explains how to enable and configure LACP on the Unity Storage System.

Understanding link aggregation

Link aggregation does NOT work by passing packets across all the links in an aggregate group in a round-robin fashion. When a packet arrives, LACP calculates the source and destination address hash (which can be L2, L3, or L4 policies, with L4 being the default), and automatically assigns any given source-destination pair to one of the links in the aggregate. As a result, a single TCP connection can never achieve speeds surpassing the throughput of a single link.

For example, while you might aggregate 4x 1Gbps links into a single aggregate, you'll never get more than 1Gbps in any single data transfer. Even in the case of multiple sessions at the same time from multiple clients, 50/50 load balancing is almost never achieved in real-life implementations; around 70/30 is more common.

For more information about LACP, see:

http://en.wikipedia.org/wiki/Link_aggregation

Requirements and guidelines for implementing LACP

This section lists network and infrastructure requirements for implementing LACP, as well as guidelines/best practices for configuring the Ethernet switches for LACP.

- LACP only operates point-to-point between two partner devices connected together: for example, the Unity Storage System and the Ethernet switches.

- LACP must be enabled at both ends of the link to be operational. Refer to the Ethernet switch manufacturer's documentation for information on setting up LACP on the Ethernet switches.

- The link between the Unity Storage System and the Ethernet switch(es) must be Full-Duplex.

- Both the Unity Storage System and the Ethernet switches must be running at the same speed (1Gbps or 10Gbps).

- The Ethernet switches must support the IEEE 802.3ad Link Aggregation Standard.

- To prevent a single point-of failure in your configuration, make sure to connect each controller node to a different Ethernet switch, as explained in "Understanding network aggregation" in the *Network Configuration Guide*.

3

Enabling LACP using the nxadmin CLI

The Unity Storage System provides the `nic` command in the Unity Storage System's menu-based nxadmin CLI for enabling and monitoring LACP on the Unity Storage System.

► **Before you begin:**

● Enabling LACP over the network will cause disconnection. Perform these steps through KVM console, or through IPMI console.

● You must not enable LACP on nx99 otherwise you will lock yourself out of the system.

> **CAUTION:** On a clustered system, you must enable LACP on each controller node individually. Before you enable LACP on a controller node, however, you must transition any Pool Resource Groups and/or the System Management component to the second controller in the system. You must then repeat this process to enable LACP on the second controller.

► **To enable and configure LACP on the Unity Storage System:**

1. Access the nxadmin CLI.

2. When the NestOS Admin Menu displays, type **5** (**Run a Command**), and then press Enter.

3. At the command: prompt, type one of these command to enable LACP on the Unity Storage System, in either active or passive mode:

   ● Active mode:

   ```
   nic modify-aggr -L active nx0
   ```

   Where `nx0` represents the primary interface on the Unity Storage System. You can also enable LACP on the secondary interface, if available: to enable LACP on the secondary interface, replace `nx0` with `nx1`.

   ● Passive mode:

   ```
   nic modify-aggr -L passive nx0
   ```

   Where `nx0` represents the primary interface on the Unity Storage System. You can also enable LACP on the secondary interface, if available: to enable LACP on the secondary interface, replace `nx0` with `nx1`.

4. Press Enter. The Unity Storage System disconnects from the network.

5. Configure the Ethernet switch to set the ports that you want to combine into a logical channel. The Unity Storage System comes back online once LACP negotiation is complete.

6. Test and confirm network connectivity to the Unity Storage System.

3

Adding a storage pool

Unity provides the **Create a Storage Pool** wizard to guide you through the process of creating a storage pool.

Before you begin

If your Unity deployment is set up to use Unity authentication, consider adding user accounts to the system that you can then assign as Pool Administrators to the storage pool. You may also want to add user accounts for file system-level access; you can then configure the relevant access permissions when you create file systems.

How to allocate storage with Unity

- Take into account the number of file systems and/or LUNs that you need per storage pool, and divide the disk space in the storage pool accordingly. When allocating disk space, keep in mind that metadata and snapshots also consume storage.

- Consider future capacity requirements, particularly when allocating space usage to file systems and LUNs.

- You are not required to allocate all available volumes to the storage pool when you initially create the pool. However, keep in mind that any unallocated volumes remain unused on the system until you allocate them to the storage pool.

- Consider how you intend to expose file systems on the system: using (to Windows-based systems), (to UNIX/Linux-based systems), or using both sharing.

- Consider the users and groups that will access the file systems, as well as the file systems-level access permissions that you need to give each user and/or group.

- If your deployment includes the Unity Data Replication package, make sure the remote Unity that you intend to use as your replication site has adequate storage capacity to match the capacity on the primary site.

- If your deployment includes the Data Replication and/or Snapshots features, make sure there is enough storage capacity for both replicated data and scheduled snapshots of your data.

- If your deployment includes Nexsan storage enclosures attached externally to your Unity, make sure the system(s) is properly connected to Unity and that it is powered on.

- If your environment is set up as a many-to-one configuration, you cannot create a storage pool if the Disaster Recovery site is down or unreachable. This is to ensure uniqueness of storage pool names across all sites.

► **To create a storage pool:**

1. On the **Unity navigation bar**, click **Storage > Storage Pools**.

2. In the **Storage Pools** panel, click **Add Storage Pool**. The **Create a Storage Pool** wizard opens.

3. In the **Available** listing, select a storage system or volume and click **Allocate**.

Figure 3-9: Create a Storage Pool: Properties

4. Optionally, change either of the following:

   a. the **Storage Pool** name.

   b. the **Resource Group** that you want to assign the storage pool to.

   Click the **Next** button.

5. If the new pool has FASTier drives, specify whether they should be used for **READ** or **WRITE** (see "Assigning FASTier devices," below). Click the **Next** button.

6. Verify your settings and click the **Create** button.

Next steps

After the pool is created, these are typical follow-on tasks:

● Creating another storage pool

● Adding a file system on page 57

● Creating a LUN on page 69

► **Assigning FASTier cache devices:**

● You assign a read/write cache device as either read cache OR write cache.

● Unity only uses read cache devices once the RAM cache on the system is full. Read cache devices are filled only as files are read. This means that Unity uses read caching only on the second file access.

- Write-only cache devices aggregate smaller writes in one large write. They are particularly useful for many small, synchronous writes. Asynchronous writes will see no improvement.

For more information about FASTier cache devices, please contact your Nexsan reseller or Nexsan Support Representative.

3

Adding a file system

Unity provides the **Create a File System** wizard to guide you through the process of file system setup.

Before you begin

Planning the content, size, and distribution of file systems on Unity can improve performance, manageability, and overall ease-of-use of the system.

You should carefully choose the contents of a file system to avoid two common pitfalls: having too many file systems of a very specific nature, or having very few file systems of a general nature. For example, file systems for general use are easier to set up in the beginning, but can cause problems later. A better approach is to create separate file systems with a specific purpose or group of users in mind.

However, creating too many file systems also has its drawbacks. For example, it is much more efficient to create a *home* file system rather than creating separate file systems for each user's home directory. See Home Directories.

In general, by keeping the number of file systems and other resources low, the performance of Unity is optimized.

Before you add file systems to a storage pool on Unity, review these guidelines:

- Take into account the number of file systems that you need per storage pool, and divide the disk space in the storage pool accordingly. When allocating disk space, keep in mind that file system metadata and snapshots also consume storage.

- Consider future capacity requirements, particularly when allocating space usage to file system.

- Consider how you intend to expose file systems: either CIFS sharing, NFS sharing, FTP sharing (Nexsan Unity authentication only), or CIFS and/or NFS and/or FTP sharing.

- Consider the users and groups that will access the file systems as well as the share-level access permissions that you need to give each user and group.

- If your environment is set up as a many-to-one configuration, you cannot create a file system if the Disaster Recovery site is down or unreachable. This is to ensure uniqueness of file system names across all sites.

3

Step 1: Setting the file system name and storage pool

▶ **To assign a file system name and storage pool:**

1. On the **Unity navigation bar**, select **Storage > File Systems**.

2. Click **Add File System**. The **Create a File System** wizard opens.

Figure 3-10: Step 1: Naming the File System and choosing the pool
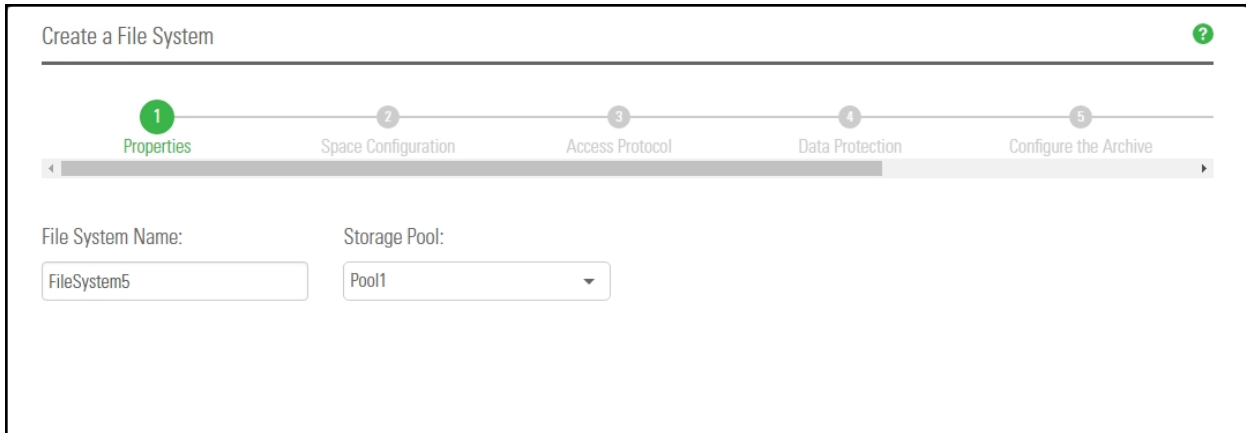
3. You can accept or change the:

    a. **File System Name**

    b. **Storage Pool** assignment, if more than one storage pool exists. Select which pool you want to assign to the file system to.

    Click the **Next** button.

Step 2: Configuring space settings

In this step, configure reserved space, quota, and record size.

Figure 3-11: Step 2: Space settings

► **To configure space settings:**

1. In the wizard step 2 **Space Configuration** panel, you can specify:

Setting	Description
Reserved Space	*You can reserve a set amount of disk space in the storage pool for the exclusive use of the file system. (Read more ...)*
	If you add another file system to the storage pool, the space available to the new file system is the difference of the total disk space in the storage pool minus any reservations set aside for other Unity file systems. For example, in a storage pool with two file systems and 10 TB of available disk space, if a reservation of 6 TB is allocated to one file system, then the second file system has 4 TB of available disk space.
	► **To reserve space for the file system in the storage pool:**

Setting	Description
	● Move the slider left or right to set the desired amount of reserved space, Or ● Enter a value in the box to the right of the slider. **Note** To increase reserved space when you are using a limited quota, you must first increase the quota.
Quota	*A usage quota allows Unity to dynamically expand a file system's storage capacity. (Read more ...)* You can reserve all available disk space for the file system, if needed, except for the last 6.31 MB, which space may be required for system-related operations, such as data replication. **Note:** This space automatically becomes available in the event that there is no more disk space reservation available in the storage pool.) ► **To specify the file system quota:** 1. Click the **Quota** ⬤ button. 2. Do one of the following: ● Move the **Quota** slider left or right to decrease or increase the quota limit. ● Enter a value in the box to the right of the slider.
Record Size	*Use this setting if you want to optimize for database applications that have specific file sizes. It defines the suggested size of each data block used by the File System. (Read more ...)* File system record size is dynamic and Unity can write in smaller blocks for applications requiring a different record size. It is not recommended to change the default file systems record size except where the application is database-driven and the database record size is precisely known. File systems have a default record size of 128 KB, which is the maximum size.
Data Compression	⚠ **CAUTION:** If you turn on data compression for a file system, and then you turn it off before you set up replication for the file system, part of the data is compressed and the other part is not. Since the file system has not been replicated yet, the compression settings are not inherited and data compression is off at the remote site. If you set a space quota on the file system and that quota is almost full, the file system on the remote site will not have enough space to accommodate data coming from the primary file system. As a result, replication will fail. Perform one of these actions before replication: ● Increase the quota to match the actual space used by data on the file system. ● Set the quota to *Unlimited*. ● Enable data compression on both sites.

3

| Setting	Description
	You can enable/disable compression at the file system level.
	Compression allows for better performance of the File Systems or LUNs, since the files to read/write are much smaller. However, it will also increase CPU usage. Compression can be enabled or disabled at any time.
	This setting takes precedence over the settings defined at the storage pool level. If you enabled data compression at the pool level before creating this file system, the file system already has data compression enabled. If you choose to disable data compression on the file system, only that file system will be affected.
	Compression allows for better performance of the file system since the files to read/write are much smaller. However, it will also increase CPU usage. Compression can be enabled/disabled at any time.
	Notes:
	• When you set up replication for file systems that have the compression setting enabled, file systems on the remote site inherit the compression settings.
	• Enabling or disabling data compression does not affect existing data. It will only affect data that will be written to the file system after the change.

2. Click the **Next** button.

Note is only displayed if your Unity deployment includes Unity's Data Protection feature. For more information about Snapshots and Data Replication, please contact your Nexsan reseller or Nexsan Support Representative.

3

Step 3: Configuring the access protocol

Now select the **Access Protocol** for the file system.

- A file system that you expose using the CIFS sharing method can also be accessed by UNIX/Linux-based systems using a CIFS client implementation for UNIX (such as, *Samba*).

- A file system that you expose using the NFS sharing method can also be accessed by Windows-based systems using an NFS client implementation for Windows (available in *Microsoft Services for UNIX*)

- You cannot expose a file system to Windows-based systems over the CIFS protocol if Unity is connected to an LDAP Directory service; the CIFS sharing option is not available in LDAP Directory service implementations.

- If you configured LDAP Directory service as the user authentication mode for Unity: exposing a file system over the CIFS protocol in an LDAP environment is only supported with anonymous read and/or anonymous read/write access enabled for the share.

- A file system that you expose using the FTP sharing method can be accessed by UNIX/Linux-based and Windows-based systems using the FTP protocol. FTP sharing is only supported for Nexsan Unity authentication. It must be enabled at the site level beforehand.

- If the file system will be accessed over IIS, do not enable case-sensitivity for the share.

Figure 3-12: Step 3:Configuring the access method
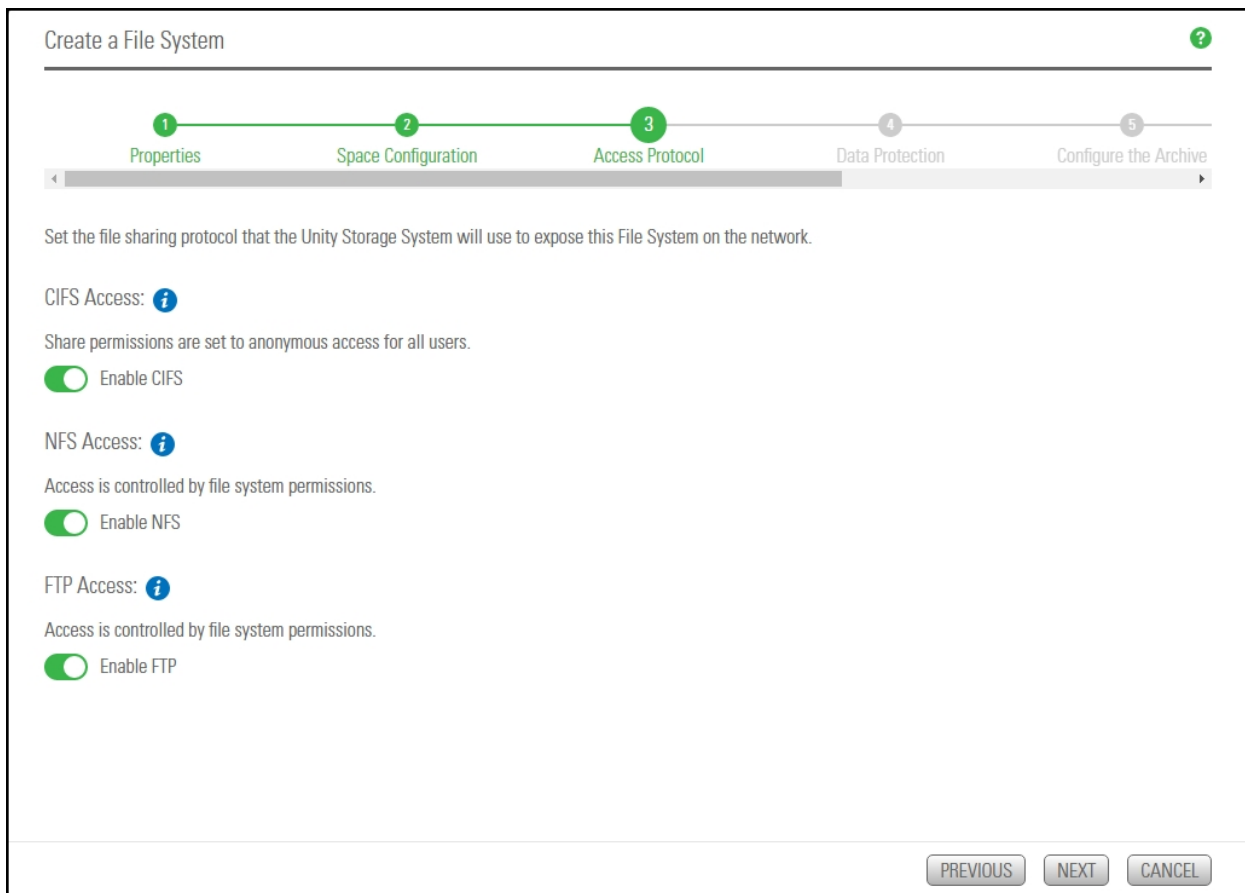
► To configure the access protocol:

- Choose any of the following:

Now select the **Access Protocol** for the file system.

- A file system that you expose using the CIFS sharing method can also be accessed by UNIX/Linux-based systems using a CIFS client implementation for UNIX (such as, *Samba*).

- A file system that you expose using the NFS sharing method can also be accessed by Windows-based systems using an NFS client implementation for Windows (available in *Microsoft Services for UNIX*)

- You cannot expose a file system to Windows-based systems over the CIFS protocol if Unity is connected to an LDAP Directory service; the CIFS sharing option is not available in LDAP Directory service implementations.

- If you configured LDAP Directory service as the user authentication mode for Unity: exposing a file system over the CIFS protocol in an LDAP environment is only supported with anonymous read and/or anonymous read/write access enabled for the share.

- A file system that you expose using the FTP sharing method can be accessed by UNIX/Linux-based and Windows-based systems using the FTP protocol. FTP sharing is only supported for Nexsan Unity authentication. It must be enabled at the site level beforehand.

- If the file system will be accessed over IIS, do not enable case-sensitivity for the share.
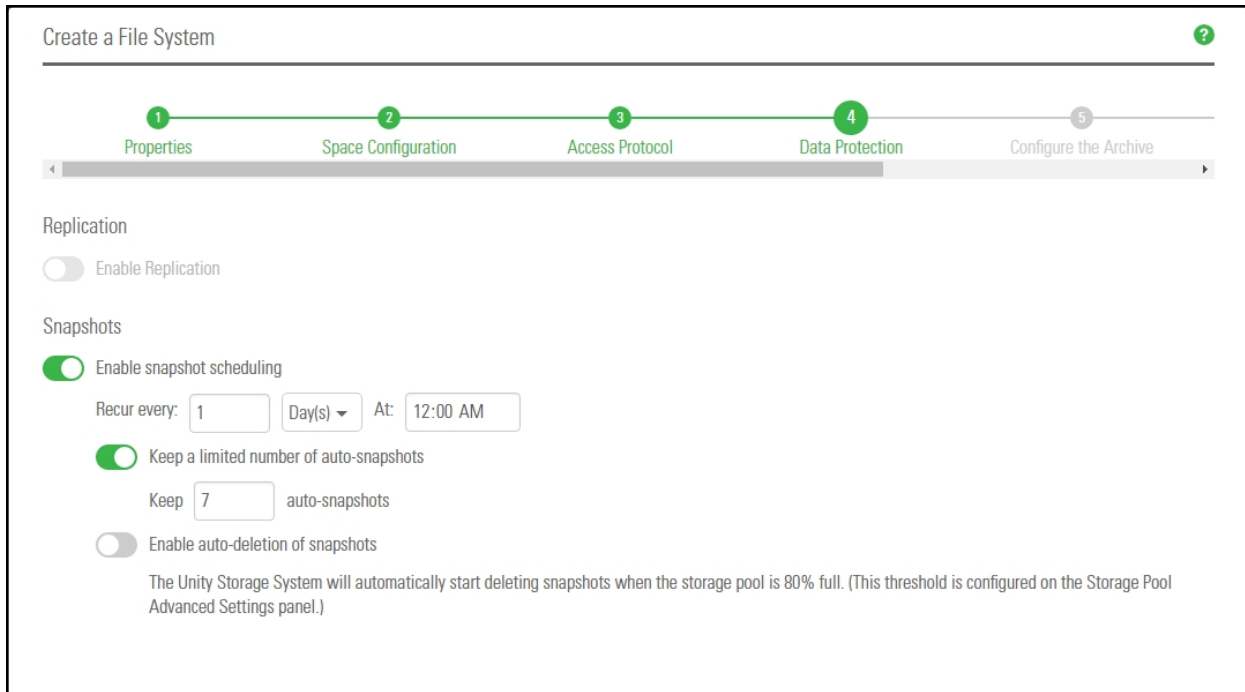
3

Step 4: Configuring Data Protection

Now you need to enable:

- Replication
- Snapshots scheduling

To enable replication for a file system, you need a second Unity Storage System that you can connect the current system to.

Figure 3-13: Step 4: Setting Replication and Snapshots scheduling

► **To configure data protection for the file system:**

1. If your Unity System is connected to a remote Unity System and has replication set up, select **Enable Replication**.

2. Optionally, select **Enable snapshot scheduling**. By default, automatic snapshots are enabled every day at midnight and a limit of seven snapshots are maintained.

3. Adjust the schedule for auto-snapshots to be taken, according to your requirements. You can change the number, frequency and time of day.

4. Specify the maximum number of auto-snapshots to be retained.

5. Enable auto deletion of snapshots if you want Unity to delete snapshots when the storage pool is 80% full. The threshold is configured on the **Storage Pool Advanced Settings** page.

6. Click the **Next** button.

Step 5: Configuring Active Archive

If you have **Unity Active Archive** configured, this step of the **Add File System** wizard prompts you to select the **Archive Settings** for the file system.
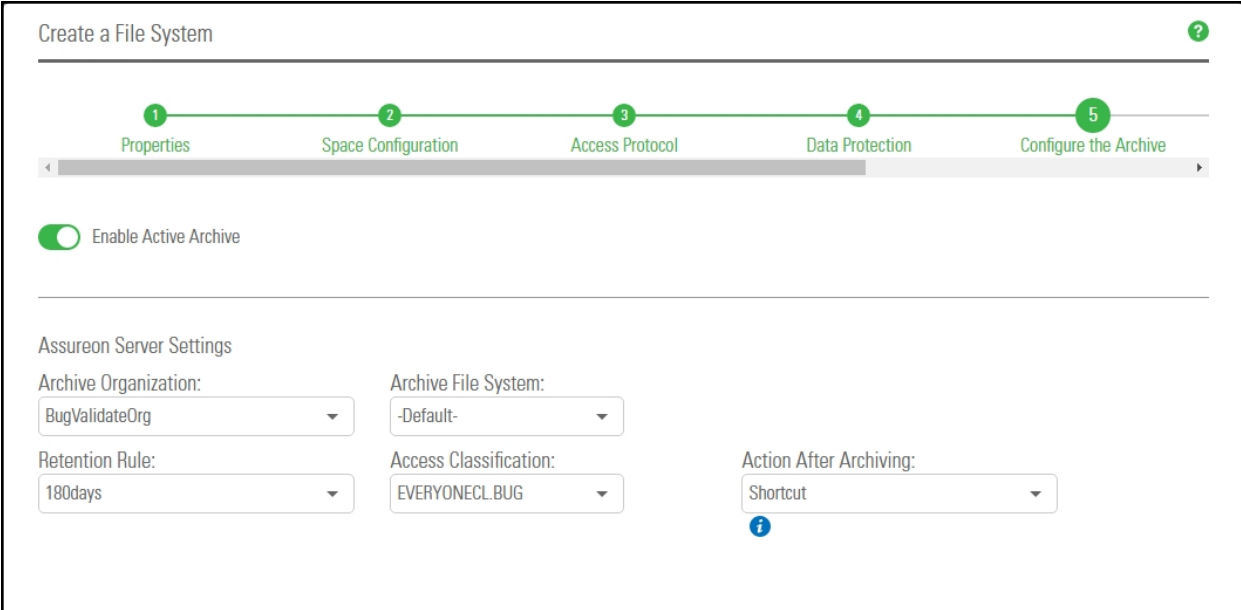
This step only appears if you have Unity Active Archive on this Unity Storage System. Unity Active Archive enables you to set data retention policies to automatically offload stale data and release primary storage. This in turn enables increase the performance of your primary storage without increasing its size.

Archiving allows you to retain data, using Nexsan's Assureon archiving capabilities.

► **To configure Active Archive settings:**

1. Select the **Enable Active Archive** button

Figure 3-14: Step 5: Enable Active Archive

2. The following Active Archive settings are the settings on Assureon Server by which data from your file system will be archived. The options that appear here are defined on the Assureon Server.

Table 3-1: Assureon Server Settings

Setting	Description
Archive Organization	Select the Assureon organization to be used for archiving. An organization is a group of one or more file systems which share retention rules, access classifications, and reports.
Archive File System	Select the file system in the Archive Organization to be used for archiving. A file system consists of a database, storage location (the stores), manifest and audit files as well as replication options. Think of it as a self-contained archive that shares properties with the other file systems within an organization.
Retention Rule	Select the retention rule to be used for data archived from this file system. Retention rules specify how long a file is kept under management. The default is 180 days, but the range is from 90 days to 99 years.
Access Classification	Select the access classification to be used for data archived from this file system. When a file is placed under Assureon management, it is stored using classification and sub classification information. Classifications enable you to control access to files. They also provide an intuitive way to search, audit, and dispose of files.
Action After Archiving	Define what is to happen to files once they have been archived: **Shortcut**, **Leave**, or **Remove**. **Note** Files will not be converted to shortcuts, or removed if asynchronous replication is enabled.
Sync	**Archive Files** Performs a complete archive of the file system, either manually or on a schedule. This feature does not affect Real Time Archiving. **Archive Folder Security** Performs a complete archive of the file system's folder security, either manually or following a schedule. This does not affect Real-Time archiving.
Real-Time	**Archive Files** Performs a persistent and ongoing archive of files, as changes are detected. Files are checked and archived if necessary every minute. **Archive Folder Security** Performs a persistent and ongoing archive of folder security, as changes are detected. Files are checked and archived if necessary every minute.

3. Click the **Next** button.

Step 6: Verifying settings

Now you review the summary of your settings carefully before applying the configuration settings.

▶ **To review your settings:**

1. Review the summary of the settings shown on screen.

2. To revise any of your settings, you can click **Previous** to go back.

   OR

3. Click any of the step numbers at the top of the panel to jump to that section of the wizard. For example, if you want to change **Properties**, click:

   Properties

4. When you are ready to proceed, click **Create**.

The wizard displays file system creation progress as it applies your settings.

Now you can **Add another file system** or click **No, I'm finished**.

Step 7: Viewing results

In this step, the wizard displays results as Unity creates the new File System.

Figure 3-15: File System wizard: Viewing configuration results
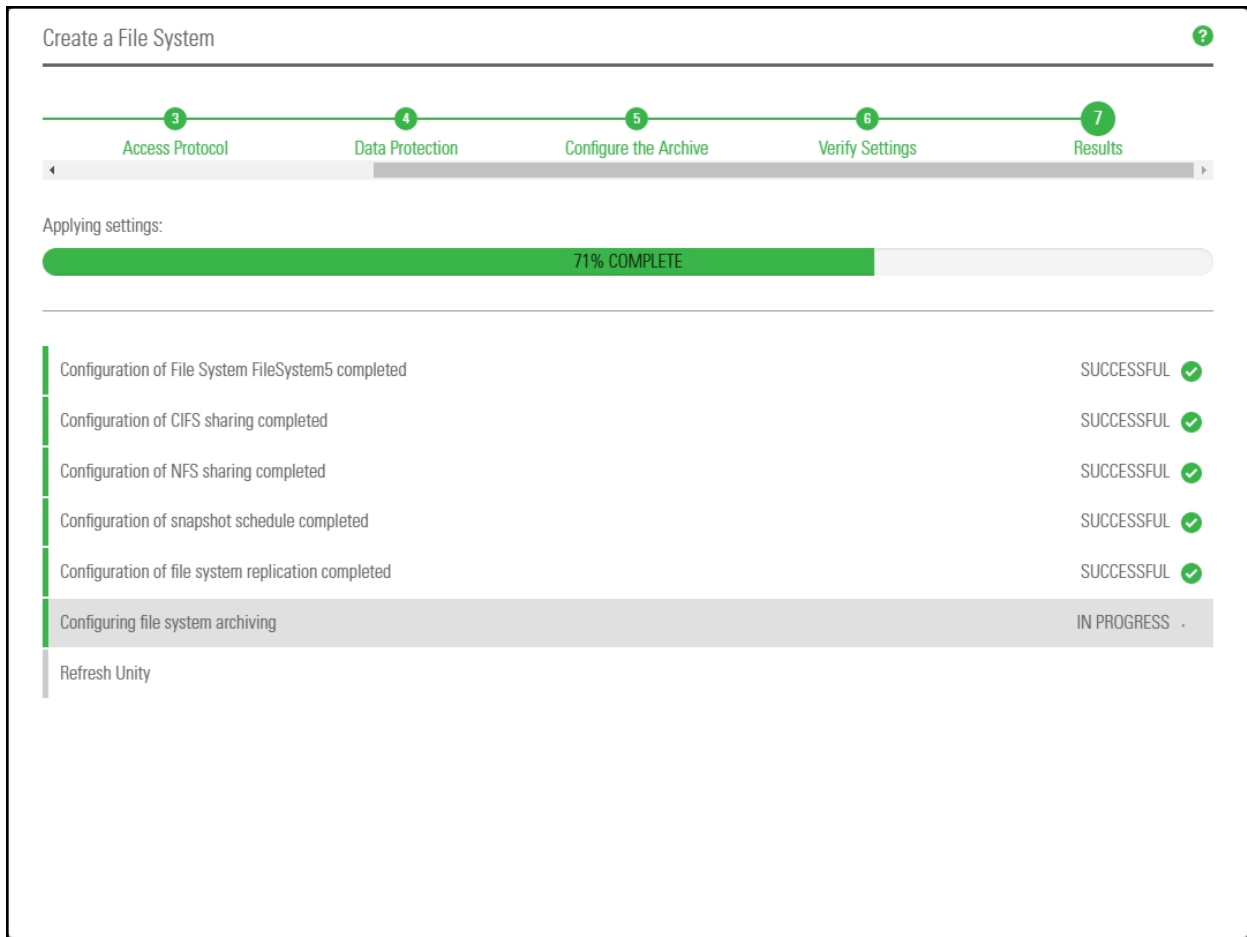
The wizard displays error events that the system encounters during the creation process. You can view more details about an error event by expanding the corresponding entry.

► **To view more details for an error event:**

● Click the **View Error** link corresponding to the error event.

Unity informs you when it successfully creates the File System. It also asks you if you want to create another File System in the storage pool.

Creating a LUN

This section describes the process for adding a LUN to a storage pool on Unity, including guidelines for LUN management, and steps for setting up CHAP (Challenge Handshake Authentication Protocol) authentication. You add a LUN to a storage pool using the Create a LUN wizard; before starting the Create a LUN wizard, review the guidelines provided in the subsequent sections.

Note If you select the option to create a new iSCSI target during the LUN creation process (*step 1*), the Create a LUN wizard includes 7 steps. This section only describes the process for adding a LUN using the default, or an existing target. Unity provides the Target Setup wizard to guide you through the process for adding a target to a storage pool; for more information, see Adding an iSCSI target on page 12.

► **Before you begin:**

● If you intend to use CHAP (Challenge Handshake Authentication Protocol) authentication, you must add CHAP users to the Unity System.

● You can add one or more iSCSI targets to storage pools where you intend to add LUNs. You can create a separate target for each LUN or assign multiple LUNs to a single target; see Adding an iSCSI target on page 12.

● If your environment is set up as a many-to-one configuration, you cannot create a LUN if the Disaster Recovery site is down or unreachable. This is to ensure uniqueness of LUN names across all sites.

The Create a LUN wizard guides you through the process of adding a LUN to a storage pool.

Prerequisites

To add a LUN, you must first define a storage pool.

► **To start the Create a LUN wizard:**

1. On the **Unity navigation bar**, select **LUNs**.

2. Click **Add LUN**.

This section includes these steps:

3

Step 1: Setting the LUN name and block size

This step of the Create a LUN wizard prompts you to specify a name for the new LUN, set block size, as well as define client-specific (initiators) settings.

Figure 3-16: Create a LUN wizard, Step 1: Setting the LUN name and block size
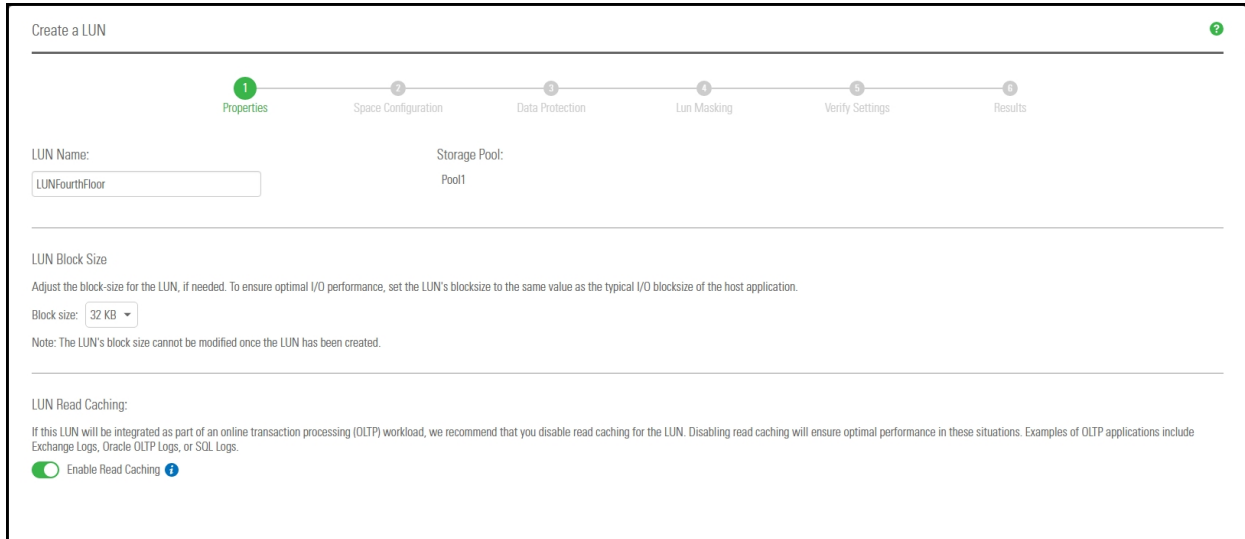
3

► **To define the LUN:**

1. Type a name for the LUN in the **LUN Name** field.

   The name must start with an (upper-case or lower-case) alphabetic; and, with the exception of the underscore (_), hyphen (-), and period (.), the name can only contain alphanumeric characters, without spaces.

   These characters are NOT allowed:

   ```
   " / \ [ ] : ; | = , + * ? < >
   ```

   Note If your environment is set up as a many-to-one configuration, LUN names must be unique across all sites.

2. In the **LUN Blocksize** section, adjust the block size for the LUN, if needed.

   To ensure optimal I/O performance, set the LUN's block size to the same value as the typical I/O block size of the host application. Aligning the volume block size to the typical I/O block size from the application can significantly improve application performance.

   Table 3-2: Recommended block size for the application used

Application / Data type	Recommended block size
Windows / Linux Boot	64 KB
Microsoft Exchange 2010 DB	32 KB
Microsoft Exchange 2010 Log	128 KB
Oracle OLTP	8 KB
SQL Server	64 KB
Video Streaming	128 KB

   Notes:

   - You CANNOT modify the LUN's block size once the LUN is created.

   - The maximum block size for Unity is 128 KB.

3. (Optionally) Disable read caching for the LUN. For database OLTP LUNs, we recommend to disable read caching to increase performance.

4. Click **Next** to continue.

Step 2: Space configuration settings for the LUN

This step of the Create a LUN wizard prompts you to specify space usage settings for the LUN.

Note If you are using data replication, Nexsan recommends using thin-provisioned LUNs.

This table illustrates how Unity distributes disk space to LUNs for a storage pool of 10 TB.

Table 3-3: Distribution of disk space to LUNs

Space usage settings	Total available space in storage pool: 10 TB	
	LUN 0 (Thin-provisioned)	LUN 1 (Thick-provisioned)
Reservation	4 TB	6 TB
Virtual volume size	20 TB	N/A
Physical capacity	4 TB	6 TB
Virtual volume size as seen by initiators	20 TB	6 TB

Figure 3-17: Create a LUN wizard, Step 2: Space configuration

► **To configure space usage for the LUN:**

1. To use the **Thin Provisioning** feature (enabled by default): Accept or update the **LUN Size** value.This determines the disk space that clients see when they connect to the LUN.

   Notes:

   - Once you set the virtual volume size for a LUN, you cannot decrease it; however, you can increase it at any time.

   - The virtual volume size cannot be less than the reserved space.

   - You cannot switch to Thick Provisioning after the LUN is created.

2. Specify the **Reservation** space for the LUN in the storage pool. This space will be reserved for the exclusive use of the LUN.

   When you reserve space for a LUN, Unity allocates the specified amount of disk space in the storage pool to the LUN. If you add another LUN to the storage pool, the space available to the new LUN is the difference of the total disk space in the storage pool minus any reservations that you set for other LUNs on the system.

   For example, in a storage pool with 2 LUNs and 10 TB of available disk space, if a reservation of 6 TB is allocated to one LUN, then the second LUN has 4 TB of disk space available to it.

3. Optionally, select **Create a Thick-provisioned LUN**.

   Accept the default **LUN size**, or enter a value to change it. Thick Provisioning will use the specified amount of physical disk space.

   Notes:

   - The Unity graphical user interfaces do not support switching from thick to thin LUN provisioning after a LUN is created. Contact Nexsan Support if you need to perform a conversion.

   - Once you set the minimum volume size for a LUN, you cannot decrease it; however, you can increase it as needed.

   - If you intend to use snapshots with a Thick-provisioned LUN, keep in mind that each snapshot consumes disk space equivalent to the total size of the snapshot, so please make sure to plan your space consumption requirements accordingly.

   For LUNs hosted in a VMware environment, we recommend using Thick-provisioned LUNs.

4. Click the **Next** button to continue.

Step 3: Enabling data replication and snapshot scheduling

This step of the Create a LUN wizard prompts you to enable data replication for the LUN, if data replication with one or more remote sites is configured for the storage pool, and also to configure the snapshots schedule and auto-deletion settings for snapshots.

Limitations

- We do not recommend enabling snapshots scheduling when using LUNs in a Hyper-V environment. You can take manual snapshots and roll back data to a snapshot.

- We do not recommend enabling snapshot scheduling when using LUNs in a VMware environment. To take manual snapshots and roll back data to a snapshot for VMware, see the *VMware Best Practices Guide* on the Nexsan Unity Documentation & Online Help page.

Figure 3-18: Create a LUN wizard: Replication and snapshots

► **To enable data replication for the LUN:**

1. Select **Enable Replication**. This option is disabled if you have not yet configured data replication for the storage pool. If you enable this option, Unity replicates the LUN to the remote site during the next scheduled data replication.

2. If you don't need to enable snapshot scheduling, click **Next** on the wizard panel to continue.

► **To configure snapshot scheduling for the LUN:**

Note There can only be one snapshot schedule per LUN.

1. Configure the snapshot schedule for the LUN:

   a. Select **Enable snapshot scheduling**. This option is selected by default. Clearing the check box disables snapshot scheduling.

   b. Specify a recurrence pattern for the schedule by typing a value in the **Recur every** field; then, select the recurrence period from the drop-down list: **Minutes(s)**, **Hour(s)**, **Day(s)**, **Week(s)**, or **Month(s)**.

      • For example, if you want Unity to take a snapshot every two hours, type 2 in the **Recur every** field and select **Hour(s)** from the recurrence type drop-down list.

      • If you select **Week(s)** from the recurrence type drop-down list, then select the day or days of the week that you want Unity to take automatic snapshots on.

      • If you select **Month(s)**, then select the month or months of the year, as well as the calendar dates that you want Unity to take automatic snapshots on.

2. Select **Enable the auto-deletion of snapshots** if you want Unity to automatically delete scheduled snapshots for the LUN when the storage pool is 80% full. Unity deletes snapshots—starting with the oldest automatic snapshot on the system—until used disk space capacity in the storage pool falls below the 80% threshold. Unity does not delete manual snapshots when you enable this option; only scheduled automatic snapshots are processed.

3. Click **Next** to continue.

Step 4: LUN Masking

This step of the Create a LUN wizard prompts you to select a LUN Mask. A LUN Mask enables you to make a LUN accessible to hosts through the selected Target(s). You can use an existing LUN Mask or create a new one. Unity has two types of LUN Masks, one for Fibre Channel and the other one for iSCSI for each storage pool.

Note If the system is replicated, you must also create a LUN Mask on the replicated site for the LUN to be accessible when a failover occurs.

► **To select a Mask:**

1. Select one of these options:

   • **Use pre-defined Fibre Channel LUN Mask**: This mask includes the common, unique Fibre Channel target.

   • **Use pre-defined iSCSI LUN Mask**: This mask contains all iSCSI targets and is accessible to all hosts.

   • **Use an existing LUN Mask**: If you previously created one or more LUN Masks, they will display in the drop-down list.

- **Create a new LUN Mask**: This step adds a step to the wizard for defining a LUN Mask. See the next step.

- **None**: If you select this option, you will need to select or create a LUN Mask later to make the LUN accessible to hosts; .

Figure 3-19: Create a LUN wizard, Step 4: Selecting a Mask

2. Click **Next** to continue. If you selected to create a new LUN Mask, the wizard will continue to Step 5: Create a new LUN Mask below.

   If you selected an existing LUN Mask, the wizard will continue to Step 6: Verifying settings on the next page.

Step 5: Create a new LUN Mask

This step of the **Create a LUN** wizard prompts you to create a new LUN Mask if you selected that option in the previous step. The LUN mask is used to make the LUN visible to a host using the target you associate with the LUN.

When creating an iSCSI LUN, you specify the initiators you want and assign one or more of the available iSCSI targets to the LUN. If you have not created iSCSI targets yet, you must skip this step because the wizard will not let you continue. After creating the LUN, you have the possibility to associate it to a target by following the steps in . For steps to create an iSCSI target, see Adding an iSCSI target on page 12.

When creating a Fibre Channel LUN, you specify the initiators you want and then assign the unique common Fibre Channel target to the LUN.

► **To add a new LUN mask:**

1. Select the **Add to a new LUN Mask** option.

Figure 3-20: Create a LUN wizard, Step 5: Create LUN Mask
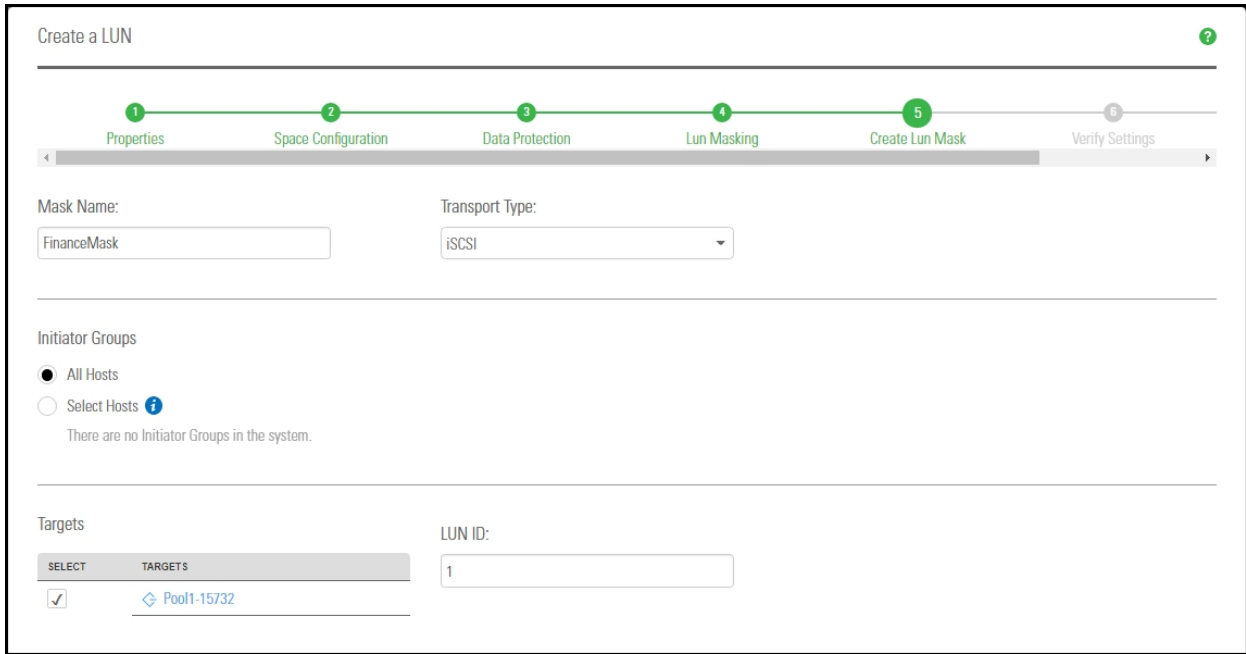
2. Enter a meaningful name in the **Name** field.

3. From the **Transport Type** drop-down list, select **iSCSI** or **Fibre Channel**. The **Target** selection is automatically updated with the existing target associated with the storage pool.

4. Select an Initiator Group. An initiator group must contain either Fibre Channel or iSCSI initiators. An initiator cannot be selected in multiple groups.

5. Enter a LUN ID or let Unity assign the next available number. The LUN ID is a number used to identify a LUN—from 0 to 254. Each LUN associated to the same target and the same initiators must have a unique LUN ID. However, if you associate each LUN to a different target or to different initiators (even if they are part of the same target), there is no need for the LUN IDs to be different. For LUN masking, the LUN ID has to be unique within the same mask.

6. Click **Next** to continue.

Step 6: Verifying settings

This step of the Create a LUN wizard summarizes the settings you selected for your LUN. Review the summary carefully before applying the configuration settings.

► **To change a LUN configuration setting:**

● Click **Previous** to go back to the corresponding configuration step.

Or

● Click the corresponding step identifier at the top of the Create a LUN wizard panel. For example, if you want to rename the LUN, click **Properties**.

Figure 3-21: Create a LUN wizard: Verify Settings
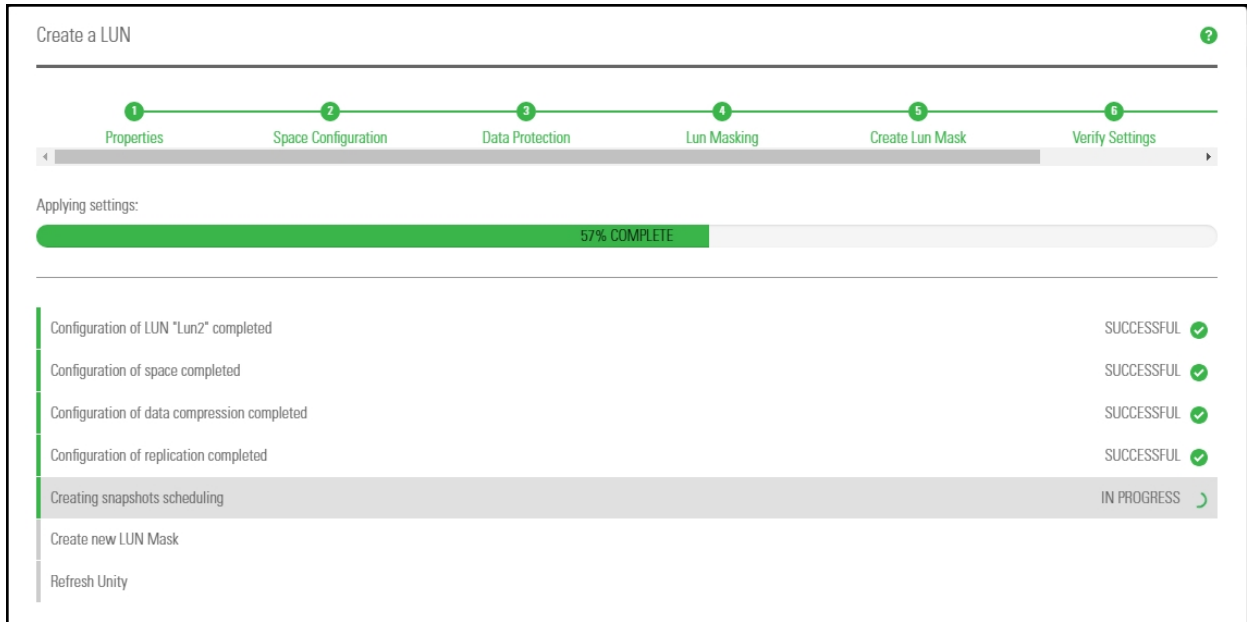

When you are satisfied with the configuration settings, click **Create** at the bottom of the panel.

Step 7: Viewing progress

In this step, the Create a LUN wizard displays progress as Unity creates the new LUN.

Figure 3-22: Create a LUN wizard: Viewing configuration results

The Create a LUN wizard displays error events that the system encounters during the LUN creation process. You can view more details about an error event by expanding the corresponding entry.

▶ **To view more details for an error event:**

● Click the **View Error** link corresponding to the error event.

Unity informs you when it successfully creates the LUN. It also asks you if you want to create another LUN in the storage pool.

Chapter 4

Clustering

The Nexsan Unity has built in Active/Active Clustering capability, whereby both controller nodes on Unity operate in active mode—that is, both controllers can actively serve data in parallel—in addition to providing full redundancy in the event that one of the controller nodes fails.

For detailed information on Clustering, see *Chapter 8: Clustering* in the *Unity Software User Guide*.

This section includes these topics:

4

Cluster configuration recommendations

To use Unity in a Microsoft Hyper-V 2012 R2 cluster environment, perform the following tasks after completing the configuration procedures detailed in Microsoft Hyper-V 2012 R2 recommendations on page 39.

Note The following recommendations are based on the assumption that Microsoft Hyper-V 2012 R2 cluster has already been installed. For further information on installation, please refer to the Microsoft documentation.

Use Node & File Share Witness (FSW) Quorum for cluster configuration, especially for even numbers of Cluster Nodes. Please refer to the following Microsoft documentation for more information: *How to Configure the Node and File Share Majority Quorum*.

Recommendations and requirements for clusters using Node and File Share Majority

- Use a Server Message Block (SMB) file system on a Windows Server 2003 or Windows Server 2008-2012 file server.

- Ensure that the file system has a minimum of 5 MB of free space.

- Ensure that the file system is dedicated to the cluster and is not used in other ways (including storage of user or application data).

- Do not place the file system on a node that is a member of this cluster or that will become a member of this cluster in the future.

- You can place the file system on a file server that has multiple file systems serving different purposes. This may include multiple file system witnesses, each one a dedicated file system. You may also place the file system on a clustered file server (in a different cluster), typically a clustered file server containing multiple file systems that serve different purposes.

- Place the file system on a server that is a member of a domain, in the same forest as the cluster nodes.

- For the folder that the file system uses, make sure that the administrator has Full Control file system and NTFS permissions.

- Do not use a file system that is part of a Distributed File System (DFS) Namespace.

Recommendations for a multi-site cluster

- You can co-locate the external file system on one of the sites where a node/nodes are located.

  Note It is recommended to configure the external file system in a separate third site or third failure domain. The file system must be isolated from any kind of failure (network, hardware or environmental) of the Hyper-V nodes.

Chapter 5

Joining a Windows Active Directory domain

This section describes how to join an Active Directory domain using the System Configuration wizard. The wizard prompts you for connection details to the Microsoft Windows Active Directory server on your network, including the Active Directory domain name, as well as the domain administrator's user name and password to connect to the server.

Note SMBv1 must be enabled on Domain Controllers when using Active Directory Authentication on Unity.

This section includes these topics:

5

Microsoft Active Directory domain requirements

This section describes the Microsoft Active Directory support requirements for Unity. Carefully review this table before joining Unity to a Microsoft Active Directory domain.

Requirement	Description

Operating Systems	• Windows Server 2016
	• Windows Server 2012
	• Windows Server 2008 R2
	• Windows Server 2008 x86 or x64, including:
	   • Windows Server 2008 with Service Pack 1
	   • Windows Server 2008 with Service Pack 2
	• Window Server 2003 R2 x86 or x64

Reverse DNS	The Microsoft Active Directory implementation must be configured with a reverse DNS lookup zone.
Global catalog and LDAP catalog ports	The primary domain controller that Unity connects to must have both the global catalog port (3268) and the LDAP catalog port (389) open. In a Microsoft Active Directory forest implementation, all domain controllers must have these ports open.
Time server	The primary domain controller that Unity connects to must be configured as a reliable time source (time server capability) for the domain. In a Microsoft Active Directory forest implementation, all domain controllers must have this capability. If the Microsoft Active Directory implementation does not provide, or is not configured for, time server capability, you must specify a valid Network Time Protocol (NTP) source for Unity to synchronize its date and time with.
Domain administrator privileges	You will need to provide domain credentials for a domain administrator, or of a user who has full domain administrative privileges. If the user account does not have domain administrator privileges, you must create computer objects for Unity in the Active directory domain, and give the corresponding user account management access to the objects before joining the domain.
DNS alias for non-standard domain names	Use a DNS alias if the domain controller name starts with a digit, or contains nonstandard characters. If the name of the primary domain controller that you configure Unity to connect to starts with a digit, or contains nonstandard characters, you must set up an alias—made up of only standard characters—for the domain controller on the DNS server; standard characters include: (A-Z, a-z), digits (0-9), and hyphens (-). You must also add a resource record for the alias in the reverse DNS lookup zone. Later, when you configure the Unity Storage System to join the Microsoft Active Directory domain, you must specify the domain controller's alias, including its fully qualified domain name (FQDN), in the Domain Controller

Requirement	Description
	(optional) field.
	As an example, if the domain controller uses this name: **1MYDC_ 001.mydomain.lan**,
	1. Create this alias for the domain controller on the DNS server: **MYDC-001**
	2. Add a resource record for the alias in the reverse DNS lookup zone.
	3. During the Site Setup process, when configuring Unity to join the Microsoft Active Directory domain, specify the domain controller's alias, including its fully qualified domain name (FQDN), in the Domain Controller (optional) field: **MYDC-001.mydomain.lan**
LM Manager authentication level	By default, Unity uses NTML level 2 authentication. If your Active Directory Domain Controller uses a different authentication level, you must change this setting by selecting another LM Compatibility Level.
Creation of machine accounts	The Microsoft Active Directory implementation must support the creation of machine accounts in the default Organizational Unit (OU). .

Delegating control to a non-Administrator user account

After creating a computer object in the Active Directory server, you must give full control to the non-Administrator user account for the selected Organization Unit (OU), so that this user can operate Unity in your Active Directory environment.

► **To delegate control:**

1. To open Active Directory Users and Computers:

   a. Click **Start** then select **Control Panel**.

   b. Double-click **Administrative Tools**.

   c. Double-click **Active Directory Users and Computers**.

   To open Active Directory Users and Computers in Windows Server 2012, click **Start** , and type `dsa.msc`.

2. In the console tree, right-click the organizational unit (OU) for which you want to delegate control, under *Active Directory Users and Computers\ domain node*.

3. Click **Delegate Control** to start the Delegation of Control wizard.

4. Click **Add** and select the non-Administrator user account used in the previous section. Click the **Next** button.

Figure 5-1: Active Directory - Delegation of Control wizard: select a user

5
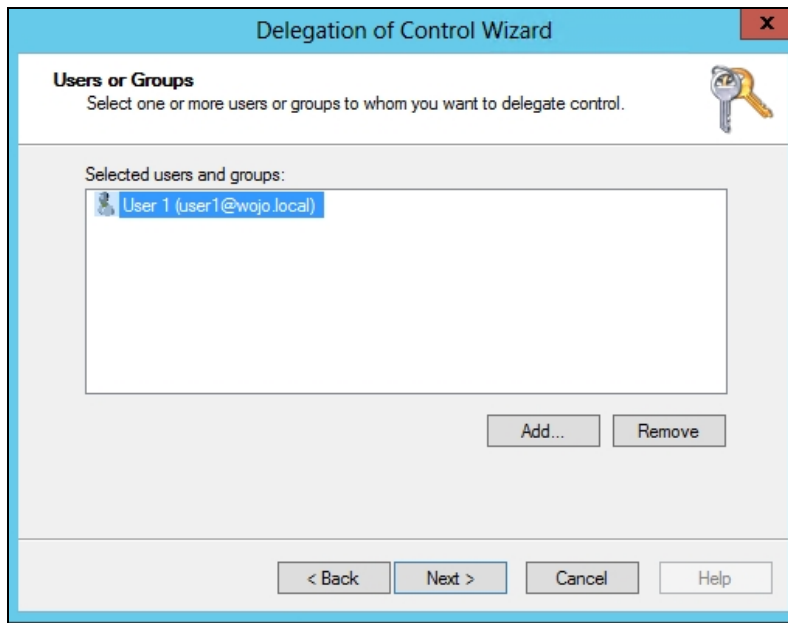
5. Select **Create a custom task to delegate** and click the **Next** button.

Figure 5-2: Active Directory - Delegation of Control wizard: select tasks to delegate
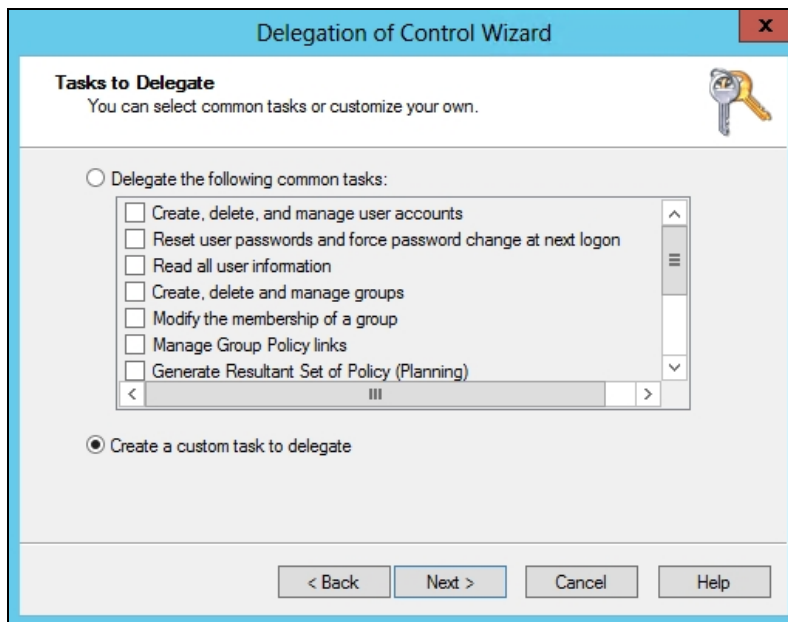
6. Select **This folder...** and click the **Next** button.

Figure 5-3: Active Directory - Delegation of Control wizard: select the task scope
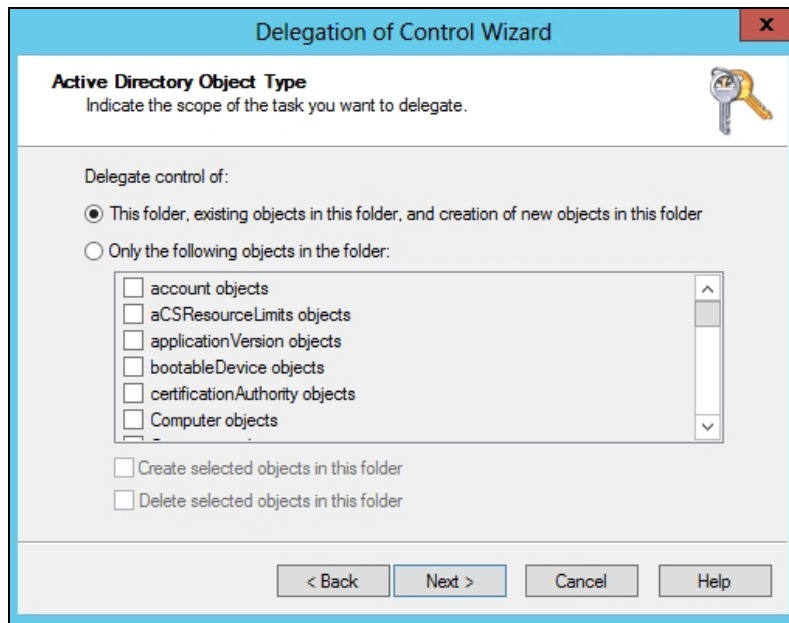
7. Give **Full Control** access to the non-Administrator user account and click **Next**.

Figure 5-4: Active Directory - Delegation of Control wizard: select permissions
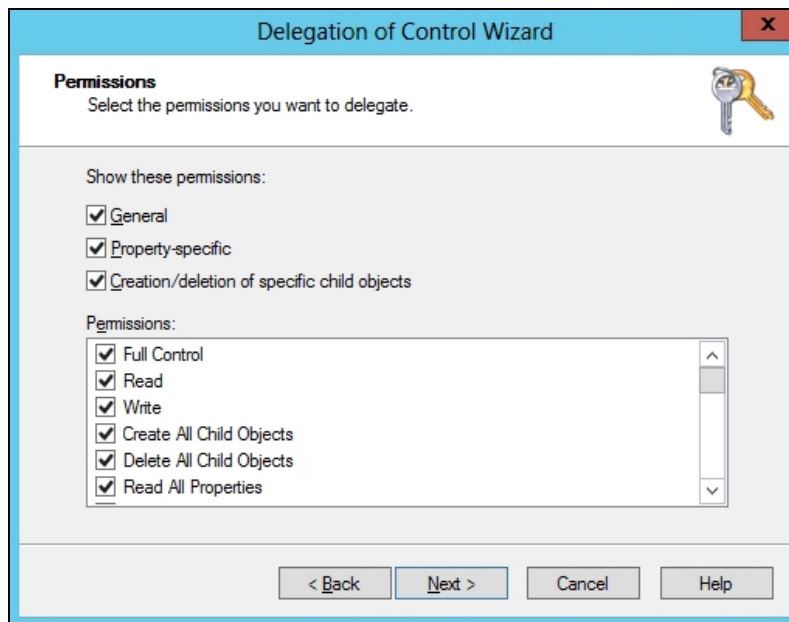
8. Click **Finish**.

Creating computer objects on the Active Directory server

In a typical deployment, Unity requires Domain Administrator privileges to join a Microsoft Active Directory domain. This process allows Unity to automatically create and configure computer objects for Unity on the Microsoft Active Directory server, without any manual intervention from a network administrator.

In some environments, specifying Domain Administrator credentials to integrate Unity with the Microsoft Active Directory Domain is not desirable, or possible. For these deployments, a network administrator can join Unity to a Microsoft Active Directory Domain using a user account with limited domain administrative privileges.

To allow this, you must manually perform configuration steps for creating and configuring computer objects for Unity on the Microsoft Active Directory server:

● Determine or create the non-Administrator domain user account that you want to use to join Unity to the Microsoft Active Directory Domain. Delegate full control to this user before joining the Active Directory domain.

● Create a computer object(s) for Unity on the corresponding Active Directory Server for each controller node, as described in this procedure.

● Configure the attributes for the computer object(s) according to the settings described in this procedure.

● Use the **Advanced** button to join Unity join Unity to the Microsoft Active Directory Domain using the credentials for the non-Administrator domain user account.

> **CAUTION: RISK OF OUTAGE**
>
> Do not join Unity with Active Directory to Domain Controllers hosted on VMware. Domain Controllers used with Unity and Active Directory must either be a physical device or hosted externally to Unity.

► To create a computer object for a non-Administrator user account:

1. On the relevant Active Directory Server, add a new computer object for Unity, using each controller node's host name.

   > **CAUTION:** When creating the computer object, make sure to enter the host name exactly as it is configured on Unity, or on each of its controller nodes.

   ► To obtain the host name for Unity controller nodes:

   a. Access the nxadmin CLI on Unity via SSH or remote console. Download and install an SSH client of your choice on a client machine that has network connectivity to Unity. You can use Putty, which is a (free) open source telnet and SSH client, available for download at this URL:

      http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html

   b. Once you download and install an SSH client, launch it, and enter the IP address of a controller node.

   c. When the login prompt displays, type **nxadmin**, and press Enter.

   d. When you are prompted for the password, type the nxadmin (Nexsan Unity Administrator) password configured on Unity, and then press Enter. If you are connecting to a system that has not yet been configured using the Nexsan Unity System Configuration wizard—that is, an uninitialized Unity— you must type the default password for the nxadmin (Nexsan Unity Administrator) account: PASSWORD (all upper-case).

   e. On each controller node, run the `hostname` command.

   f. Take note of Unity host name; for example, `ES253957-001-01`.

2. Give the non-Administrator domain user account the ability to perform the operation for integrating Unity with the Active Directory Domain. You must give the non-Administrator domain user account the ability to join each controller node to the Active Directory Domain.

It is important that you perform this step, since, by default, the privileges for joining a new computer object to the Active Directory Domain are automatically assigned to the Domain Administrator user/group account.

Here is an example:
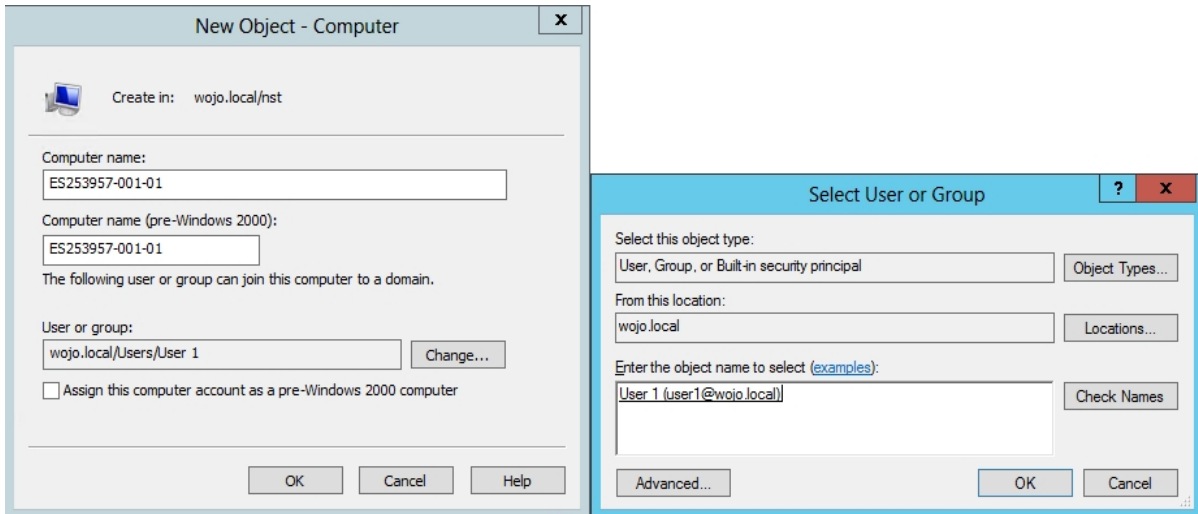
3. Set the following attributes for the computer object that you added for Unity to the Active Directory Server. You must set these attributes separately for each controller node.

> ⚠ **CAUTION:** Use the Active Directory Service Interfaces Editor (ADSI Edit) to set the attributes for the computer object(s). For each attribute, make sure to specify the value using the exact letter case, as shown.

Table 5-1: Computer object attributes

Attribute	Value to set…

dNSHostName	`<NESTHOSTNAME>.<domain name>`
	For example:
	`ES777666-001-01.qadomain.net`

msDS-SupportedEncryptionTypes	31
servicePrincipalName	• `cifs/<NESTHOSTNAME>.<domain name>` For example: `cifs/ES777666-001-01.qadomain.net` • `host/<NESTHOSTNAME>.<domain name>` For example: `host/ES777666-001-01.qadomain.net` • `HTTP/<NESTHOSTNAME>.<domain name>` For example: `HTTP/ES777666-001-01.qadomain.net` • `nfs/<NESTHOSTNAME>.<domain name>` For example: `nfs/ES777666-001-01.qadomain.net` • `root/<NESTHOSTNAME>.<domain name>` For example: `root/ES777666-001-01.qadomain.net` • `host/<NESTHOSTNAME>` For example: `host/ES777666-001-01`

userPrincipalName	`host/<NESTHOSTNAME>.<domain name>@<DOMAINNAME>`
	For example:
	`host/ES777666-001-01.qadomain.net@QADOMAIN.NET`

userAccountControl	4130

Note If the domain you are joining is `department.company.com`, make sure to use that whole name in *Step 7*.

4. In the **distinguishedName** attribute of the computer object, take note of the Organizational Unit names, in this format: *OU=name1,OU=name2*, etc. You will need this for *Step 7*.

   Note You can create a new OU at the root of the domain tree or use an existing user-defined OU.

   In the example below, you would use *OU=Finance,OU=OU2*.
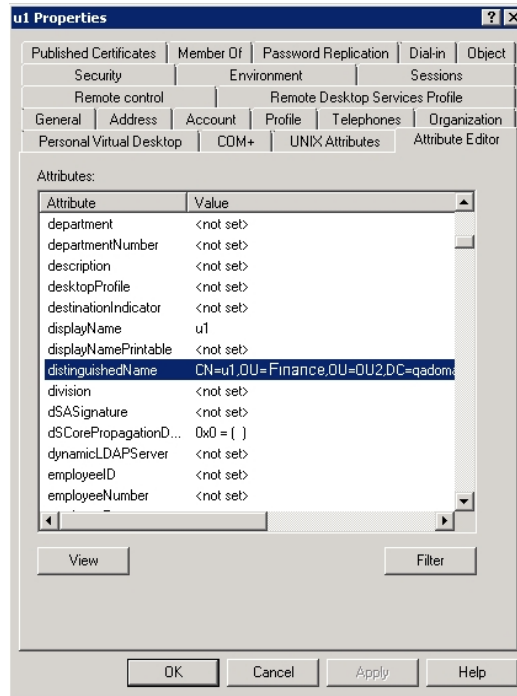
5. Repeat **step 3** above for the computer object that you added for the 2nd controller node.

6. Configure Unity using the Nexsan Unity System Configuration wizard (if not already configured).

7. Join Unity to the Microsoft Active Directory Domain in Nexsan Unity.

   Make sure you specify the user name and password for the non-Administrator domain user account that you granted the ability to perform the operation for integrating Unity with the Active Directory Domain.

   Make sure to use the same (whole) domain name as in *Step 3*.

   a. At the Configure User Authentication Mode step, click the **Advanced** button.

   b. Enter the Organizational Unit (OU) names obtained in *Step 4*.

   c. Select the **Use pre-defined computer objects** option.

   d. Click the **Apply** button.

8. After configuring Unity and successfully joining the system to the Microsoft Active Directory Domain, reset the **userAccountControl** attribute to **69632**—for each Unity computer object that you added to the Active Directory Server: DONT_EXPIRE_PASSWORD | WORKSTATION_TRUST_ACCOUNT.

Chapter 6

Using Windows VSS

Unity's VSS Hardware Provider serves as the interface between Windows Volume Shadow Copy Service running on a host system and Unity. Upon receiving instructions from a VSS host to create, mount, and restore snapshots, the VSS Hardware Provider sends the appropriate commands to Unity and returns the result of these commands to the host.

Note The VSS Hardware Provider supports both iSCSI and Fibre Channel LUNs.

► **Prerequisites:**

You must install the VSS Hardware Provider on a Windows Server host; it can be installed on any of the following operating systems:

- Windows Server 2016
- Windows Server 2012
- Windows Server 2008 R2
- Windows Server 2008
- Windows Server 2003 R2

Installing the VSS Hardware Provider

The installation of the VSS Hardware Provider is available on the Unity Discovery CD.

► **Before you begin:**

Make sure to review the list of supported operating systems in Using Windows VSS above.

If you install the VSS Hardware Provider on Windows Server 2003 R2, you will see several warning messages:

- For the **Run As** pop-up message, select **Current user** and uncheck the **Run this program with restricted access** option. This pop-up will appear multiple times. Perform the same steps as mentioned above each time.
- For any file replace warning, click **Yes**.
- For Windows logo verification warning, click **Continue**.

► **To install the VSS hardware provider:**

1. On the Unity Discovery CD, open the **VSS** folder and double-click **NSTVSS.exe**.
2. On the Welcome page, click **Next**.

3. On the Choose Destination Location page:

- To select the default installation folder, click **Next**.

- To select another folder, click **Browse** and navigate to the desired folder. Click **Next**.
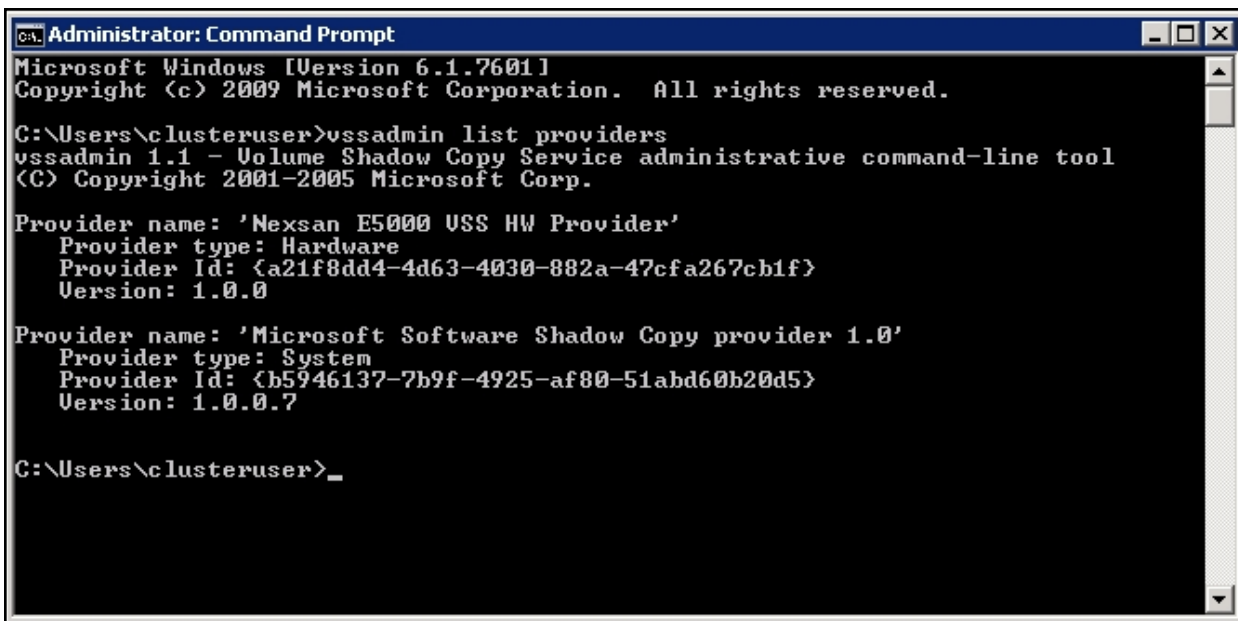
Figure 6-1: Installing VSS Hardware Provider
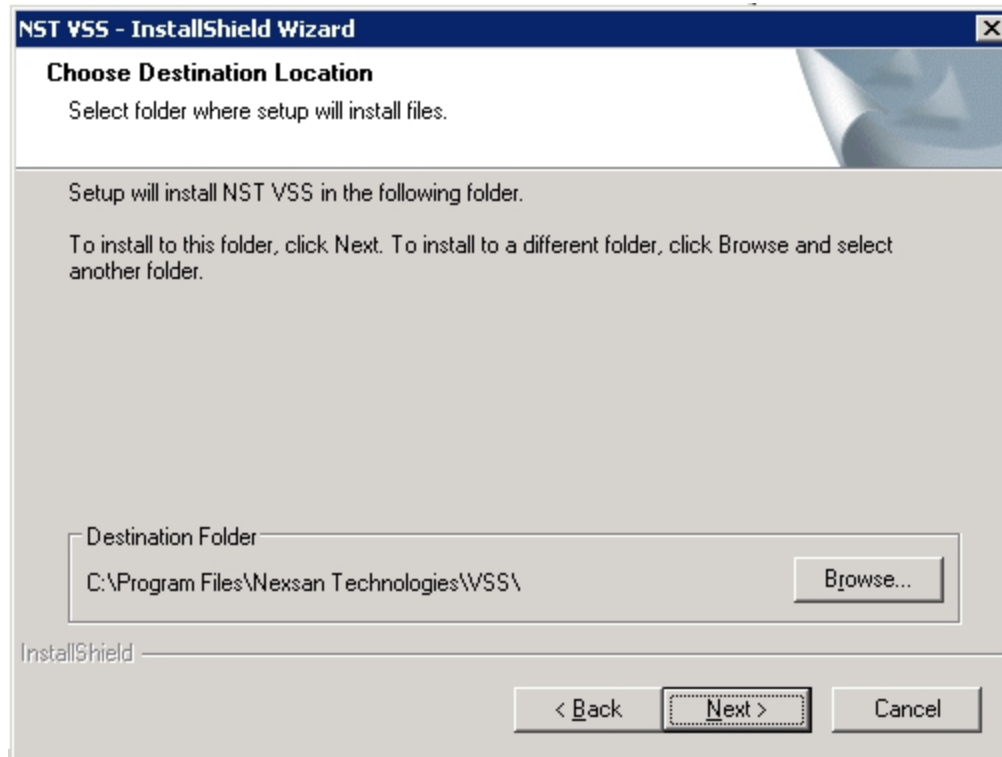
4. On the Ready to Install page, click **Install**.

5. On the Installation Complete page, click **Finish** to exit the wizard.

6. Verify the VSS Hardware Provider installation:

   a. Open a command prompt.

   b. Type this command: `vssadmin list providers`

   c. If the installation was successful, the list should display an entry for Nexsan VSS Hardware provider.

Figure 6-2: Verifying the VSS Hardware Provider installation

```
Administrator: Command Prompt                                    _ □ ×
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation.  All rights reserved.

C:\Users\clusteruser>vssadmin list providers
vssadmin 1.1 - Volume Shadow Copy Service administrative command-line tool
(C) Copyright 2001-2005 Microsoft Corp.

Provider name: 'Nexsan E5000 VSS HW Provider'
    Provider type: Hardware
    Provider Id: {a21f8dd4-4d63-4030-882a-47cfa267cb1f}
    Version: 1.0.0

Provider name: 'Microsoft Software Shadow Copy provider 1.0'
    Provider type: System
    Provider Id: {b5946137-7b9f-4925-af80-51abd60b20d5}
    Version: 1.0.0.7


C:\Users\clusteruser>_
```

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7. Start the VSS Hardware Provider service:

   a. Open the *Services* application.

   b. Locate and right-click the **NSTVSSProvider** service.

Figure 6-3: Starting the VSS Hardware Provider service
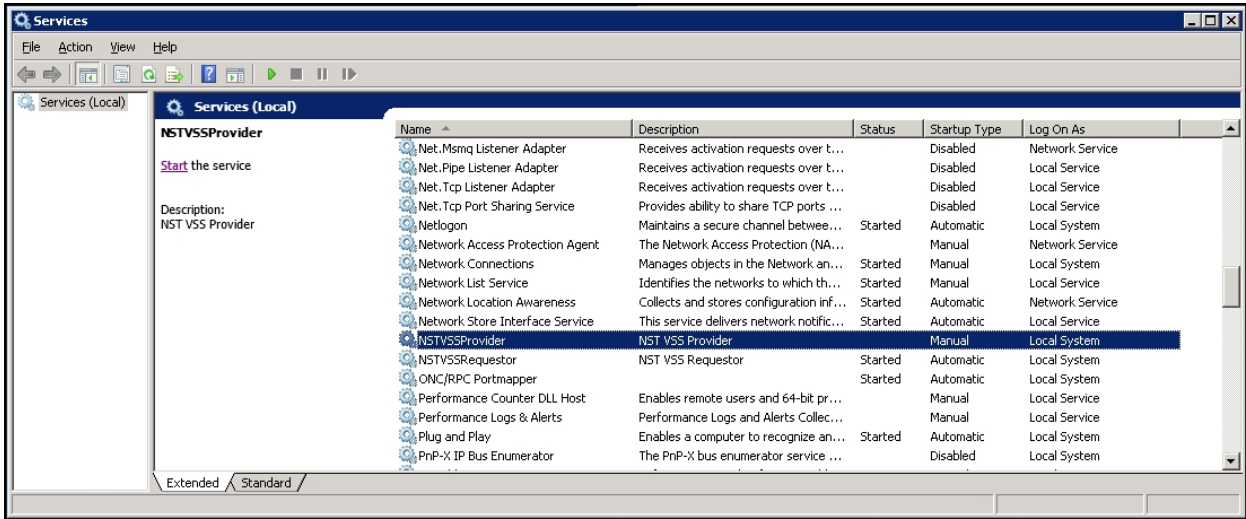
   c. Select **Start** from the context menu.

   d. Make sure the **NSTVSSProvider** service status indicates *Started*.

   e. Verify that the **NSTVSSRequestor** service status is *Started*.

► **What's next:**

Enabling the Microsoft VSS client for LUNs

You can enable the VSS client on the pool hosting the LUNs that will be managed by VSS before or after installing the VSS Hardware Provider.

► **To enable the VSS Hardware Provider on a LUN:**

1. On the **Unity navigation bar**, select **Storage > Storage Pools**.

2. Select the storage pool that you need to enable Microsoft VSS for. The **Pool Summary** panel opens.

3. Select **Summary > Advanced Settings**.

4. Click the Enable VSS client button to permit Unity's VSS Client to manage snapshots for LUNs hosted on this pool.

Figure 6-4: Storage Pool panel, Advanced Settings
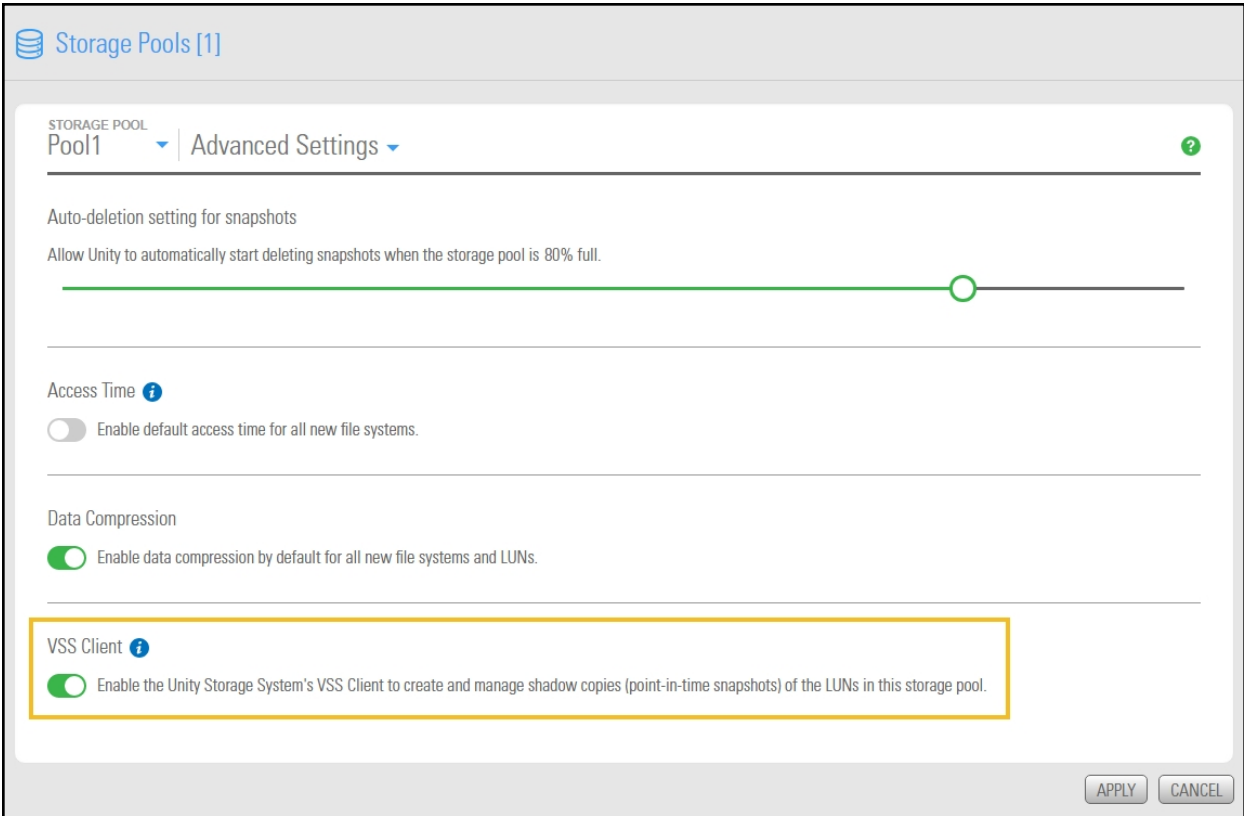
2. Click the **Apply** button.

▶ **Related topics:**

Installing the VSS Hardware Provider on page 91

Discovering your LUNs with the Windows iSCSI Initiator on page 16

Creating a VSS snapshot

Unity's VSS Hardware Provider enables you to take snapshots of one or more LUNs. As opposed to Unity, the VSS Hardware Provider enables you to create groups of multiple LUNs and to take snapshots of these groups.

For applications running on multiple LUNs, such as an SQL Server database, you can create a snapshot of all the LUNs that are being used for the database. This enables you to restore the data residing on multiple LUNs at the same time, and not lose data integrity, such as database links.

► **To create a snapshot using the VSS Hardware Provider:**

1. On the Windows host, open *Explorer*.

2. Right-click a VSS-managed volume and select **Properties**.

3. Click the **Nexsan Unity** tab.

4. Click **Create Snapshot**.

Figure 6-5: Creating VSS snapshots on the Windows host
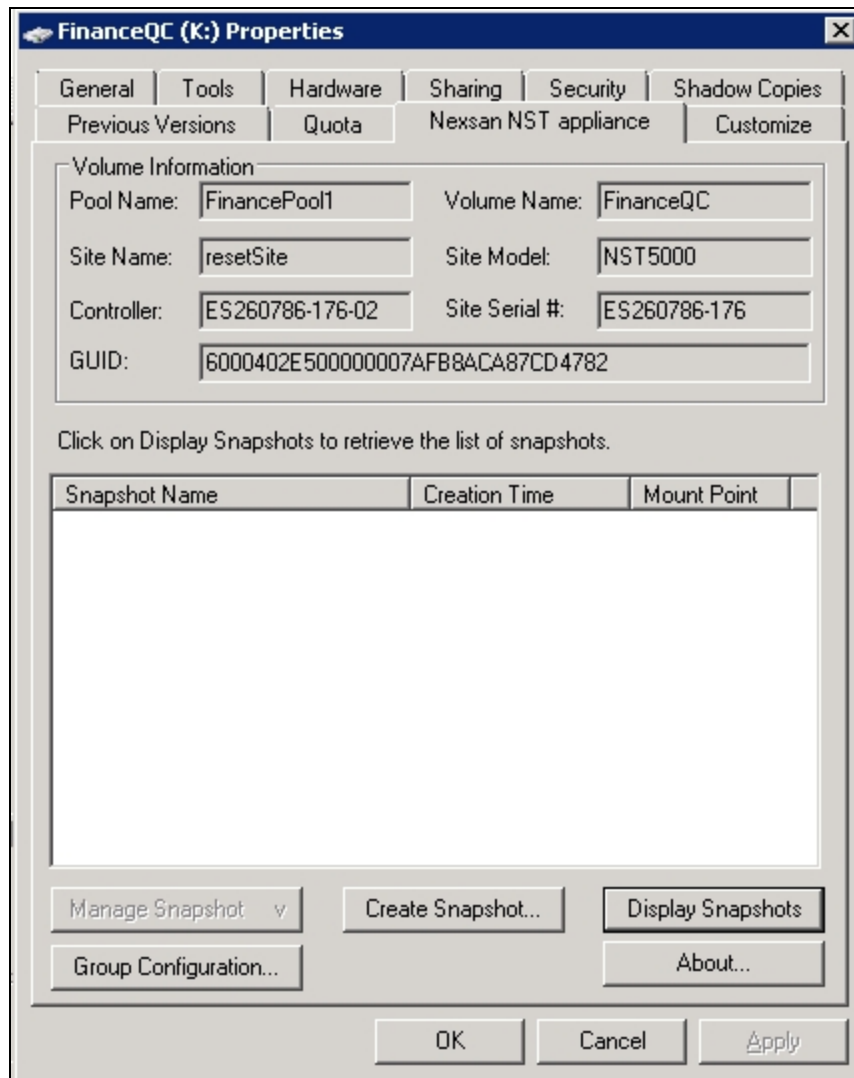
5. By default, the volume from which you opened the Properties dialog box is selected. Optionally, enter a name for the snapshot. Do one of the following:

- To take a snapshot of the current volume, click **OK**.

- To take a snapshot of a group, select multiple LUNs from the list and click **OK**.

In this example, we create a group snapshot.

Figure 6-6: Creating a VSS group snapshot
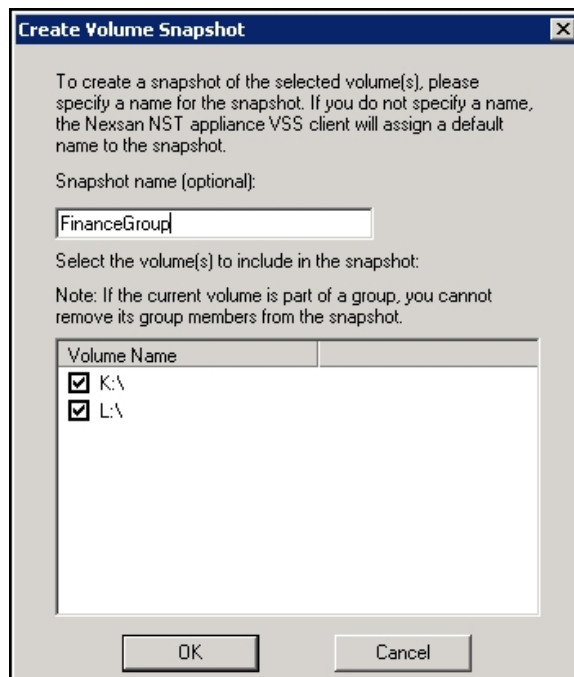
6. After successful creation of the snapshot, you will see a confirmation message. Click **OK**.

Back on the Properties page, you can see the new snapshot appearing in the list. Group snapshots include _ grp in their name. This image provides an example of a group snapshot.

Figure 6-7: Viewing a VSS snapshot on the Properties page
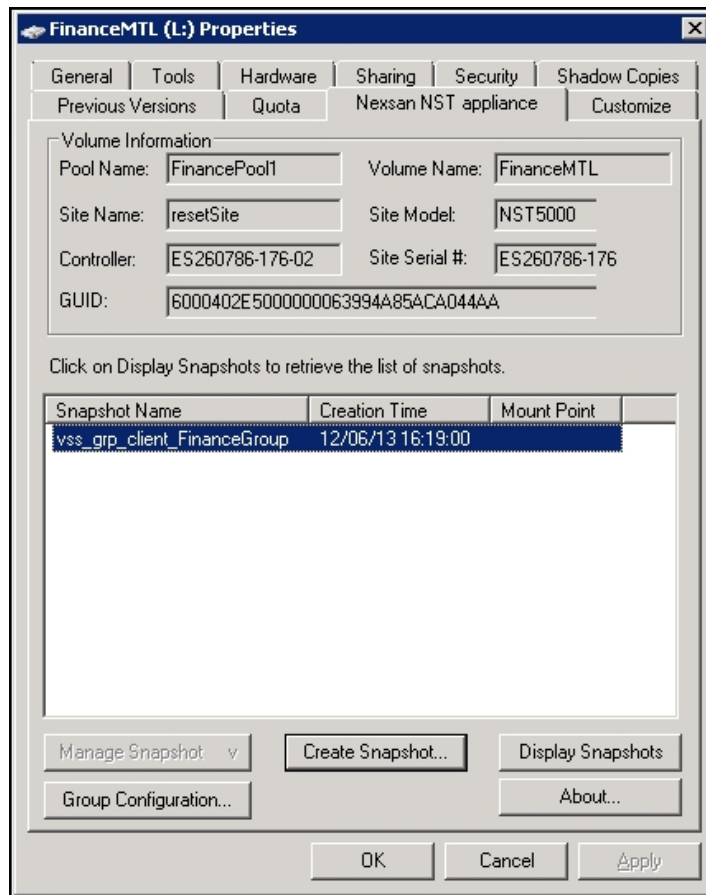
You can also view the VSS snapshot from Unity. See

► **What's next:**

You can mount—also referred to as browse in Unity—unmount, rollback, and delete the snapshot as required.

► **Related topics:**

Browsing a VSS snapshot on the facing page

Rolling back data to a VSS snapshot on page 102

Deleting a VSS snapshot on page 104

Browsing a VSS snapshot

You can use the VSS Hardware Provider's snapshot browsing snapshot browsing mechanism to recover individual files from a snapshot in case the files are accidentally deleted or overwritten, or corrupted in the snapshot's parent LUN.
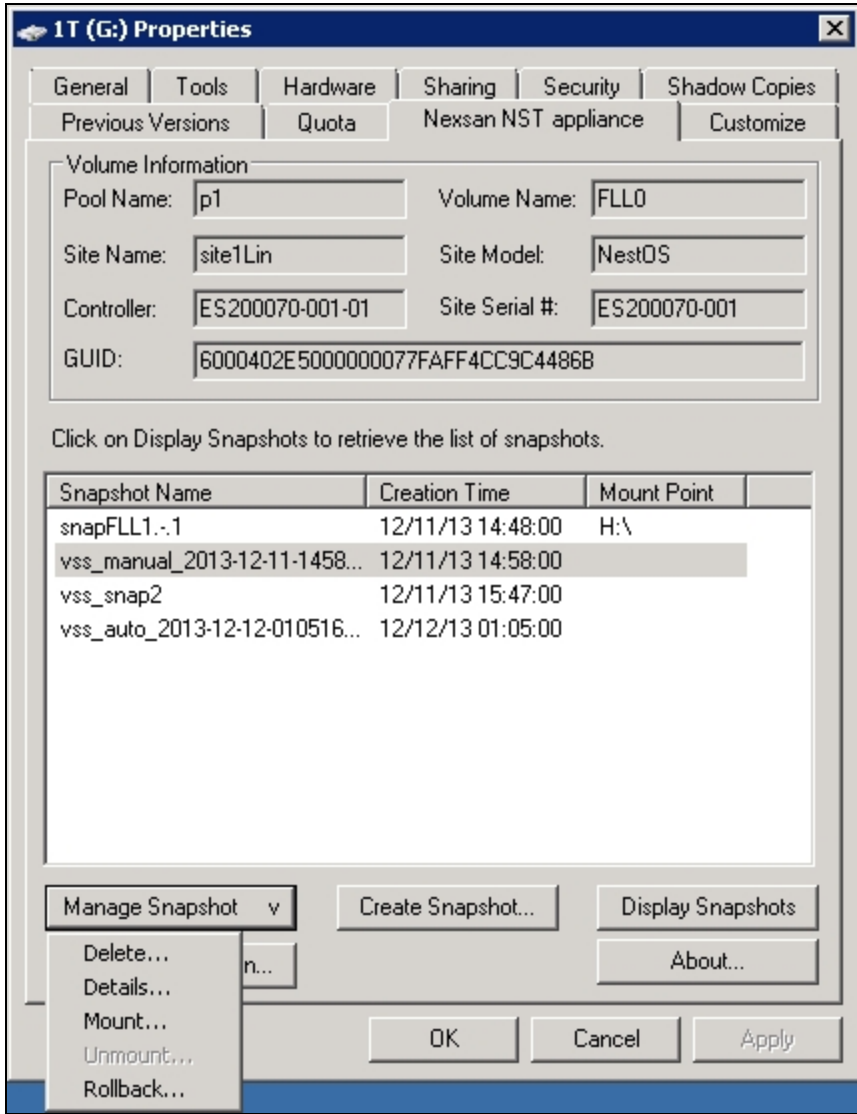
Notes:

● The Management (mgmt) target must be connected for the **Manage Snapshot** button to be available and thus perform browsing.

● The VSS feature must be enabled for the storage pool in Unity.

● When you browse, or mount, a LUN snapshot using the VSS Hardware Provider on the Windows host, that same snapshot appears as *Browsing Enabled* in Unity.

● If the snapshot is already mounted in Unity, you will not be able to mount it with the VSS Hardware Provider.

Note When browsing or mounting a LUN snapshot using the VSS Hardware Provider on Windows hosts, the disk is read-only. This applies to both iSCSI and Fibre Channel LUNs.

► **To mount a VSS snapshot:**

1. On the Windows Server host, open *Explorer*.

2. Right-click the volume where the snapshot to browse is hosted and select **Properties**.

3. Select the **Nexsan Unity** tab.

4. Click **Display Snapshots**.

5. Select the snapshot to mount.

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6. From the **Manage Snapshot** drop-down list, select **Mount**.

Figure 6-8: Browsing a VSS snapshot
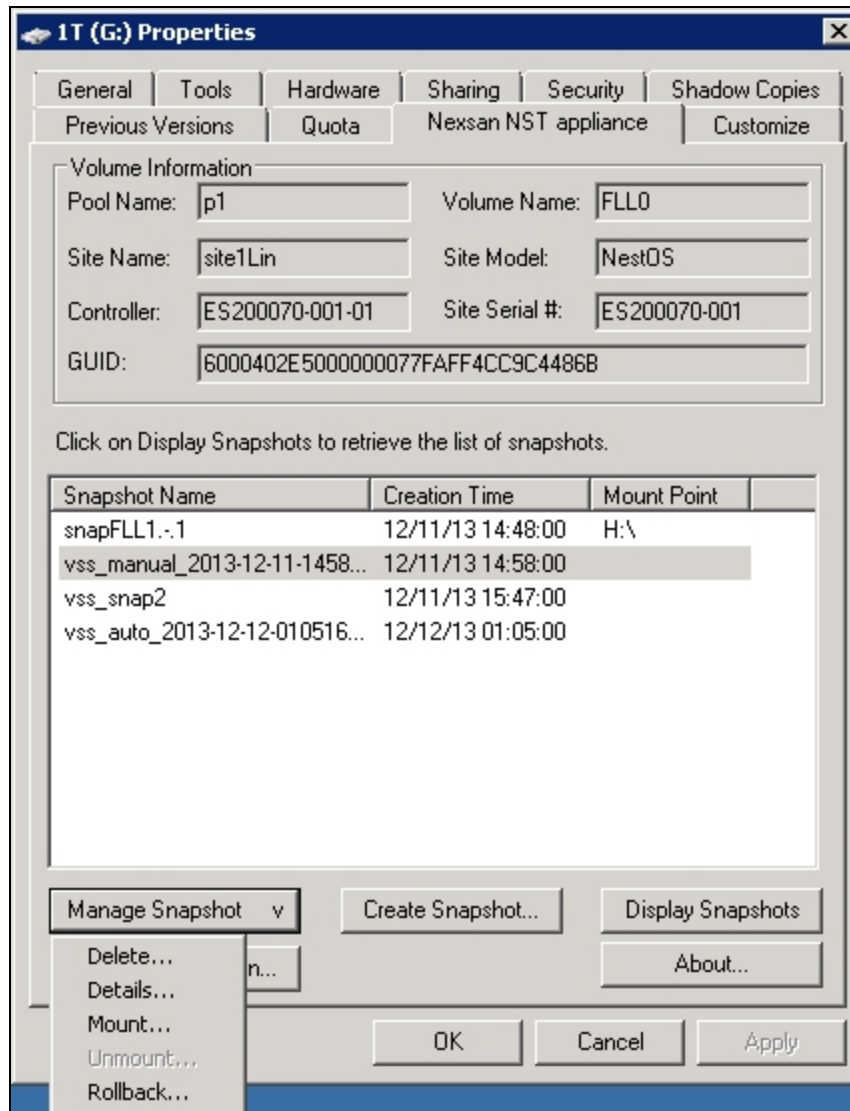
7. A new window opens where you assign drive letter/mount path from the drop-down list. Click **OK**.

Figure 6-9: Assigning a drive letter to the VSS snapshot
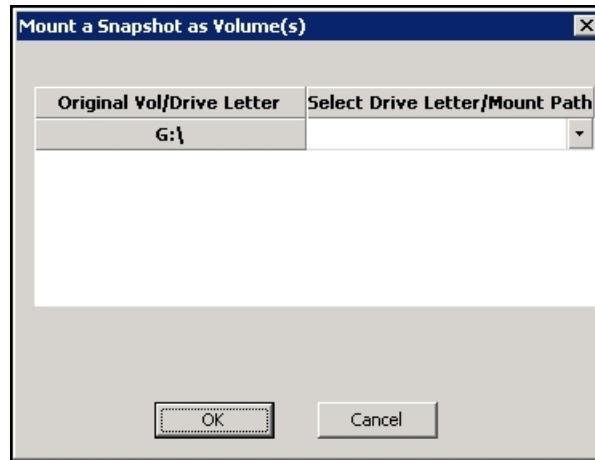
8. Yo will see a confirmation message after successful mounting. Once refreshed, the list shows the Mount Point against the snapshot name.

   a. Check if a new volume appears under **Hard Disk Drives** with the drive letter you provided in the previous step.

   b. Verify that all files present in the original volume when the snapshot was taken are in the new volume.

► **To unmount a VSS snapshot:**

1. From the **Nexsan Unity** tab, select the snapshot you mounted.

2. From the **Manage Snapshot** drop-down list, select **Unmount**.

3. A confirmation message appears: *Snapshot successfully unmounted*. The volume that appeared with the assigned drive letter name under **Hard Disk Drives** is no longer present.

► **Related topics:**

Creating a VSS snapshot on page 96

Rolling back data to a VSS snapshot on the next page

Deleting a VSS snapshot on page 104

Viewing VSS client information

This section describes how to view the space currently used by LUN snapshots managed by the VSS Hardware Provider.

You can view the space consumption from Unity, along with the name of the Windows Server host, and the LUN mount point.

► **To view VSS client information for a LUN:**

1. On the **Unity navigation bar**, select **Storage > LUNs**.

2. Click the link to the LUN you want to view VSS Information for.

3. Select **Summary > VSS**.

Figure 6-10: LUNs VSS panel
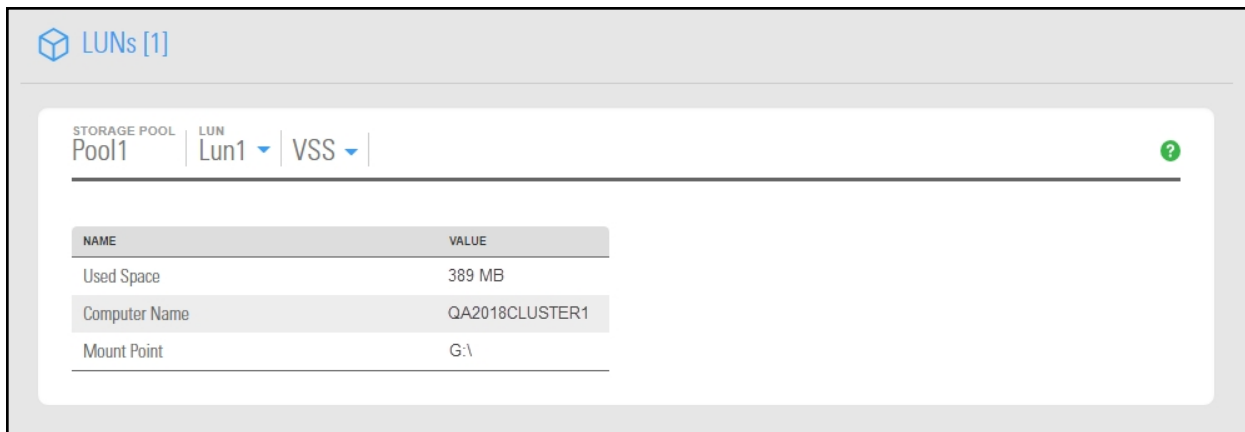
Rolling back data to a VSS snapshot

The rollback function reverts a LUN's contents to what they were at the time the snapshot was taken, including all file- and folder-level permission settings and access-level attributes. This function also automatically deletes all snapshots that are newer than the snapshot that you roll back to, including all manual snapshots of the LUN and snapshots that have browsing enabled. The VSS Hardware Provider also enables you to roll back data for groups of LUNs, using the group snapshot.

Unity provides the rollback function for extreme circumstances: for example, if all the data in a LUN is corrupted and can no longer be recovered. The rollback function overwrites all the existing data in the LUN with the contents of the snapshot that you roll back to; any new data that was added after the snapshot is recorded, including updates to existing data, is lost during the rollback process and cannot be undone.

Notes:

● The Management (mgmt) target must be connected for the **Manage Snapshot** button to be available and thus perform the rollback.

● The VSS feature must be enabled for the storage pool in Unity.

► **To roll back data to a VSS snapshot:**

1. On the Windows Server host, open *Explorer*.

2. Right-click the volume where the snapshot to roll back to is hosted and select **Properties**.

3. Select the **Nexsan Unity** tab.

4. Click **Display Snapshots**.

5. Select the snapshot that you wish to use for data restore.

6. From the **Manage Snapshot** drop-down list, select **Rollback**.

Figure 6-11: Rolling back data to a VSS snapshot

7. You will be prompted to confirm the restore operation. Type **Yes** in the field and click **OK**.

Figure 6-12: Confirming the VSS snapshot rollback
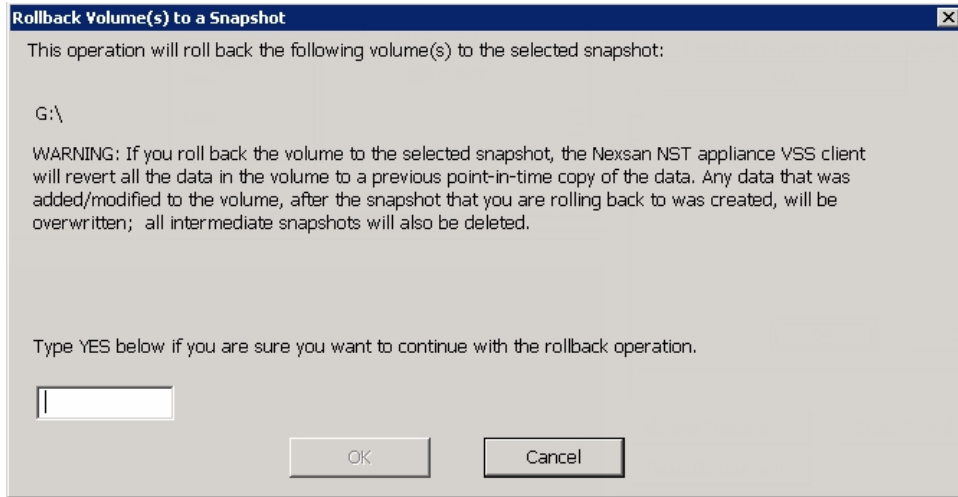
8. Restart these services:
   - Volume Shadow Copy
   - NSTVSSProvider
   - NSTVSSRequestor

9. Verify that the data present in the volume correspond to the data in the snapshot.

Deleting a VSS snapshot

This section describes how to delete a LUN snapshot using Unity's VSS Hardware Provider.

Notes:

- The Management (mgmt) target must be connected for the **Manage Snapshot** button to be available and thus perform a deletion.
- The snapshot must be unmounted before it can be deleted; for steps to unmount a snapshot, see Browsing a VSS snapshot on page 99.
- The VSS feature must be enabled for the storage pool in Unity.
- You can also delete a LUN snapshot created by the VSS Hardware Provider from Unity.

► **To delete a VSS snapshot:**

1. On the Windows Server host, open *Explorer*.
2. Right-click the volume where the snapshot to delete is hosted and select **Properties**.
3. Select the **Nexsan Unity** tab.
4. Click **Display Snapshots**.
5. Select the snapshot to delete.

6. From the **Manage Snapshot** drop-down list, select **Delete**.

Figure 6-13: Deleting a VSS snapshot
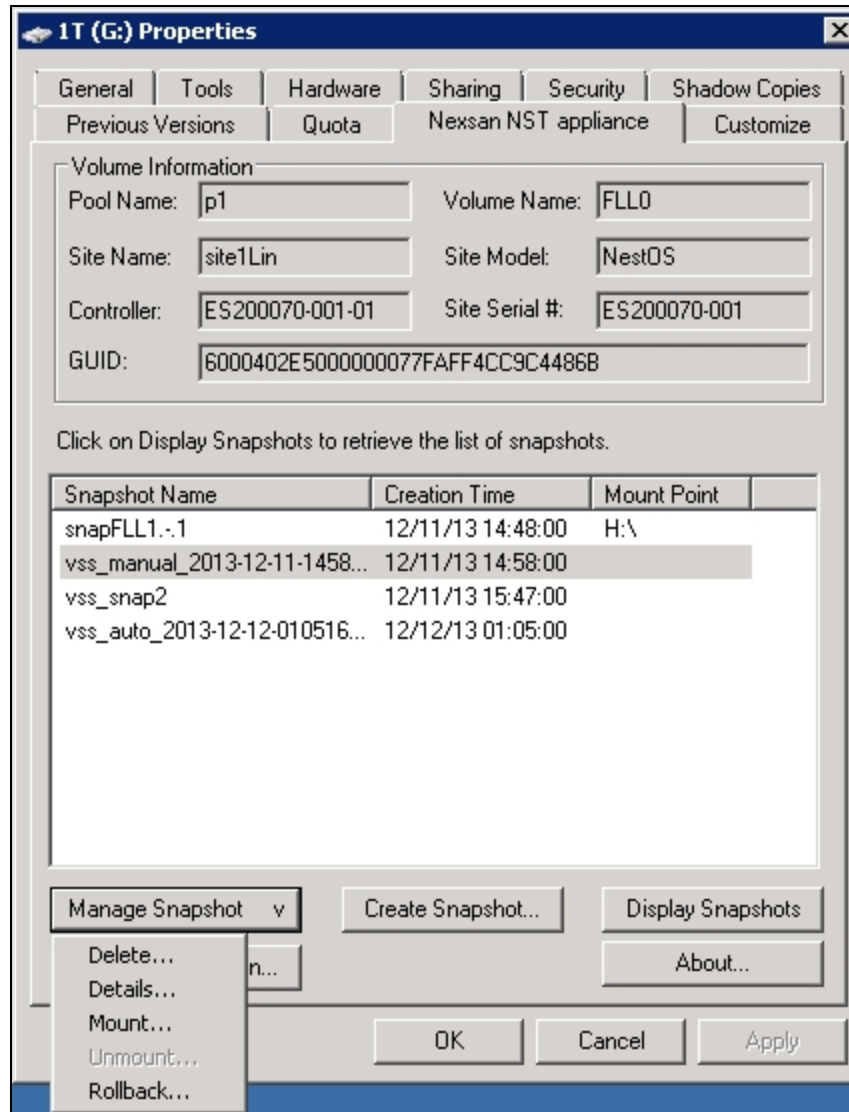
7. A warning message will appear. Click **Yes** to confirm the deletion and refresh.

    The snapshot is no longer listed under the **Nexsan Unity** tab.

►   **Related topics:**

Enabling the Microsoft VSS client for LUNs on page 94

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Nexsan Unity support:
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