

SnapDrive® 5.0 for Windows®

Installation and Administration Guide

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Preface

How to use this information

These topics describe how to install, configure, and operate the SnapDrive® 5.0 software. They do not cover basic system or network administration, such as IP addressing, routing, and network topology.

The following topics provide information on using the SnapDrive Help:

- ◆ “[Audience](#)” on page xiii
- ◆ “[About storage system command execution](#)” on page xiii
- ◆ “[Interface conventions](#)” on page xiii
- ◆ “[Typographic conventions](#)” on page xiv
- ◆ “[Special messages](#)” on page xv

Audience: This information is for system administrators who possess a working knowledge of storage systems. It assumes that you are familiar with the following topics:

- ◆ The New Technology File System (NTFS) and CIFS protocols, as applicable to file transfers
- ◆ Fibre Channel Protocol (FCP)
- ◆ Internet SCSI (iSCSI) protocol
- ◆ Basic network functions and operations
- ◆ Windows Server 2003 management
- ◆ Windows security
- ◆ Data storage array administration concepts
- ◆ Storage system management

About storage system command execution: You can manage storage system in the following three ways:

- ◆ Through the Web-based FilerView® utility
- ◆ From the storage system console
- ◆ From any computer on the network that can access the storage system through a Telnet session

Note

The previous three management methods are specific to storage system management only, not to SnapDrive operation.

Interface conventions: Throughout this guide, all examples involving commands and procedures assume a host running Windows Server 2003.

For procedures that use the Windows graphical user interface, the term “select” means that you should click, double-click, or right-click the control element, as appropriate. In many instances, you can press a corresponding key to achieve the same result. For example, if that element is a radio button, a dot appears in the associated circle; if it is a check box, an “x” appears in the box; if it is an item in a drop-down list, that item becomes highlighted; if it is a button control, a command is usually executed, and so on.

Menus, toolbars, and icons: When referring to graphical interface navigation within FilerView or Windows Server 2003, the greater-than symbol (>) points to the next element leading to your final destination. For example, My Computer > Manage > System Tools > Device Manager > SCSI and RAID controllers > Microsoft iSCSI Initiator means to right-click the My Computer icon on the desktop of the system you are configuring, click Manage on the drop-down menu, double-click System Tools, double-click Device Manager, double-click SCSI and RAID controllers, and then double-click Microsoft iSCSI Initiator.

Keystrokes: When describing key combinations, this guide uses a hyphen (-) to separate individual keys. For example, “Ctrl-D” means “press the Control and D keys simultaneously.” Also, this guide uses the term “Enter” to refer to the key that generates a carriage return, although the key is labeled “Return” on some keyboards.

Visual elements: In describing what to look for when executing SnapDrive-related operations, this document uses the term “screen” synonymously with “application window” whenever discussing the Windows environment. “Panel” refers either to a pop-up message or to a tabbed display, as in a property sheet or a procedural wizard. “Pane” refers to a portion of the application window, usually containing a list of items and having its own set of scroll bars.

Typographic conventions: The following table describes the typographic conventions used in this guide.

Convention	Type of information
<i>Italic type</i>	Words or characters that require special attention. Placeholders for information you must supply. For example, if the guide refers to <i>share name</i> , you must type the actual share name. Book titles in cross-references.

Convention	Type of information
Monospaced font	Command and daemon names. Information displayed on the system console or other computer monitors. The contents of files.
Bold monospaced font	Words or characters you type at the system console or some other computer console. What you type is always shown in lowercase letters, unless you must type it in uppercase letters.

Special messages: This guide uses the following conventions to indicate special messages:

Note

A note contains important information that helps you install or operate the system efficiently.

Attention

An attention contains instructions you must follow to avoid damage to equipment, a system crash, or the loss of data.

This overview covers the following topics:

- ◆ “[New features in this version](#)” on page 2
- ◆ “[SnapDrive license management](#)” on page 3
- ◆ “[Common terms and technologies](#)” on page 4
- ◆ “[How SnapDrive works](#)” on page 7
- ◆ “[How LUNs work](#)” on page 12
- ◆ “[Planning disk allocation](#)” on page 14
- ◆ “[Understanding volume size](#)” on page 15

New features in this version

SnapDrive 5.0 introduces the following new features:

- ◆ Space reclamation in the active file system
For more information, see [“Reclaiming blocks on a LUN”](#) on page 145, and [“Space reclamation commands”](#) on page 220.
- ◆ Initiator group (igroup) management
For more information, see the procedures [“Creating a LUN”](#) on page 99, and [“Connecting LUNs”](#) on page 118.
- ◆ Support for VMware® Guest OS using the Microsoft iSCSI Software initiator
For more information, see [“VMware support”](#) on page 8.
- ◆ Support for GPT partitions
For more information, see [“GPT partition support”](#) on page 9.
- ◆ Volume-based restoration of disconnected LUNs
For more information, see [“Restoring a volume on a SnapMirror destination”](#) on page 200, and [“Snapshot commands”](#) on page 231.
- ◆ Integration with SnapVault to provide updates on a SnapVault secondary system
For more information, see [“Using SnapVault with SnapDrive”](#) on page 171 and [“SnapVault commands”](#) on page 236.

SnapDrive license management

Ways to manage SnapDrive licenses

SnapDrive enables you to view or change your license after you have installed it on your host using either Microsoft Management Console (MMC) or the SnapDrive command line interface (sdcli.exe utility). For more information on using the command line interface, see “[SnapDrive license commands](#)” on page 213.

You can also manage SnapDrive licenses on remote hosts if you have added those hosts to your SnapDrive MMC. For more information on managing remote instances of SnapDrive, see “[Managing multiple remote instances of SnapDrive with the Add SnapDrive feature](#)” on page 80.

Managing SnapDrive licenses from MMC

To view or change a license for LUN Provisioning and Snapshot Management after the software has been installed, from Microsoft Management Console (MMC), complete the following steps.

Step	Action
1	Expand the Storage option in the left MMC pane , if it is not already expanded.
2	Select SnapDrive, or SnapDrive List if you have added remote instances of SnapDrive to MMC; right-click the instance of SnapDrive you want to change; and select SnapDrive Licenses. Result: The SnapDrive Licenses window is displayed.
3	View or change the license for LUN Provisioning and Snapshot Management, as needed.

Common terms and technologies

This section defines the terms and technologies that you encounter while reading this document. The section defines the terms in a *SnapDrive-specific* context. Go to any of the following topics for more information:

- ◆ “[block pointers](#)” on page 4
- ◆ “[failover](#)” on page 4
- ◆ “[file system](#)” on page 4
- ◆ “[host](#)” on page 5
- ◆ “[host bus adapter \(HBA\)](#)” on page 5
- ◆ “[initiator](#)” on page 5
- ◆ “[logical unit number \(LUN\)](#)” on page 5
- ◆ “[Microsoft Cluster Service \(MSCS\)](#)” on page 5
- ◆ “[network interface card \(NIC\)](#)” on page 5
- ◆ “[Snapshot copy](#)” on page 6
- ◆ “[storage area network \(SAN\)](#)” on page 6
- ◆ “[storage system](#)” on page 6
- ◆ “[target](#)” on page 6
- ◆ “[virtual disk](#)” on page 6
- ◆ “[volume](#)” on page 6
- ◆ “[Windows Server cluster](#)” on page 6

block pointers

Block pointers are used by a storage system to locate the physical disk block on which data is stored.

failover

Failover refers to situations in which one system component fails, but another component takes over its functions, allowing the system to continue to operate.

file system

“File system” refers to New Technology File System (NTFS), the native Windows Server file system supported by SnapDrive. (NetApp storage systems use the Write Anywhere File Layout (WAFL®) file system internally, but SnapDrive makes WAFL transparent to virtual disk (LUN) users, who interact with data stored on the storage system using Windows procedures only.)

host	A host is a computer system that accesses data on a storage system.
host bus adapter (HBA)	A host bus adapter (HBA) is the adapter used to connect hosts and storage systems in a NetApp storage area network (SAN) so that hosts can access logical unit numbers (LUNs) on the storage systems using FCP, iSCSI, or both. <i>See also</i> logical unit number (LUN).
initiator	An initiator is used to send SCSI I/O commands to a target. FCP initiator: An FCP initiator is a port on an FCP HBA on a host. iSCSI initiator: An iSCSI initiator is a port on an NIC on a host or iSCSI HBA. <i>See also</i> target.
logical unit number (LUN)	A logical unit number (LUN) is a SCSI identifier of a logical unit of storage on a target. This guide often refers to LUNs as “virtual disks,” and vice versa. <i>See also</i> virtual disk.
Microsoft Cluster Service (MSCS)	Microsoft Cluster Service (also known as MSCS) is a service that runs on hosts in a Windows Server cluster and enables the clustering functionality on those hosts. <i>See also</i> Windows Server cluster.
network interface card (NIC)	A network interface card (NIC) is a Gigabit Ethernet (commonly known as “GbE”) or a Fast Ethernet card that is compliant with the IEEE 802.3 standards. These cards can provide the following connectivity functions: ◆ Connect hosts and storage systems to a local area network (LAN) ◆ Connect hosts and storage systems to data-center switching fabrics: specifically, enable hosts to connect to LUNs on storage systems using iSCSI

Snapshot copy	“Snapshot copy” refers to the Data ONTAP Snapshot technology, which facilitates recovery after accidental deletion or modification of the data stored on a storage system by referencing a point-in-time image of that data.
storage area network (SAN)	A storage area network (SAN) is a storage setup composed of one or more storage systems and connected to one or more hosts in an FCP or an iSCSI environment. To a Windows host running SnapDrive, a connected SAN is just another target storage device within which SnapDrive can create and manage LUNs. <i>See also</i> target <i>and</i> virtual disk.
storage system	A storage system, formerly referred to as a filer, is a system that supports FCP (Fibre Channel Protocol), iSCSI (Internet SCSI), and GbE (Gigabit Ethernet) protocols.
target	A target is used to receive the SCSI I/O commands that an initiator sends. For SANs, a target is a storage system. <i>See also</i> initiator.
virtual disk	A virtual disk is a functional unit of storage on a storage system that, for all practical purposes, behaves like a locally attached disk on a Windows host. This guide often refers to virtual disks as “logical unit numbers” (LUNs), and vice versa.
volume	A volume is a functional unit of storage on a storage system, made up of a collection of physical disks. A volume can be composed of one or more redundant arrays of independent disks (RAID) groups to ensure data integrity and availability if multiple disks fail simultaneously within the same volume. For more information about storage system volumes, see the <i>Storage Management Guide</i> .
Windows Server cluster	A Windows Server cluster is a cluster that contains up to eight nodes. The number of nodes depends on the software running on the host nodes.

How SnapDrive works

This section explains briefly what SnapDrive does and does not do and describes its components. Go to any of the following topics for more information:

- ◆ [“What SnapDrive does”](#) on page 7
- ◆ [“What SnapDrive does not do”](#) on page 8
- ◆ [“SnapDrive MultiStore support”](#) on page 8
- ◆ [“SnapVault support in SnapDrive”](#) on page 8
- ◆ [“VMware support”](#) on page 8
- ◆ [“GPT partition support”](#) on page 9
- ◆ [“SnapDrive LUN boot disk \(SAN booting\) support”](#) on page 9
- ◆ [“SnapDrive cluster support”](#) on page 9
- ◆ [“About the SnapDrive components”](#) on page 10

What SnapDrive does

SnapDrive software integrates with the Windows Volume Manager so that storage systems can serve as virtual storage devices for application data in Windows Server 2003 environments.

SnapDrive is dependent on the virtual disk service. The virtual disk service must be started on the host prior to installing SnapDrive.

SnapDrive manages virtual disks (LUNs) on a storage system, making these LUNs available as local disks on Windows hosts. This allows Windows hosts to interact with the LUNs just as if they belonged to a directly attached redundant array of independent disks (RAID).

SnapDrive provides the following additional features:

- ◆ It enables online storage configuration, LUN expansion, and streamlined management.
- ◆ It integrates Data ONTAP Snapshot technology, which creates point-in-time images of data stored on LUNs.
- ◆ It works in conjunction with SnapMirror® software to facilitate disaster recovery from either asynchronously or synchronously mirrored destination volumes.
- ◆ It enables SnapVault updates of qtrees to a SnapVault destination.
- ◆ It enables management of SnapDrive on multiple hosts.
- ◆ It enables support on MSCS configurations.
- ◆ It enables iSCSI protocol management.

What SnapDrive does not do

SnapDrive does not support the following uses:

- ◆ A LUN managed by SnapDrive cannot be configured as a “dynamic” disk (a storage device that is divided into volumes rather than partitions); it can serve only as a “basic” disk (a storage device for host-side application data).
- ◆ A LUN cannot be configured as an extended partition. SnapDrive supports only a single, primary partition on a LUN.
- ◆ LUNs created in FilerView or at the storage system command line cannot be managed unless certain steps are taken to prepare these disks for SnapDrive. For more information, see “[Managing LUNs not created in SnapDrive](#)” on page 140.

SnapDrive MultiStore support

If a storage system uses the optional MultiStore® feature of Data ONTAP® software to create virtual storage systems (vFiler™ units), SnapDrive can create, connect to, and manage LUNs on the vFiler units in the same way it does on the physical storage system. You accomplish this by providing the name for the vFiler unit rather than the name of the physical storage system to create a connection. It is transparent to the host whether the attached storage system is a physical storage system or a virtual vFiler unit.

SnapDrive is supported on vFiler greater than 0 only when using the iSCSI protocol.

For information on SnapDrive features not currently supported in a MultiStore environment, see the *SnapDrive 5.0 for Windows Release Notes*.

For more information on MultiStore and vFiler units, see the Data ONTAP *MultiStore Management Guide*.

SnapVault support in SnapDrive

SnapDrive provides SnapVault backup support of existing SnapVault configurations when your storage system is running Data ONTAP 7.2.1 or later. For more information, see “[Using SnapVault with SnapDrive](#)” on page 171.

VMware support

SnapDrive provides support with VMware ESX Server 3.0.1 on x86 platforms using the Microsoft iSCSI Software Initiator 2.03 or later. MSCS configurations do not support VMware. Additionally, VMware is not supported on x64 and IA64 platforms, and MPIO is not supported on VMware Guest OS. Because MPIO is not supported, you must not install the Microsoft iSCSI Software Initiator with the MPIO option selected.

GPT partition support

SnapDrive supports the GUID partition table (GPT) partitioning style on new LUNs created by SnapDrive when you have Data ONTAP 7.2.1 or later installed on your storage system.

Windows does not support the GPT partition style on shared LUNs. Shared LUNs will continue to use the MBR partition style. The maximum size of an MBR partition style LUN is 2 TB or the maximum space on the volume, whichever is smaller.

SnapDrive does not support MBR LUNs that are converted to GPT style LUNs. If you have an existing MBR style LUN, rather than converting, you must create a new GPT LUN using SnapDrive, then copy all the data from the MBR LUN to the GPT LUN.

Note

GPT LUNS have a Microsoft reserved partition (MSR), which is invisible to applications like Disk Management and the Windows Explorer. When you create a LUN that has the GPT partition style, the LUN size appears smaller than the size you specified when you created it. This is due to the space used by the MSR. To create a GPT LUN that is 16 GB or less, you must have at least 32 MB of space available for the MSR. For GPT LUNs greater than 16 GB, you must have at least 64 MBs of MSR space.

SnapDrive LUN boot disk (SAN booting) support

SnapDrive supports both bootable LUNs (SAN booting) and nonbootable LUNs. It differentiates between the two in the Microsoft Management Console (MMC) by representing each LUN type with a unique icon. For more information, see [“SAN Booting with SnapDrive”](#) on page 185.

SnapDrive cluster support

SnapDrive can be deployed in a nonclustered configuration (a single host connected to a single storage system) as well as in topologies involving the following cluster technologies:

- ◆ Windows clusters (MSCS)
To protect against node failure, Windows clustering fails over applications from the host node to the surviving node.
- ◆ NetApp active/active configuration
If a storage system fails, the partner storage system takes over the functions of the failed storage system, thus protecting data and ensuring continued storage availability.

Note

SnapDrive LUNs are supported in a NetApp active/active configuration; however, during cluster takeover and giveback, SnapDrive operations will fail for LUNs located on the active/active storage systems until the takeover and giveback process is completed.

About the SnapDrive components

Some of the software components of SnapDrive are integrated in the SnapDrive software; others are available on the NOW site at <http://now.netapp.com/>.

Note

All SnapDrive components, and their respective software and firmware, must be installed on the storage system and Windows host before you can successfully use the software.

Integrated components: The following SnapDrive components are integrated in the software and automatically installed during installation:

◆ SnapDrive “snap-in”

This software module integrates with the Microsoft Management Console (MMC) to provide a graphical interface for managing LUNs on the storage system. The module does the following:

- ❖ Resides in the Windows Server 2003 computer management storage tree
- ❖ Provides a native MMC snap-in user interface for configuring and managing LUNs
- ❖ Supports remote administration so that you can manage SnapDrive on multiple hosts
- ❖ Provides SnapMirror® integration
- ❖ Provides AutoSupport integration, including event notification

◆ SnapDrive command-line interface

The sdcli.exe utility enables you to manage LUNs from the command prompt of the Windows host. You can do the following tasks with the sdcli.exe utility:

- ❖ Enter individual commands
- ❖ Run management scripts

◆ Underlying SnapDrive service

This software interacts with software on the storage system to facilitate LUN management for the following:

- ❖ A host

- ❖ Applications running on a host
- ◆ NetApp Volume Shadow Copy Service (VSS) Hardware Provider on Windows 2003 hosts

The NetApp VSS Hardware Provider is a module of the Microsoft VSS framework. The NetApp Hardware Provider enables VSS Snapshot technology on NetApp storage systems when SnapDrive is installed on Windows 2003 hosts.

How LUNs work

This section explains how LUNs work. Go to any of the following topics for more information:

- ◆ [“How the storage system interacts with a LUN”](#) on page 12
- ◆ [“How Windows hosts interact with a LUN”](#) on page 12
- ◆ [“LUN capabilities and limitations”](#) on page 12
- ◆ [“Protocols to access LUNs”](#) on page 13
- ◆ [“Overview of how data is accessed from LUNs”](#) on page 13

How the storage system interacts with a LUN

To the storage system, a LUN is a logical representation of a physical unit of storage. Therefore, the storage system handles each LUN as a single storage object. The size of this LUN is slightly larger than the raw disk size reported to the Windows host. SnapDrive must be used to expand the LUN for the Windows host to recognize the newly created disk space.

Note

You can expand a LUN, but you cannot reduce it.

How Windows hosts interact with a LUN

You manage LUNs on the storage system just as you manage other Windows disks that store application data. Similarly, the LUNs on the storage systems are automatically formatted by SnapDrive the same way that you format other Windows disks. Moreover, a Windows host interacts with all user data files on the LUN as if they were NTFS files distributed among the disks of a locally attached RAID array.

You do not need to be aware that your data files actually are part of a single virtual disk file that is stored on the storage system; the intricacies of WAFL file management remain completely transparent to you as you manage SnapDrive LUNs from the Windows host.

LUN capabilities and limitations

A LUN managed by SnapDrive can be used for data storage and can be a boot disk. A LUN cannot be a dynamic disk.

SnapDrive can also make a Snapshot copy of LUNs when they are used for data storage, and it can work with SnapMirror at the volume level and SnapVault at the qtree level for data protection.

When a LUN is a boot disk, the following actions are unavailable in SnapDrive:

- ◆ Delete
- ◆ Disconnect
- ◆ Expand
- ◆ Restore

Protocols to access LUNs

You can access the SnapDrive-created LUNs using one or both of the following two protocols:

- ◆ Fibre Channel Protocol (FCP)
- ◆ iSCSI

You must have the appropriate hardware and firmware, if any, and software installed on your host and the storage system before you can use these protocols to access LUNs.

Note

SnapDrive 5.0 supports both FCP and iSCSI on the same Windows host connecting to different LUNs. Because of a Microsoft limitation, SnapDrive 5.0 does not support FCP and iSCSI on the same Windows host connecting to the same LUN. It is possible, however, to have different nodes in a cluster, each using a different protocol, connecting to the same LUN.

Overview of how data is accessed from LUNs

In a SAN environment, an initiator (on the Windows host) initiates a SCSI I/O operation to a target (storage system). The operation can be initiated using either the FCP or the iSCSI protocol, depending on the type of initiator installed on your Windows host and the setup on the target. A target can receive SCSI requests using FCP if a supported HBA is installed and FCP is licensed. Similarly, a target can receive SCSI requests using iSCSI if a supported HBA or the Microsoft iSCSI Software Initiator is installed, and if iSCSI is licensed.

After a target receives a SCSI I/O request, the appropriate operation is performed by writing data to or fetching data from the LUN.

Planning disk allocation

This section explains how to plan storage system disk allocation. Go to either of the following topics for more information:

- ◆ “[Configuring RAID groups](#)” on page 14
- ◆ “[Hot spare disks](#)” on page 14

Configuring RAID groups

You can assign more than one RAID group to a single storage system volume; in fact, you *should* do so if the volume contains more than 14 disks. This ensures data integrity and availability if multiple disks fail simultaneously within the same volume.

The number of disks in each RAID group on a volume should be balanced to allow maximum performance.

For more information about RAID groups, see the *Storage Management Guide* for your version of Data ONTAP.

Hot spare disks

Hot spare disks are disks held in reserve globally, in case an active disk fails.

Hot spare disks in a storage system do not belong to any particular volume. In fact, any disk in the storage system that has not yet been assigned to a volume (and has not been marked bad) is treated as a hot spare.

If the storage system has multiple volumes, any available spare can replace a failed disk on any volume, as long as the following conditions are true:

- ◆ The spare is as large or larger than the disk it replaces.
- ◆ The replacement disk resides on the same storage system as the failed disk.

Always keep at least one hot spare disk in the storage system. This ensures that a spare disk is available at all times. As soon as an active disk fails, the storage system automatically reconstructs the failed disk by using the hot spare. You don’t have to intervene manually—except to replace the failed disk after the reconstruction is complete.

Note

To receive proactive alerts about the status of disks in your storage system, enable the Data ONTAP AutoSupport feature.

Understanding volume size

This section explains storage system volumes and how to manage space reservation. Go to any of the following topics for more information:

- ◆ [“What a volume stores”](#) on page 15
- ◆ [“Volume-size rules”](#) on page 15
- ◆ [“Space-related storage system options set by SnapDrive”](#) on page 16
- ◆ [“What space reservation provides”](#) on page 16
- ◆ [“Disk space usage with space reservation”](#) on page 16
- ◆ [“What fractional reserve is”](#) on page 17

What a volume stores

The space on a volume is used to store the following:

- ◆ The LUNs, which in turn contain the host data
- ◆ Data that changes between Snapshot copies
- ◆ The active file system of the LUN
- ◆ Metadata

Volume-size rules

The following factors govern the appropriate minimum size for a volume that will hold a LUN:

- ◆ The volume must be more than twice the combined size of all the LUNs on the volume if a Snapshot copy of the volume will be created. This enables the volume to hold the LUNs and a special reserved space, so that no matter how much the contents of the LUNs change between Snapshot copies, the entire contents of the disks can be written to the volume. See [“How Snapshot copies work”](#) on page 150 for more information.
- ◆ The volume must also provide enough additional space to hold the number of Snapshot copies you intend to keep online. The amount of space consumed by a Snapshot copy depends on the amount of data that changes after the Snapshot copy is taken. The maximum number of Snapshot copies is 255 per storage system volume.

Space-related storage system options set by SnapDrive

The following space-related settings are set by SnapDrive on your storage system:

- ◆ Upon LUN creation or connection, SnapDrive automatically sets space reservation to On for each LUN.
- ◆ The snap reserve option is reset to 0 percent for all volumes holding SnapDrive LUNs.

Data ONTAP can reserve a certain percentage of raw volume capacity exclusively for Snapshot copy creation. By default, the snap reserve percentage on the storage system volume is 20 percent, and SnapDrive does not automatically change this. Therefore, you must manually reset the percentage to 0 percent. For details, see “” on page 43.

What space reservation provides

Space reservation ensures that write operations to a LUN always have enough space. Space reservation prevents Snapshot copy creation whenever the storage system volume storing the LUN might not have enough free space to accommodate all future write and overwrite operations to LUNs on that volume. This prevents situations in which all writable blocks on the volume are locked by Snapshot copies, and no blocks are available for writing new data.

Disk space usage with space reservation

When you first create a LUN with space reservation enabled, it is granted a space reservation equal to its size. This reserved space is subtracted from the total available disk space on the storage system volume on which the LUN resides. As data is written to the LUN, the space occupied by that data is subtracted from the remaining available volume space and added to the used volume space.

When you create a Snapshot copy of the storage system volume holding the LUN, that Snapshot copy locks down all the disk blocks occupied by live data.

By monitoring the remaining available space in the storage system volume, space reservations determine whether Snapshot copy creation is allowed. When the amount of available space on the storage system volume falls to below the threshold you set to prevent overwriting space reserved LUNs, Snapshot creation is blocked.

For more information about the effects of space reservation on LUNs, see the chapter regarding space reservation for volumes and LUNs in the *Block Access Management Guide*.

What fractional reserve is

SnapDrive enables you to monitor fractional space reservation thresholds when you are using Data ONTAP 7.1 or later. *Fractional reserve* controls the amount of space Data ONTAP reserves in a traditional or FlexVol volume to enable overwrites to space-reserved LUNs. On traditional volumes or FlexVol volumes with volume space reserve guarantee, fractional reserve is by default set to 100 percent. This means that Data ONTAP automatically reserves 100 percent of the total LUN size for overwrites. For example, if you create a 500-GB space-reserved LUN, Data ONTAP by default ensures that the host-side application storing data in the LUN always has access to 500 GB of space.

You can reduce the amount of space reserved for overwrites to less than 100 percent when you create LUNs in the following types of volumes:

- ◆ Traditional volumes
- ◆ Flexible volumes that have the `guarantee` option set to `volume`.

If the `guarantee` option for a flexible volume is set to `file`, then fractional reserve for that volume is set to 100 percent and is not adjustable.

To set space reservation monitoring in SnapDrive, see “[Monitoring fractional space reservations](#)” on page 143.

For more information about fractional space reservations, see the *Block Access Management Guide*.

The topics that follow explain the tasks you must complete before installing the SnapDrive application software. These tasks include:

- ◆ Determining your SnapDrive configuration and what it requires in terms of hardware, software, settings, and background reading
- ◆ Configuring your hosts
- ◆ Configuring your storage systems
- ◆ Cabling your SnapDrive configuration
- ◆ Setting up your SnapDrive service account
- ◆ Verifying your configuration and domain settings

Note

The requirements discussed in these topics apply to *each* storage system and host you connect in the various configurations supported by SnapDrive.

Go to any of the following topics for more information:

- ◆ [“What to read”](#) on page 20
- ◆ [“Selecting a SnapDrive configuration”](#) on page 21
- ◆ [“iSCSI configurations”](#) on page 23
- ◆ [“FCP configurations”](#) on page 27
- ◆ [“MPIO configurations”](#) on page 30
- ◆ [“Preparing hosts”](#) on page 33
- ◆ [“Preparing storage systems”](#) on page 37
- ◆ [“Configuring pass-through authentication for SnapDrive”](#) on page 44
- ◆ [“Preparing the SnapDrive service account”](#) on page 47
- ◆ [“SnapDrive user interfaces”](#) on page 49

What to read

SnapDrive installation requirements and procedures vary according to the protocols you use to create LUNs. Use the following table to determine which documents you should read.

Note

You can obtain the documents listed below at <http://now.netapp.com/>.

To create...	Read...
iSCSI-accessed LUNs	◆ This document ◆ If you are using the Microsoft iSCSI Software Initiator, the Microsoft iSCSI Software Initiator documentation, available at the Microsoft site For the most up-to-date list of supported initiators, see the SnapDrive Compatibility Matrix at http://now.netapp.com/NOW/knowledge/docs/olio/guides/snapmanager_snapdrive_compatibility/snapdrive.shtml. ◆ Data ONTAP <i>Block Access Management Guide</i>, which shipped with your storage system
FCP-accessed LUNs	◆ This document ◆ <i>FCP Windows Host Utilities for Native OS Setup Guide</i>, which shipped with your NetApp Windows Attach Kit For the most up-to-date list of supported initiators, see the SnapDrive Compatibility Matrix at http://now.netapp.com/NOW/knowledge/docs/olio/guides/snapmanager_snapdrive_compatibility/snapdrive.shtml. ◆ Data ONTAP <i>Block Access Management Guide</i>, which shipped with your storage system

Selecting a SnapDrive configuration

SnapDrive supports a variety of configurations. The following factors can help you decide which configuration to deploy:

- ◆ LUN access protocol—iSCSI, FCP, or both
- ◆ Host operating system—Windows Server 2003 32-bit, x64, and Itanium® (IA64) versions (Standard Edition or Enterprise Edition), or Windows Server 2003 R2
- ◆ Host operating system Service Pack level
 - ❖ For Windows Server 2003: SP1 or SP2
- ◆ Host operating system hotfix level (various combinations of mandatory and optional hotfixes, which are determined by host operating system, Service Pack level, and special SnapDrive options. See “[Required hotfixes](#)” on page 22.)
- ◆ Special options (Windows clustering, storage system cluster failover, MPIO)

Go to either of the following topics for more information:

- ◆ “[Recommendations for choosing a configuration](#)” on page 21
- ◆ “[Required hotfixes](#)” on page 22

Recommendations for choosing a configuration

When deciding which type configuration to use with SnapDrive, keep the following recommendations in mind:

- ◆ For all configurations, place the host and storage system in the same broadcast domain, so that LUN I/O commands do not need to make router hops.
- ◆ For Windows cluster configurations, segregate internal cluster traffic from both host-storage system traffic and data-center traffic whenever possible.
- ◆ Do not permit internal cluster traffic on a GbE network used for transferring data from host to storage system. Instead, use a Fast Ethernet connection for all cluster traffic. This ensures that a single network error cannot affect both the connection for internal cluster traffic and the connection to the quorum disk.
- ◆ To determine the feasibility of SnapDrive configurations not described in the following sections, contact technical support.

Related topics:

- ◆ “[Preparing hosts](#)” on page 33
- ◆ “[Preparing storage systems](#)” on page 37

Required hotfixes

The following table lists the hotfixes required by SnapDrive on each supported Windows host operating system.

Windows Server 2003 Standard or Enterprise Edition 32-bit or 64-bit (x64 and IA64) with...
SP1 with the following hotfixes: ◆ 898790 ◆ 902837 ◆ 908249 ◆ 912063 ◆ 913648 ◆ 922772 ◆ 923424 ◆ 923801 ◆ 931300
Note At this time, SnapDrive 5.0 requires hotfix 908249 for both Standard and Enterprise Editions of Microsoft Windows Server 2003.
Windows Server 2003 Standard or Enterprise Edition 32-bit or 64-bit (x64 and IA64) with...
SP2 with the following hotfix: ◆ 931300

Note

For a list of the latest service packs and hotfixes required by SnapDrive, see the SnapDrive 5.0 Description Page at <http://now.netapp.com/NOW/cgi-bin/software/>.

iSCSI configurations

This section describes the supported iSCSI configurations. Go to any of the following topics for details:

- ◆ [“Single host direct-attached to a single storage system”](#) on page 23
- ◆ [“Single host attached to a single storage system through a GbE switch”](#) on page 24
- ◆ [“Single host attached to a single storage system through a dedicated switch”](#) on page 25
- ◆ [“Windows cluster connected to a storage system cluster through a dedicated GbE switch”](#) on page 25

Related topics:

- ◆ [“FCP configurations”](#) on page 27
- ◆ [“MPIO configurations”](#) on page 30
- ◆ [“Required hotfixes”](#) on page 22

Single host direct-attached to a single storage system

The configuration in the following illustration uses a GbE crossover cable to attach the host directly to the storage system. Such an arrangement minimizes latency and eliminates unwanted network broadcasts.

The host and storage system in this configuration each use the following connection hardware:

- ◆ 1 GbE NIC dedicated to host-storage system data transfer
- ◆ 1 Fast Ethernet (or GbE) NIC to connect to the data-center fabric

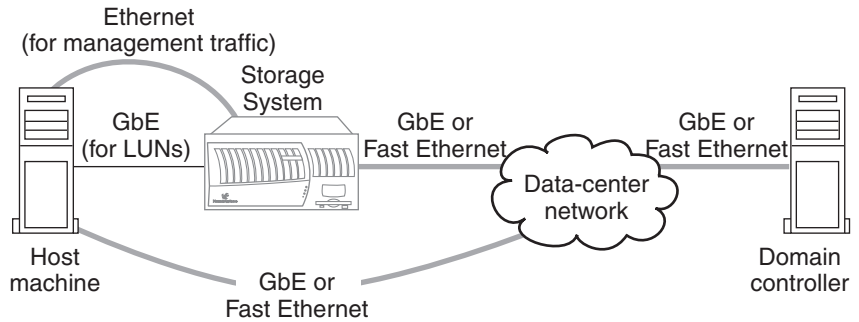
Note

Both the storage system and the host *must* be within the same broadcast domain.

Note

LUN traffic and management traffic in an iSCSI configuration can be performed over a single GbE connection; however, for best results, you should separate the traffic as shown in the following illustration.

Windows requirements: For Windows OS and hotfix requirements for iSCSI, see [“Required hotfixes”](#) on page 22.



Single host attached to a single storage system through a GbE switch

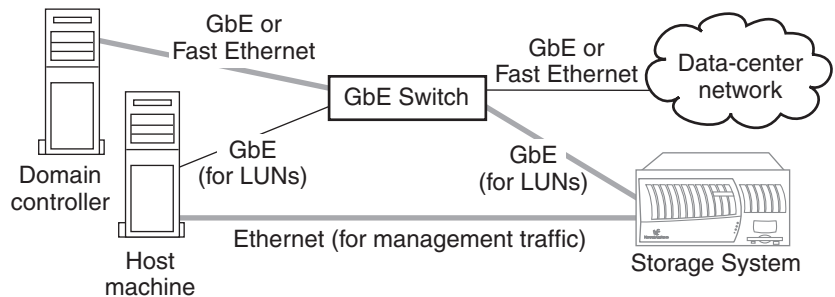
The following illustration depicts a single-homed configuration that places a network switch between the storage system and the host. Such an arrangement provides good performance and also segregates host-storage system traffic by directing it through a single pair of switch ports.

Because the switch connects to the data-center fabric, the host and storage system in this configuration each use a single GbE NIC both for host-storage system data transfers and for connecting to the data-center fabric.

Note

LUN traffic and management traffic in an iSCSI configuration can be performed over a single GbE connection; however, for best results, you should separate the traffic as shown in the following illustration.

Windows requirements: For Windows OS and hotfix requirements for iSCSI, see “[Required hotfixes](#)” on page 22.



Single host attached to a single storage system through a dedicated switch

The following illustration depicts a multihomed configuration that employs a GbE switch between the storage system and the host. In addition to providing good performance and segregating host-storage system traffic to the dedicated switch, this arrangement minimizes disruptions in situations where network routing configuration changes frequently.

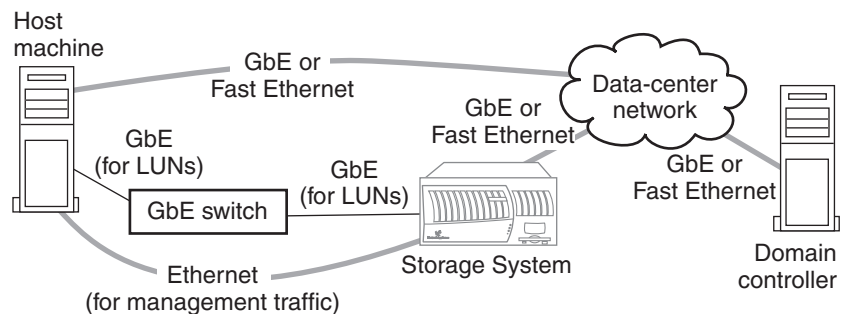
The host and storage system in this configuration each use the following hardware for the connection:

- ◆ 1 GbE NIC dedicated to host-storage system data transfer
- ◆ 1 Fast Ethernet (or GbE) NIC to connect to the data-center fabric

Note

LUN traffic and management traffic in an iSCSI configuration can be performed over a single GbE connection; however, for best results, you should separate the traffic as shown in the following illustration.

Windows requirements: For Windows OS and hotfix requirements for iSCSI, see “[Required hotfixes](#)” on page 22.



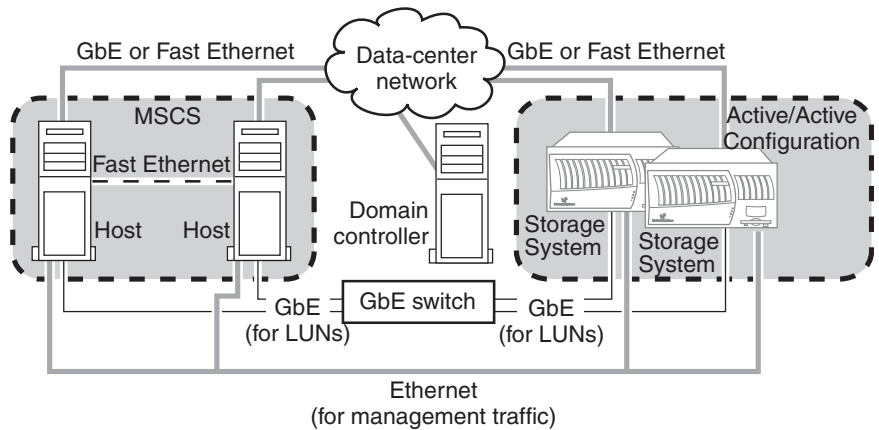
Windows cluster connected to a storage system cluster through a dedicated GbE switch

The configuration in the following illustration employs both a Windows cluster and a storage system cluster. The diagram also pictures an optional but recommended “private” network that handles internal cluster traffic (rather than host-storage system data traffic).

You can also create configurations that connect the host cluster to multiple storage systems or storage system active/active configuration, and you can connect a storage system or storage system active/active configuration to multiple hosts.

Note

LUN traffic and management traffic in an iSCSI configuration can be performed over a single GbE connection; however, for best results, you should separate the traffic as shown in the following illustration.



Windows requirements: For Windows OS and hotfix requirements for iSCSI, see “[Required hotfixes](#)” on page 22.

FCP configurations

This section describes the supported FCP configurations. Go to any of the following topics for details:

- ◆ [“Single host direct-attached to a single storage system”](#) on page 27
- ◆ [“Single host attached to a single storage system through a FCP switch”](#) on page 28
- ◆ [“Windows cluster attached to a storage system active/active configuration through an FCP switch”](#) on page 28

Related topics:

- ◆ [“iSCSI configurations”](#) on page 23
- ◆ [“MPIO configurations”](#) on page 30
- ◆ [“Required hotfixes”](#) on page 22

Single host direct-attached to a single storage system

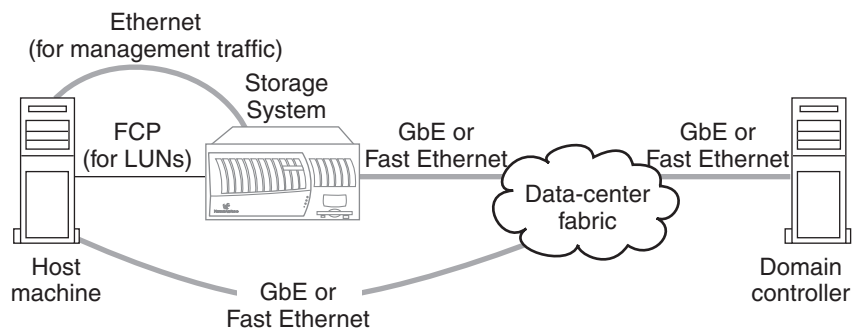
The following illustration shows a configuration that uses a crossover FCP cable to attach the host directly to the storage system.

The host and storage system in this configuration each use the following connection hardware:

- ◆ 1 HBA to transfer LUN data between storage system and host
- ◆ 1 Fast Ethernet or GbE NIC to connect to the data-center fabric

Attention

For this configuration, both the storage system and the host must be within the same broadcast domain.



Windows requirements: For Windows OS and hotfix requirements for FCP, see “[Required hotfixes](#)” on page 22.

Single host attached to a single storage system through a FCP switch

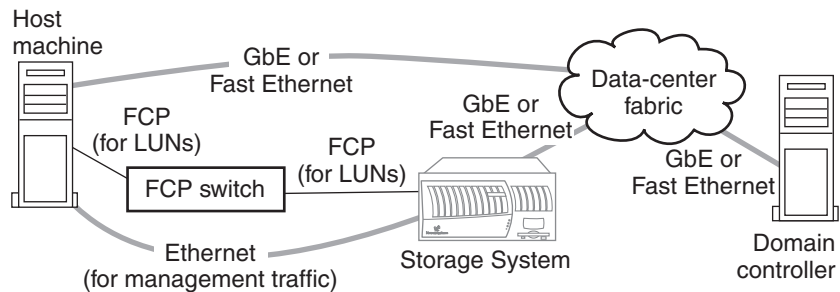
The configuration in the following illustration uses a dedicated FCP switch to handle all host-storage system data traffic for LUNs.

The host and storage system in this configuration each use the following hardware:

- ◆ 1 HBA to transfer LUN data between storage system and host
- ◆ 1 Fast Ethernet or GbE NIC to connect to the data-center fabric

Note

LUN traffic and management traffic in an FCP configuration can be performed over a single GbE connection, however, for best results, you should separate the traffic as shown in the following illustration.

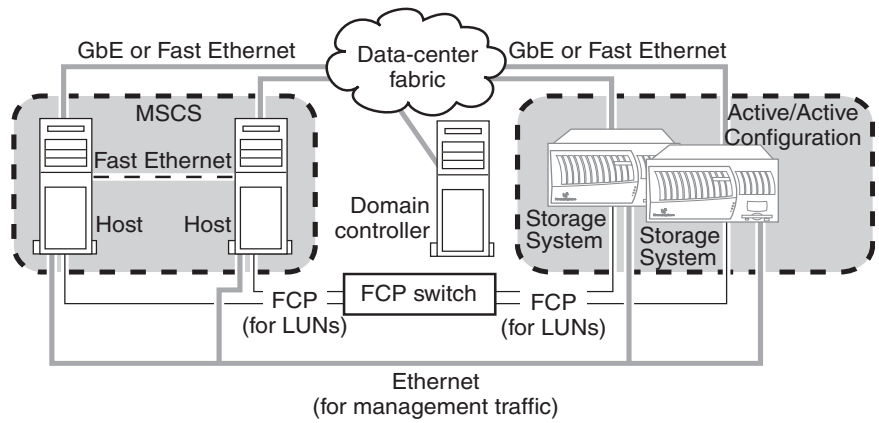


Windows requirements: For Windows OS and hotfix requirements for FCP, see “[Required hotfixes](#)” on page 22.

Windows cluster attached to a storage system active/active configuration through an FCP switch

The following illustration depicts a configuration that employs both a Windows cluster and a storage system active/active configuration connected through an FCP switch. It also pictures an optional but recommended dedicated network for internal cluster traffic.

You can create similar configurations that connect the Windows cluster to multiple storage systems or storage system active/active configuration.



Windows requirements: For Windows OS and hotfix requirements for FCP, see “[Required hotfixes](#)” on page 22.

MPIO configurations

This section describes the supported MPIO configurations. Go to any of the following topics for more information:

- ◆ [“Single host direct-attached to single storage system”](#) on page 30
- ◆ [“Windows cluster attached to storage system active/active configuration through a switch”](#) on page 31

For information about the latest supported MPIO configurations, see the NOW site.

Note

MPIO is not an installable module with SnapDrive 5.0. If you plan to use path management with SnapDrive, you can download the Data ONTAP DSM for Windows MPIO from the NOW site. For more information, see the *Data ONTAP DSM for Windows MPIO Installation and Administration Guide*.

Related topics:

- ◆ [“iSCSI configurations”](#) on page 23
- ◆ [“FCP configurations”](#) on page 27
- ◆ [“Required hotfixes”](#) on page 22

Single host direct-attached to single storage system

FCP configuration: This configuration uses two or more FCP HBAs to support MPIO between a host and a storage system. The host has at least two HBAs, and the storage system has at least two FCP adapters.

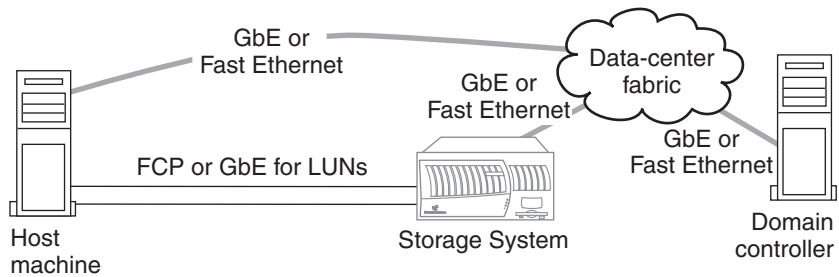
The host and storage system in this configuration each use the following connection hardware:

- ◆ 2 FCP HBAs to transfer multipathed LUN data between storage system and host
- ◆ Fast Ethernet (or GbE) NIC to connect to the data-center fabric

iSCSI configuration: This configuration uses iSCSI HBAs or the Microsoft iSCSI Software Initiator to support MPIO between a host and a storage system. The storage system has two GbE network adapters, and the host has one or both of the following configurations:

- ◆ Two or more iSCSI HBAs
- ◆ The Microsoft iSCSI Software Initiator and two GbE NICs

The following illustration depicts a single host direct-attached to a single storage system using either FCP or iSCSI over MPIO.



Windows requirements: For Windows OS and hotfix requirements for MPIO, see “[Required hotfixes](#)” on page 22.

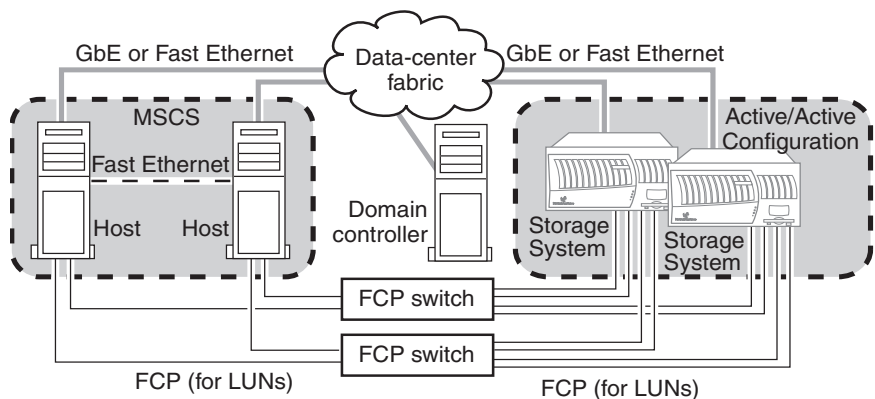
Windows cluster attached to storage system active/active configuration through a switch

FCP configuration: The configuration in the following diagram employs both a Windows cluster and a storage system active/active configuration connected through an FCP switch. The diagram also pictures an optional but recommended dedicated network for all internal cluster traffic.

Each host in this configuration uses the following connection hardware:

- ◆ 2 HBAs to transfer multipathed LUN data between storage system and host
- ◆ 1 GbE (or Fast Ethernet) NIC to connect to the data-center fabric
- ◆ 1 optional Fast Ethernet, GbE, or 10/100 NIC for internal cluster traffic

Each storage system in this configuration requires two dual-port FCP adapters and a GbE (or Fast Ethernet) NIC to connect to the data-center fabric. (See your Data ONTAP *Block Access Management Guide* for details.)

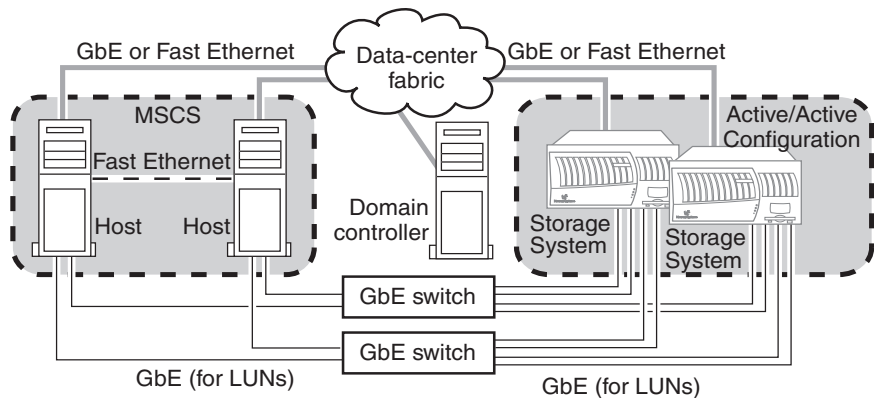


iSCSI configuration: The configuration in the following diagram employs both a Windows cluster and a storage system active/active configuration connected through a GbE switch. The diagram also pictures an optional, but recommended, dedicated network for all internal cluster traffic.

Each host in this configuration uses the following connection hardware:

- ◆ Two GbE (or two iSCSI HBAs) to transfer multipathed LUN data between storage system and host
- ◆ 1 GbE (or Fast Ethernet) NIC to connect to the data-center fabric
- ◆ 1 optional Fast Ethernet, GbE, or 10/100 NIC for internal cluster traffic

Each storage system configuration requires at least two GbE (or Fast Ethernet) NICs to connect to the data-center fabric. (See your Data ONTAP *Block Access Management Guide* for details.)



Windows requirements: For Windows OS and hotfix requirements for MPIO, see “[Required hotfixes](#)” on page 22.

Preparing hosts

Before installing SnapDrive, you need to prepare your Windows hosts by performing the following tasks:

- ◆ Verify that each host meets the requirements summarized in the table that follows.
- ◆ Install on each host the proper operating system edition, Service Pack, and hotfixes for your SnapDrive configuration.
- ◆ Install on each host the proper connection hardware or software, such as drivers and firmware, for your SnapDrive configuration.

See “[Verifying minimum requirements](#)” on page 33 and “[Determining which components are installed](#)” on page 35 for more information.

Related topics:

- ◆ “[Preparing storage systems](#)” on page 37
- ◆ “[Preparing the SnapDrive service account](#)” on page 47

Verifying minimum requirements

Each host in your SnapDrive configuration must meet the following requirements.

Component	Requirement	
CPU	32-bit	64-bit
	2.8 GHz Pentium 4 or compatible	x64: Intel® Xeon® or AMD Opteron™ IA64: Intel Itanium
Memory	1 GB	

Component	Requirement
HBAs and software initiators	For FCP, see the FCP Host Utilities (Attach Kits) for Windows at: http://now.netapp.com/NOW/cgi-bin/software/ For iSCSI HBA, see the iSCSI Host Attach Kit for Windows at: http://now.netapp.com/NOW/cgi-bin/software/ For a list of the latest compatible software for SnapDrive 5.0, see the SnapDrive Compatibility Matrix at: http://now.netapp.com/NOW/knowledge/docs/olio/guides/snapmanager_snapdrive_compatibility/ For the Microsoft iSCSI Software Initiator, see the Microsoft site at: http://www.microsoft.com/downloads/
Operating system	For Windows OS, Service Pack, and hotfix requirements, see “ Required hotfixes ” on page 22.

To determine the exact number and type of HBAs and NICs required by each host in your SnapDrive configuration, consult “[Selecting a SnapDrive configuration](#)” on page 21.

Interface drivers: To ensure high network bandwidth and ease of configuration, make sure you have the latest firmware and drivers for the HBAs and NICs you are using, as follows:

- ◆ The NIC you use to facilitate data transfer for the Microsoft iSCSI Software Initiator can come from any vendor, but it must have the appropriate logo certification: “Designed for Windows Server 2003.”
- ◆ The latest FCP driver and firmware is available on NOW at <http://now.netapp.com/NOW/cgi-bin/software/>. From this gateway, navigate to the SAN Host Attach Kit for Fibre Channel Protocol on Windows download page.
- ◆ The Microsoft iSCSI Software Initiator must be downloaded from the Microsoft site.

- ◆ The latest iSCSI driver and firmware from NOW at <http://now.netapp.com/NOW/cgi-bin/software/>. From this gateway, navigate to the iSCSI Host Attach Kit for Windows download page.

Determining which components are installed

Before you begin installing SnapDrive or any of the required HBAs and initiators, you can check if these components are already installed to determine whether you need to perform a new installation or whether an upgrade is necessary.

Determining whether the iSCSI Software Initiator is installed: To determine whether the iSCSI Software Initiator is installed on your Windows host, complete the following steps.

Step	Action
1	Double-click Add/Remove Programs in the Windows Control Panel.
2	In the list of currently installed programs, determine whether Microsoft iSCSI Software Initiator is listed.
3	If the Microsoft iSCSI Software Initiator is not listed and you want to install it, see “ Installing the iSCSI Software Initiator ” on page 64.

Determining whether FCP or iSCSI HBA or MPIO components are installed: To determine whether FCP or iSCSI HBA or MPIO components are installed, complete the following steps.

Step	Action	
1	In the left MMC pane, select Device Manager.	
2	In the right MMC pane, double-click SCSI and RAID controllers.	
3	If...	Then...
	An FCP or iSCSI HBA is not listed and you want to install one or both	See “ Installing the FCP or iSCSI components ” on page 63 for more information.
	Multipath support is not listed	See “ Installing the SnapDrive components ” on page 68 for more information.

Determining whether SnapDrive is installed: To determine whether SnapDrive is installed on your Windows host, complete the following steps.

Step	Action
1	Double-click Add/Remove Programs in the Windows Control Panel.
2	In the “Currently installed programs” list, determine whether SnapDrive is listed.
3	If SnapDrive is not listed, see Chapter 3, “ Installing, Uninstalling, or Upgrading SnapDrive ,” on page 51.

Preparing storage systems

Before installing SnapDrive, you must prepare the storage systems in your SnapDrive configuration to meet the following conditions:

- ◆ The storage systems are online.
- ◆ The storage systems are running at least Data ONTAP 7.0.5.
- ◆ The HBAs and NICs in your storage systems meet the requirements for your particular host-target SnapDrive configuration.

Note

For the latest SnapDrive storage system requirements, see the SnapDrive Compatibility Matrix on the NetApp on the Web (NOW) site at <http://now.netapp.com/NOW/cgi-bin/software/>.

For detailed information about storage system administration, see your Data ONTAP *Storage Management Guide*.

Go to any of the following topics for more information:

- ◆ “[Verifying minimum storage system requirements](#)” on page 37
- ◆ “[Checking storage system licenses](#)” on page 38
- ◆ “[Starting FCP and iSCSI services](#)” on page 38
- ◆ “[Volume and storage system options set by SnapDrive](#)” on page 38
- ◆ “[SnapDrive-specific limitations](#)” on page 39
- ◆ “[Recommendations](#)” on page 39
- ◆ “[Preparing a volume for SnapDrive](#)” on page 40
- ◆ “[Creating a storage system volume](#)” on page 41

Related topics:

- ◆ “[Preparing hosts](#)” on page 33
- ◆ “[Preparing the SnapDrive service account](#)” on page 47

Verifying minimum storage system requirements

Each storage system in your SnapDrive configuration must meet the requirements in the following table.

Component	Minimum requirement
Operating system	Data ONTAP 7.0.5

Component	Minimum requirement
Licenses	◆ iSCSI, if you plan to use iSCSI-accessed LUNs ◆ FCP, if you plan to use FCP-accessed LUNs ◆ SnapRestore®, which is required only for restoring LUNs from Snapshot copies ◆ SnapMirror, if you plan to use the SnapMirror option ◆ FlexClone®, to enable volume clone functionality ◆ SnapVault, if you want to use SnapVault for archiving LUN backup sets ◆ MultiStore, if you plan to create LUNs on vFiler units.

Note

The iSCSI and FCP licenses supplied with SnapDrive enable all the CIFS functionality necessary for using SnapDrive. If you also want *full-featured, direct CIFS access* to a particular storage system, you must install a separate CIFS license on that storage system.

Checking storage system licenses

You can determine which licenses are enabled on your storage system (and enable additional licenses) by opening FilerView in your Web browser and then navigating to Filer > Manage Licenses. Alternatively, you can connect to the storage system through a Telnet session and issue the `license` command at the storage system prompt. Use the `license add code` command to enable a license at the storage system command line. See your Data ONTAP documentation for details.

Starting FCP and iSCSI services

After you verify that licenses for FCP, iSCSI, or both are enabled on your storage system, you must start the services by entering the `fcv start` command or the `iscsi start` command at the storage system command line. See the *Block Access Management Guide* for more information.

Volume and storage system options set by SnapDrive

SnapDrive checks (and resets) various storage system and volume options at key points:

- ◆ When you start SnapDrive

- ◆ When you create a LUN
- ◆ When you connect a host to a LUN

The following table shows the defaults reset by SnapDrive and when those resets take place; you should *not* change these values.

Option type	Parameter	SnapDrive setting	When
LUN	Space reservation	File-based space reservation reset to On	◆ Disk creation
Volume	create_ucose	On	◆ Disk creation ◆ Disk connection
Volume	convert_ucose	On	◆ Disk creation ◆ Disk connection
Volume	nosnapdir	Off	◆ Disk creation ◆ Disk connection
Volume	Snapshot copy schedule	Off	◆ Disk creation ◆ Disk connection

SnapDrive-specific limitations

SnapDrive has the following limitations:

- ◆ SnapDrive supports LUNs on qtrees, but you cannot manage quotas from SnapDrive.
LUNs can be created within a qtree and quota limits for that qtree will be enforced; therefore, you will not be able to create a LUN or expand an existing LUN beyond the quota limit set for that qtree.
- ◆ SnapDrive supports the use of SnapMirror to replicate volumes, but it does not support the use of SnapMirror to replicate individual qtrees.
- ◆ SnapDrive does not support the use of LUN cloning.

Recommendations

Heed the following recommendations whenever you use SnapDrive:

- ◆ Use SnapDrive to create and manage all the LUNs on your storage system.

- ◆ *Never* disable the space reservation setting for any LUN managed by SnapDrive.
- ◆ If you want to dedicate all free space on a volume to LUNs, *do* set the snap reserve setting on the storage system to 0 percent. In this case, Snapshot copy creation is not guaranteed.
- ◆ Place all LUNs connected to the same host on a dedicated volume accessible by just that host.
- ◆ Unless you can be sure that name resolution publishes only the storage system interface you intend, configure each network interface by *IP address*, rather than by name.
- ◆ If you use Snapshot copies, you cannot use the entire space on a storage system volume to store your LUN.
The storage system volume hosting the LUN should be at least twice the combined size of all the LUNs on the volume.
- ◆ Do not create any LUNs in /vol/vol0. This is a storage system limitation.
This volume is used by Data ONTAP to administer the storage system and should not be used to contain any LUNs.

Preparing a volume for SnapDrive

You must perform the following tasks to create a volume that can hold the SnapDrive LUNs attached to a single host:

- ◆ Create a storage system volume.
- ◆ Create a qtree (only necessary if you plan to store LUNs at a qtree root, rather than at the dedicated volume root).
- ◆ Create a CIFS share to the root of the volume so that your host can access the volume or qtree holding the LUNs attached to that host. For more information, see “[Creating a storage system volume](#)” on page 41.

Note

The iSCSI and FCP licenses supplied with SnapDrive enable all the CIFS functionality necessary for using SnapDrive, including CIFS share creation. If you also want *full-featured, direct CIFS access* to a particular storage system, you must install a separate CIFS license on that storage system.

- ◆ Reset the snap reserve option to 0 percent on the volume holding all the LUNs attached to the host (optional, but highly recommended).

Note

You can use either the graphical user interface (GUI)-based FilerView utility or the command-line prompt on the storage system (through a Telnet session, for example) to create a volume dedicated to SnapDrive LUNs.

For more information about the following procedures, see the *Data ONTAP Block Access Management Guide*.

Guidelines for creating storage system volumes: When you create a storage system volume to hold LUNs, keep the following in mind:

- ◆ You can create multiple LUNs on a storage system volume.
- ◆ A LUN must reside at either the root of a volume (traditional or flexible) or the root of a qtree.

Note

Do not create LUNs on the vol0 volume.

Optimizing your storage system volumes: You can optimize your storage system volumes in the following ways:

- ◆ When multiple hosts share the same storage system, each host should have its own dedicated volume on that storage system to hold all the LUNs connected to that host.

For more information about this recommendation, see “[Reasons for creating Snapshot copies using SnapDrive](#)” on page 151.

- ◆ When multiple LUNs exist on a storage system volume, the dedicated volume on which the LUNs reside must contain the LUNs for just one host—and must *not* contain any other files or directories. Creating LUNs on different dedicated volumes is necessary to ensure that Snapshot copies are consistent and to avoid the possibility of busy Snapshot copies. To optimize Snapshot copy space usage, it is better to have fewer LUNs per volume, with one LUN per volume being the optimum configuration.

Creating a storage system volume

To create a volume on the storage system, complete the following steps.

Step	Action
1	Using your Web browser, open a FilerView session to the storage system on which you are creating the traditional or flexible volume. Example: Enter <code>http://accounting-filer2/na_admin/</code> in the Address field of your Web browser.
2	From the main FilerView menu, navigate to Volumes > Add.

Step	Action
3	Follow the instructions in the FilerView wizard to add either the traditional or flexible volume. See the FilerView Help and the <i>Storage Management Guide</i> for information about the fields.
4	Create a CIFS share to the root of the volume you created in Step 3 , making sure that no other shares exist for this volume. (See “ Creating a CIFS share ” on page 43.) Reset the snap reserve option for this dedicated LUN-storage volume to 0 percent. (See “” on page 43.)

You can also create a storage system volume by opening a Telnet session and issuing the `vol create vol_name` command at the storage system prompt. See the *Storage Management Guide* for details.

Creating a qtree: To create a qtree on the storage system to host multiple LUNs, complete the following steps.

Step	Action
1	Using your Web browser, open a FilerView session to the storage system on which you are creating the traditional or flexible volume. Example: Enter <code>http://accting-filer2/na_admin/</code> in the Address field of your Web browser.
2	From the main FilerView menu, navigate to Volumes > Qtrees > Add.
3	Complete the FilerView transaction to add the qtree. See the FilerView Help and the <i>Storage Management Guide</i> for information about the fields.

Note

You can create LUNs at the root of a qtree, but LUNs do not support the storage system’s qtree *quota* capability.

You can also create a qtree by opening a Telnet session and issuing the `qtree create path` command at the storage system prompt. See the *Storage Management Guide* for details.

Creating a CIFS share: To establish a CIFS share for a volume that will contain LUNs, complete the following steps.

Step	Action
1	Make sure CIFS is enabled and configured on the storage system. For SnapDrive to operate properly, the storage system's CIFS (NetBIOS) name must exactly match the storage system listed (UNIX host name). For more information about running CIFS setup, see your Data ONTAP <i>File Access Management Guide</i>.
2	From the main FilerView menu, navigate to CIFS > Shares > Add.
3	Complete the FilerView transaction to add the CIFS share. See the FilerView Help and the <i>Storage Management Guide</i> for information about the fields.

Configuring pass-through authentication for SnapDrive

This section explains pass-through authentication and how to configure it. Go to the following topics for more information:

- ◆ [“Reasons for configuring pass-through authentication”](#) on page 44
- ◆ [“Configuring pass-through authentication”](#) on page 44

Reasons for configuring pass-through authentication

You can use pass-through authentication between a Windows host and a storage system. You might want to use pass-through authentication for any of the following reasons:

- ◆ You do not have a domain controller available.
- ◆ You want to install your Windows host as a stand-alone server in a workgroup environment without any dependency on another system for authentication, even if there is a domain controller available.
- ◆ Your Windows host and the storage system are in two different domains.
- ◆ Your Windows host is in a domain and you want to keep the storage system in a workgroup with no direct access by domain users or domain controller.

Related topics:

- ◆ [“Preparing hosts”](#) on page 33
- ◆ [“Preparing storage systems”](#) on page 37

Configuring pass-through authentication

To configure pass-through authentication between a Windows host and a storage system for SnapDrive, complete the following steps.

Note

You must have root privileges on the storage system and administrator privileges on the Windows hosts to perform the following operations.

Prerequisite: If your Windows host has existing LUNs on a storage system in a domain, disconnect them before setting up your host to work with a storage system in a workgroup; otherwise, the LUNs in the domain will not show up under SnapDrive in MMC, and SnapDrive might hang. This is because your host can connect only to LUNs on storage systems in a workgroup or to LUNs on storage systems in a domain, but not both.

Step	Action
On the storage system	
1	Enter the following command to create a user account: <pre>useradmin user add <i>user_name</i> -g <i>group</i></pre> <i>user_name</i> is the name of the SnapDrive user. -g is the option you use to specify a user group. <i>group</i> is the name of the group to which you want to add the new user. Example: The following example will add a user called snapdrive to the BUILTIN\Administrators group on the storage system. <pre>useradmin user add snapdrive -g Administrators</pre> Note_____ You will need to provide this user name in a later step in this procedure. Therefore, make a note of the user name, including the letter case—lowercase or uppercase—of each character in the user name. _____
2	Enter a password, when prompted to do so, for the user account you are creating. You are prompted to enter the password twice. Note_____ You will need to provide this exact password in a later step in this procedure. Therefore, make a note of the password, including the letter case. _____

Step	Action
3	Check to ensure that the user account you just created belongs to the local administrator's group on the storage system by entering the following command: <pre>useradmin user list</pre> For information about how to assign a user account to a specific storage system group, see “Types of access to establish” on page 47. For additional information, see the section about creating local groups on the storage system in the <i>Data ONTAP File Access Management Guide</i>.
4	Create a CIFS share on the storage system, as described in “ Creating a CIFS share ” on page 43.
On each Windows host that needs access to the storage system	
5	Create a local user account, using the same user name and password that you specified in Step 1 and Step 2. Tip: Set up the local user account so that the password for the account never expires. For detailed instructions on how to create local user accounts, see your Windows documentation.
6	Log in to each Windows host as the local user you created in Step 5 and install SnapDrive by following the procedure described in “Installing SnapDrive for the first time” on page 62. Note _____ If you are configuring pass-through authentication for Windows hosts that are clustered, you must use a domain account to run the cluster service. All nodes of the cluster must be in the same domain; however, the storage system can be in a different domain or workgroup. _____

Preparing the SnapDrive service account

Requirements for creating the SnapDrive service account

Before installing SnapDrive, you must establish a SnapDrive service account and add it to the Administrators group. The service account must be created using US-ASCII characters only, even when you use non-ASCII operating systems. You must log in to this account from the Administrators group whenever you need to perform SnapDrive-related functions on either a host or a storage system. See [“Types of access to establish”](#) for more information.

Related topics:

- ◆ [“Preparing hosts”](#) on page 33
- ◆ [“Preparing storage systems”](#) on page 37

Types of access to establish

You must establish the following types of access for the SnapDrive service account:

- ◆ You must be able to log in to the host using the service account.
If at any time you change the password for this account (for example, from the Windows login panel), remember that you must make the same change to the password the SnapDrive service uses to log in. You can do this from the Start Menu: choose Settings > Control Panel > Administrative Tools > Services > SnapDrive > Log On.
- ◆ The service account must have administrator privileges on both the storage system and host.
- ◆ If you do not have pass-through authentication configured, the service account must be a domain account.
- ◆ If you do not have pass-through authentication configured, the host and storage system must belong to the same domain as the service account, or they must belong to domains that have direct or indirect trust relationships with the domain to which the service account belongs.
- ◆ The service account must belong to the BUILTIN\Administrators group on the storage system.

You can accomplish this in several ways, including connecting a Remote Administration session to the storage system from the host. For instance, right-click the Local Machine icon in the Computer Management window, select Connect to Another Computer from the drop-down menu, and then select the storage system from the list of machines.

Next, add the service account to the Administrators group. (One way to do this is by clicking My Computer, right-clicking Manage on the drop-down menu, then navigating to System Tools > Local Users and Groups > Groups > Administrators.)

- ◆ The host must have access to the storage system volumes on which you plan to store LUNs.

You enable such access by creating a CIFS share on the storage system for each volume you want the host to access. This can be done only after you create the volumes or qtrees. For more information about this procedure, see [“Creating a CIFS share”](#) on page 43.

SnapDrive user interfaces

The following list covers the different interfaces you can use to execute the various SnapDrive or SnapDrive-related commands:

- ◆ *FilerView* refers to the Web-based management utility on storage systems running Data ONTAP.
- ◆ *Storage system console* refers to the command-line prompt of a console attached directly to the storage system.
- ◆ *Telnet session* refers to the command-line prompt of a Telnet session connected to the storage system.
- ◆ *Host console* refers to a console attached directly to the host. It displays console session 0, which receives all SnapDrive error messages and notifications. (A Terminal Service session does not receive these messages.)

Note

When you create or manage LUNs using the host console, Remote Administration option, or the multihost management feature in SnapDrive, you can choose between the following SnapDrive user interfaces:

- ◆ The GUI interface of the SnapDrive plug-in
 - ◆ `sdcli.exe` commands in the Windows command-line environment
-
- ◆ *Remote administration* refers to a connection initiated by selecting Action > “Connect to another computer” in the Computer Management Console of a Windows computer on the same network as the SnapDrive host. This type of session enables you to manage the host as if you were using a console directly attached to the host.

Note

Do not use the Terminal Service if you can avoid it. Use the system console or a Remote Administration session instead.

SnapDrive user interface capabilities

Not all user interfaces are appropriate for all SnapDrive-related operations. The following table lists some of the methods appropriate for performing some common SnapDrive-related operations.

SnapDrive-related operation	Recommended interfaces
Creating a CIFS share	◆ FilerView ◆ Storage system console ◆ Telnet session to the storage system ◆ Remote Management session to the storage system
Creating and managing volumes and qtrees	◆ FilerView ◆ Storage system console ◆ Telnet session to the storage system
SnapDrive-related SnapMirror and SnapVault operations	◆ FilerView ◆ Storage system console ◆ Telnet session to the storage system Note _____ Use these interfaces to set up and initialize SnapMirror and SnapVault. These features must already be configured for SnapDrive to use them.
Creating and managing LUNs	◆ Host console ◆ Remote Management session to the host

The following topics explain the procedures you must follow to install or upgrade to SnapDrive 5.0, or to uninstall any version of SnapDrive.

Use one of the following procedures, depending on what is currently installed on your system:

- ◆ If an earlier version of SnapDrive is currently installed, follow the instructions in the section [“Upgrading to SnapDrive 5.0”](#) on page 52.
- ◆ If no version of SnapDrive is installed, follow the instructions in the section [“Installing SnapDrive for the first time”](#) on page 62.
- ◆ If you want to uninstall SnapDrive, follow the instructions in the section [“Uninstalling SnapDrive”](#) on page 78.

Go to the following topics for more information about upgrading, installing and uninstalling SnapDrive:

- ◆ [“Upgrading the storage system”](#) on page 53
- ◆ [“Upgrading a server cluster to SnapDrive 5.0”](#) on page 54
- ◆ [“Upgrading a single system to SnapDrive 5.0”](#) on page 58
- ◆ [“SnapDrive and MPIO compatibility issues”](#) on page 61
- ◆ [“Installing the FCP or iSCSI components”](#) on page 63
- ◆ [“Installing the SnapDrive components”](#) on page 68

Upgrading to SnapDrive 5.0

When to use this section: Use this section if a previous version of SnapDrive is installed on your system.

If you are using MPIO with a previous version of SnapDrive: MPIO is not part of the SnapDrive 5.0 installation package, and versions of MPIO that were installed with versions of SnapDrive prior to 4.2 are not recognized by SnapDrive 5.0. For continued path management support with SnapDrive 5.0, you must upgrade to Data ONTAP DSM for Windows MPIO *before* upgrading to SnapDrive 5.0. You can download Data ONTAP DSM for Windows MPIO from the NOW site.

Which procedure to follow: How you upgrade to SnapDrive 5.0 depends on the components of SnapDrive you are currently using and on your Windows configuration.

To upgrade...	Follow procedures under...
A Microsoft Windows server cluster	“Upgrading a server cluster to SnapDrive 5.0” on page 54
A single system	“Upgrading a single system to SnapDrive 5.0” on page 58
A system with a version of MPIO earlier than Data ONTAP DSM for Windows MPIO	“SnapDrive and MPIO compatibility issues” on page 61

Upgrading the storage system

Note

If a storage system upgrade is necessary, upgrade the storage system before installing SnapDrive. For more information, see “[Preparing storage systems](#)” on page 37.

SnapDrive 5.0 requires at least Data ONTAP 7.0.5 on the storage system. For a list of the latest compatible software for SnapDrive 5.0, see the SnapDrive Compatibility Matrix at:

http://now.netapp.com/NOW/knowledge/docs/olio/guides/snapmanager_snapdrive_compatibility/

To upgrade the storage system, complete the following steps.

Step	Action
1	Upgrade the storage system to at least Data ONTAP 7.0.5. See the <i>Data ONTAP Upgrade Guide</i> for details.
2	When the storage system upgrade is complete, install SnapDrive on your Windows system. In a server cluster, install SnapDrive on each node in the cluster.

Upgrading a server cluster to SnapDrive 5.0

Use this section only if your Microsoft Server cluster is currently running SnapDrive 3.x, 4.0, or 4.1.

Upgrade process

Follow this process to upgrade a server cluster.

Stage	Process
1	Plan and announce downtime. Pick a time for the upgrade when loss of access will have the least effect on your users. You will need to restart the cluster nodes if the cluster needs to be upgraded to the Service Pack and hotfix level required by SnapDrive 5.0 (see “Selecting a SnapDrive configuration” on page 21).
2	When the time you have set arrives, make sure nobody are using the system and no SnapDrive operations are running.
3	Check that the cluster is functioning properly. Make sure that the Cluster Groups are online and that you can perform a “move group” operation back and forth between nodes. Note If the cluster service is not running, SnapDrive will be unable to collect data necessary for disk enumeration and will cause warning messages to be logged in the Event Viewer.
4	Prepare your cluster for the upgrade. See “Preparing for the upgrade” on page 56.
5	If necessary, upgrade Data ONTAP on the storage system. If an upgrade is necessary, you will have to reboot storage system. See “Upgrading the storage system” on page 53.

Stage	Process
6	If you are running the DataFabric® Manager Host Agent, stop the DataFabric Manager Host Agent service. Note You might have to upgrade your DataFabric Manager Host Agent, depending on the version you are running. See the <i>SnapDrive 5.0 for Windows Release Notes</i> for more information.
7	Ensure that MMC is closed.
8	Install the components you need for FCP or iSCSI (see “Selecting a SnapDrive configuration” on page 21 for supported configurations). Choose one of the following options. ◆ If you will be creating and managing LUNs using the iSCSI Software Initiator, download and install the Microsoft iSCSI Software Initiator on both nodes: ❖ For download instructions, see Microsoft download site. ❖ For detailed installation instructions, see “Installing the iSCSI Software Initiator” on page 64. ◆ If you will be creating and managing LUNs using the iSCSI protocol and HBA, install or upgrade the iSCSI components on both nodes. See the <i>iSCSI Windows Host Utilities for Native OS Setup Guide</i>. This document is on the NOW site (http://now.netapp.com/). ◆ If you will be creating and managing LUNs using FCP, install or upgrade the FCP components on both nodes. See the <i>FCP Windows Host Utilities for Native OS Setup Guide</i>. This document is on the NOW site (http://now.netapp.com/). For a list of the latest compatible software for SnapDrive 5.0, see the SnapDrive Compatibility List at http://now.netapp.com/NOW/knowledge/docs/olio/guides/snapmanager_snapdrive_compatibility/.

Stage	Process
9	Install SnapDrive 5.0 on all nodes, starting with the nodes that do not own the cluster resources and rotating which system is the owner until all nodes in the cluster have SnapDrive installed. See “Installing the SnapDrive components” on page 68. Note _____ If you try to use MMC or <code>sdcli.exe</code> after upgrading SnapDrive on the first node and before upgrading SnapDrive on the other nodes, you will get an error message indicating that the SnapDrive service is unavailable due to an invalid tag. This message occurs because two versions of SnapDrive are temporarily present on the same cluster. No corrective action is needed; just upgrade SnapDrive on the other node.
10	If you installed MPIO with a version of SnapDrive earlier than 4.2, download and install the Data ONTAP DSM for Windows MPIO. MPIO is not installed with SnapDrive 5.0 and path management will not be available until a new version of MPIO is installed.
11	Back up your application data. If you have SnapManager, use SnapManager rather than SnapDrive to create the backup.
12	If you use SnapManager, stop SnapManager before upgrading SnapDrive.

Preparing for the upgrade

To prepare for the upgrade, complete the following steps.

Step	Action
1	If you have SnapManager, make sure that you have a valid and up-to-date SnapManager backup and that no SnapManager backups are scheduled to occur while you are upgrading. If there are backups scheduled, cancel them.

Step	Action
2	If necessary, upgrade the operating systems on the cluster nodes to the required service pack and hotfix level. See “Preparing hosts” on page 33. If you need to apply a new Service Pack or hotfix, you will have to reboot the cluster.
3	Create a full backup, including system state, and create an emergency repair disk for each node before upgrading to SnapDrive 5.0.
4	If you use SnapManager, stop SnapManager before upgrading SnapDrive.

Upgrading a single system to SnapDrive 5.0

Use this section only if you are currently running SnapDrive 3.x, 4.0, or 4.1.

Upgrade process

Follow this process to upgrade a single system to SnapDrive 5.0.

Stage	Process
1	Create a full backup, including system state, and create an Emergency Repair Disk.
2	Install the required version of the iSCSI Software Initiator, iSCSI HBA driver, or FCP HBA driver. See “Installing the FCP or iSCSI components” on page 63.
3	If necessary, upgrade Data ONTAP on the storage system. If an upgrade is necessary, you will have to reboot the storage system and return to Step 8 . See “Upgrading the storage system” on page 53.
4	If you are running the DataFabric® Manager Host Agent, stop the DataFabric Manager Host Agent service. Note _____ You might have to upgrade your DataFabric Manager Host Agent depending on the version you are running. See the <i>SnapDrive 5.0 for Windows Release Notes</i> for more information. _____
5	Ensure that MMC is closed.

Stage	Process
6	Install the components you need for FCP or iSCSI (see “Selecting a SnapDrive configuration” on page 21 for supported configurations). Choose one of the following options: ◆ If you will be creating and managing LUNs using the iSCSI Software Initiator, download and install the Microsoft iSCSI Software Initiator on both nodes: ❖ For download instructions, see Microsoft download site. ❖ For detailed installation instructions, see “Installing the iSCSI Software Initiator” on page 64. ◆ If you will be creating and managing LUNs using the iSCSI protocol and HBA, install or upgrade the iSCSI components on both nodes. See the <i>iSCSI Windows Host Utilities for Native OS Setup Guide</i>. This document is on the NOW site (http://now.netapp.com/). ◆ If you will be creating and managing LUNs using the FCP protocol, install or upgrade the FCP components on both nodes. See the <i>FCP Windows Host Utilities for Native OS Setup Guide</i>. This document is on the NOW site (http://now.netapp.com/). For a list of the latest compatible software for SnapDrive 5.0, see the SnapDrive Compatibility List at http://now.netapp.com/NOW/knowledge/docs/olio/guides/snapmanager_snapdrive_compatibility/.
7	If you use SnapManager, stop SnapManager before upgrading SnapDrive.
8	Install SnapDrive 5.0. See “Installing the SnapDrive components” on page 68.
9	If you installed MPIO with a version of SnapDrive earlier than 4.2, download and install the Data ONTAP DSM for Windows MPIO. MPIO is not installed with SnapDrive 5.0 and path management will not be available until a new version of MPIO is installed.

Stage	Process
10	Back up your application data. If you have SnapManager, use SnapManager rather than SnapDrive to create the backup.

SnapDrive and MPIO compatibility issues

If you are upgrading *both* MPIO and SnapDrive: Data ONTAP DSM for Windows MPIO is not compatible with SnapDrive versions earlier than 4.2. If you are using SnapDrive 4.1 or earlier with MPIO (ntapdsm.sys), and you want to upgrade *both*, you must uninstall the earlier version of SnapDrive *without uninstalling the earlier MPIO drivers*.

The following procedure enables you to continue providing multipath support during this type of upgrade.

Note

If you have SnapDrive 4.1 or earlier installed with MPIO and you attempt to upgrade to SnapDrive 5.0 without first uninstalling the earlier SnapDrive version, the installation will fail.

To upgrade both to SnapDrive 5.0 and to Data ONTAP DSM for Windows MPIO, complete the following steps.

Step	Action
1	Uninstall SnapDrive 4.1 or earlier using the Add/Remove Programs utility in the Windows Control Panel. This method uninstalls SnapDrive without removing the legacy MPIO drivers.
2	Install Data ONTAP DSM for Windows MPIO. For more information and to download the installation package, go to http://now.netapp.com/NOW/cgi-bin/software/ . Results: You are prompted to reboot twice.
3	Install SnapDrive 5.0. See “ Installing the SnapDrive components ” on page 68.

Installing SnapDrive for the first time

Use this section to install SnapDrive 5.0 if you have no previous version of SnapDrive or MPIIO.

Installation process Follow this process to install SnapDrive 5.0 for the first time.

Stage	Process
1	If necessary, upgrade Data ONTAP on your storage system. See “ Preparing storage systems ” on page 37.
2	Install the required version of the iSCSI Software Initiator, iSCSI HBA, or FCP components. See “ Installing the FCP or iSCSI components ” on page 63.
3	Install SnapDrive 5.0. See “Installing the SnapDrive components” on page 68. In a server cluster, install SnapDrive on all nodes, beginning with the nodes that do not own the SnapDrive resources. Perform a “move group” operation to move the resources to another node in the cluster before installing SnapDrive on the last node.

Installing the FCP or iSCSI components

Supported protocols: SnapDrive 5.0 supports two protocols for creating and managing LUNs: iSCSI and FCP.

Note

Both FCP and iSCSI protocols are supported on the same host; however, FCP and iSCSI connections from the same host to the same LUN are not supported.

What you need to do: Before you install SnapDrive 5.0, you need to do one of the following.

If...	Then...
You will be using the iSCSI protocol and software initiator to create and manage LUNs	Install the Microsoft iSCSI Software Initiator. See “ Installing the iSCSI Software Initiator ” on page 64.
You are currently using the iSCSI protocol and hardware initiator to create and manage LUNs and will continue to use it	Upgrade the iSCSI driver and firmware. For a list of supported iSCSI initiators, see the iSCSI Solutions on the NOW site at http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/iscsi_support_matrix.shtml/ .
You will be using the iSCSI protocol and hardware initiator to create and manage LUNs and have not previously used it	Install the iSCSI host bus adapter, driver, and firmware. For a list of supported iSCSI initiators, see the iSCSI Solutions on the NOW site at http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/iscsi_support_matrix.shtml/ .

If...	Then...
You are currently using the FCP protocol to create and manage LUNs and will continue to use it	Upgrade the FCP driver and firmware. See the <i>FCP Windows Host Utilities for Native OS Setup Guide</i>. This document is on the NOW site (http://now.netapp.com/). Note _____ The FCP upgrade stops the SnapDrive service. SnapDrive restarts when the system is rebooted. If you proceed without a reboot, restart the SnapDrive service manually. _____
You will be using the FCP protocol to create and manage LUNs and have not previously used it	Install the FCP host bus adapter, driver, and firmware. See the <i>FCP Windows Host Utilities for Native OS Setup Guide</i>. This document is on the NOW site (http://now.netapp.com/).
For a list of the latest compatible software for SnapDrive 5.0, see the SnapDrive Compatibility List at: http://now.netapp.com/NOW/knowledge/docs/olio/guides/snapmanager_snapdrive_compatibility/	

Installing the iSCSI Software Initiator

To install the Microsoft iSCSI Software Initiator, complete the following steps.

Step	Action
1	Download the Microsoft iSCSI Software Initiator from the Microsoft site.
2	Click the Microsoft iSCSI Initiator Installer Package icon.

Step	Action
3	In the iSCSI Installation Options screen: If you are going to use the iSCSI Initiator to create and manage LUNs, make sure that the check boxes are selected for the Initiator Service and the Software Initiator. Note The Virtual Port Driver option is unavailable because it is automatically installed during the Microsoft iSCSI Initiator installation and upgrade. If you are using VMware Guest OS, clear the check box for the Microsoft MPIO Multipathing Support for iSCSI. MPIO is not supported by VMware Guest OS. Otherwise, if you require MPIO on iSCSI, leave the box checked.
4	Follow the directions in the installer wizard to install the Microsoft iSCSI Initiator. For more information about installing and configuring the Microsoft iSCSI Initiator, see <i>iSCSI Microsoft Windows Initiator Support Kit Setup Guide</i>. This document is on the NOW site (http://now.netapp.com/).

Upgrading the iSCSI Software Initiator

Choose one of the following procedures to upgrade your Microsoft iSCSI Software Initiator depending on whether you are using a stand-alone host or a Windows cluster.

Upgrading a single, nonclustered Windows host: To upgrade the Microsoft iSCSI Software Initiator on a stand-alone Windows host, complete the following steps.

Step	Action
1	Stop the SnapDrive service. See “ Stopping and starting the SnapDrive service ” on page 76.

Step	Action
2	If you are running SnapManager for Exchange, stop the application-specific services (for example, Microsoft Exchange System Attendant), which have iSCSI dependencies. Note————— You can also remove iSCSI dependencies using SnapManager for Exchange Configuration Wizard; however, this option is not recommended and should only be used if you are unable to stop the application-specific services.
3	Install the new iSCSI software initiator. For more information, see “Installing the iSCSI Software Initiator” on page 64.
4	From MMC, click Services and Applications > Services and restart the SnapDrive service.

Upgrading the iSCSI Software Initiator on clustered Windows

hosts: To upgrade the Microsoft iSCSI Software Initiator on a Windows cluster, complete the following steps.

Step	Action
1	Stop the SnapDrive service. See “Stopping and starting the SnapDrive service” on page 76.
2	If you are running SnapManager for Exchange, stop the application-specific services (for example, Microsoft Exchange System Attendant), which have iSCSI dependencies. Note————— You can also remove iSCSI dependencies using SnapManager for Exchange Configuration Wizard; however, this option is not recommended and should only be used if you are unable to stop the application-specific services.
3	Close MMC.

4	Install the new iSCSI software package on all nodes, starting with the nodes that do not own the cluster resources and rotating which system is the owner until all nodes in the cluster have the new iSCSI initiator installed. For more information, see “ Installing the iSCSI Software Initiator ” on page 64.
5	From MMC, click Services and Applications > Services and restart the SnapDrive service on each node in the cluster.

Installing the SnapDrive components

Prerequisites

The following prerequisites must be met in order to successfully install the new SnapDrive components:

- ◆ Perform this procedure from the system console, not from a Terminal Service client.
- ◆ In a cluster, install SnapDrive 5.0 on all nodes, one at a time. If you are upgrading SnapDrive in a cluster, start with the nodes that do not own the SnapDrive resources and perform a “move group” operation on the node that owns the resources before upgrading that node.

To install the new SnapDrive components, complete the following steps.

Note

If you are upgrading or installing SnapDrive to support a SnapManager installation, see “[Installing SnapDrive on SnapManager verification servers](#)” on page 77.

Step	Action
1	Make sure that you have installed the required FCP or iSCSI components. See “ Installing the FCP or iSCSI components ” on page 63.
2	If you are running the DataFabric Manager Host Agent, stop the DataFabric Manager Host Agent service.
3	If a version of SnapDrive is already installed on your system, stop the SnapDrive service, if you have not already done so, and close the Microsoft Management Console (MMC) window. See “Stopping and starting the SnapDrive service” on page 76. Attention _____ If you are currently running SnapDrive 4.1 or earlier with MPIO (ntapdsm.sys), and you want to upgrade both to Data ONTAP DSM for Windows MPIO <i>and</i> to SnapDrive 5.0, you must first uninstall the earlier version of SnapDrive. For more information, see “SnapDrive and MPIO compatibility issues” on page 61.

Step	Action	
4	Browse to the location of the SnapDrive installation package and double-click SnapDrive5.0.exe.	
5	Click Next on the “Welcome to the InstallShield Wizard for SnapDrive” screen.	
6	If this is a new SnapDrive installation, read and accept the license agreement, and then click Next.	
7	If you are upgrading SnapDrive, the Program Maintenance panel appears. Click Modify/Upgrade, and then click Next.	
8	The SnapDrive license panel is displayed. If you are upgrading SnapDrive, the license information will be displayed. If this is a first time installation, enter your license key in the space provided. Click Next.	
9	If you are using the iSCSI Software Initiator or iSCSI HBAs and...	Then...
	The Installed Version shown on the Microsoft iSCSI screen is the same as, or later than, the Minimum Required Version	Click Next and proceed to the next step.
	The Installed Version is earlier than the Minimum Required Version	Update the driver (see “ Installing the FCP or iSCSI components ” on page 63), and then restart the SnapDrive InstallShield Wizard.
10	If...	Then...
	You are upgrading from SnapDrive 3.x or later	Skip to Step 16 .
	This is a new SnapDrive installation	Continue with the next step.
11	In the Customer Information panel, type your user name and organization name, and then click Next.	

Step	Action	
12	The Destination Folder panel prompts you for a directory in which to install SnapDrive on the host. By default, this is C:\Program Files\NetApp\SnapDrive\ for new installations. To accept the default, click Next and then proceed to Step 13. To specify a different location, click the Change button. In the Change Current Destination Folder panel, either type the path to the target directory in the Folder Name text box, or navigate to the folder you prefer and select it. When the correct target location appears in the Folder Name text box, click OK to return to the Destination Folder panel, and then click Next. Note _____ If you are upgrading SnapDrive from a version earlier than 4.1, the default installation directory is C:\Program Files\SnapDrive\. _____	
13	On the SnapDrive Service Credentials screen, click Add. Result: The Select User window is displayed.	
14	If you are installing or upgrading SnapDrive for use with a storage system in...	Then in the “From this location” field...
	A domain	Verify that the location is set to the proper domain.
	A workgroup	Click the Locations button and select the local host.

Step	Action
15	In the “Enter the object name to select” text box, type the user name with administrator privileges that you want to use; then click the Check Names button to verify the user you entered. Click OK. Note_____ User names are currently limited to no more than 19 characters. _____ Note_____ If you are installing SnapDrive for use with a storage system in a workgroup, enter the name of the user that you configured in “Configuring pass-through authentication” on page 44. _____
16	Type the account password in both the Password and Confirm Password text boxes; then click Next.
17	On the “Ready to” panel, click Install. Result: The Installing SnapDrive screen appears, informing you that installation might take several minutes to complete. Note_____ If you are running SnapDrive 3.0 and you previously installed NetApp VSS Hardware Provider 1.0, a message informs you that the previous installation will be removed from your system. During the SnapDrive 5.0 installation, an updated NetApp VSS hardware provider will be installed. _____

Step	Action
18	When the InstallShield Wizard Complete screen appears, click Finish. SnapDrive is successfully installed on your host. Note _____ If you are upgrading a server cluster and you try to use MMC after upgrading SnapDrive on the first node and before upgrading SnapDrive on the second node, you get an error message indicating that the SnapDrive service is unavailable owing to an invalid tag. This message is the result of the temporary presence of two versions of SnapDrive on the same cluster. No corrective action is needed; just upgrade SnapDrive on the other node.

Performing unattended SnapDrive installations

To simplify installations when you have multiple systems, you can create batch scripts to perform an unattended install or uninstall of SnapDrive.

To perform an unattended SnapDrive installation, complete the following steps.

Step	Action
1	Copy the SnapDrive executable to your Windows host.
2	Create a batch file (a file with a .bat extension) containing the appropriate switch combinations for your unattended install. See “Examples of unattended install command syntax” on page 75 to view some of the available syntax options. Note _____ SnapDrive 5.0 does not support unattended upgrade or removal of SnapDrive versions earlier than 4.0, nor does it support unattended upgrade of earlier MPIO (ntapdsm.sys) versions to Data ONTAP DSM for Windows MPIO. To uninstall versions of SnapDrive earlier than 4.2, use Add/Remove Programs in the Windows Control Panel. To upgrade MPIO, see “SnapDrive and MPIO compatibility issues” on page 61.

Unattended install switch descriptions

The following table contains the switches you can use when performing an unattended install and a description of each switch.

Switch	Description
<code>/s /v</code>	Invokes SnapDrive installation in unattended or silent mode.
<code>"/qn"</code>	Enables you to pass arguments and other SnapDrive installation-specific switches and parameters.
<code>SILENT_MODE=1</code>	Enables SnapDrive to properly execute the unattended install feature. This switch is required for first-time installs, upgrades, and complete uninstalls.
<code>LPSM_SERIALNUMBER=</code>	Specifies that a valid LUN Provisioning and Snapshot Management license be entered.
<code>INSTALLDIR=target installation directory</code>	Specifies the target installation directory to which SnapDrive will be installed. This switch is only required when installing SnapDrive for the first time
<code>SVCUSERNAME=DOMAIN\USERNAME</code>	Specifies the domain and username that SnapDrive will use during the unattended install.
<code>SVCUSERPASSWORD=PASSWORD</code>	Specifies the password that will be used by SnapDrive.
<code>SVCCONFIRMUSEROPASSWORD=PASSWORD</code>	Specifies the confirmation password for the user being used for the unattended install.

Switch	Description
REINSTALLMODE=vomus	Specifies the type of reinstall mode to be used: v indicates that the installation should be run from the source package and to cache the local package. Note Do not use the v option for first time installations of SnapDrive. o reinstalls SnapDrive if an older version is present or if SnapDrive files are missing. m indicates that all SnapDrive required registry entries FROM HKEY_LOCAL_MACHINE and HKEY_CLASSES_ROOT should be rewritten. u indicates that all SnapDrive required registry entries from HKEY_CURRENT_USER and HKEY_USERS should be rewritten. s reinstalls all shortcuts and re-caches all icons, overwriting any existing shortcuts and icons.
REINSTALL=ALL	Reinstalls all SnapDrive features.
/x	Removes SnapDrive 5.0 from your system. Note SnapDrive 5.0 does not support unattended removal of SnapDrive versions earlier than 4.2. See the Note in Step 2, “Performing unattended SnapDrive installations” on page 72 for more information.
/Li	Specifies that a SnapDrive installation log should be generated.
IGNORE_COMPMGMT_RUNNING=0	Specifies that the SnapDrive installation will abort if MMC is open and a message is displayed indicating that MMC must be closed.

Switch	Description
IGNORE_COMPMGMT_RUNNING=1	Specifies that the SnapDrive installation will proceed even if MMC is open. If no switch is specified, the SnapDrive installation will abort if MMC is open and a message is displayed indicating that MMC must be closed.
CUSTOMHELP=1	Displays usage information for all unattended install switches.
Note _____ In the event that you incorrectly enter any of the unattended install command switches, a pop-up dialog box appears displaying the correct switch combination or command usage.	

Examples of unattended install command syntax

The following are examples of the common syntax variations of the unattended install command.

Command syntax for complete first time SnapDrive installation:

```
snapdrive5.0.exe /s /v"/qn SILENT_MODE=1 /Li SDInstall.log
LPSM_SERIALNUMBER=serialnumber INSTALLDIR="c:\Program Files\
NetApp\SnapDrive\" SVCUSERNAME=domain\username
SVCUSERPASSWORD=password SVCCONFIRMUSERPASSWORD=password"
```

Command syntax for a complete SnapDrive upgrade (x86 SnapDrive installation) — major upgrade from SnapDrive 4.2.1 and earlier:

```
snapdrive5.0.exe /s /v"/qn SILENT_MODE=1 /Li SDInstall.log
LPSM_SERIALNUMBER=serialnumber SVCUSERNAME=domain\username
SVCUSERPASSWORD=password SVCCONFIRMUSERPASSWORD=password"
```

Command syntax for complete SnapDrive upgrade (x64 and IA64 installations) — normal upgrade from SnapDrive 4.2.1 and earlier:

```
snapdrive5.0.exe /s /v"/qn REINSTALLMODE=vomus REINSTALL=ALL
SILENT_MODE=1 /Li SDInstall.log LPSM_SERIALNUMBER=serialnumber
SVCUSERNAME=domain\username SVCUSERPASSWORD=password
SVCCONFIRMUSERPASSWORD=password"
```

Command syntax for custom help:

```
snapdrive5.0.exe /s /v"/qn CUSTOMHELP=1"
```

For help when upgrading from versions of SnapDrive earlier than 4.0:

```
/s /v"/qn REINSTALLMODE=v CUSTOMHELP=1"
```

Setting a preferred IP address for storage system host-name resolution

You can configure SnapDrive to use a preferred IP address for storage systems having more than one IP address. Setting a preferred IP address enables SnapDrive to properly resolve a storage system host name.

To set the preferred IP address for a storage system in SnapDrive, complete the following steps.

Step	Action
1	Perform the following actions: a. Expand the Storage option in the left MMC panel, if it is not already expanded. b. Double-click SnapDrive, or SnapDrive List if you are managing multiple instances of SnapDrive, and double-click the name of the SnapDrive host on which you want to set the preferred storage system IP address. c. Select Disks. d. Right-click Disks and select Properties from the menu.
2	In the Disks Properties window, click the Preferred Storage System IP Addresses tab.
3	Enter the storage system name and preferred IP address for that storage system in the spaces provided. Note_____ If you are using an iSCSI HBA in your storage system, do not set the IP address of the target HBA as the preferred IP address. Instead, use the IP address of the storage system's management port. _____
4	Click Apply.
5	Repeat Step 3 and Step 4 for each storage system for which you want to set a preferred IP address.
6	Click OK.

Stopping and starting the SnapDrive service

When you upgrade SnapDrive or add new SnapDrive components, it is sometimes necessary to stop or restart the SnapDrive service.

To stop or start the SnapDrive service, complete the following steps.

Step	Action
1	In the left MMC pane, expand the Services and Applications option and select Services.
2	In the right MMC pane, scroll down the list of service and locate the SnapDrive service.
3	Double-click SnapDrive. Result: The SnapDrive Properties window is displayed.
4	Under Service status, click Stop or Start, then click OK to exit the SnapDrive Properties window.

Installing SnapDrive on SnapManager verification servers

If you are upgrading or installing SnapDrive to support a SnapManager installation, and you use verification servers, remember to install SnapDrive 5.0 on the verification servers as well as on the production systems. Both the verification server and the production servers must be using the same version of SnapDrive.

If a verification server will be connecting to LUNs over an iSCSI session, make sure you also install the Microsoft iSCSI Software Initiator on the verification server (see “[Installing the iSCSI Software Initiator](#)” on page 64) and establish a session from the verification server to the iSCSI target on the storage system where the database to be verified resides. This connection enables the verification server to connect to the Snapshot copy LUN that contains the database, and you must create it explicitly before the verification server attempts to connect to the LUN.

For instructions for establishing an iSCSI session, see “[Establishing an iSCSI session to a target](#)” on page 89.

Note

For this purpose, create only an iSCSI session; do not use the Create Disk wizard, which would create a new LUN as well.

Uninstalling SnapDrive

Perform the following steps if you need to uninstall SnapDrive.

Step	Action
1	Navigate to the folder containing the SnapDrive installation package from which you performed the original installation (or the CD directory).
2	Launch the SnapDrive executable (snapdrive5.0.exe, for example), which guides you through the uninstall procedure.

The topics that follow explain how to perform various SnapDrive management tasks. This chapter does not describe how to manage LUNs in SnapDrive. For more information on managing LUNs, see “[Managing LUNs](#)” on page 117.

- ◆ “[Administering SnapDrive remotely](#)” on page 80
- ◆ “[Managing initiators using SnapDrive](#)” on page 83
- ◆ “[Enabling SnapDrive notification](#)” on page 84

Administering SnapDrive remotely

Managing multiple remote instances of SnapDrive with the Add SnapDrive feature

You can manage multiple remote instances of SnapDrive from one MMC by using the Add SnapDrive feature in the SnapDrive MMC.

Requirements for using the Add SnapDrive feature: To add remote instances of SnapDrive to MMC, the remote Windows host must meet the following requirements:

- ◆ The host must exist.
- ◆ SnapDrive must be installed and the SnapDrive service must be running.
- ◆ The same version of SnapDrive that is installed on your local machine must be installed on your remote machine.
- ◆ The same SnapDrive platform that is installed on your local machine must be installed on your remote machine. For example, if your local machine has the x64 SnapDrive platform installed, the remote host must also have the x64 SnapDrive platform installed.
- ◆ The host name, not the IP address, must be specified when adding it to the local host's MMC.

Note

There is no requirement regarding the OS type that is running on either the local or remote hosts.

Adding remote SnapDrive instances using the Add SnapDrive feature: To add SnapDrive instances from remote hosts to the local SnapDrive MMC, complete the following steps.

Step	Action
1	Expand the Storage option in the left MMC pane, if it is not already expanded.
2	Select SnapDrive and then right-click to select Add SnapDrive from the menu.

Step	Action
3	In the Add SnapDrive window, type the name of the remote SnapDrive host you want to add. Note_____ In order for remote management to work properly, be sure to enter the host name, not the IP address, of the remote host. _____
4	Click OK. Result: SnapDrive changes to SnapDrive List under the Storage option in MMC, and the remote SnapDrive instance is listed beneath it with the name of the remote host in parentheses. In addition, the local host is represented in parentheses as “Local.” Note_____ SnapDrive saves the list of SnapDrive instances that have been added to MMC and loads the list whenever MMC is restarted. _____
5	To add additional remote SnapDrive instances, repeat Step 2 through Step 4. Note_____ SnapDrive does not limit the number of remote instances you can add to MMC SnapDrive List. _____

Deleting a remote SnapDrive instance: To delete a remote instance of SnapDrive, complete the following steps.

Step	Action
1	Expand the Storage option in the left MMC pane, if it is not already expanded.
2	Expand the SnapDrive List option.
3	Select the remote instance of SnapDrive that you want to delete and then right-click to select Delete SnapDrive from the menu.

Step	Action
4	Click OK. Result: The remote SnapDrive instance is removed from MMC on the local machine. If all remote SnapDrive instances are deleted, SnapDrive List reverts to SnapDrive under the Storage option in MMC.

Remote administration using the “Connect to another computer” feature

You can also use the “Connect to another computer” feature to administer SnapDrive on remote Windows hosts.

Remote administration requirements: To run remote administration of SnapDrive, the remote Windows administration host machine must meet the same software requirements as the production host machine, except that you do not need to install the LUN drivers. This entails the following specific requirements:

- ◆ The same version of SnapDrive that is installed on your production machine must be installed on your remote machine.
- ◆ When prompted during installation for the account used to access the storage system, you must specify the same account used for access from the production host machine.

Running remote administration: To run remote administration, complete the following steps *from the remote administration machine* (not from the production host machine).

Step	Action
1	Select Computer Management, click Action from the menu choices on top of MMC, and then select Connect to Another Computer. Result: The Select Computer panel is displayed.
2	In the Select Computer panel, browse to or select the host production machine you want to administer remotely. Result: The MMC window of the host machine appears on your remote machine, enabling you to manage SnapDrive remotely.

Managing initiators using SnapDrive

When you create a LUN using SnapDrive, SnapDrive adds a new igroup, or uses existing igroups if they follow SnapDrive naming standards, for each initiator (one igroup per initiator) and maps the LUNs to these igroups. When MPIO is installed, SnapDrive enables you to manage initiators on a LUN by providing an option for you to add and remove initiators even when the initiator has been modified outside of SnapDrive.

For more information on MPIO, see the *Data ONTAP DSM for Windows MPIO Installation and Administration Guide*.

Adding and removing initiators

To add or remove initiators, complete the following steps.

Step	Action
1	Double-click SnapDrive in the left MMC pane, and then select Disks. Result: The currently connected disks are displayed in the right panel of MMC.
2	Select in the right pane the disk to which you want to add or remove initiators.
3	Click Action (from the menu choices on top of MMC), and then select Add/Remove Initiator. Result: The Initiators Management screen is displayed.
4	To add or remove initiators, follow the instructions in the Initiators Management screen. Note _____ If you remove an initiator that belongs to an igroup to which other initiators have been added, a dialog box informs you that all initiators will be removed. Click Yes to remove all initiators. If you try to remove an initiator that belongs to an igroup that contains initiators from another host, the operation will fail. SnapDrive does not support this configuration. _____
5	Click OK.

Enabling SnapDrive notification

SnapDrive enables you to set up e-mail notification and enable storage system AutoSupport in the event of a SnapDrive message or storage system error. When you set up notification, you can specify the following information:

- ◆ Whether and where to send e-mail notification
- ◆ What types of messages to report
- ◆ Whether to allow a subset of events to be posted to AutoSupport on the storage system

Note

To use storage system AutoSupport with SnapDrive Notification Settings, you must enable AutoSupport on the storage system. See your Data ONTAP documentation for information about how to enable AutoSupport.

Enabling SnapDrive notification: To enable e-mail notification for selected SnapDrive events, complete the following steps.

Step	Action
1	Select the appropriate SnapDrive instance, click Action from the menu choices on top of MMC, and then select Notification Settings. Result: The Notification Settings panel is displayed.
2	In the Notification Settings panel, perform the following actions: a. Select Send E-mail Notification. b. Type the outgoing SMTP server, and the From and the To addresses. c. Select one or more Event Types about which you want to be notified. d. Select the Event Category items about which you want to be notified when the specified event types take place. e. Select Use Storage System AutoSupport if you want to enable a subset of the Windows System Events for AutoSupport on the storage system. f. Click OK.

Step	Action
3	You can verify the e-mail output of the Event Notification feature by clicking Send a Test E-mail on the Notification Settings panel.

The topics that follow explain how to manage iSCSI sessions that you use to access LUNs on the targets (storage systems).

Go to any of the following topics for more information:

- ◆ [“Tasks for managing iSCSI sessions”](#) on page 88
- ◆ [“Establishing an iSCSI session to a target”](#) on page 89
- ◆ [“Disconnecting an iSCSI target from a Windows host”](#) on page 92
- ◆ [“Disconnecting a session to an iSCSI target”](#) on page 93
- ◆ [“Examining details of iSCSI sessions”](#) on page 95

Tasks for managing iSCSI sessions

Ways to establish iSCSI sessions: You can establish iSCSI sessions to targets on which your LUNs will exist in the following two ways:

- ◆ Establish iSCSI sessions prior to creating LUNs.
For detailed information, see “[Establishing an iSCSI session to a target](#)” on page 89.
- ◆ Establish iSCSI sessions during the creation of a LUN.
If an iSCSI session does not exist to a target on which you create a LUN, SnapDrive launches the Create iSCSI Session wizard and establishes the session.
For detailed information, see “[Establishing an iSCSI session to a target](#)” on page 89.

Other iSCSI management tasks: In addition to the preceding iSCSI management tasks, you can perform the following iSCSI-specific tasks:

- ◆ Disconnect an iSCSI target from the Windows host.
For detailed information, see “[Disconnecting an iSCSI target from a Windows host](#)” on page 92.
- ◆ Examine details about iSCSI sessions.
For detailed information, see “[Examining details of iSCSI sessions](#)” on page 95.

Establishing an iSCSI session to a target

You need to have an iSCSI session to a target on which you manage a LUN. You establish this session prior to creating a LUN.

Note If you do not establish an iSCSI session to a target prior to creating a LUN on it, SnapDrive prompts you for information it needs to establish the session during the course of LUN creation. After you supply the information, the iSCSI session is established during the LUN creation process. For detailed information, see [“Creating a LUN”](#) on page 99.

iSCSI software initiator node naming standards

When you install the Microsoft iSCSI Software Initiator, an applet is installed that enables you to rename the initiator node to something other than the standard iSCSI qualified name (IQN) or IEEE EUI-64 (EUI) formats. Data ONTAP, however, does not recognize non-standard initiator node names and will return an error when you attempt to create a LUN using a node name that does not use the IQN or EUI formats.

The following are the formats for standard initiator node names.

IQN-type node name uses the following format:

`iqn.yyyy-mm.reverse_domain_name:any`

For example:

`iqn.1991-05.com.microsoft:winclient1`

The EUI-type node name format consists of the “eui.” prefix, followed by 16 ASCII-encoded hexadecimal characters. For example:

`eui.02004567A425678D`

Establishing an iSCSI session to a target

To establish an iSCSI session to a target, complete the following steps.

Step	Action
1	Verify that the iSCSI service is started.

Step	Action
2	Perform the following actions to launch the Create iSCSI Session wizard: a. Expand the Storage option in the left MMC panel, if it is not expanded already. b. Double-click SnapDrive List and select the appropriate SnapDrive instance. c. Select iSCSI Management. d. Click Action (from the menu choices on top of MMC). e. Select Establish New Session from the drop-down menu.
3	In the Create iSCSI Session wizard, click Next. Result: The Provide Storage System Identification panel is displayed.
4	In the Provide Storage System Identification panel, enter the NetBIOS name or IP address of the target (storage system) you want to establish the iSCSI session with, and then click Next. Note— The IP address you enter is the storage system's management port IP address, <i>not</i> the target portal IP address to which SnapDrive will establish an iSCSI session. You will select the IP address for establishing an iSCSI session in Step 6. Result: The Provide iSCSI HBA panel is displayed.
5	In the upper pane of the Provide iSCSI HBA panel, click the radio button next to the iSCSI HBA you want to use.

Step	Action
6	In the lower pane of the Provide iSCSI HBA panel, perform the following actions: a. Select the target portal to which SnapDrive will establish the iSCSI session by clicking the button next to the IP address of the target portal you want to use. b. If your target requires authentication, select Use CHAP, and then type the user name and password that iSCSI will use to authenticate the initiator to the target. For more information about CHAP, see “Understanding CHAP authentication” on page 91. c. Click Next. Result: The Completing the iSCSI Session Wizard panel is displayed.
7	In the Completing the iSCSI Session Wizard, perform the following actions: a. Review the information to make sure it is accurate. b. If the information is not accurate, use Back to go back to previous panels of the wizard to modify information. c. Click Finish. Result: An iSCSI session to the target is established.

Understanding CHAP authentication

The Challenge Handshake Authentication Protocol (CHAP) enables authenticated communication between iSCSI initiators and targets. When you use CHAP authentication, you define the CHAP user names and passwords on the initiator and the storage system.

During the initial stage of the iSCSI session, the initiator sends a login request to the storage system to begin the session. The login request includes the initiator’s CHAP user name and algorithm. The storage system responds with a CHAP challenge. The initiator provides a CHAP response. The storage system verifies the response and authenticates the initiator. The CHAP password is used to compute the response.

Disconnecting an iSCSI target from a Windows host

To disconnect an iSCSI target from a Windows host, complete the following steps.

Step	Action
1	Perform the following actions to disconnect an iSCSI target: a. Expand the Storage option in the left MMC panel, if it is not expanded already. b. Double-click SnapDrive, or SnapDrive List if you are managing multiple instances of SnapDrive, and double-click the name of the SnapDrive host on which you want to disconnect an iSCSI target. c. Double-click iSCSI Management. d. Select the iSCSI session that you want to disconnect. e. Click Action (from the menu choices on top of MMC). f. Select Disconnect Target from the drop-down menu. Result: A SnapDrive pop-up box is displayed prompting you to confirm your action. Additionally, if you have LUNs connected to the iSCSI target, a warning pop-up box is displayed prompting you to confirm that all LUNs on the iSCSI target can be terminated.
2	Click Yes. Result: The selected iSCSI target is disconnected from the Windows host. Note _____ You must disconnect any LUNs connected to the target before the target can be disconnected.

Disconnecting a session to an iSCSI target

You can disconnect an iSCSI session from an iSCSI target when you have more than one session and you do not want to disconnect the target or other sessions connected to that target. For example, when you are using MPIO, you can disconnect iSCSI sessions to create a single path to a LUN. For more information on MPIO, see the *Data ONTAP DSM for Windows MPIO Installation and Administration Guide*.

To disconnect a session to an iSCSI target, complete the following steps.

Step	Action
1	Perform the following actions to disconnect a session to an iSCSI target: a. Expand the Storage option in the left MMC panel, if it is not expanded already. b. Double-click SnapDrive, or SnapDrive List if you are managing multiple instances of SnapDrive, and double-click the name of the SnapDrive host on which you want to disconnect an iSCSI session. c. Double-click iSCSI Management. d. Select the iSCSI target from which you want to disconnect a session.
2	In the right MMC pane, select the iSCSI session you want to disconnect.

Step	Action
3	Click Action (from the menu choices on top of MMC), and select Disconnect Session. Result: A SnapDrive pop-up box is displayed prompting you to confirm your action. Additionally, if you disconnect the last session to the iSCSI target and you have LUNs connected to the target, a warning pop-up box is displayed prompting you to confirm that all LUNs on the iSCSI target can be terminated. Note _____ If you have only one iSCSI session connected to the iSCSI target, performing this procedure will disconnect the iSCSI target from the Windows host.
4	Click Yes. Result: The selected iSCSI session is disconnected from the iSCSI target.

Examining details of iSCSI sessions

The following table describes the iSCSI session details you can examine using the Computer Management (MMC) window on your Windows host. For instructions, go to [“Examining details of iSCSI sessions”](#) on page 96.

Property	Description
For all iSCSI sessions	
iSCSI Target Name	iSCSI name of the target
Number of LUNs	Number of LUNs to the target portal to which the Windows host is connected
For a specific iSCSI session	
Initiator HBA	Initiator HBA being used for the iSCSI session
Initiator IP	Initiator IP address
Target Portal IP	Target portal’s IP address to which the iSCSI session exists
Target Portal IP Port	Target portal’s port number on which the target is listening for iSCSI session requests

Examining details of iSCSI sessions

To examine the details of iSCSI sessions from your Windows host, complete the following steps.

Step	Action	
1	Perform the following actions: a. Expand the Storage option in the left MMC panel, if it is not expanded already. b. Double-click SnapDrive, or SnapDrive List if you are managing multiple instances of SnapDrive, and double-click the name of the SnapDrive host on which you want to view iSCSI session details. c. Select iSCSI Management.	
2	If you want to view...	Then...
	The details of all iSCSI targets connected on the Windows host	The details are displayed in the right MMC panel.
	The details of a specific iSCSI session connected from the Windows host to a particular target	a. Double-click iSCSI Management. b. Select the connected iSCSI target whose details you want to view. Result: The details are displayed in the right MMC panel.

Go to any of the following topics to learn about LUN management:

- ◆ [“About LUN management”](#) on page 98
- ◆ [“Creating a LUN”](#) on page 99
- ◆ [“Creating a LUN as a quorum disk on a new Windows 2003 cluster”](#) on page 109

About LUN management

After you install SnapDrive to manage your LUNs, keep the following in mind:

- ◆ You must never create, delete, or rename LUNs from FilerView or the storage system command line.
- ◆ You must perform all LUN management functions using SnapDrive from the host machine.

Note

Execute all SnapDrive operations from the console of your host machine, through a Remote Administration connection, or using the `sdcli.exe` command-line utility. You can also manage multiple instances of SnapDrive on a single host from MMC. For more information, see “[Managing multiple remote instances of SnapDrive with the Add SnapDrive feature](#)” on page 80. Do not use Terminal Services because you might not be able to see all SnapDrive error messages, and the list of available drive letters will not be up-to-date.

Creating a LUN

Go to any of the following topics for information on creating LUNs.

- ◆ “[Rules for creating a LUN](#)” on page 99
- ◆ “[About volume mount points](#)” on page 99
- ◆ “[Volume mount point limitations](#)” on page 99
- ◆ “[Creating a LUN](#)” on page 100

Rules for creating a LUN

Keep the following rules in mind when creating a LUN:

- ◆ If you are adding the LUN to a cluster, make sure to perform the following procedure, “[Creating a LUN](#)” on page 100, on the node that owns that the cluster group in which you are creating a new physical disk resource.

Note

Shared disks on cluster nodes that do not own the disks often display as unknown and unreadable in MMC Disk Management utility; however, the disks will continue to function normally on all nodes in the cluster.

- ◆ To ensure that Snapshot copies can be made, do not attempt to create a LUN on a storage system volume that holds anything other than LUNs. Conversely, do not put anything other than LUNs on a storage system volume that contains LUNs.
- ◆ Create LUN names using US-ASCII characters only, even when you are using non-ASCII operating systems.

About volume mount points

A *volume mount point* is a drive or volume in Windows that is mounted to a folder that uses NTFS. A mounted drive is assigned a drive path instead of a drive letter. Volume mount points enable you to surpass the 26-drive-letter limitation. By using volume mount points, you can graft, or mount, a target partition into a folder on another physical disk. SnapDrive supports the creation of up to 120 mount points. For more information about volume mount points, see Microsoft article 280297 and 205524.

Volume mount point limitations

When creating mount points on clustered Windows 2003 servers, keep these additional limitations in mind:

- ◆ The mounted volume must be of the same type as its root; that is, if the root volume is a shared cluster resource, the mounted volume must also be shared, and if the root volume is dedicated, the mounted volume must also be dedicated.
- ◆ You cannot create mount points to the quorum disk.
- ◆ If you have a mount point from one shared disk to another, SnapDrive will verify that they are in the same cluster group and that the mounted disk resource is dependent on the root disk source.

Creating a LUN

To create an FCP- or iSCSI-accessed LUN, complete the following steps.

Step	Action
1	Create the dedicated volumes to hold your LUNs on the storage system and create CIFS shares for those volumes. For more information on creating volumes, see “Creating a storage system volume” on page 41. For more information about creating CIFS shares, see “Creating a CIFS share” on page 43, and also consult the <i>Data ONTAP File Access Management Guide</i>.
2	Verify that the FCP or iSCSI services have been started on the storage system. For more information, see “Starting FCP and iSCSI services” on page 38.
3	Perform the following actions to launch the Create Disk wizard: a. Expand the Storage option in the left MMC panel, if it is not expanded already. b. Double-click SnapDrive List and select the appropriate SnapDrive instance. c. Select Disks. d. Click Action (from the menu choices on top of MMC). e. Select Create Disk from the drop-down menu. Result: The Create Disk wizard is launched. f. In the Create Disk wizard, click Next.

Step	Action	
4	In the Provide a Path and Name panel, perform the following actions: ◆ In the “Enter a Virtual Disk UNC Path to Storage System Volume or Qtree” field, type the storage system location for the LUN (\\storage1\\vol1, for example). Alternatively, click Browse and navigate to that location. ◆ In the “Enter a Name for the New Virtual Disk” field, type a descriptive name for the LUN; for example, “corporate_billing” or “sunnyvale_gym.” The name you enter in this field is automatically made lowercase. Click Next. Result: The Select a Virtual Disk Type panel is displayed.	
	In the Select a Virtual Disk Type panel, perform one of the following actions:	
5	If...	Then...
	The LUN will belong to a single-host system	Select Dedicated, click Next, and then skip to Step 7 . Note _____ By default, if you have Data ONTAP 7.2.1 or later installed on your storage system, SnapDrive uses the GPT partitioning style for all dedicated LUNs. LUNs created on storage systems with versions of Data ONTAP earlier than 7.2.1 will continue to use the master boot record (MBR) partition style. The maximum size of an MBR partition style LUN is 2 TB or the maximum space on the volume, whichever is smaller.
	The LUN will be a Windows cluster resource	Select Shared, click Next, and then proceed to the next step. Note _____ Windows does not support the GPT partition style on shared LUNs. Shared LUNs continue to use the MBR partition style.
6	In the “Information About the Microsoft Cluster Services System” panel, verify that you want the disk to be shared by the nodes listed, and then click Next.	

Step	Action
7	In the Select Virtual Disk Properties panel, either select a drive letter from the list of available drive letters or enter a volume mount point for the LUN you are creating. When you create a volume mount point, enter the drive path that the mounted drive will use: for example, G:\mount_drive1\. Note_____ The root of the volume mount point must be owned by the node on which you are creating the new disk. _____ Note_____ You can create cascading volume mount points (one mount point mounted on another mount point); however, in the case of a cascading mount point created on an MSCS shared disk, you might receive a system event warning indicating that disk dependencies might not be correctly set. This is not the case, however, as SnapDrive will create the dependencies and the mounted disks will function as expected. _____
8	While still in the Select Virtual Disk Properties panel, complete the following actions: ◆ Click Yes or No for the option labeled “Do you want to limit the maximum disk size to accommodate at least one snapshot?” If you select Yes, the disk size limits displayed are accurate only when they first appear on the Select Virtual Disk Properties panel. When this option is selected, the following actions might interfere with the creation of at least one Snapshot copy: ❖ The option is set to No and SnapDrive is used to create an additional LUN in the same storage system volume. ❖ A LUN is created in the same storage system volume <i>without</i> using SnapDrive. ❖ Data objects other than LUNs are stored on this storage system volume. ◆ Select a disk size, which must fall within the minimum and maximum values displayed in the panel. ◆ Click Next. Result: If the settings on the storage system volume or qtree on which you are creating the LUN do not allow SnapDrive to proceed with the create operation, the Important Properties of the Storage System Volume panel is displayed, as described in Step 9. Otherwise, Step 9 is skipped.

Step	Action	
9	The “Important Properties of the Storage System Volume” panel displays the settings that will be used for the volume or qtree you specified in Step 4 of this procedure. SnapDrive requires the storage system volume containing LUNs to have the following properties: ◆ create_ucose = on ◆ convert_ucose = on ◆ snapshot_schedule = off ◆ nosnapdir = off Note_____ SnapDrive cannot proceed to create a LUN unless these settings are configured as shown. Therefore, you must accept these settings. _____ Click Next.	
10	If...	Then...
	The LUN will belong to a single-host system	Go to Step 16 .
	The LUN will be a Windows cluster resource	Go to the next step.
11	In the Select Initiators panel, perform the following actions: a. Double-click the cluster group name to display the hosts that belong to the cluster. b. Click the name of a host to select it. Result: The list of Available Initiators for that host is displayed in the bottom-left pane.	

Step	Action
12	In the Select Initiators panel, select the initiator for the LUN you are creating and use the arrows to move it back and forth between the two panes. If you select an iSCSI initiator, and an iSCSI connection to the storage system on which you are creating the LUN does <i>not</i> exist, SnapDrive launches the Create iSCSI Session wizard, and you are prompted to select a target portal and initiator. Also, if your target requires authentication of hosts that connect to it, you can type that information here. After you click OK, the iSCSI connection from the Windows host to the storage system is established, even if you do not complete the Create Disk wizard. If you have MPIO installed and you are using FCP, you have the option to select several FCP initiators.
13	Repeat Step 11 and Step 12 for all hosts, and then click Next. Result: The Select igroup Management Type panel is displayed. Note_____ The Next button remains unavailable until initiators for all hosts of a cluster have been selected. _____

Step	Action	
14	In the “Select igroup Management Type” panel, specify whether you will use automatic or manual igroup management. If you select automatic igroup management, SnapDrive uses existing igroups or, when necessary, creates new igroups for the initiators you specified in Step 11 through Step 13 . If you select manual igroup management, you manually choose existing igroups or create new ones as needed.	
	If you specify...	Then...
	Automatic igroup management	Click Next. You are done with igroup management. Result: SnapDrive uses existing igroups, one igroup per initiator, or, when necessary, creates new igroups for the initiators you specified in Step 11 through Step 13.
	Manual igroup management	Click next, and then perform the following actions: - In the Select igroups panel, select from the list the igroups to which you want the new LUN to belong. Repeat this action for each node in the cluster. Note _____ A LUN can be mapped to an initiator only once. OR Click Manage igroups and for each new igroup you want to create, type a name in the igroup Name text box, select initiators, click Create, and then click Finish to return to the Select igroups panel. - Click Next. Note _____ The Next button will remain unavailable until the collection of selected igroups contains all the initiators you selected in Step 12.

Step	Action
15	In the “Specify Microsoft Cluster Services Group” panel, perform the following actions. a. From the Group drop-down list, select a cluster group to which the newly created LUN will belong. OR Select Create a New Cluster Group to create a new cluster group and then put the newly created LUN in that group. Note_____ When selecting a cluster group for your LUNs, choose the cluster group your application will use. If you are creating a volume mount point, the cluster group is already selected. This is because the cluster group owns your root volume physical disk cluster resources. _____ b. Click Next. Result: The Completing the Create Disk Wizard panel is displayed. c. Go to Step 19.
16	In the Select Initiators panel, select the FCP or iSCSI initiator for the LUN you are creating, and use the arrows to move it back and forth between the two panes. If you select an iSCSI initiator, and an iSCSI connection to the storage system on which you are creating the LUN does <i>not</i> exist, you are prompted to select a target portal. Also, if your target requires authentication of hosts that connect to it, you can type that information here. After you click OK, the iSCSI connection from the Windows host to the storage system is established, even if you do not complete the Create Disk Wizard. Note_____ Select only one initiator unless you have MPIO installed for multipath management. _____
17	In the Select Initiators panel, click Next. Result: The Select igroup Management Type panel is displayed.

Step	Action	
18	In the “Select igroup Management Type” panel, specify whether you will use automatic or manual igroup management. If you select automatic igroup management, SnapDrive uses existing igroups or, when necessary, creates new igroups for the initiator you specified in Step 16 . If you select manual igroup management, you manually choose existing igroups or create new ones as needed.	
	If you specify...	Then...
	Automatic igroup management	Click Next. You are done with igroup management. Result: SnapDrive uses existing igroups, one igroup per initiator, or, when necessary, creates new igroups for the initiators you specified in Step 11 through Step 13.
	Manual igroup management	Click next, and then perform the following actions: - In the Select igroups panel, select from the list the igroups to which you want the new LUN to belong. Note _____ A LUN can be mapped to an initiator only once. Repeat this action for each node in the cluster. OR - Click Manage igroups and for each new igroup you want to create, type a name in the igroup Name text box, select initiators, click Create, and then click Finish to return to the Select igroups panel. - Click Next. Note _____ The Next button will remain unavailable until the collection of selected igroups contains all the initiators you selected in Step 12.

Step	Action
19	In the Completing the Create Disk Wizard panel, perform the following actions: a. Verify all the settings. b. If you need to change any settings, click Back to go back to the previous Wizard panels. c. Click Finish. Disk creation might take several seconds to complete. SnapDrive displays disk creation progress on the bar at the bottom of MMC. Result: A message is displayed indicating that the new LUN has been successfully created. The new LUN now appears under SnapDrive in the left MMC panel.

Creating a LUN as a quorum disk on a new Windows 2003 cluster

Prerequisites: When you create a Windows cluster whose quorum disk will be a LUN, you must ensure the following:

- ◆ You have two to eight host machines with Windows Server 2003 Standard Edition or Enterprise Edition installed.
- ◆ Your storage system is running at least Data ONTAP 7.0.5.
- ◆ Each node of the cluster contains the features in the following table.

If...	Then...
You want the quorum disk to be an iSCSI-accessed LUN	Each host node must have the following installed: ◆ If you are using the Microsoft iSCSI Software Initiator: ❖ A GbE NIC (as recommended in the iSCSI Microsoft Initiator Software Support Kit) ❖ The Microsoft iSCSI Software Initiator driver ❖ (Optional) a Fast Ethernet NIC dedicated to internal cluster traffic For information about the Microsoft iSCSI Software Initiator, see the Microsoft site. ◆ If you are using a WHQL signed iSCSI HBA: ❖ The driver and firmware for the iSCSI HBA
You want the quorum disk to be an FCP-accessed LUN	Each host node must have the following installed: ◆ A Data ONTAP qualified FCP HBA ◆ The driver and firmware for the FCP HBA For information about the qualified FCP HBAs, go to http://now.netapp.com/.

Guideline to prevent resource competition in a Windows cluster: To ensure that all nodes of the cluster host never start simultaneously following a power failure, change the file timeout value in the boot.ini file to 10 seconds for one node and 90 seconds for the other nodes. This allows plenty of time for one

node to “get ahead” of the other nodes, preventing the computer from competing for the shared disk, which could cause a failure. See Microsoft article 259267 for more information.

Related topics:

- ◆ “[Creating a LUN as a quorum disk](#)” on page 110

Creating a LUN as a quorum disk

The following procedure describes the steps you must perform to set up a new Windows Server 2003 cluster (2-node to 8-node) using a LUN as a quorum disk.

This procedure does not describe in detail the steps to set up the Windows nodes for a cluster. If you need details about such steps, you must refer to your Microsoft documentation.

To install and configure a LUN as a cluster quorum disk on a new Windows Server 2003 cluster, complete the following steps.

Task	Procedure
1	Install Windows Server 2003 on all nodes that will be part of the cluster. For more information about installing the Windows Server 2003 software, see your Microsoft documentation. After the installation is complete, for the purpose of this procedure: ◆ Ignore the “Manage your server” window that is displayed after a new installation of Windows Server 2003. ◆ Do not run the Cluster Administrator utility yet.
2	Make sure that the following are installed on all nodes of the cluster: ◆ Appropriate FCP HBA drivers, WHQL signed iSCSI HBA drivers, or the Microsoft iSCSI Software Initiator drivers For information about the drivers, see “Prerequisites” on page 109. ◆ SnapDrive 5.0 For information about installing SnapDrive, see “Installing, Uninstalling, or Upgrading SnapDrive” on page 51.

Task	Procedure
3	If you are using the Microsoft iSCSI software, establish iSCSI connections to the storage system from all nodes of the cluster using each node's MMC. To go to MMC, select Start > Programs > Administrative Tools > Computer Management. For information about how to establish iSCSI connections, see “Establishing an iSCSI session to a target” on page 89.
4	Create a shared LUN on node 1 and note the path and drive letter you assign to the LUN. Note Shared LUNs must use the MBR partitioning style. For information about how to create a LUN, see “Creating a LUN” on page 99. Note Because this LUN will be designated as a quorum disk later in this procedure, you must create a disk of adequate size according to Microsoft's recommendations.
5	On node 1, launch the Windows Server 2003 Cluster Administrator. If the Cluster Administrator is launched for the first time on this node, you are prompted to specify the action to take. Select Create New Cluster from the Action drop-down list. If the Cluster Administrator is launched subsequently, it does not prompt you to specify the action to take. In that case, select File > New > Cluster from the Cluster Administrator. Result: The New Server Cluster Wizard is displayed.

Task	Procedure	
6	In the New Server Cluster Wizard, follow the prompts to type the following information: ◆ Windows domain name and cluster name ◆ The node that will be the first node in the cluster The node you are working on currently should be the selected node in the wizard. ◆ IP address for the server cluster ◆ User name and password for the cluster service account Note _____ Note the user name and password you enter; you need it in a later step in this procedure. Result: After you have entered the above information in the New Server Cluster wizard windows, the Proposed Cluster Configuration panel is displayed.	
7	If...	Then...
	The LUN you created in Step 4 is automatically selected as the quorum disk Note _____ Verify that the LUN selected is the one you created and not the local quorum.	Go to Step 8 .
	The LUN you created in Step 4 is not selected as the quorum disk	◆ Click the quorum button. ◆ Change the drive letter to that of the LUN and click Next.
8	Step through the remaining panels of the New Server Cluster Wizard. After you finish using the New Server Cluster Wizard, the first node in the cluster is up and functional.	

Task	Procedure
9	Go to the Windows host that will be the next node in the cluster and, from SnapDrive, connect to the LUN you created in Step 4 from this node, using the path and drive letter you noted in Step 4. Note— The Shared disk option is automatically selected. Result: SnapDrive prompts you for the cluster name. For information about how to connect a LUN, see “Connecting LUNs” on page 118.
10	Enter the cluster name you created in Step 6 . Click OK.
11	Launch the Windows Server 2003 Cluster Administrator and perform the following actions: - Select File > Open Connection. - Select Add Nodes to Cluster. - Type the name of the cluster (as in Step 6). - Click Next. Result: The Add Nodes wizard is displayed with the name of the node on which you are currently working.

Task	Procedure	
12	In the Add Nodes wizard, follow the prompts to perform the following tasks in the wizard panels: a. If the name of the node on which you are working currently is not displayed, type the name of the node or click Browse to find the node. Then click Add to add the node to the list. b. Select Advanced > Advanced (minimum) Configuration. c. Enter the password for the cluster service account. Note _____ This password should be the same as the one you entered in Step 6. _____ Result: After you enter the information, the Proposed Cluster Configuration panel is displayed.	
13	If...	Then...
	The proposed cluster configuration is as expected	Follow the Add Nodes wizard prompts to complete the remaining steps of the wizard. Result: The node is added to the cluster.
	The proposed cluster configuration is not as expected	Make the appropriate changes, and then follow the Add Nodes wizard prompts to complete the remaining steps of the wizard. Result: The node is added to the cluster.

Task	Procedure	
14	Use the Cluster Administrator to verify that the cluster is functioning correctly by performing a “move group” operation from one node to the other and then back to the original node. Note _____ You should perform the “move group” operation for all nodes in the cluster to ensure proper operation.	
15	If...	Then...
	The node you added to the cluster was the last node	Go to Step 19 .
	The node you added to the cluster was not the last node	Go to Step 9 .

You have added the desired number of nodes to a Windows Server 2003 cluster. The server cluster is up and operational. Now you can create shared disks for your applications.

For information about how to create shared disks, see “[Creating a LUN](#)” on page 99.

The topics that follow explain how to use SnapDrive to manage LUNs.

- ◆ [“Connecting LUNs”](#) on page 118
- ◆ [“Making drive letter or path modifications to a LUN”](#) on page 127
- ◆ [“Disconnecting LUNs”](#) on page 130
- ◆ [“Deleting a LUN”](#) on page 133
- ◆ [“Deleting folders within volume mount points”](#) on page 135
- ◆ [“Expanding LUNs”](#) on page 136
- ◆ [“Managing LUNs not created in SnapDrive”](#) on page 140
- ◆ [“Monitoring fractional space reservations”](#) on page 143
- ◆ [“Reclaiming blocks on a LUN”](#) on page 145

Connecting LUNs

When connected, a LUN enables you to save, delete, modify, and manage the files it contains. You can also make Snapshot copies of the entire disk and restore the disk, along with its contents, to the state captured by a previous Snapshot copy. Additionally, you can disconnect or delete the disk.

Rules for connecting:

- ◆ Unless the LUN is shared within a Windows cluster, the LUN must not be connected to more than one host.
- ◆ LUNs should be created using SnapDrive. If you want to connect a LUN that was not created in SnapDrive, see “[Managing LUNs not created in SnapDrive](#)” on page 140

Note

Do not try to connect to a LUN if it is already connected to another machine; SnapDrive does not support such simultaneous use.

For instructions for connecting a LUN, see “[Connecting to a LUN](#)” on page 118.

Connecting to a LUN

To connect your Windows host to a LUN, complete the following steps.

Step	Action
1	Close all Explorer windows on your host.
2	Perform the following actions to launch the Connect Disk wizard: a. Expand the Storage option in the left MMC panel, if it is not expanded already. b. Double-click SnapDrive, or SnapDrive List if you are managing multiple instances of SnapDrive, and double-click the name of the SnapDrive host you want to manage. c. Select Disks. d. Click Action (from the menu choices on top of MMC). e. Select Connect Disk from the drop-down menu.
3	In the Connect Disk Wizard, click Next.

Step	Action	
4	In the Provide a Virtual Disk Location panel, perform the following actions. a. Click Browse. b. Navigate to the storage system volume on which the LUN resides. c. Select the LUN to which you want to connect. d. Click Next. The Select a Virtual Disk Type panel is displayed.	
5	If the LUN...	Then...
	Will belong to a single system	Select Dedicated, click Next, and then continue to Step 7 .
	Will become a Windows cluster resource	Select Shared, click Next, and then continue to the next step. Note If the disk you are connecting was created with the GPT style partition, only the dedicated disk type option is available for selection. Windows does not support GPT style partitions on shared LUNs.
6	In the Information about the Microsoft Cluster Services System panel, verify that you want the disk to be shared by the nodes listed, and then click Next.	

Step	Action	
7	In the Select Virtual Disk Drive Letter panel, perform the following actions: a. Either select a drive from the list of available drive letters or enter a mount point for the LUN you are connecting. When you create a volume mount point, enter the drive path that the mounted drive will use: for example, G:\mount_drive1\. Note_____ The root volume of a new mount point must be owned by the node on which you are creating the new disk. _____ Note_____ You can create cascading volume mount points (by mounting one mount point on another mount point); however, in the case of a cascading mount point created on a MSCS shared disk, you might receive a system event warning indicating that disk dependencies might not be correctly set. This is not the case, however, and the mounted disks will function as expected. _____ b. Click Next.	
8	If the LUN...	Then...
	Will belong to a single-host system	Go to Step 13 .
	Will be a Windows cluster resource	Go to the next step.

Step	Action
9	In the Select Initiators panel, perform the following actions: a. Double-click the cluster group name to display the hosts that belong to the cluster. b. Click the name of a host to select it. The list of available initiators for that host is displayed in the lower-left pane. c. Select the initiator for the LUN you are creating, and use the arrows to move it back and forth between the Available Initiators and Selected Initiators list. Note _____ If you have MPIO installed, you can select more than one initiator. _____ d. Repeat Step b through Step c for all the hosts. e. Click Next. Note _____ The Next button is unavailable until initiators for all hosts of a cluster are selected. _____ Result: The Select igroup Management Type panel is displayed.

Step	Action	
10	In the “Select igroup Management Type” panel, specify whether you will use automatic or manual igroup management. If you select automatic igroup management, SnapDrive uses existing igroups or, when necessary, creates new igroups for the initiators you specified in Step 9 . If you select manual igroup management, you manually choose existing igroups or create new ones as needed.	
	If you specify...	Then...
	Automatic igroup management	Click Next. You are done with igroup management. Result: SnapDrive uses existing igroups, one igroup per initiator, or, when necessary, creates new igroups for the initiators you specified in Step 9.
	Manual igroup management	Click next, and then perform the following actions: a. In the Select igroups panel, select from the list the igroups to which you want the new LUN to belong. Repeat this action for each node in the cluster. Note _____ A LUN can be mapped to an initiator only once. OR b. Click Manage igroup and for each new igroup you want to create, type a name in the igroup Name text box, select initiators, click Create, and then click Finish to return to the Select igroups panel. c. Click Next. Note _____ The Next button will remain unavailable until the collection of selected igroups contains all the initiators you selected in Step 9.

Step	Action
11	In the Specify Microsoft Cluster Services Group panel, perform the following actions: a. Select a cluster group from the Group drop-down list to which the newly created LUN will belong. OR Select Create a New Cluster Group to create a new cluster group and then put the LUN you are connecting to in that group. Note _____ If you are creating a volume mount point, the root volume is already selected. b. Click Next. Result: The Completing the Create Disk Wizard panel is displayed.
12	Go to Step 15 .

Step	Action
13	In the Select Initiators panel, perform the following actions: a. Select the FCP or the iSCSI initiator for the LUN you are creating from the Available Initiators list on the left side. Note _____ FCP and iSCSI are supported on the same host, however, FCP and iSCSI are not supported on the same host connecting to the same LUN. SnapDrive will not allow you to select both protocols when connecting a LUN. Note _____ If MPIO is installed on the system, you can select multiple FCP initiator ports or one iSCSI session. b. Click the right arrow to move the selected initiator to the Selected Initiators list on the right side. c. If you change your mind, you can move an initiator from the Selected Initiators list to the Available Initiators list by selecting the initiator and clicking the left arrow. d. Click Next. The Completing the Connect Disk Wizard panel is displayed. Note _____ See the <i>Block Access Management Guide</i> for information about how to determine the port for your HBA.

Step	Action	
14	In the “Select igroup Management Type” panel, specify whether you will use automatic or manual igroup management. If you select automatic igroup management, SnapDrive uses existing igroups or, when necessary, creates new igroups for the initiators you specified in Step 13 . If you select manual igroup management, you manually choose existing igroups or create new ones as needed.	
	If you specify...	Then...
	Automatic igroup management	Click Next. You are done with igroup management. Result: SnapDrive uses existing igroups, one igroup per initiator, or, when necessary, creates new igroups for the initiators you specified in Step 13.
	Manual igroup management	Click next, and then perform the following actions: a. In the Select igroups panel select from the list the igroups to which you want the new LUN to belong. Repeat this action for each node in the cluster. Note _____ A LUN can be mapped to an initiator only once. OR b. Click Manage igroups and for each new igroup you want to create, type a name in the igroup Name text box, select initiators, click Create, and then click Finish to return to the Select igroups panel. c. Click Next. Note _____ The Next button will remain unavailable until the collection of selected igroups contains all the initiators you selected in Step 9.

Step	Action
15	In the Completing the Connect Disk Wizard panel, perform the following actions: a. Verify all the settings. b. If you need to change any settings, click Back to go back to the previous Wizard panels. c. Click Finish. Note_____ If a LUN has volume mount points when you connect it, SnapDrive removes the mount points before completing the connection. _____ Result: The Computer Management window is displayed, with the newly connected LUN now appearing under SnapDrive > Disks in the left panel.

Making drive letter or path modifications to a LUN

There might be instances when you need to change the drive letter or mount point path for a LUN. SnapDrive enables you to add, change, or remove a drive letter or path for an existing LUN.

Adding or changing a drive letter or path for an existing LUN

To add or change a drive letter or mount point path to which a LUN has been assigned, complete the following steps.

Step	Action
1	Double-click SnapDrive in the left MMC pane, and then select Disks. Result: The currently connected disks are displayed in the right MMC panel.
2	In the right pane, right-click on the disk that you want to modify and choose Change Drive Letter and Paths from the menu. Result: The Change Drive Letter and Paths window is displayed.
3	Click either Add or Change, depending on the action you want to take. Note_____ The Change option is unavailable for mount points. _____

Step	Action
4	In the Add or Change Drive Letter or Path window, select a drive letter or enter path in the space provided, then click OK. By removing the last volume mount point on a shared disk, SnapDrive removes the resource dependency from the root disk. If you are creating a mount point from one shared disk to another, SnapDrive verifies they are in the same cluster group and creates a dependency to the root disk resource if it is the first volume mount point to that root disk. Note When you create the first volume mount point to a root disk that is shared and is being used by MSCS, SnapDrive takes offline the physical disk resource, presenting the mounting volume, as part of the resource dependency process. As a result, any other cluster resources that depend on the physical disk resource will also be taken off line. An example of this is the Exchange System Attendant cluster resource. SnapDrive automatically brings the physical disk resource back online but will not bring the Exchange resources back online. Exchange resources should be brought back online manually by the administrator using the Cluster Administrator.

Moving a mount point with the Windows Explorer

You can cut and paste a folder that is a volume mount point to another folder on the same drive using the Windows Explorer, and SnapDrive recognizes the path change to the mount point. You cannot, however, cut and paste a volume mount point folder to a different drive.

Removing a drive letter or mount point for an existing LUN

To remove a drive letter or mount point path to which a LUN has been assigned, complete the following steps.

Step	Action
1	Double-click SnapDrive in the left MMC pane, and then select Disks. Result: The currently connected disks are displayed in the right MMC panel.

Step	Action
2	In the right pane, right-click on the disk that you want to modify and choose Change Drive Letter and Paths from the menu. Result: The Change Drive Letter and Paths window is displayed.
3	Click Remove, then click OK to proceed with the operation. Note_____ When you remove the last volume mount point to a root disk that is shared and is being used by MSCS, SnapDrive takes offline the physical disk resource, presenting the mounted volume, as part of the resource dependency removal process. As a result, any other cluster resources that depend on the physical disk resource will also be taken offline. An example of this is the Exchange System Attendant cluster resource. SnapDrive automatically brings the physical disk resource back online but will not bring the Exchange resource back online. Exchange resources should be brought back online manually by the administrator using the Cluster Administrator. _____ Note_____ This command will not delete the folder that was created at the time the volume mount point was added. After you remove a mount point, an empty folder will remain with the same name as the mount point you removed. _____

Disconnecting LUNs

When the host is disconnected from a LUN, you cannot see or modify the LUN's contents, make Snapshot copies of the LUN, or use Snapshot technology to restore the LUN to a previous Snapshot copy. However, the LUN still exists on the storage system volume.

Guidelines for disconnecting a LUN: The following guidelines apply to disconnecting a LUN:

- ◆ You must make sure that the LUN you are disconnecting is not monitored with the Windows Performance Monitor (perfmon).
- ◆ You can only disconnect a shared LUN (that is, a non-quorum disk) after removing the cluster resource dependencies from the LUN.

Note

SnapDrive manages the dependencies to the root disk for volume mount points.

- ◆ You can disconnect a quorum disk only after replacing it with another disk that takes over as a quorum disk for the cluster.
- ◆ You must make sure when disconnecting LUNs on a Microsoft cluster that all hosts in the cluster are available to SnapDrive in order for disconnect operation to succeed.

Note

SnapDrive does not allow you to disconnect disks containing volume mount points. To disconnect a disk with volume mount points, first change, move, or delete the mount point and then disconnect the disk to which it was mounted. For more information, see “[Disconnecting a LUN](#)” on page 131

Ways to disconnect a LUN: You can disconnect a LUN in one of the following two ways:

- ◆ By disconnecting in a normal manner, as described in “[Disconnecting a LUN](#)” on page 131
 - ◆ By forcing a disconnect, as described in “[Forcing a disconnect](#)” on page 132
- When you force a disk to disconnect, it results in the disk being unexpectedly disconnected from the Windows host.
- Under ordinary circumstances, you cannot disconnect a LUN that contains a file being used by an application such as Windows Explorer or the Windows operation system. However, you can force a disconnect to override this protection.

Disconnecting a LUN

To disconnect a LUN from a host, complete the following steps.

Step	Action
1	Make sure that neither Windows Explorer nor any other Windows application is using or displaying any file on the LUN you intend to disconnect.
2	Double-click SnapDrive in the left MMC pane, and then select Disks. Result: The currently connected disks are displayed in the right MMC panel.
3	Select in the right pane the disk that you want to disconnect. Note _____ If you are disconnecting a disk that contains volume mount points, change, move, or delete the volume mount points on the disk first before disconnecting the disk containing the mount points; otherwise, you will not be able to disconnect the root disk. For example, disconnect G:\mount_disk1\, then disconnect G:\. Note _____ If you try to disconnect a LUN that belongs to an initiator group (igroup) that contains initiators from another host, the operation will fail. This type of configuration cannot be created in SnapDrive because it is not supported.
4	Click Action (from the menu choices on top of MMC), and then select Disconnect Disk.
5	When prompted, click Yes to proceed with the operation. Result: The icons representing the disconnected LUN disappear from both the left and right MMC panels. Note _____ This procedure will not delete the folder that was created at the time the volume mount point was added. After you remove a mount point, an empty folder will remain with the same name as the mount point you removed.

Related topic:

- ◆ [“Forcing a disconnect”](#) on page 132

Forcing a disconnect

Before you decide to force a disconnect of a SnapDrive LUN, be aware of the following consequences:

- ◆ Any cached data intended for the LUN at the time of forced disconnection is not committed to disk.
- ◆ Any mount points associated with the LUN are also removed.
- ◆ A pop-up message announcing that the disk has undergone “surprise removal” appears in the console session.

To force a disconnect from a LUN, complete the following steps.

Step	Action
1	Make sure that neither Windows Explorer nor any other Windows application is using or displaying any file on the LUN you intend to disconnect.
2	Select Start > Programs > Administrative Tools > Computer Management. Result : The Computer Management window (MMC) is launched.
3	Double-click SnapDrive in the left MMC pane, and then select Disks. Result: The currently connected disks are displayed in the right MMC panel.
4	Select in the right pane the disk that you want to “force disconnect.”
5	Click Action (from the menu choices on top of MMC), and then select Force Disconnect Disk.
6	When prompted, click Yes to proceed with the operation. Result: The icons representing the disconnected LUN disappear from both the left and right MMC panels.

Related topic:

- ◆ [“Disconnecting a LUN”](#) on page 131

Deleting a LUN

Guidelines for deleting a LUN

Keep the following guidelines in mind when deleting a LUN:

- ◆ Make sure that the LUN you are deleting is not being monitored with the Windows Performance Monitor (perfmon).
- ◆ Use the Delete Disk feature cautiously, because after you delete a LUN, you cannot use SnapDrive to undelete it.
- ◆ You can only delete a shared LUN (that is, a non-quorum disk) after removing the cluster resource dependencies from the LUN and verifying that all nodes in the cluster are powered on and functioning properly.
- ◆ When deleting LUNs on a Microsoft cluster, you must make sure that all hosts in the cluster are available to SnapDrive for the delete operation to succeed.
- ◆ Make sure the LUN you want to delete is not being used by a host.

Deleting a LUN

To delete a LUN, complete the following steps.

Step	Action
1	Double-click SnapDrive in the left MMC pane, and then select Disks. Result: The currently connected disks are displayed in the right MMC panel.

Step	Action
2	In the right pane, select the disk that you want to delete. Note_____ If you are deleting a disk that contains volume mount points, change, remove, or delete the volume mount points on the disk first before deleting the disk containing the mount points: for example, delete G:\mount_disk1\, then delete G:\. If your volume mount point contains data, keep in mind that SnapDrive will not warn you that data is present when you delete the mount point. For more information about deleting a folder within a volume mount point, see “Deleting folders within volume mount points” on page 135. _____ Note_____ If you try to delete a LUN that belongs to an initiator group (igroup) that contains initiators from another host, the operation will fail. SnapDrive does not support this configuration. _____
3	Click Action (from the menu choices on top of MMC), and then select Delete Disk.
4	When prompted, click Yes to proceed with the operation. Result: The icons representing the deleted LUN disappear from both the left and right panes of the Computer Management window. Note_____ This procedure will not delete the folder that was created at the time the volume mount point was added. After you remove a mount point, an empty folder will remain with the same name as the mount point you removed. _____

Deleting folders within volume mount points

When you use the Windows Explorer to delete a folder that you have created under a volume mount point, you might receive an error message similar to the following:

Cannot delete *Foldername*: Access Denied. The source file may be in use.

Foldername is the name of the folder you want to delete.

This happens because the Windows Recycle Bin does not understand volume mount points and tries to delete the drive on which the mount point resides rather than the folder on the mount point.

Deleting folders within volume mount points

To delete a folder within a mount point, complete the following steps.

Step	Action
1	Using Windows Explorer, click on the folder you want to delete.
2	Click Shift and Delete simultaneously to bypass the Recycle Bin.

For more information about deleting folders within volume mount points, see Microsoft article 243514.

Expanding LUNs

When to expand a LUN: As your storage needs increase, you might need to expand a LUN to hold more data. A good opportunity for doing this is right after you have expanded your storage system volumes.

Note

A LUN cannot be expanded more than ten times its original size. Also keep in mind that LUNs with MBR style partitions have a size limit of 2 TB, and LUNs with GBT style partitions have a storage system size limit of 16 TB.

Considerations when expanding a LUN: When you expand a LUN, keep the following in mind:

- ◆ Understand the storage-management implications of expanding the LUN. See [“Understanding volume size”](#) on page 15 for more information.
- ◆ After you increase the size of a LUN, you cannot reduce it, except by restoring a Snapshot copy made prior to the expansion of the LUN (see the note below). Such a restore causes the loss of any data added to the LUN after you expanded the LUN. (Conversely, restoring a Snapshot copy of a LUN whose size has since been reduced enlarges the LUN to its former size.)

Note

If it is necessary to restore a LUN from a Snapshot copy made before the LUN was expanded, you must disconnect the disk using SnapDrive and then restore the disk from the storage system console. When the LUN is restored, reconnect the disk using SnapDrive.

- ◆ When creating a quorum disk, make sure it is the size recommended by Microsoft for your Windows cluster setup. You cannot expand a LUN while it is serving as a quorum. If you need to expand your current quorum disk, you must do one of the following:
 - ❖ Create a new LUN and designate it as a quorum.
 - ❖ Create a temporary LUN to serve as a quorum while you expand the old quorum disk. Once the old quorum disk has been expanded, assign it as the quorum for the cluster and delete the temporary quorum.

For information about how to perform the previous two procedures, see [“Expanding a quorum disk”](#) on page 138.

- ◆ While a LUN is being expanded, it might not be available for use. Plan your LUN expansion at a time when applications are less likely to be accessing the LUN.

For instructions on expanding a LUN, see the following topics:

- ◆ “[Expanding a LUN](#)” on page 137
- ◆ “[Expanding a quorum disk](#)” on page 138

Expanding a LUN

To expand a LUN, complete the following steps.

Note

If you increase the size of your LUN, you might need to close and reopen MMC before the increased LUN size becomes visible in the Disk Management snap-in.

Step	Action
1	Double-click SnapDrive in the left MMC pane, and then select Disks. Result: The currently connected disks are displayed in the right MMC panel.
2	Select in the right pane the disk that you want to expand.
3	Click Action (from the menu choices on top of MMC), and then select Expand Disk. Result: The Expand Disk screen is displayed.

Step	Action
4	In the Expand Disk screen, perform the following steps: a. Leave the field labeled “Do you want to limit” set to the default setting of Yes. When you select the option “Do you want to limit the maximum disk size to accommodate at least one snapshot?” the disk size limits displayed are accurate only when they first appear on the Select Virtual Disk Properties panel. When this option is selected, the following actions might interfere with the creation of at least one Snapshot copy: ❖ The option to limit the maximum disk size to accommodate at least one Snapshot copy is <i>not</i> selected when SnapDrive is used to create an additional LUN in the same storage system volume. ❖ A LUN is created in the same storage system volume <i>without</i> using SnapDrive. ❖ Data objects other than LUNs are stored on this storage system volume. b. Type the amount by which you want to expand the LUN. ❖ Set the units for this value (MB, GB, or TB) in the box to the right of the Expand by Size box. ❖ Pick a value for the Expand by Size box that falls between the maximum and minimum sizes listed on the panel. c. Click OK. A message indicating that the expansion operation was completed successfully is displayed.
5	Create a new Snapshot copy of the expanded LUN. For more information, see “Creating Snapshot copies” on page 151.

Related topic:

- ◆ “[Expanding a quorum disk](#)” on page 138

Expanding a quorum disk

To expand a LUN that is a quorum disk in a Microsoft cluster, complete the following steps.

Step	Action	
1	If...	Then...
	You would like to create a new LUN and designate that disk as a quorum	a. Create a new LUN as described in “Creating a LUN” on page 99. b. Designate the newly created disk as the quorum using the Cluster Administrator on the owning node of your Windows cluster. For information about how to set a disk as a quorum, see your Windows documentation. c. Delete the original quorum disk as described in “Deleting a LUN” on page 133.
	You would like to keep the original quorum disk and expand it	a. Create a new LUN as described in “Creating a LUN” on page 99. b. Designate the newly created disk as the quorum using the Cluster Administrator on the owning node of your Windows cluster. For information about how to set a disk as a quorum, see your Windows documentation. c. Expand the original quorum disk (which is now a regular LUN) as described in “Expanding a LUN” on page 137. d. Designate the expanded disk as the quorum using the Cluster Administrator on the owning node of your Windows cluster. For information about how to set a disk as a quorum, see your Windows documentation. e. Delete the disk you created in Step 1 as described in “Deleting a LUN” on page 133.

Related topic:

- ◆ “[Expanding a LUN](#)” on page 137

Managing LUNs not created in SnapDrive

You can use SnapDrive to manage LUNs on your storage system even if SnapDrive was not used to create the LUNs (for example, LUNs created with FilerView or with VDS); however, you might need take several steps to prepare the LUNs for SnapDrive management. This is useful when you want to use SnapDrive to manage LUNs created using the Data ONTAP VDS Hardware Provider, for instance.

Prerequisites for SnapDrive to manage LUNs not created in SnapDrive

The following prerequisites must be met for SnapDrive to manage LUNs that were not created with SnapDrive:

- ◆ LUN names must be all US-ASCII characters.
- ◆ LUN names must be lowercase.

Note_____

In earlier versions of SnapDrive, LUNs were required to have the .lun extension in order to be managed by SnapDrive; however, .lun extensions are no longer required as of SnapDrive 4.2.

Preparing LUNs not created in SnapDrive in a stand-alone Windows configuration

To prepare LUNs not created in SnapDrive in a stand-alone Windows configuration to be managed by SnapDrive, complete the following steps.

Step	Action
1	Shut down the Windows host. Note_____ Shutting down your Windows host ensures that all data has been flushed and that Snapshot copies are consistent.

Step	Action
2	Using FilerView or the storage system console, complete the following steps: a. Take a Snapshot copy of the volume on which the LUNs reside. b. Unmap the LUN from the initiator group. c. If the LUN name uses uppercase or non-US-ASCII characters, rename the LUN from the storage system console, using the <code>lun move</code> command.
3	Restart the Windows host.
4	Using SnapDrive, connect to the renamed LUN, as described in “Connecting LUNs” on page 118.
5	Using SnapDrive, take a Snapshot copy of the newly connected LUN as described in “Creating Snapshot copies” on page 151.

Preparing LUNs not created in SnapDrive in a clustered Windows configuration

To prepare LUNs not created in SnapDrive in a clustered Windows configuration to be managed by SnapDrive, complete the following steps.

Step	Action
1	In SnapDrive, create a shared disk on the storage system to temporarily designate as the quorum disk, as described in “Creating a LUN as a quorum disk on a new Windows 2003 cluster” on page 109.
2	For each resource in this cluster group, record all dependencies: a. Using Cluster Administrator, right-click the resource and select Properties. b. Select the Dependencies tab. c. Record all dependencies for the resource.

Step	Action
3	Designate the newly created disk as the quorum using the Cluster Administrator on the owning node of your Windows cluster. For information about how to set a disk as a quorum, see your Windows documentation.
4	Check that space reservation is on or that there is enough space available for space reservation to be turned on.
5	Shut down each cluster node. Note— Shutting down your Windows hosts ensures that all data has been flushed and that Snapshot copies are consistent.
6	Using FilerView or the storage system console, complete the following steps: a. Make a Snapshot copy of the volume on which the LUNs reside. b. Unmap the LUN from the initiator group. c. If the LUN name uses uppercase or non-US-ASCII characters, rename the LUN from the storage system console, using the <code>lun move</code> command.
7	Restart each node in the Windows cluster.
8	Using SnapDrive, connect to the renamed LUN as described in “ Connecting LUNs ” on page 118.
9	Designate the renamed disk as the quorum using the Cluster Administrator on the owning node of your Windows cluster and recreate any dependencies recorded in Step 2 . For information about how to set a disk as a quorum, see your Windows documentation.
10	Delete the disk you created in Step 1 as described in “ Deleting a LUN ” on page 133.
11	Using SnapDrive, make a Snapshot copy of the newly connected LUN as described in “ Creating Snapshot copies ” on page 151.

Monitoring fractional space reservations

SnapDrive 5.0 enables you to monitor fractional space reserved for LUNs on a storage system volume when your storage system is running Data ONTAP 7.1 or later. To monitor the fractional space reserved on your storage system from your Windows host, SnapDrive enables you to perform the following tasks:

- ◆ Set fractional space reservation thresholds for volumes containing LUNs
- ◆ Set rate-of-change percentage between two Snapshot copies or between a Snapshot copy and the active file system of the storage system volume
- ◆ Monitor space that can be reclaimed by deleting a Snapshot copy
- ◆ Set monitor polling interval
- ◆ Enable and disable e-mail notification

For more information about fractional space reservations, see the *Block Access Management Guide*.

Enabling space reservation monitor e-mail notification

To enable the space reservation e-mail notification feature in SnapDrive, see “[Enabling SnapDrive notification](#)” on page 84.

Configuring space reservation monitoring

To configure fractional space reservation monitoring in SnapDrive, complete the following steps.

Step	Action
1	Perform the following actions: a. Expand the Storage option in the left MMC panel, if it is not already expanded. b. Double-click SnapDrive, then select Disks. Right-click Disks and select Properties from the menu.
2	In the Disks Properties window, select the Space Reservations Monitor tab.

Step	Action
3	In the Space Reservations Monitor panel, perform the following actions: a. Type a value in the Monitor Time Interval field, in minutes. Values can be between 0 (disable) and 10,080 minutes (7 days). b. Under the Space Reservations Monitor Settings tree, select the storage system and volume name. Your selections are displayed in the Storage System and Volume fields to the right of the tree. c. Type the Reserve Available percentage threshold. d. Type the Rate of Change threshold (in kilobytes, megabytes, gigabytes, or terabytes). e. Select “Alert when there is no space left to create snapshot” if you want to be notified if this condition occurs.
4	Click Add/Update after making any changes, then click OK or Apply to save your changes.
5	Click OK.

Reclaiming blocks on a LUN

To optimize Snapshot copy space usage, SnapDrive provides a feature called Space Reclaimer that enables you to mark newly freed blocks as available on WAFL files systems when files are deleted from a LUN.

- Recommendations**
- Keep these recommendations in mind when using Space Reclaimer:
- ◆ Do not run disk defragmentation at the same time Space Reclaimer is running. Doing so can slow the disk reclamation process.
 - ◆ Run Space Reclaimer when system usage is low: for instance, at night.

- Prerequisites**
- You must keep in mind the following prerequisites when using Space Reclaimer:
- ◆ To use this feature, you must have Data ONTAP 7.2.1 or later installed on your storage system.
 - ◆ You must have at least 5 MB of free space available on the LUN.

- Limitations**
- Space Reclaimer currently has the following limitations:
- ◆ It can be initiated from the owner node only in MSCS configurations.
 - ◆ It reclaims nearly all space from newly freed blocks, but not 100 percent of the space.

Starting space reclamation

To start Space Reclaimer in SnapDrive, perform the following steps.

Step	Action
1	Double-click SnapDrive in the left MMC pane and then select Disks. Result: The currently connected disks are displayed in the right MMC panel.
2	Select in the right pane the disk on which you want to start Space Reclaimer.
3	Right-click the disk and select Start Space Reclaimer from the menu.

Step	Action	
4	If SnapDrive detects that there is...	Then a window displays...
	Space to reclaim	Confirming that the LUN can be optimized for Snapshot copy creation. Continue to Step 5 .
	No space to reclaim	Notifying you that you do not need to run Space Reclaimer on the selected disk.
5	To limit the amount of time Space Reclaimer runs on a LUN, in the Confirm Space Reclamation on Disk window, select Limit (in minutes) Space Reclamation operation check box, and then in the space provided type the number of minutes you want Space Reclaimer to run on the LUN. By default, Space Reclaimer runs until the LUN is optimized.	
6	Click Yes to continue. The space reclamation process runs in the background. You can monitor the Space Reclaimer progress in the status bar at the bottom of MMC. Note SnapDrive might indicate that it is necessary to run Space Reclaimer again after it has successfully completed a space reclamation process. This can happen if data is deleted from a LUN while Space Reclaimer is running. It is strongly recommended that no read/writes are performed during the space reclamation process.	

Stopping space reclamation

To stop reclaiming space on a LUN, complete the following steps.

Step	Action
1	Double-click SnapDrive in the left MMC pane and then select Disks. Result: The currently connected disks are displayed in the right MMC panel.
2	Select in the right pane the disk on which you want to stop Space Reclaimer.
3	Right-click the disk and select Stop Space Reclaimer from the menu.

Reasons for SnapDrive to automatically stop Space Reclaimer

Space Reclaimer stops automatically in the following instances:

- ◆ During any LUN management operation on a LUN running Space Reclaimer
- ◆ During any Snapshot copy management operation except Snapshot copy rename and delete
- ◆ On all LUNs of the same storage system volume during Snapshot copy creation
- ◆ If the SnapDrive service is stopped
- ◆ During a cluster failover
- ◆ During LUN restore operations for any volume mount points directly or indirectly mounted (cascading) from the disk being restored
- ◆ During any MPIO path management operations, including adding or removing an initiator or active path selection

The topics that follow describe how to use the SnapDrive Snapshot copy feature to create Snapshot copies for backing up and restoring data, and they also provide an overview of the methods and media you can use to archive your LUN Snapshot copies to tape or other offline media. (For detailed instructions, see the documentation for the archiving application you use.)

Go to any of the following topics for more information:

- ◆ [“How Snapshot copies work”](#) on page 150
- ◆ [“Creating Snapshot copies”](#) on page 151
- ◆ [“Connecting to LUN copies”](#) on page 156
- ◆ [“Restoring LUNs from Snapshot copies”](#) on page 163
- ◆ [“Volume-based Snapshot copy restoration with SnapDrive”](#) on page 166
- ◆ [“Deleting Snapshot copies”](#) on page 167
- ◆ [“Overview of archiving and restoring Snapshot copies”](#) on page 169

How Snapshot copies work

What a Snapshot copy is: A Snapshot copy is a point-in-time, read-only image of the storage system volume. Snapshot copies can restore your databases rapidly if you encounter data corruption or other problems.

Because Snapshot copies reside on disk instead of tape, this technology complements conventional backup processes. Snapshot copies do not physically replicate the data on your disks, and therefore, they are not intended to replace conventional procedures for archiving to tape or other offline media.

Creating Snapshot copies

Reasons for creating Snapshot copies using SnapDrive: Snapshot operations on a single LUN actually make a Snapshot copy of all the LUNs on the volume. Because a storage system volume can contain LUNs from multiple hosts, the only consistent LUNs are those connected to the host that created the SnapDrive Snapshot copy. In other words, within a Snapshot copy, a LUN is not consistent if it is connected to any host other than the one that initiated the Snapshot copy. (This is why you are advised to dedicate your storage system volumes to individual hosts.) Therefore, it is important to back up a LUN using a SnapDrive Snapshot copy rather than using other means, such as creating Snapshot copies from the storage system console.

For more information about Snapshot copies, see the *Data Protection Online Backup and Recovery Guide*.

Note

If you use the SnapManager product to manage your database, instead of SnapDrive you must use SnapManager to create Snapshot copies. For more information about using SnapManager to create Snapshot copies, see the current *SnapManager Installation and Administration Guide* for your product.

Additionally, as part of the SnapDrive Snapshot copy process, the file system (NTFS) is flushed to disk and the disk image in the Snapshot copy is in a consistent state. This consistency cannot be ensured if the Snapshot copy was created outside the control of SnapDrive (that is, at the storage system console, or using the FilerView interface or rsh, or by backing up the LUN file in the active file system.)

Restrictions on Snapshot copy creation: Note the following facts about SnapDrive and Snapshot copies:

- ◆ You can keep a maximum of 255 Snapshot copies with Data ONTAP.
After the number of Snapshot copies has reached the limit, the Snapshot Create operation fails, and you must delete some of the old Snapshot copies before you can create any more.
- ◆ SnapDrive does not support Snapshot copies that are created from the storage system console, because such a practice can lead to inconsistencies within the NTFS file system. Therefore, use only SnapDrive to create Snapshot copies of LUNs.
- ◆ You cannot create a Snapshot copy of a LUN connected to a Snapshot copy. For more information, see “[Snapshot cautions](#)” on page 158.

- ◆ SnapDrive automatically turns off the Snapshot copy schedule on a storage system volume that stores LUNs, so that the storage system does not create automatic Snapshot copies.

Note

Any Snapshot copies inadvertently made at the storage system console or through FilerView are dimmed (unavailable) in the SnapDrive plug-in and are not usable by SnapDrive.

Snapshot copy requirements: The following requirements must be met:

- ◆ You must create Snapshot copies through the SnapDrive MMC snap-in or through sdcli.exe, rather than the storage system console or the volume Snapshot copy schedule on the storage system. This is because SnapDrive must first flush NTFS so that the LUN is consistent at the moment the Snapshot copy is made. This ensures the usability of the LUN file in the Snapshot copy directory.
- ◆ Snapshot names must be created using US-ASCII characters only, even when using non-ASCII operating systems.

SnapDrive limitation: The SnapDrive service can perform only one task at a time. If you schedule multiple tasks to start at exactly the same time, the first will proceed, and SnapDrive will queue the others until the first task either succeeds or times out.

For more information: The following topics provide instructions on using SnapDrive to create a Snapshot copy:

- ◆ [“Creating a Snapshot copy”](#) on page 153
- ◆ [“Scheduling Snapshot copies”](#) on page 154

Creating a Snapshot copy

To create a Snapshot copy using SnapDrive, complete the following steps.

Step	Action
1	Perform the following actions to get to the Create Snapshot menu item: a. Expand the Storage option in the left MMC pane, if it is not expanded already. b. Double-click SnapDrive, or SnapDrive List if you have multiple instances of SnapDrive in MMC. c. Select the instance of SnapDrive you want to manage. d. Double-click Disks. e. Double-click the disk for which you want to create a Snapshot copy. f. Select Snapshots. g. Click Action (from the menu choices on top of MMC). h. Select Create Snapshot from the drop-down menu. Result: The Create Snapshot text box is displayed.
2	In the Create Snapshot text box, perform the following actions: a. Type an easy-to-interpret name for the Snapshot copy. For example, expenses_db_15Jan03_4pm. Note _____ Snapshot copy names must be created using US-ASCII characters only, even when using non-ASCII operating systems. _____ b. Click OK. Result: Your Snapshot copy is created. Information about the Snapshot copy appears in the right MMC panel, in a list with all previous Snapshot copies for that volume.

**Scheduling
Snapshot copies**

Make sure that you have read the Snapshot copy requirements described in “[Snapshot copy requirements](#)” on page 152 before you follow this procedure.

To schedule SnapDrive Snapshot copies, complete the following steps.

Note
All steps except Step 1 in the following procedure are performed using the Scheduled Task Wizard, a Windows task scheduling tool available on your Windows server.

Step	Action
1	Create a batch file (a file with a .bat extension) containing the following command on the Windows host on which you are scheduling Snapshot copies: <pre>sdcli snap create [-m MachineName] -s SnapshotName -D DriveLetterList [. . .] [-x]</pre> <i>MachineName</i> is the name of the Windows host on which the command will be executed. If no machine name is specified, the command is executed on the local machine. <i>SnapshotName</i> is the name of the Snapshot copy to be created. <i>DriveLetterList</i> is a list of space-separated drive letters. When <i>-x</i> flag is specified, Snapshot copies are created only for the drives specified by the <i>-D</i> flag. Otherwise, Snapshot copies are created for all the disks on the storage system volumes used by the listed drives. Example: <code>sdcli snap create -s Jun_13_03 -D j k l</code> The preceding example creates a Snapshot copy named Jun_13_03 for each volume containing one or more of the LUNs mapped to the specified drives (that is, J:, K:, and L:). The Snapshot copies created are consistent for all LUNs contained by those volumes.
2	Select Start Menu > Settings > Control Panel > Scheduled Tasks.
3	Double-click Add Scheduled Task. Result: The Scheduled Task Wizard is launched.
4	In the Scheduled Task Wizard appears, click Next.

Step	Action
5	After the next panel appears, click Browse, and navigate to the folder where the batch (.bat) file you created in Step 1 is located.
6	Select the batch file.
7	After the following panel appears, select from the list of frequencies, then click Next.
8	After the following panel appears, type a start time and complete the detailed frequency parameters. The option details displayed on this panel vary depending on the Snapshot copy frequency you picked in the previous panel.
9	In the following panel, type the user name (the administrator account name and password, repeated for confirmation), then click Next.

Note

Scheduling is not limited to Snapshot copy creation. You can use the Windows task scheduler to execute any of the sdcli.exe options, or even run a batch file containing numerous command operations.

Connecting to LUN copies

SnapDrive connects a host to a LUN in a Snapshot copy in read/write mode by mounting a LUN that backs a Snapshot copy (this has been the traditional method) or by connecting to a clone of a flexible volume using a flexible volume clone (FlexClone). By default, if the prerequisites are met, SnapDrive uses FlexClone technology to connect to LUNs in a Snapshot copy. (This is useful for conducting tests or for verifying data on a live SnapMirror destination.)

About flexible volume clones

A *flexible volume clone* (FlexClone®) is a point-in-time copy of a parent flexible volume. Changes made to the parent volume after the clone is created are not inherited by the clone.

A new FlexClone volume shares the same data as the parent volume; therefore, a new FlexClone volume requires almost no additional disk space. You can split the clone from its parent if you do not want the clone and parent to share disk space. For more information about flexible volume clones, see the *Block Access Management Guide*.

Advantages of using FlexClone volumes with SnapDrive: Using FlexClone volumes with SnapDrive provides the following advantages:

- ◆ It does not create a condition for a busy Snapshot copy chain on the parent volume, unlike a LUN backed by a Snapshot copy, which is used in instances in which FlexClone volumes are not available. Instead, only a single busy Snapshot copy is created, from which the FlexClone volume is made.
- ◆ It enables you to verify data on a SnapMirror destination without breaking the mirror.

Prerequisites for using FlexClone volumes with SnapDrive: The following prerequisites must be met for SnapDrive to use FlexClone volumes:

- ◆ Your storage system must be running Data ONTAP 7.1 or later.
- ◆ Only flexible volumes can be used to create FlexClones.
- ◆ There must be enough space available on the aggregate to create a non-space-reserved flexible volume.
- ◆ FlexClone must be licensed on your storage system.

How SnapDrive implements FlexClone volumes: To implement FlexClone volumes, SnapDrive first verifies the following:

- ◆ The volume on which the LUN exists is a flexible volume and FlexClone is licensed on the storage system.

- ◆ The specified Snapshot copy on the volume has already been used for a volume clone operation. If it has and the required LUN is usable, SnapDrive uses the existing volume clone to connect the host to the LUN.

Note

A LUN is usable if it has never been, and is not currently, mapped to a host.

- ◆ If a volume has not been cloned or the LUN is not usable, SnapDrive verifies that enough space exists on the aggregate on which the volume resides and creates a new volume clone from the specified Snapshot copy.

Note

Data ONTAP does not support FlexClone volumes on the storage system root volume.

How SnapDrive identifies FlexClone volumes

A FlexClone volume can be created from different Snapshot copies on a single storage system and volume, and multiple FlexClone volumes can also be created from the same storage system, volume, and Snapshot copy. FlexClone volumes do not use CIFS shares for identification, however, which causes the share name to display as “unknown” in the Disk Location column in the SnapDrive MMC. To differentiate between multiple FlexClone volumes, SnapDrive assigns a temporary and transient tag to entries that have the “unknown” share name, to provide a unique form of identification.

About read/write connections

If FlexClone volumes are not available because the prerequisites for their use have not been met (see “[Prerequisites for using FlexClone volumes with SnapDrive](#)” on page 156), SnapDrive uses a read/write connection to a LUN in a Snapshot copy that is actually a connection to a special type of LUN with the following properties:

- ◆ It is backed by a LUN in a Snapshot copy.
- ◆ It resides in the active file system and always has an .rws extension.
- ◆ When the host reads data from this LUN, it receives data that is in the LUN that is in the Snapshot copy.
- ◆ When the host writes data to this LUN, the data is written to the LUN with the .rws extension.
- ◆ When the host reads data that has been written to the LUN with the .rws extension, that data is received from the LUN with the .rws extension.

For details, see your Data ONTAP documentation.

Disk space implications: Connecting to a LUN in a Snapshot copy does not in itself consume any additional disk space on the storage system volume. You consume additional space only as you write to the .rws file.

Note

Connecting to a LUN in a Snapshot copy works well for temporary needs such as testing. If you want to make the connection permanent, consider making a copy of the original LUN. This new LUN, like any other, will require additional space in the volume as outlined under “[Volume-size rules](#)” on page 15.

Snapshot cautions: Keep the following points in mind when working with Snapshot copies and LUNs that are backed up by a Snapshot copy:

- ◆ Information written to the .rws file is temporary; SnapDrive deletes the .rws file when you disconnect.
- ◆ You cannot merge the data written to the .rws file with the data in the Snapshot copy referenced by the .rws file.
- ◆ You cannot delete a Snapshot copy that is in use by a LUN backed by a Snapshot copy.
- ◆ You can connect to the LUN Snapshot copy only by using read/write mode and a LUN that is backed by a Snapshot copy.
- ◆ You should avoid creating a Snapshot copy of a LUN backed by a Snapshot copy. Doing so will lock the Snapshot copy backing the LUN until the newer Snapshot copy—and all Snapshot copies of that LUN—are deleted. For more information about deleting a locked Snapshot copy, see “[Problems deleting Snapshot copies due to busy snapshot error](#)” on page 168.

For instructions on connecting to a LUN in a Snapshot copy, see “[Connecting to a LUN in a Snapshot copy](#)” on page 159.

Connecting to a LUN in a Snapshot copy

To connect to a LUN in a Snapshot copy using SnapDrive, complete the following steps.

Step	Action
1	Perform the following actions to launch the Connect Disk wizard: a. Expand the Storage option in the left MMC pane, if it is not expanded already. b. Double-click SnapDrive, or SnapDrive List if you have multiple instances of SnapDrive in MMC. c. Select the instance of SnapDrive you want to manage. d. Select Disks. e. Click Action (from the menu choices on top of MMC). f. Select Connect Disk from the drop-down menu.
2	In the Connect Disk Wizard, click Next.
3	In the Provide Virtual Disk Location panel, perform the following actions: a. Click Browse to browse to the \~snapshot directory of the storage system volume holding the Snapshot copy of the LUN. b. Select a LUN file (usually with a .lun extension). c. Click Next. Result: The Select a Virtual Disk Type panel is displayed. Note_____ If you cannot see the Snapshot copy directory, make sure that <code>cifs.show_snapshot</code> is set to On and <code>vol option nosnapdir</code> is set to Off on your storage system. _____
4	In the Select a Virtual Disk Type panel, Dedicated is automatically selected because a Snapshot copy can be connected only as a dedicated LUN. Click Next. Result: The Virtual Disk Snapshot Information panel is displayed.

Step	Action
5	In the Virtual Disk Snapshot Information panel, a path to a temporary read-write LUN created when you connect to the disk backed up by the Snapshot copy is automatically specified. Click Next. Result: The Select Virtual Disk Drive Letter panel is displayed.
6	In the Select Virtual Disk Drive Letter panel, perform the following actions. - Either select a drive from the list of available drive letters or enter a mount point for the LUN you are connecting. - Click Next. Result: The Select Initiators panel is displayed.
7	In the Select Initiators panel, perform the following actions. - Select the FCP or iSCSI initiator for the LUN you are creating and use the arrows to move it back and forth between the Available Initiators and Selected Initiators list. - Click Next. Result: The Select igroup Management Type panel is displayed.

Step	Action	
8	In the “Select igroup Management Type” panel, specify whether you will use automatic or manual igroup management. If you select automatic igroup management, SnapDrive uses existing igroups or, when necessary, creates new igroups for the initiators you specified in Step 7 . If you select manual igroup management, you manually choose existing igroups or create new ones as needed.	
	If you specify...	Then...
	Automatic igroup management	Click Next. You are done with igroup management. Result: SnapDrive uses existing igroups, one igroup per initiator, or, when necessary, creates new igroups for the initiators you specified in Step 7.
	Manual igroup management	Click next, and then perform the following actions: a. In the Select igroups panel, select from the list the igroups to which you want the new LUN to belong. Repeat this action for each node in the cluster. Note _____ A LUN can be mapped to an initiator only once. OR b. Click Manage igroups and for each new igroup you want to create, type a name in the igroup Name text box, select initiators, click Create, and then click Finish to return to the Select igroups panel. c. Click Next. Note _____ The Next button will remain unavailable until the collection of selected igroups contains all the initiators you selected in Step 7.

Step	Action
9	In the Completing the Connect Disk Wizard panel, perform the following actions. a. Verify all the settings. b. If you need to change any settings, click Back to go back to the previous Wizard panels. c. Click Finish. Result: MMC is displayed with the newly connected LUN now appearing under SnapDrive > Disks in the left panel.

Restoring LUNs from Snapshot copies

When you restore a LUN from a Snapshot copy, the LUN reverts to the state it was in when the Snapshot copy was made: the restore operation overwrites all data written to the LUN since the Snapshot copy was made.

A LUN restore recalls a selected Snapshot copy. During a restore, the entire LUN drive is restored from the Snapshot copy. For a restore to succeed, no open connections can exist between the host machine (or any other application) and the files in the LUN.

Note

If you need to restore an expanded disk from a Snapshot copy, you should use a Snapshot copy that was created after the LUN was expanded. SnapDrive does not allow you to restore a LUN from a Snapshot copy that was made before the disk was expanded. If you need to do this, you must disconnect the disk using SnapDrive, then restore the disk from the storage system console using the `snap restore` command. For more information, see the *Data Protection Online Backup and Recovery Guide*. When the LUN is restored, reconnect the disk using SnapDrive.

For instructions on restoring a LUN from a Snapshot copy, go to “[Restoring a LUN from a Snapshot copy](#)” on page 164.

About the Data ONTAP LUN clone split (rapid LUN restore) feature

If you are using Data ONTAP 7.1 or later, SnapDrive uses the LUN clone split (rapid LUN restore) feature of Data ONTAP when restoring a LUN.

A LUN clone is a point-in-time, writable copy of a LUN in a Snapshot copy. After the clone is created, all read/write operations are made on the clone and read/write operations are no longer made on the original LUN.

A LUN clone shares space with the original LUN in the backing Snapshot copy. The clone does not require additional disk space until changes are made to it. When Data ONTAP splits the clone from the backing Snapshot copy, Data ONTAP copies the data from the Snapshot copy, and copies the blocks from the original LUN, to the clone. After the splitting operation, the clone becomes a regular LUN, and the original LUN is deleted by Data ONTAP.

Note

If you do not have enough disk space for both the clone and the original LUN, the split will not be initiated and no LUN restoration can occur.

Benefit of using rapid LUN restore

When rapid LUN restore, or LUN cloning, is used by SnapDrive, the clone is split from the backing Snapshot copy in the background, and the restored LUN is available to the Windows host for I/O operations within a few seconds.

To take advantage of the rapid LUN restore feature when performing a LUN restore with SnapDrive, the option must be enabled on your storage system. To determine whether this option is enabled, use the `options lun.clone_restore` command at the storage system command line. The option must be set to On. If the option is not set to On, or if you are using a version of Data ONTAP earlier than 7.1, SnapDrive will perform a Single File Snap Restore operation.

For more information about LUN clones, see the *Block Access Management Guide*.

Restoring a LUN from a Snapshot copy

To restore a LUN from a Snapshot copy, complete the following steps.

Step	Action
1	Shut down all resources directly or indirectly dependent on the LUN. Make sure that the LUN is not being used by the Windows file system or any other process, and that no user has the LUN open in Windows Explorer. Shut down any application that is using the LUN. Attention ————— Make sure that the Windows Performance Monitor (perfmon) is not monitoring the LUN.
2	Perform the following actions: a. Expand the Storage option in the left MMC pane, if it is not expanded already. b. Double-click SnapDrive, or SnapDrive List if you have multiple instances of SnapDrive in MMC. c. Select the instance of SnapDrive you want to manage. d. Double-click Disks. e. Select the LUN that you want to restore.

Step	Action
3	In the right MMC pane, perform the following actions: a. Right-click the specific Snapshot copy you want to restore. b. Select Restore Disk From Snapshot from the drop-down menu. Note _____ You can only restore a Snapshot copy that is consistent with the active file system. Inconsistent Snapshot copies are not available for restoration and are grayed out.
4	In the Restore Snapshot panel, click Yes to restore the Snapshot copy you selected. Attention _____ Do not attempt to manage any Windows cluster resources while the restore is in progress.

Checking LUN restore status

To check the status of a LUN restore, complete the following steps.

Step	Action
1	In the right MMC pane, under Storage > SnapDrive, click Disks.
2	In the left MMC pane, locate the name of the disk you are restoring. The status is displayed under the column titled Restore Status. If a restore is in progress, SnapDrive will display the percentage completed, otherwise; the status will display Normal. Note _____ You can also check the status of a LUN restore using the <code>disk list</code> command of the <code>sdcli.exe</code> utility. For more information see Appendix A, “LUN commands,” on page 225.

Volume-based Snapshot copy restoration with SnapDrive

How SnapDrive supports volume Snapshot copy restoration

SnapDrive supports volume-based Snapshot copy restoration on volumes containing only non-connected LUNs, and breaks the SnapMirror connection if the operation is performed on a live SnapMirror destination.

Volume restore functions are currently available through the `sdcli` utility. For more information, see “[Snapshot commands](#)” on page 231.

Deleting Snapshot copies

Reasons to delete Snapshot copies: Delete older Snapshot copies for the following reasons:

- ◆ To keep the number of stored Snapshot copies less than the hard limit of 255 for Data ONTAP
Be sure to delete old Snapshot copies before the hard limit is reached; otherwise, subsequent Snapshot copies could fail.
- ◆ To free space on the storage system volume
Even before the Snapshot copy limit is reached, a Snapshot copy fails if insufficient reserved space for it remains on the disk.

For instructions for deleting a Snapshot copy, see “[Deleting a Snapshot copy](#)” on page 167.

Deleting a Snapshot copy

To delete a Snapshot copy, complete the following steps.

Note—
You must make sure that the LUN whose Snapshot copy you want to delete is not being monitored with the Windows Performance Monitor (perfmon).

Step	Action
1	Perform the following actions: a. Expand the Storage option in the left MMC pane, if it is not expanded already. b. Double-click SnapDrive, or SnapDrive List if you have multiple instances of SnapDrive in MMC. c. Select the instance of SnapDrive you want to manage. d. Double-click Disks. e. Select the LUN whose Snapshot copy you want to delete.

Step	Action
2	In the right MMC pane, select the Snapshot copy you want to delete. Note_____ You can only delete a Snapshot copy that is consistent with the LUN. Inconsistent Snapshot copies are not available for deletion.
3	Click Action (from the menu choices on top of MMC).
4	Select Delete from the drop-down menu.
5	In the Delete Snapshot panel, click Yes to delete the Snapshot copy you selected. Note_____ If you get an error message stating that the Snapshot copy is busy or cannot be deleted, it is likely that the Snapshot copy is in use by a LUN that is backed by a Snapshot copy. For more information, see “Problems deleting Snapshot copies due to busy snapshot error” on page 168

Problems deleting Snapshot copies due to busy snapshot error

If you attempt to delete a Snapshot copy and you get an error message saying that the Snapshot copy is busy and cannot be deleted, you either have a Snapshot copy that was taken of a LUN backed by another Snapshot copy or the Snapshot copy backed LUN is still connected. In the first instance, you need to delete the newer Snapshot copy before the older Snapshot copy, the Snapshot copy backing the LUN, can be deleted. If the LUN backed by a Snapshot copy is still connected, disconnect it.

To see if you have busy Snapshot copies, you can view your application event log in the Event Viewer to check for messages related to busy Snapshot copies. For more information about deleting busy Snapshot copies, see the *Block Access Management Guide* for your version of Data ONTAP.

Overview of archiving and restoring Snapshot copies

A good way to protect and retain data is to archive the SnapDrive Snapshot copies of the LUNs to offline, offsite media, such as near-line technology or alternate storage methods. This practice is particularly beneficial for disaster recovery.

What to back up: When archiving backups, it is important that you select the LUNs that are *not* in the active file system. The disks in the active file system are not consistent and, therefore, will not result in reliable backups. You must also select the *Snapshot copies* of the LUNs when creating backups.

Ways to archive SnapDrive backups: You can use the Data ONTAP `dump` command or an NDMP-based backup application to archive the Snapshot copies of your LUNs.

Note

You cannot use CIFS-based or NFS-based backup products to archive the Snapshot copies of your LUNs.

Process for restoring LUNs from archival media: First, restore the LUN file from your archive media to the active file system. After the file is restored, use the SnapDrive management interface to connect to the LUN file using its original drive letter.

For more information about LUN backups, see the Data ONTAP *Block Access Management Guide*. For more information about how to perform a recovery from an offline archive, see your backup application software documentation.

Note

Further steps might be required to bring online data recovered in LUN files. This holds true for all SnapManager products. For more information about recovering LUNs using SnapManager, see the current *SnapManager System Administrator's Guide* for your product.

The following section describes how SnapDrive uses the SnapVault feature of Data ONTAP to back up Snapshot copies to a secondary storage system. This document does not describe how to set up and configure SnapVault. For information about SnapVault setup and configuration, see your Data ONTAP *Data Protection Online Backup and Recovery Guide*.

Go to either of the following topics for more information:

- ◆ [“Overview of SnapVault”](#) on page 172
- ◆ [“Initiating backups”](#) on page 173

Overview of SnapVault

SnapVault is a Data ONTAP feature that provides a fast, efficient, and centralized backup solution for replicating Snapshot copies to a secondary storage system.

Considerations using SnapVault

Keep the following considerations in mind when using the SnapVault feature with SnapDrive:

- ◆ You must have at least Data ONTAP 7.2.1 installed on your storage system.
- ◆ SnapVault must be licensed on the primary and secondary storage systems.
- ◆ SnapVault relationships must already be configured and initialized.
- ◆ A backup set might contain multiple primary storage systems and volumes, but only one volume and a one secondary storage system.
- ◆ Each backup set can span only a one volume on a secondary storage system. If multiple volumes are required, the backup will fail.
- ◆ Only qtree SnapVault configurations are supported. SnapDrive does not support volume-based SnapVault.
- ◆ SnapVault cascaded configurations are not supported.
- ◆ There is no SnapVault restoration feature.

Initiating backups

Ways in which SnapVault backups are initiated

- SnapVault backups can be initiated in two ways:
- ◆ From within the SnapDrive MMC, using the Update SnapVault option
See “[Initiating SnapVault updates from the SnapDrive MMC](#)”.
 - ◆ By using the `sdcli snapvault archive` command
See Appendix A, “[SnapVault commands](#),” on page 236.

Initiating SnapVault updates from the SnapDrive MMC

To initiate a SnapVault update for LUNs on the SnapVault primary system, complete the following steps.

Step	Action
1	Perform the following actions: a. Expand the Storage option in the left MMC pane, if it is not expanded already. b. Double-click SnapDrive in the left MMC pane. c. Double-click Disks. d. Double-click the LUN for which you want to perform a SnapVault update e. Select Primary Snapshots to display the Snapshot copies on the primary system.
2	In the right MMC pane, right-click the Snapshot copy from which you want the SnapVault update to be initiated and select SnapVault Update from the menu. Result: A Snapshot copy with the same name as the Snapshot copy you selected on the primary system is created on the secondary storage system after the SnapVault update.

The topics that follow describe the Volume Shadow Copy Service:

- ◆ “[What Volume Shadow Copy Service is](#)” on page 176
- ◆ “[Troubleshooting the VSS Hardware Provider](#)” on page 179

What Volume Shadow Copy Service is

Microsoft® Volume Shadow Copy Service (VSS) is a new feature of Microsoft Windows® Server 2003 that coordinates among data servers, backup applications, and storage management software to support the creation and management of consistent backups. These backups are called shadow copies, or Snapshot copies.

VSS requirements

In order to use VSS with SnapDrive 5.0, VSS requires the following:

- ◆ Your storage system must be running at least Data ONTAP 7.0.5.
- ◆ The Virtual Disk Service must be running on your Windows 2003 host.

Overview of VSS

VSS coordinates Snapshot copy-based backup and restore and includes these additional components:

- ◆ VSS requestor

The VSS requestor is a backup application, such as the SnapManager for Microsoft Exchange application or NTBackup. It initiates VSS backup and restore operations. The requestor also specifies Snapshot copy attributes for backups it initiates.

- ◆ VSS writer

The VSS writer owns and manages the data to be captured in the Snapshot copy. Microsoft Exchange 2003 is an example of a VSS writer.

- ◆ VSS provider

The VSS provider is responsible for the creation and management of the Snapshot copy. A provider can be either a hardware provider or a software provider:

- ❖ A hardware provider integrates storage array-specific Snapshot copy and cloning functionality into the VSS framework. The Data ONTAP VSS Hardware Provider integrates the SnapDrive service and NetApp storage systems running Data ONTAP into the VSS framework.

Note

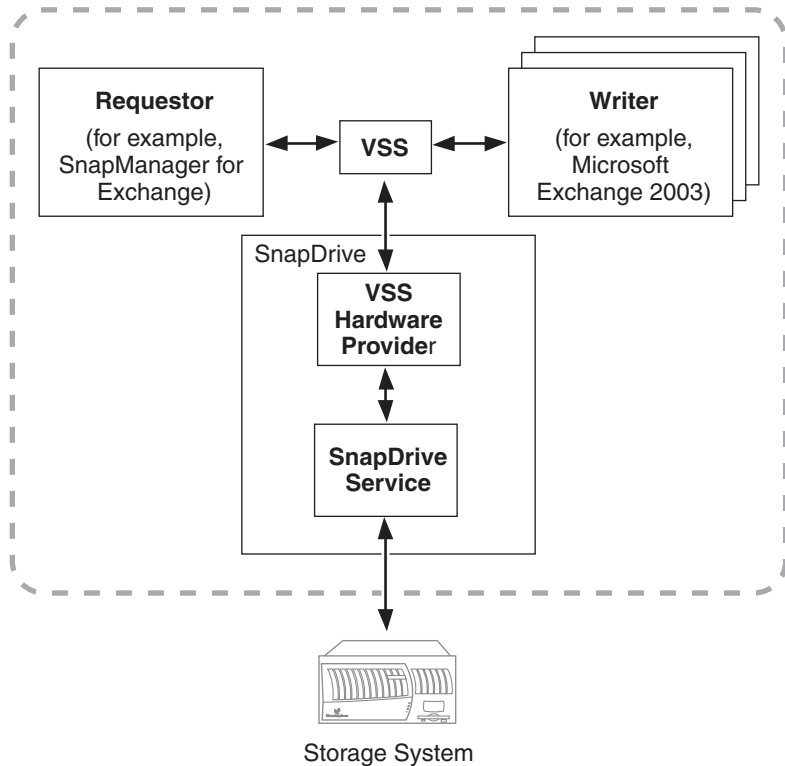
The Data ONTAP VSS Hardware Provider is installed automatically as part of the SnapDrive 5.0 software installation.

- ❖ A software provider implements Snapshot copy or cloning functionality in software that is running on the Windows system.

Note

To ensure the Data ONTAP VSS Hardware Provider works properly, do not use the VSS software provider on Data ONTAP LUNs. If you use the VSS software provider to create Snapshot copies on a Data ONTAP LUN, you will be unable to delete that LUN using the VSS hardware provider.

The following figure shows how the modules communicate through VSS.

**Typical VSS backup process**

A typical backup using SnapManager for Exchange, Exchange 2003 or Exchange 2007, and the Data ONTAP VSS Hardware Provider is outlined in the following process:

1. SnapManager determines which LUNs it wants to capture and makes sure that Exchange 2003 or Exchange 2007 is present as a valid writer.
2. SnapManager initiates the shadow copy process.

3. VSS informs Exchange and the Data ONTAP VSS Hardware Provider that a shadow copy is starting. Exchange stops writing to disk.
4. VSS ensures that NTFS is in a consistent state.
5. VSS requests the Data ONTAP VSS Hardware Provider to create a shadow copy.
6. The Data ONTAP VSS Hardware Provider requests SnapDrive to create a Snapshot copy of the storage system volume that contains the specified LUN.
7. SnapDrive requests the storage system to create a Snapshot copy of the specified volume.
8. When the shadow copy is complete, VSS returns NTFS to a normal state and informs Exchange that it can resume disk writes.
9. VSS manages the shadow copy of the LUN based on the attributes specified by the requestor. For example, VSS could mount the LUN in a Snapshot copy. In a case, however, in which SnapManager is the requestor, SnapManager tells VSS to forget about the shadow copy it just created. This enables SnapManager to have complete control of the Snapshot copy.

Troubleshooting the VSS Hardware Provider

Data ONTAP VSS Hardware Provider requirement

When you use a VSS requestor, such as SnapManager for Exchange or NTBackup, to back up a LUN backed by a storage system running Data ONTAP, the Data ONTAP VSS Hardware Provider must be used for the Snapshot copy to succeed.

Multiple providers installed

There can be many providers installed on the same Windows host, including the VSS software provider, which is always installed. The provider used is determined by either the Requestor or VSS, not the provider. If the first choice provider is not available, an alternative can be silently substituted.

To make a Snapshot copy on the storage system, the Data ONTAP VSS Hardware Provider must be used. If a Snapshot copy on the storage system is not created successfully, verify that the Data ONTAP VSS Hardware Provider was used to create the Snapshot copy.

Only the Data ONTAP VSS Hardware Provider can take a Snapshot copy on a storage system.

Viewing installed VSS providers

To view the VSS providers installed on your host, complete the following steps.

Step	Action
1	Select Start > Run and enter the following command to open a Windows command prompt: <code>cmd</code>

Step	Action
2	At the prompt, enter the following command: <pre>vssadmin list providers</pre> Result: The output should be similar to this example: Provider name: 'Data ONTAP VSS Hardware Provider' Provider type: Hardware Provider Id: {ddd3d232-a96f-4ac5-8f7b-250fd91fd102} Version: 5.0.0.1875

Troubleshooting when a Snapshot copy is not made on the storage system

If you attempt to create a backup on a NetApp storage system and a Snapshot copy is not created on the storage system, complete the following steps.

Step	Action
1	Verify that the Data ONTAP VSS Hardware Provider was used to create the Snapshot copy and that it was completed successfully. For details, see “Verifying that the VSS Hardware Provider was used successfully” on page 181.
2	If Data ONTAP VSS Hardware Provider was not used or failed to create the Snapshot copy successfully, verify your VSS configuration. For details, see “Verifying your VSS configuration” on page 181. Note_____ The VSS auto-recovery feature is not supported in this release and VSS Snapshot copy requests are rejected if this option is enabled. When the VSS auto-recovery feature is enabled or if auto-recovery is set on SQL Server 2005 or similar applications, Snapshot copy requests fail and the Application Event Log reports the error “Data ONTAP VSS hardware provider does not support this context. Please check AutoRecovery option, which is currently NOT supported.” _____

Verifying that the VSS Hardware Provider was used successfully

To verify that the Data ONTAP VSS Hardware Provider was used successfully after a Snapshot copy was taken, complete the following step.

Step	Action		
1	Open the Application Event Viewer in MMC and look for an event with the following values.		
	Source	Event ID	Description
	Navssprv	4098	The VSS provider has successfully completed CommitSnapshots for SnapshotSetId <id> in <n> milliseconds.

Note

VSS requires that the provider initiate a Snapshot copy within 10 seconds. If this time limit is exceeded, the Data ONTAP VSS Hardware Provider logs Event ID 4364. This limit could be exceeded due to a transient problem. If this event is logged for a failed backup, retry the backup.

Verifying your VSS configuration

If the Data ONTAP VSS Hardware Provider failed to run or did not successfully complete a Snapshot copy, complete the following steps.

Step	Action
1	Verify that SnapDrive is installed and running, and can communicate with the storage system. To do this, complete the following steps: - Open MMC and select the Disks icon under Snapdrive. - Select Action > Refresh. No error messages should be displayed.

Step	Action
2	Verify that options <code>lun.inquiry.mode</code> is set to <i>legacy</i> and <i>not</i> standard on the storage system. This setting applies if you are using Data ONTAP 7.2 and you are using Exchange or SQL Server for VSS-based backups. By default, the mode is set to <i>legacy</i>. To verify the setting, at the storage system prompt enter the following command: <pre>options lun.inquiry.mode</pre> To change the setting, enter the following command: <pre>options lun.inquiry.mode legacy</pre> Attention _____ To change or set this option, you must first stop FCP and iSCSI services on your storage system, which might temporarily disrupt any operations currently in progress. Use <code>fcg stop</code> and <code>iscsi stop</code> to stop the services. Use <code>fcg start</code> and <code>iscsi start</code> to restart the services after setting the mode.
3	Verify that the drives for which the Data ONTAP VSS Hardware Provider failed are backed by a LUN on a NetApp storage system. To do this, open MMC and verify that the drives appear under the Disks icon under SnapDrive.

Step	Action
4	Verify that the account used by the Data ONTAP VSS Hardware Provider is the same as the account used by SnapDrive. To do this, complete the following steps: a. In the left MMC pane, select Services and Applications > Services. b. Double-click the SnapDrive service in the right pane and select the Log On tab. c. Note the account listed in the This Account field. d. Double-click the Data ONTAP VSS Hardware Provider service in the right pane and click the Log On tab. e. Verify that the This Account field is selected, and that it contains the same account as the SnapDrive service.

The topics that follow discuss SAN booting and how SAN booting works with SnapDrive:

- ◆ “[What SAN booting is](#)” on page 185
- ◆ “[How SnapDrive supports SAN booting](#)” on page 185
- ◆ “[Configuring bootable LUNs](#)” on page 186

What SAN booting is

The term *SAN booting* means using a SAN-attached disk, such as a storage system LUN, as a boot device for a SAN host. It also entails removing internal disks from the host so the host uses the SAN for all its storage needs.

SAN booting does not require support for special SCSI operations. It is not different from any other SCSI disk operations. The HBA has hooks into the BIOS, which enables the host to boot from a LUN on the storage system.

After the HBA has accessed the BIOS, you use the BIOS boot utility to configure the LUN as a boot device. You then configure the PC BIOS to make the LUN the first disk device in the boot order. The following must be installed on the LUN:

- ◆ Windows 2003 operating system
- ◆ A driver for the FCP or iSCSI HBA

Note

Following a system failure, the bootable LUN might not remain the default boot device. In the event of a system failure, you might need to reconfigure the hard disk sequence in the system BIOS to set the bootable LUN as the default boot device.

How SnapDrive supports SAN booting

SnapDrive 5.0 detects both bootable LUNs (SAN booting) and nonbootable LUNs and differentiates between the two in the Microsoft Management Console (MMC) by representing each LUN type with a unique icon. SAN bootable LUNs are represented by an icon containing a disk with a red letter “s” in the upper left corner.

SnapDrive identifies bootable LUNs and prevents you from performing some of the operations you would normally perform on a nonbootable LUN.

When a LUN is a boot disk, the following actions are disabled or unavailable in SnapDrive:

- ◆ Disconnect
- ◆ Delete
- ◆ Expand
- ◆ Restore

SnapDrive supports the following Snapshot copy-related actions on bootable LUNs:

- ◆ Create
- ◆ Rename
- ◆ Delete

Note

Restoring Snapshot copies of bootable LUNs is not allowed by SnapDrive. For important information about Snapshot copies of bootable LUNs, see the technical white papers on the NOW site (<http://now.netapp.com/>).

Configuring bootable LUNs

See your FCP or iSCSI HBA vendor documentation for information on configuring bootable LUNs. If you are using the SAN Host Attach Kit for Fibre Channel Protocol on Windows, see the *SAN Host Attach Kit for Fibre Channel Protocol on Windows Installation and Setup Guide*. If you are using the QLogic QLA4010/4010C iSCSI HBA, see *Configuring iSCSI SAN Booting with the QLogic QLA 4010/4010C HBA*. These documents are on the NOW site (<http://now.netapp.com/>).

The topics that follow discuss how to use a SnapMirror destination volume, either synchronous or asynchronous, to replicate SnapDrive LUNs.

These topics do not explain how to set up, configure, or manage SnapMirror on your storage system. Instead, they focus on how to use SnapDrive in conjunction with SnapMirror for LUN replication. For information about SnapMirror setup and configuration, see your Data ONTAP *Data Protection Online Backup and Recovery Guide*.

Go to any of the following topics for more information:

- ◆ [“SnapMirror overview”](#) on page 188
- ◆ [“SnapMirror replication”](#) on page 191
- ◆ [“Initiating replication”](#) on page 193
- ◆ [“Connecting to a LUN on a SnapMirror destination volume”](#) on page 195
- ◆ [“Restoring a volume on a SnapMirror destination”](#) on page 200
- ◆ [“Recovering a cluster from shared LUNs on a SnapMirror destination”](#) on page 201

SnapMirror overview

SnapMirror creates either asynchronous or synchronous replicas of volumes that host LUNs.

With asynchronous SnapMirror, data is replicated from a source volume to a partner destination volume at regular intervals.

With synchronous SnapMirror, data from a source volume or qtree is replicated on a destination volume or qtree at, or near, the same time it is written to the first storage system.

When the LUN data on your source volume is offline or no longer valid, you can connect to and use the copy of the LUN on the SnapMirror destination volume. Unless otherwise indicated, the information discussed in this chapter applies to volumes that host SnapMirror LUNs, whether they are asynchronous and synchronous.

If a storage system volume or storage system holding one or more LUNs suffers a catastrophic failure, you can use a mirrored destination volume to recover the LUNs.

The following topics provide more information:

- ◆ [“Understanding replication”](#) on page 188
- ◆ [“Requirements for using SnapMirror with SnapDrive”](#) on page 189

Understanding replication

The destination volume stores replicas of the LUNs. These copies are created each time SnapMirror replication is executed. Therefore, the destination contains data that is valid up to the point when the most recent replication was executed.

Because SnapMirror is an asynchronous form of data replication, any disk writes to the source volume that follow the most recent SnapMirror replication do not appear on the destination volume until the next time the destination volume is updated. Therefore, the post-update changes to the source disk are not available in the event of a catastrophic failure.

With synchronous SnapMirror, updates are continuously written to both the source and destination volumes. In the event of a failure, the most recent changes to the source volume are also available on the destination.

Requirements for using SnapMirror with SnapDrive

To use SnapDrive in conjunction with SnapMirror, your system must meet the following requirements:

- ◆ SnapMirror must be licensed on the source and destination storage systems. For information on how to license and set up SnapMirror, see the *Data ONTAP Data Protection Online Backup and Recovery Guide*.
- ◆ Depending on the LUN protocols you are using, enable the iSCSI and FCP licenses on the destination storage systems to enable LUN connect and LUN management operations.
- ◆ You must manually create and initialize a mirror between the source and destination volumes, but you must *not* create a SnapMirror replication schedule.

When setting up SnapMirror on your storage system, you can avoid schedule conflicts with SnapDrive by setting the replication schedule on the storage system to “- - -”, which disables any scheduled transfers. When you set the replication schedule, make sure that the destination volume is in a restricted state. See the *Data ONTAP Data Protection Online Backup and Recovery Guide* for additional details.

- ◆ You must create your SnapMirror relationship using storage system names (either the fully qualified DNS name or the storage system name alone), and the network interface to be used for SnapMirror transfers (for example, filer1-e0), not IP addresses.
- ◆ The system must contain one or more SnapMirror source volumes hosting LUNs.
- ◆ The system must contain one or more SnapMirror destination volumes for each source volume.

Note

SnapDrive supports the use of SnapMirror at the volume level only; it does not support qtree-level SnapMirror operations.

- ◆ The destination volume must be at least as large as the source volume.
- ◆ The Windows domain account used by the SnapDrive service must be a member of the local BUILTIN\administrators group on both the source and destination storage systems.
- ◆ The Windows domain account used to administer SnapDrive must have full access to the Windows domain to which both the source and destination storage systems belong.
- ◆ The source and destination storage systems must be configured to grant root access to the Windows domain account used by the SnapDrive service. That is, the `wapl.map_nt_admin_priv_to_root` option must be set to On. For

information about enabling storage system options, see your Data ONTAP documentation.

- ◆ If you want to use a Windows host to access the replicated LUNs on the destination volume, the destination storage system must have at least one LUN access protocol licensed (iSCSI or FCP).
- ◆ A TCP/IP connection must exist between the source storage system and the destination storage system.
- ◆ The SnapDrive service can perform one task at a time. Therefore, if you are scheduling multiple tasks on a host, make sure that you do not schedule these tasks to start at exactly the same time. If multiple tasks are scheduled at the same time, the first will proceed, and SnapDrive will queue the others until the first task either succeeds or times out.

SnapMirror replication

Replication upon Snapshot copy creation: Each time a Snapshot copy of a LUN is created—manually or because of a Snapshot copy schedule—SnapDrive determines whether the LUN of which a Snapshot copy was made resides on a SnapMirror source volume. If so, then after the Snapshot copy has been made, SnapDrive sends a SnapMirror update request to all the destination volumes associated with the source volume for that LUN.

When you initiate a Snapshot copy of a LUN on a SnapMirror source through SnapDrive, a window with a check box labeled “Initiate SnapMirror Update” is displayed. The check box is selected by default.

Replication using rolling Snapshot copies: You can also create a special type of Snapshot copy called a “rolling” Snapshot copy, using the Update SnapMirror operation in SnapDrive. These Snapshot copies are used exclusively to facilitate frequent SnapMirror volume replication. Like regular Snapshot copies, rolling Snapshot copies are replicated to the SnapMirror destination volume as soon as they are created.

SnapDrive creates a new rolling Snapshot copy every time you initiate a mirror update operation (using the Update Mirror option in the Action menu or the `sdcli snap update_mirror` command) for a specific LUN drive residing on a SnapMirror source volume.

To guarantee that at least one rolling Snapshot copy for each LUN is always available on the destination volume, SnapDrive maintains a maximum of two rolling Snapshot copies on the source volume.

How SnapDrive manages rolling Snapshot copies: When an Update Mirror operation is initiated, SnapDrive checks for any existing rolling Snapshot copies of the LUN containing the specified LUN drive:

- ◆ If SnapDrive does not find any rolling Snapshot copies containing the LUN image, it creates a rolling Snapshot copy on the SnapMirror source volume. SnapDrive then initiates a SnapMirror update operation, which replicates the rolling Snapshot copy on the destination volume.
- ◆ If SnapDrive finds one rolling Snapshot copy, it creates a second rolling Snapshot copy and initiates a SnapMirror update.
- ◆ If SnapDrive detects two rolling Snapshot copies for the LUN, it deletes the older rolling Snapshot copy and creates a new one to replace it. Then SnapDrive initiates a SnapMirror update.

Note

When you connect to a LUN in a Snapshot copy that is located on a traditional volume, SnapDrive creates a LUN backed by a Snapshot copy on the active file system. When a new Snapshot copy is created as part of a synchronous SnapMirror update, that new Snapshot copy will lock the Snapshot copy from which the LUN was connected. While the original Snapshot copy is locked, you will be unable to delete it until the next SnapMirror update when the first Snapshot copy is deleted automatically.

How rolling Snapshot copies are named: The following format is used to name the rolling Snapshot copies:

@snapmir@{ *GUID* }

GUID (Globally Unique Identifier) is a unique 128-bit number generated by SnapDrive to uniquely identify each rolling Snapshot copy.

Examples: The following are examples of rolling Snapshot copies:

@snapmir@{58e499a5-d287-4052-8e23-8947e11b520e}

@snapmir@{8434ac53-ecbc-4e9b-b80b-74c5c501a379}

Initiating replication

Requirements: Make sure you have read and satisfied the requirements listed in “[Requirements for using SnapMirror with SnapDrive](#)” on page 189 before you use the procedures in this section.

Initiating replication after Snapshot copy creation: Because SnapDrive automatically initiates SnapMirror replication once a Snapshot copy for a LUN on a SnapMirror source volume has been created, to initiate replication after a Snapshot copy has been created, you need either to manually create a Snapshot copy or to set up a schedule for automatic Snapshot copy creation.

If...	Then...
You want to manually create a Snapshot copy	See “ Creating a Snapshot copy ” on page 153.
You want to set up a schedule for Snapshot copy creation	See “ Scheduling Snapshot copies ” on page 154.

Initiating replication using the Update Mirror feature: To initiate replication using the SnapDrive Update Mirror feature, complete the following steps.

Step	Action
1	Select Start > Programs > Administrative Tools > Computer Management. Result: The Computer Management window (MMC) is launched.

Step	Action
2	Perform the following actions to select the LUN that you want to replicate and initiate the Update Mirror operation: a. Expand the Storage option in the left MMC pane, if it is not expanded already. b. Double-click SnapDrive, or SnapDrive List if you have multiple instance of SnapDrive in MMC. c. Select the instance of SnapDrive you want to manage. d. Double-click Disks. e. Select the LUN that you want to replicate in the right MMC panel. f. Click Action (from the menu choices at the top of MMC window). g. Select Update Mirror from the drop-down menu. Note The Update Mirror option is not available if no mirror is configured. Result: The Update Mirror operation is initiated and a rolling Snapshot copy of the LUN is created. After the Snapshot copy has been created on the mirrored source volume, SnapDrive automatically updates the mirrored destination volume.

Connecting to a LUN on a SnapMirror destination volume

Requirements for connecting to a LUN on a SnapMirror destination volume

The following requirements must be satisfied before you can connect to a destination volume:

- ◆ A CIFS share for the SnapMirror destination volume must exist.
- ◆ If you are using a version of Data ONTAP earlier than 7.1 on your storage system, the SnapMirror destination volume must be in the “broken” state before you can connect to a LUN in that volume.

Note

SnapDrive supports the use of FlexClone volumes in Data ONTAP 7.1 or later, which enables you to clone an independent volume from a parent FlexVol volume so that the mirror can remain unbroken. For more information, see [“Connecting to LUN copies”](#) on page 156.

- ◆ The LUN on an asynchronous SnapMirror destination must be restored from the most recent SnapDrive-created Snapshot copy containing a valid image of that LUN. The restoration is performed by SnapDrive as part of the LUN connect operation on an active file system or on a SnapMirror destination volume.

Note

The most recent Snapshot copy must be one created by SnapDrive to ensure data consistency. Data ONTAP creates a Snapshot copy that is more recent than the Snapshot copy created by SnapDrive; however, the Data ONTAP Snapshot copy cannot be used by SnapDrive because it is not consistent.

Using SnapDrive to meet the requirements for connecting to a destination volume

SnapDrive automates the process of meeting the requirements for connecting to a destination volume. SnapDrive checks the SnapMirror state on the destination volume holding the LUN. If the destination volume is an unbroken SnapMirror destination, SnapDrive displays the exact actions necessary to complete a connection to a LUN. If you agree to proceed with the connection, SnapDrive performs the following operations:

- ◆ SnapDrive breaks the SnapMirror replication for the destination volume.
- ◆ In the case of an asynchronous SnapMirror relationship, SnapDrive performs a restore operation from the most recent Snapshot copy containing a consistent image of the LUN.

Note

If you are running Data ONTAP 7.1 or later, instead of performing a Single File SnapRestore (SFSR) operation, SnapDrive will perform a rapid LUN restore (LUN clone and split) operation when restoring a LUN from a Snapshot copy.

Connecting to a LUN in a mirrored destination volume

To connect to a LUN in a mirrored destination volume, complete the following steps.

Step	Action
1	Select Start > Programs > Administrative Tools > Computer Management. Result: The Computer Management window (MMC) is launched.
2	If the source volume is not available, you might need to perform the following actions to rescan disks: a. Expand the Storage option in the left MMC pane, if it is not expanded already. b. Double-click Disk Management. c. Click Action (from the menu choices at the top of MMC window). d. Select Rescan Disks from the drop-down menu.
3	Connect to the mirrored LUN on the SnapMirror destination storage system. See “Connecting LUNs” on page 118 for more information.
4	If you want to break the mirror and connect to a SnapMirror destination volume that is online and, in the case of an asynchronous SnapMirror volume, perform a single file SnapRestore operation or rapid LUN restore, click Yes in the Connect Disk dialog box. Note _____ Perform this step only if the destination volume is not “broken”. The mirror does not need to be broken if you connect to a LUN inside a Snapshot copy. _____

Step	Action	
5	If the LUN...	Then...
	Will belong to a single system	Select Dedicated Drive, click Next, then skip to Step 7 .
	Will be a Windows cluster resource	Select Shared Drive and then click Next.
6	Verify that you want the disk to be shared by the nodes listed, then click Next.	
7	In the Select Virtual Disk Drive Letter window, examine the properties of the LUN and assign a drive letter, then click Next.	
8	In the Select Initiators window, select an initiator for each host in the cluster. See “ Connecting LUNs ” on page 118 for more information.	

Step	Action	
9	In the “Select igroup Management Type” panel, specify whether you will use automatic or manual igroup management. If you select automatic igroup management, SnapDrive uses existing igroups or, when necessary, creates new igroups for the initiators you specified in Step 8 . If you select manual igroup management, you manually choose existing igroups or create new ones as needed.	
	If you specify...	Then...
	Automatic igroup management	Click Next. You are done with igroup management. Result: SnapDrive uses existing igroups, one igroup per initiator, or, when necessary, creates new igroups for the initiators you specified in Step 8.
	Manual igroup management	Click next, and then perform the following actions: - In the Select igroups panel select from the list the igroups to which you want the new LUN to belong. Repeat this action for each node in the cluster. Note _____ A LUN can be mapped to an initiator only once. OR - Click Manage igroups and for each new igroup you want to create, type a name in the igroups Name text box, select initiators, click Create, and then click Finish to return to the Select igroups panel. - Click Next. Note _____ The Next button will remain unavailable until the collection of selected igroups contains all the initiators you selected in Step 8.

Step	Action	
10	If the LUN...	Then...
	Will belong to a single system	Go to Step 11 .
	Will be a Windows cluster resource	Select the cluster group that will own this cluster resource. Alternatively, provide the information for SnapDrive to create a new group, click Next, then go to Step 11 .
11	Click Finish to connect to the LUN. Result: The Computer Management window appears, with the LUN on the destination volume appearing under SnapDrive in the left (“Tree”) pane. Details appear in the right pane.	

Restoring a volume on a SnapMirror destination

How volume restoration works on a SnapMirror destination

The volume restore feature in SnapDrive enables you to restore all the LUNs on a volume from a single Snapshot copy. A volume restoration is performed automatically when you establish a connection to the first LUN on a SnapMirror destination.

Prerequisites for using the volume restore feature

The following prerequisites must be met before SnapDrive can initiate a volume-based Snapshot copy restoration:

- ◆ All LUNs on the active file system must be consistent in the Snapshot copy you intend to use to restore.
- ◆ LUNs on the active file system must be of the same size and have the same name as the selected Snapshot copy.
- ◆ A SnapMirror relationship must exist.
- ◆ LUNs on the volume being restored must be disconnected from the host before they can be restored from the Snapshot copy.

Volume restore functions are currently available through the `sdccli` utility. For more information, see “[Snapshot commands](#)” on page 231.

Recovering a cluster from shared LUNs on a SnapMirror destination

When the volume on which a shared LUN (physical disk resource) is located becomes unavailable, the cluster services fail and all MSCS physical disk resources become unavailable.

If the failed volume was configured for SnapMirror, the cluster services can be brought back up by connecting to the LUNs on the SnapMirror destination volume.

Prerequisites: The following prerequisites must be met before you can successfully use the procedure described in this section to connect to shared LUNs on a SnapMirror destination and thus recover your MSCS cluster:

- ◆ A SnapMirror replica of the source volume must exist on the destination volume prior to the failure of the physical disk resource.
- ◆ You must know the original drive letters and paths to the shared LUNs on the SnapMirror source volume.
- ◆ You must know the MSCS cluster name.

For detailed instructions: See “[Connecting to shared LUNs on a SnapMirror destination](#)” on page 202 for a step-by-step procedure.

Connecting to shared LUNs on a SnapMirror destination

To connect to shared LUNs on a SnapMirror destination, complete the following steps.

Step	Action
1	Configure the cluster service to start manually on all nodes of the cluster by performing the following actions on each node of the cluster: a. Select Start > Programs > Administrative Tools > Computer Management. b. Expand the Services and Applications option in the left MMC pane, if it is not expanded already. c. Click Services in the left MMC pane. d. Double-click Cluster Service. e. Select Manual from the Startup Type list.
2	Reboot all nodes of the cluster. Note_____ The reboot is required so the existing LUNs fail to mount and, therefore, the drive letters that were in use will be released. _____

Step	Action
3	On one of the nodes in the cluster, complete the following steps. 1. Create a shared disk on the SnapMirror destination storage system to be used as a temporary quorum disk. See “Creating a LUN” on page 99. After you have successfully completed the Create Disk wizard, you see the following message. This message is expected and does not indicate a problem. “You have successfully configured a disk on this system with the intention of it being a shared resource in MSCS. As MSCS does not appear to be installed on this system, please install MSCS.” 2. Click OK to ignore the message. 3. Disconnect the shared disk you just created. See “Disconnecting LUNs” on page 130. 4. Start the cluster service using the <code>-fixquorum</code> option. a. Select Start > Programs > Administrative Tools > Computer Management. b. Expand the Services and Applications option in the left MMC pane, if it is not expanded already. c. Click Services in the left MMC pane. d. Double-click Cluster Service. e. In the Start Parameters field, enter <code>-fixquorum</code>. f. In the Service Status field, click Start, then click OK. 5. Reconnect the shared disk you created in Step 1. See “Connecting LUNs” on page 118. 6. Using the Cluster Administrator, make the newly connected shared disk the quorum disk. 7. Stop the cluster service, then restart the cluster service on all nodes in the cluster. 8. Remove dependencies on all failed physical disk resources, then remove the physical disk resources.

Step	Action
4	On the cluster node you used in Step 3, follow the steps described in “Connecting to a LUN” on page 118, keeping in mind the following information to connect to a LUN: a. When prompted for the LUN path in the Provide Virtual Disk Location panel, specify or browse to the LUN file in the active file system (not the one in the Snapshot copy) on the SnapMirror destination volume. b. After you specify the LUN path and click Next, you see a message that a single file SnapRestore or rapid LUN restore will be performed. Click Yes to continue. c. When prompted for disk type in the Select a Virtual Disk Type panel, select Shared. d. When prompted for a drive letter in the Select Virtual Disk Drive Letter panel, select the same drive letter that was being used for the LUN on the SnapMirror source volume.

Step	Action
5	After you have successfully completed the Connect Disk wizard, you see one of the following two error messages. These error messages are expected and do not indicate a problem. Error message 1: "Unable to connect disk. Failure in Mounting volume on the disk. Error: Could not find the volume mounted for the LUN as there does not seem to be any new volumes mounted by the Mount Manager" This error might also appear in the following form: "Unable to connect disk. Failure in connecting to the LUN. Error: Timeout has occurred while waiting for disk arrival notification from the operating system." Error message 2: "Unable to retrieve a list of LUN snapshots. Error: The device is not ready." Note Error message 2 is displayed instead of error message 1 when McAfee NetShield is installed on your Windows server. Click OK to ignore the error message.
6	Repeat Step 4 and Step 5 for each shared LUN on the cluster.
7	Configure the cluster service to start automatically on the system to which you connected shared LUNs by performing the actions listed in Step 1 of this procedure; however, this time select Automatic from the Startup Type list.
8	Restore any resource dependencies you removed in Step 3 .

Step	Action
9	Use the Cluster Administrator to verify that the cluster is functioning correctly as follows: ◆ Ensure that all resources are online. ◆ Perform a “move group” operation from one node to the other and then back to the original node. ◆ Move the quorum disk from the temporary disk you created in Step 3 back to the original disk. ◆ Delete the temporary disk. Result: You have successfully connected to the shared LUNs in a SnapMirror destination volume.

This topics that follow detail the SnapDrive operations you can execute through the `sdcli` command-line utility, which enables you to enter SnapDrive commands individually or through automation scripts.

Go to any of the following topics for more information:

- ◆ “[Using sdcli commands](#)” on page 208
- ◆ “[SnapDrive configuration commands](#)” on page 212
- ◆ “[SnapDrive license commands](#)” on page 213
- ◆ “[Initiator group management commands](#)” on page 214
- ◆ “[Fractional space reservation monitoring commands](#)” on page 216
- ◆ “[Space reclamation commands](#)” on page 220
- ◆ “[SnapDrive preferred IP address commands](#)” on page 221
- ◆ “[iSCSI connection commands](#)” on page 222
- ◆ “[iSCSI initiator commands](#)” on page 223
- ◆ “[LUN commands](#)” on page 225
- ◆ “[Snapshot commands](#)” on page 231
- ◆ “[SnapVault commands](#)” on page 236

Using sdcli commands

The `sdcli` commands consist of three input parameters (for example, `sdcli snap create`), which must be specified in the correct order, followed by one or more command-line switches. You can specify the command-line switches in any order.

Valid variations:

```
sdcli disk connect -d z -dtype dedicated
-p \\filer2\SD_only\mktng.lun -I host4 10:00:00:00:C9:2B:FD:12

sdcli disk connect -I host4 10:00:00:00:C9:2B:FD:12 -d z
-p \\filer2\SD_only\mktng.lun -dtype dedicated
```

Attention

Command-line switches are case-sensitive. For instance, the `-d` switch refers to a single drive letter, while the `-D` switch refers to one or more drive letters separated by spaces.

Go to any of the following topics for more information.

- ◆ [“Executing sdcli commands”](#) on page 208
- ◆ [“Common command switches”](#) on page 209
- ◆ [“Command-specific switches”](#) on page 211

Executing sdcli commands

To run `sdcli` commands, complete the following steps.

Step	Action
1	Using a host that has SnapDrive installed, select Start Menu > Run.
2	Type <code>cmd</code> in the dialog box entry field, and then click OK.
3	After the Windows command prompt window opens, navigate to the directory on your host where SnapDrive is installed. Example: C: <code>cd \Program Files\NetApp\SnapDrive\</code>

Step	Action
4	Enter the individual command you want to run. Make sure to include all input parameters in the proper order and to specify both required and desired command-line switches in any order. Example: <pre>sdcli disk disconnect -d R</pre> Alternatively, enter the name and path of the automation script you want to run. Example: <pre>C:\SnapDrive Scripts\disconnect_R_from_host4.bat</pre>

Common command switches

Some or all of the `sdcli` commands share the command-line switches listed in the following table.

Switch	Comment
-d	The drive letter or mount point assigned to the LUN. If <code>sdcli</code> cannot find the drive letter specified through the <code>-d</code> switch, it displays a list of all LUNs connected to the host. Example: <code>-d j</code> indicates that the LUN is mapped to the J: drive on the host.
-D	A list of drive letters or mount points separated by spaces. Example: <code>-D j k l</code> indicates that the command applies to the J:, K:, and L: drives.
-dtype	The drive type (shared or dedicated).
-e	The name of an existing MSCS resource group, which is required only if the LUN is shared among MSCS nodes.
-i	The initiator name. ◆ For FCP, the initiator name is the WWPN (World Wide Port Name) for the initiator, which takes the form <code>hh:hh:hh:hh:hh:hh:hh:hh</code>. ◆ For iSCSI, the initiator name takes the form <code>iqn.iSCSI qualified name</code>. For more information on iSCSI node names, see the <i>Block Access Management Guide</i>.

Switch	Comment
-I	The list of hosts and initiators. Separate the character strings that specify hosts and initiators with spaces. To specify the host, you can use either an IP address (<i>nnn.nnn.nnn.nnn</i>) or a machine name recognized by the domain controller. To specify the initiator, type the appropriate WWPNN, which you can determine through the <i>lputilnt.exe</i> utility supplied with your NetApp FCP HBA Attach Kit. After you launch <i>lputilnt.exe</i>, navigate to Main Menu > Adapter > Configuration Data and select “16 - World-Wide Name” in the Region field. The available WWPNNs appear in the list box directly beneath the Region field. When MPIO is running, you can specify up to four node-initiator pairs. The first NodeMachineName in the cluster applies to two of the available initiator WWPNNs; the other NodeMachineName applies to the remaining pair of initiator WWPNNs.
-IG	The list of node machine names and existing igroup names, in pairs. One pair is required for dedicated disks. Two pairs are required for shared disks (at least one pair for each cluster node).
-m	The host on which the operation is executed. You can use an IP address or a machine name to identify the host. Note _____ Do not specify the -m switch when running an <i>sdcli</i> command on the local host.
-n	The name and description of an MSCS cluster resource group to be created as part of the associated command. This switch is required only if you need to create an MSCS cluster resource group to facilitate the sharing of a LUN among MSCS cluster nodes.
-np	The IP address and port of the network portal on the iSCSI connection target.
-p	The UNC path to the location of the LUN on the storage system. This string takes the following form: \\filename\sharename\virtualdiskfilename.lun.

Switch	Comment
-z	Specifies the size (in megabytes) of a new LUN—or the number of megabytes by which an existing LUN is to be expanded. The minimum size for MBR partition-style LUNs is 32 MB and the minimum for GPT style LUNs is 64 MB. The maximum sizes vary according to the remaining available space in your volume. For more information, see “ Understanding volume size ” on page 15.

Command-specific switches

Switches that apply to just one command appear with those commands in the sections that follow.

SnapDrive configuration commands

The `sdcli` utility supports the following iSCSI configuration operation: `list`.

Operation
<code>sysconfig list</code> displays the SnapDrive configuration information for your host.
Syntax: <code>sdcli sysconfig list</code>

SnapDrive license commands

The `sdcli` utility supports the following SnapDrive license operations: set and list.

Operation
<code>license set</code> sets the license key for the specified module. Syntax: <pre>sdcli license set -module <i>ModuleName</i> -key <i>LicenseKey</i></pre> -module LPSM (for LUN Provisioning and Snapshot Management) -key 14 character license key Example: <pre>sdcli license set -module LPSM -key ABCDEFGHIJKLMN</pre> The preceding example sets the license key for the LPSM module.
<code>license list</code> displays all SnapDrive licenses installed. Syntax: <pre>sdcli license list</pre>

Initiator group management commands

The `sdcli` utility provides the following SnapDrive igroup operations: list, create, rename, and delete.

Operation
<code>igroup list</code> displays all igroups on a storage system that have initiators on the local host or, if specified, a remote host. Syntax: <pre>sdcli igroup list [-m MachineName] -f StorageSystem</pre> <code>-f</code> specifies the storage system name or IP address for which the igroups will be listed. Examples: <pre>sdcli igroup list -f 172.17.167.45</pre> The preceding example displays the igroup list for the storage system with the IP address 172.17.167.45. <pre>sdcli igroup list -m server3 -f v34filer</pre> The preceding example displays the igroup list for the storage system v34filer, which has initiators on the remote host server3.
<code>igroup create</code> enables you to create a new igroup. Syntax: <pre>sdcli igroup create [-m MachineName] -f StorageSystem -I NodeName InitiatorName -ig igroupName</pre> <code>-I</code> lists the machine name and initiator name in pairs. Note A new igroup is created for only one machine, so you must specify the same machine name for each of pair. <code>-ig</code> specifies the name of the igroup you are creating. Example: <pre>sdcli igroup create -f v34filer -I server3 10:00:00:00:c9:48:c9:5d server3 10:00:00:00:c9:48:c9:5e -ig v3group1</pre> The preceding example creates a new igroup called v3group1 on a storage system called v34filer for two initiators, 10:00:00:00:c9:48:c9:5d and 10:00:00:00:c9:48:c9:5e, on a host called server3.

Operation

`igroup rename` enables you to rename an existing igroup.

Syntax:

```
sdcli igroup rename [-m MachineName] -f StorageSystem -ig igroupName -igNew  
igroupNewName
```

`-ig` specifies the name of the existing igroup you are renaming.

`-igNew` specifies the new name of the igroup.

Example:

e.g. `sdcli igroup rename -f 172.17.167.45 -ig v3group1 -igNew v3group1fc`

The preceding example renames an igroup from `v3group1` to `v3group1fc` on a storage system with the IP address `172.17.167.45`.

`igroup delete` enables you to delete an existing igroup if there is no LUN mapped to it.

Syntax:

```
sdcli igroup delete [-m MachineName] -f StorageSystem -ig igroupName
```

`-ig` specifies the name of the igroup you want to delete.

Example:

`sdcli igroup delete -f 172.17.167.45 -ig v3group1fc`

The preceding example deletes the igroup named `v3group1fc` from the storage system with the IP address `172.17.167.45`.

Fractional space reservation monitoring commands

The `sdcli` utility supports the following fractional space reservation monitoring commands: `list`, `set`, `snap delta`, `snap reclaimable`, `vol info`, and `delete`.

Operation
<code>spacemon get</code> displays the space reservation monitoring settings for the specified host. Syntax: <pre>sdcli spacemon list {-m <i>MachineName</i>}</pre> <i>MachineName</i> is the machine name on which you want to execute the command. If no machine name is specified, the command is executed on the local machine.

Operation

`spacemon set` sets the space reservation monitoring settings for the specified host.

Syntax:

```
sdcli spacemon set -mi Monitoring interval -f filename -vn Volume Name {-m MachineName} -rap Threshold for Reserved Available Percentage -roc Threshold for Rate of Change -ccs true|false
```

Monitoring interval is the frequency, in minutes, at which you want to monitor fractional space available.

filename is the name of the storage system on which the LUNs reside.

Volume Name is the name of the volume you want to monitor.

Threshold for Reserved Available Percentage is the point at which you want to be warned of a low space reservation condition.

Threshold for Rate of Change is the point at which you want to receive a notification. Use kb, mb, gb, or tb to specify the value as kilobytes, megabytes, gigabytes, or terabytes.

`-ccs` is used to monitor whether a Snapshot copy can be created. True indicates that you want to monitor whether a Snapshot copy can be created. False indicates that you do not want to monitor whether a Snapshot copy can be created.

MachineName is the machine name on which you want to execute the command. If no machine name is specified, the command is executed on the local machine.

Example:

```
sdcli spacemon set -mi 30 -f filer1 -vn testvol -rap 90 -roc 500mb -ccs true
```

The preceding example shows that fractional space reservations will be monitored every 30 minutes on the volume named testvol on filer1. The threshold for testvol is 90 percent of the reserved available percentage and the threshold for rate of change is 500 MB. SnapDrive will verify storage system and volume names and that space is available for Snapshot copies to be created.

Operation

`spacemon snap_delta` displays the rate of change between two Snapshot copies or between a Snapshot copy and the active file system of the storage system volume.

Syntax:

```
sdcli spacemon snap_delta -f filename -vn Volume Name -s1 snapshot1 name -s2 snapshot2 name {-m MachineName}
```

filename is the name of the storage system on which the volume exists.

Volume Name is the name of the volume for which you want to display the snap delta.

snapshot1 is the name of the Snapshot copy you want to compare with either a second Snapshot copy or with the active file system.

snapshot2 is name of the second Snapshot copy.

MachineName is the machine name on which you want to execute the command. If no machine name is specified, the command is executed on the local machine.

`spacemon snap_reclaimable` displays the space that can be reclaimed by deleting a Snapshot copy.

Syntax:

```
sdcli spacemon snap_reclaimable -f filename -vn Volume Name -s snapshot
```

filename is the name of the storage system on which the volume exists.

Volume Name is the name of the volume on which the Snapshot copy resides.

snapshot is the name of the Snapshot copy for which you want to view reclaimable space.

`spacemon vol_info` displays information about fractional space reserved volumes.

Syntax:

```
sdcli spacemon vol_info {-m MachineName}
```

MachineName is the machine on which you want to execute the command. If no machine name is specified, the command is executed on the local machine.

Note

Output for the `spacemon vol_info` command is displayed in XML format.

Operation

`spacemon delete` enables you to delete the fractional space reservation monitor settings for the specified storage system volume.

Syntax:

```
sdcli spacemon delete -f filename -vn Volume Name {-m MachineName}
```

filename is the name of the storage system on which the volume exists.

Volume Name is the name of the volume from which you want to delete fractional space reservation settings.

Space reclamation commands

The `sdcli` utility provides the following SnapDrive space reclamation operations: start, stop, analyze, and status.

Operation
<code>spacereclaimer start</code> starts the SnapDrive space reclamation process. Syntax: <pre>sdcli spacereclaimer start [-m MachineName] -d MountPoint [-t TimeToRun]</pre> <code>-d</code> specifies the LUN mount point on which you want to start Space Reclaimer. <code>-t</code> specifies the amount of time Space Reclaimer will run on the specified LUN. Specify a time from 1 to 10080 minutes (7 days).
<code>spacereclaimer stop</code> stops the space reclamation process. Syntax: <pre>sdcli spacereclaimer stop [-m MachineName] -d MountPoint</pre>
<code>spacereclaimer analyze</code> checks whether space reclamation is needed for the LUN specified. Syntax: <pre>sdcli spacereclaimer analyze [-m MachineName] -d MountPoint</pre>
<code>spacereclaimer status</code> displays the space reclamation status for the LUN specified. If you specified a time to run when you started Space Reclaimer, the status displays the number of minutes remaining. If no time was specified, the status displays the percentage of space remaining for space reclamation. Syntax: <pre>sdcli spacereclaimer progress [-m MachineName] [-D MountPointList]</pre> <code>-D</code> specifies a list of LUN mount points. This list is optional. If no mount points are specified, SnapDrive displays the status for all Space Reclaimer operations.

SnapDrive preferred IP address commands

The `sdcli` utility supports the following SnapDrive preferred IP operations: set, list, and delete.

Operation
<code>preferredIP set</code> sets the SnapDrive preferred IP address for the specified storage system. Syntax: <pre>sdcli preferredIP set -f <i>FilerName</i> -IP <i>PreferredIPAddress</i></pre> Example: <pre>sdcli preferredIP set -f filer1 -IP 172.18.53.94</pre> The preceding example sets the SnapDrive preferred IP address for the storage system named <code>filer1</code> to <code>172.28.53.94</code>.
<code>preferredIP list</code> displays all SnapDrive preferred IP addresses. Syntax: <pre>sdcli preferredIP list</pre>
<code>preferredIP delete</code> deletes the preferred IP address for the specified storage system. Syntax: <pre>sdcli preferredIP delete -f <i>FilerName</i></pre> Example: <pre>sdcli preferredIP delete -f filer1</pre>

iSCSI connection commands

The `sdcli` utility supports the following iSCSI connection operations: disconnect and list.

Operation
<code>iscsi_target disconnect</code> disconnects the specified iSCSI initiator from the specified iSCSI target on all portals. Syntax: <pre>sdcli iscsi_target disconnect -t <i>TargetName</i></pre> Example: <pre>sdcli iscsi_target disconnect -t iqn.1992.08.com.netapp:sn.33604307</pre> The preceding example disconnects the specified iSCSI target.
<code>iscsi_target list</code> displays a list of all iSCSI targets. For each target, the command displays all portals through which the target is available or to which the target is connected. Syntax: <pre>sdcli iscsi_target list {-f <i>FilerName</i> -i <i>InitiatorPortName</i>}</pre> <code>-f</code> displays all targets on the specified storage system. Example: <pre>sdcli iscsi_target list -f filer2</pre> The preceding example lists all the iSCSI targets on the <code>filer2</code> storage system, as well as all portals those targets are available through or connected to.

iSCSI initiator commands

The `sdcli` utility supports the following iSCSI initiator-related operations: list, establish session, and terminate session.

Operation
<code>iscsi_initiator list</code> displays a list of all iSCSI sessions on the specified machine. Syntax: <pre>sdcli iscsi_initiator list {-m MachineName} -s</pre> <i>MachineName</i> is the machine name on which you want to execute the command. If no machine name is specified, the command is executed on the local machine. <code>-s</code> enumerates the iSCSI sessions. Example: <pre>sdcli iscsi_initiator list -s</pre> The preceding example displays all iSCSI sessions on the local host.
<code>iscsi_initiator establish_session</code> establishes a session with a target using the specified HBA. Syntax: <pre>sdcli iscsi_initiator establish_session {-m MachineName} {-h HBA_ID} {-hp HBA Portal ID} -t TargetName -np IPAddress IPPort {-c CHAPName CHAPPassword}</pre> <code>-h HBA_ID</code> is used to establish the iSCSI session. The HBA ID can be obtained by using the <code>sdcli sysconfig list</code> command. <code>-hp HBA Portal ID</code> is used to specify the portal on the iSCSI HBA to be used to establish the iSCSI session. The HBA Portal ID can be obtained by using the <code>sdcli sysconfig list</code> command. <code>-t TargetName</code> is the name of the iSCSI target. <code>-np IP Address IPPort</code> specify the IP address and IP port of the network portal on the target. The IP Port can be obtained by using the <code>sdcli iscsi_initiator list</code> command. Example: <pre>sdcli iscsi_initiator establish_session -h 0 -t iqn.1992-8.com.netapp:maya -np 172.18.53.94 3260</pre> The preceding example establishes an iSCSI session with the specified target using the specified HBA ID.

Operation

`iscsi_initiator terminate_session` terminates the session.

Syntax:

```
sdcli iscsi_initiator terminate_session {-m MachineName} -s Session_ID
```

MachineName is the machine name on which you want to execute the command. If no machine name is specified, the command is executed on the local machine.

`-s` is the session ID of the session you want to terminate.

Example:

```
sdcli iscsi_initiator terminate_session -s 0xffffffff868589cc-0x4000013700000006
```

The preceding example terminates the specified iSCSI session on the local machine.

LUN commands

The `sdcli` utility supports the following LUN-related operations: create, connect, delete, disconnect, expand, add initiator, remove initiator, list, add mount, and remove mount.

Operation
<code>disk create</code> creates a new LUN. Syntax: <pre>sdcli disk create [-m MachineName] -d MountPoint -p UNC path -z DriveSize [-rs Reserve Snapshot Space y n] [-I < NodeMachineName InitiatorName > +] [-IG < NodeMachineName GroupName > +] -dtype {shared dedicated} [{-e "ResourceGroupName"} [-n "ResourceGroupName" "ResourceGroupDesc"]}]</pre> <code>-rs</code> enables you to limit the maximum disk space of the LUN you are creating to allow for at least one Snapshot copy on the volume. For an explanation of the other switches listed in the <code>disk create</code> syntax, see “Common command switches” on page 209. Examples: <pre>sdcli disk create -dtype dedicated -z 1024 -p \\filer2\sd_vds_only\mktng.lun -d R -I host3 10:00:00:00:C9:2B:FD:12</pre> The preceding example creates a dedicated, 1-GB LUN named <code>mktng.lun</code> in the <code>filer2</code> volume named <code>sd_vds_only</code>. Next, it connects this LUN to the host as drive <code>R</code>: <pre>sdcli disk create -p \\133.25.61.62\sd_vds_only\mktng.lun -d r -z 4096 -dtype shared -e "mktng" -I host4 10:00:00:00:C9:2B:FD:12 host4 10:00:00:00:C9:2B:FD:11 host5 10:00:00:00:C9:2B:FC:12 host5 10:00:00:00:C9:2B:FC:11</pre> The preceding example creates a shared, 4-GB LUN on <code>host4</code> (the local machine running the <code>sdcli</code> command) and maps it to drive <code>R</code>;, using a pair of initiators.

Operation

`disk connect` connects a LUN to a host by mapping the LUN to a Windows drive letter.

Syntax:

```
sdcli disk connect [-m MachineName] -p UNCpath -d MountPoint [-I < NodeMachineName  
InitiatorName ...] | [-IG NodeMachineName GroupName >...] -dtype {shared | dedicated}  
{[-e "ResourceGroupName"] | [-n "ResourceGroupName" "ResourceGroupDesc"]} [-c  
"ClusterName"]
```

Example:

```
sdcli disk connect -d s -dtype shared -p \\filer2\sd_vds_only\mktng.lun -I host3  
10:00:00:00:C9:2B:FD:1B host3 10:00:00:00:C9:2B:FD:1C host4 10:00:00:00:C9:2B:FD:12  
host4 10:00:00:00:C9:2B:FD:11 -e "tech_mktng" -c "mktng"
```

The preceding example connects a LUN (LUN) in the filer2 volume `sd_vds_only` and named `mktng.lun`, which belongs to the MSCS cluster resource group `tech_mktng` on the `mktng` cluster.

`disk delete` deletes a LUN. The LUN must be connected (mapped to a Windows drive letter) for the command to succeed.

Note

You must make sure that the LUN you are deleting is not being monitored with the Windows Performance Monitor (perfmon).

Syntax:

```
sdcli disk delete [-m MachineName] {-p UNCpath | -d MountPoint}
```

Example:

```
sdcli disk delete -p \\133.25.61.62\sd_vds_only\mktng.lun
```

The preceding example deletes the LUN `mktng.lun` from the `sd_vds_only` volume on the storage system identified by the IP address `133.25.61.62`.

Operation

`disk disconnect` disconnects a LUN from the host. The LUN must be connected (mapped to a Windows drive letter) for the command to succeed.

Note

You must make sure that the LUN you are disconnecting is not monitored with the Windows Performance Monitor (perfmon).

Syntax:

```
sdcli disk disconnect [-m MachineName] {-p UNCpath | -d MountPoint} [-f]
```

Attention

The `-f` switch causes the LUN to be forcibly unmounted, even if an application or the Windows operating system is using it. Therefore, use this feature with extreme care.

Examples:

```
sdcli disk disconnect -d z
```

The preceding example disconnects the LUN mapped to the drive letter “Z:” on the SnapDrive host running the `sdcli` command.

```
sdcli disk disconnect -p \\filer2\sd_vds_only\mktng.lun -f
```

The preceding example forces disconnection of the LUN `mktng.lun`, which is in the `sd_vds_only` volume on `filer2`. Because the `-f` switch is being used, all open files in the LUN might be lost or corrupted.

`disk expand` expands the disk by a user-specified size, as long as that figure falls within the SnapDrive-specified minimum and maximum values.

Syntax:

```
sdcli disk expand [-m MachineName] {-p UNCpath | -d MountPoint} -z DriveSizeIncrement
```

DriveSizeIncrement is measured in megabytes.

Example:

```
sdcli disk expand -z 1024 -d p
```

The preceding example increases the LUN mapped to “P:” by 1 GB. (In practice, SnapDrive expands the disk by the amount specified by `-z`, plus a certain increment required for system overhead.)

Operation

`disk add_initiator` adds a new initiator to a LUN.

Syntax:

```
sdcli disk add_initiator [-m MachineName] {-p UNCpath | -d MountPoint} -i  
InitiatorPortName
```

Examples:

```
sdcli disk add_initiator -d E -i 21:00:00:e0:8b:85:19:ba
```

The preceding example adds an initiator to a LUN mapped to drive E: on the SnapDrive host from which the `sdcli` command was executed.

```
sdcli disk add_initiator -p \\sdwatf2\\sdwatf2_vol1\\sdwath2_EEE.lun -i  
21:00:00:e0:8b:85:19:ba
```

The preceding example adds an initiator to a LUN located at the path `\\sdwatf2\\sdwatf2_vol1\\sdwath2_EEE.lun` on the SnapDrive host from which the `sdcli` command was executed.

`disk remove_initiator` removes an initiator from the specified LUN.

Syntax:

```
sdcli disk remove_initiator [-m MachineName] {-p UNCpath | -d MountPoint} -i  
InitiatorPortName
```

Note

If you try to remove an initiator that belongs to an igroup that contains initiators from another host, the operation will fail. SnapDrive does not support this configuration.

Examples:

```
sdcli disk remove_initiator -d E -i 21:00:00:e0:8b:85:19:ba
```

The preceding example removes an initiator from a LUN mounted on drive letter “E:” on the SnapDrive host running the `sdcli` command.

```
sdcli disk remove_initiator -p \\sdwatf2\\sdwatf2_vol1\\sdwath2_EEE.lun -i  
21:00:00:e0:8b:85:19:ba
```

The preceding example removes an initiator on a LUN located at the path `\\sdwatf2\\sdwatf2_vol1\\sdwath2_EEE.lun` on the SnapDrive host from which the `sdcli` command was executed.

Operation

`disk list` displays a list of all the LUNs connected to the host.

Syntax:

```
sdcli disk list [-m MachineName]
```

Example:

```
sdcli disk list
```

The preceding example lists all the SnapDrive LUNs mapped to drive letters on the local host. Among the items listed are the following values:

- ◆ UNC path (storage system name, sharename, virtualdiskfilename, and might also include qtreename)
- ◆ Storage System Name
- ◆ Storage System Path (storage system-side path, which includes volume name and LUN name)
- ◆ Type
- ◆ Disk serial number
- ◆ Back by Snapshot (if this is a LUN in a Snapshot copy, this displays the storage system-side path to the Snapshot copy)
- ◆ Shared (whether the disk is dedicated or shared)
- ◆ BootOrSystem Disk
- ◆ SCSI port
- ◆ Bus
- ◆ Target
- ◆ LUN
- ◆ Readonly
- ◆ Disk size (in megabytes)
- ◆ Disk Partition Style (either MBR or GPT)
- ◆ Clone Split Restore status
- ◆ Disk ID
- ◆ Volume name
- ◆ Mount points (the drive letter and path to which the LUN is mapped on the host)
- ◆ IP Addresses (IP addresses on the target storage system)

Operation

`disk add_mount` adds a volume mount point.

Syntax:

```
sdcli disk add_mount {-m MachineName} -vn Volume Name -mp Volume Mount Point {-create_folder}
```

Volume Name is the name of the volume that you are trying to add or move. The volume name can be located in the output from the `disk list` command.

Volume Mount Point is the location you want to mount the LUN. This can also be a drive letter.

Example:

```
sdcli disk add_mount -vn \\?\Volume{db6160d8-1f14-11da-8ef3-000d5671229b} -mp  
G:\mount_vol1 -create_folder
```

`disk remove_mount` removes a volume mount point or drive letter.

Note

This command will not delete the folder that was created at the time the volume mount point was added. After you remove a mount point, an empty folder will remain with the same name as the mount point you removed.

Syntax:

```
sdcli disk remove_mount {-m MachineName} -vn Volume Name -mp Volume Mount Point
```

Snapshot commands

The table that follows lists the Snapshot copy-related operations supported by the `sdcli` utility: create, delete, list, mirror list, mount, rename, restore, unmount, update mirror., restore volume check, and restore volume.

Operation
<code>snap create</code> creates a new Snapshot copy of the specified LUNs on the SnapDrive system. Syntax: <pre>sdcli snap create [-m MachineName] -s SnapshotName -D MountPointList [. . .] [-x]</pre> <code>-x</code> causes data to be flushed and consistent Snapshot copies to be created only for the drives and mount points specified by the <code>-D</code> switch. Otherwise, SnapDrive flushes data and creates consistent Snapshot copies for all LUNs connected to the host and residing on storage system volumes. Note Snapshot copies are created at the volume level. When a Snapshot copy is created using <code>-x</code> with the <code>-D</code> switch, Snapshot copies are also created for any additional disks mapped to the host that reside on the same volumes as the disks specified. Snapshot copies for the unspecified disks are dimmed in the SnapDrive MMC because they are inconsistent. Example: <pre>sdcli snap create -s Jun_13_03 -D j k l</pre> The preceding example creates a Snapshot copy named <code>Jun_13_03</code> for each volume containing one or more of the LUNs mapped to the specified drives (that is, J:, K:, and L:). The Snapshot copies created are consistent for all LUNs contained by those volumes.
<code>snap delete</code> deletes an existing Snapshot copy. Note You must make sure that the LUN whose Snapshot copy you are deleting is not being monitored with the Windows Performance Monitor (perfmon). Syntax: <pre>sdcli snap delete [-m MachineName] -s SnapshotName -D MountPointList [. . .]</pre> Example: <pre>sdcli snap delete -s Jun_13_03 -D k</pre> The preceding example deletes the Snapshot copy named <code>Jun_13_03</code> that is associated with the LUN mapped to K: on the local host.

Operation

`snap list` lists all the Snapshot copies that exist for the specified LUN.

```
sdcli snap list [-m MachineName] -d MountPoint
```

Example:

```
sdcli snap list -d j
```

The preceding example displays all the Snapshot copies that exist for the volume containing the LUN mapped to “J:” on the local host.

`snap mirror_list` displays the SnapMirror relationships associated with the SnapMirror source volume, including the SnapMirror source storage system, volume, and Snapshot copy; the destination storage system and volume; the current state of the SnapMirror relationship; and whether FlexClone volumes can be created on the destination to allow mirror verification without breaking the mirror.

```
sdcli snap mirror_list -d MountPoint
```

MountPoint is a drive letter or mount point path of the SnapMirror source drive.

Example:

```
C:\Program Files\NetApp\SnapDrive>sdcli snap mirror_list -d e
1 SnapMirror destination(s)
Source: andes-1:s Snapshot: andes-2(0084186538)_d.27 Destination: andes-2:d
Snapmirrored [FlexClone Success]
The operation completed successfully.
```

The preceding example displays the SnapMirror relationship between source drive E: on the storage system volume andes-1 and the destination storage system volume andes-2. The source has one Snapshot copy named andes-2(0084186538)_d.27. FlexClone volumes are enabled on the destination.

`snap mount` mounts a Snapshot copy of a LUN. Snapshots are always mounted in read/write mode.

Syntax:

```
sdcli snap mount [-m MachineName] [-r LiveMachineName] -k LiveMountPoint -s
SnapshotName -d MountPoint
```

LiveMachineName refers to the name of the host connected to the LUN in the active file system. When left unspecified, `-r` defaults to the local host.

LiveMountPoint refers to the drive letter or mount point assigned to the LUN in the active file system.

Example:

```
sdcli snap mount -r host3 -k j -s Jun_13_03 -d t
```

The preceding example maps the Snapshot copy named Jun_13_03 to drive T: on the local host. This Snapshot copy represents a point-in-time image of the LUN mapped to J: on host3.

Operation

`snap rename` enables you to change the name of an existing Snapshot copy.

Syntax:

```
sdcli snap rename [-m MachineName] -d MountPoint -o OldSnapshotName -n NewSnapshotName
```

Example:

```
sdcli snap rename -d j -o Jun_13_03 -n last_known_good
```

The preceding example changes the name of the June_13_03 Snapshot copy associated with the J: drive to last_known_good.

`snap restore` replaces the current LUN image in the active file system with the point-in-time image captured by the specified Snapshot copy.

Note

You must make sure that the LUN you are disconnecting is not being monitored with the Windows Performance Monitor (perfmon).

Syntax:

```
sdcli snap restore [-m MachineName] -d MountPoint -s SnapshotName
```

Example:

```
sdcli snap restore -d l -s Jun_13_03
```

The preceding example restores the LUN mapped to L: on the local host to its state when the Snapshot copy named Jun_13_03 was taken.

Operation

`snap unmount` disconnects a Snapshot copy of a LUN that is mounted as a LUN.

Note

You must make sure that the LUN whose Snapshot copy you are disconnecting is not being monitored with the Windows Performance Monitor (perfmon).

Syntax:

```
sdcli snap unmount [-m MachineName] -d MountPoint [-f]
```

Attention

The `-f` argument forcibly unmounts the LUN, even if it is in use by an application or Windows. Such a forced operation could cause data loss, so use it with extreme caution.

Examples:

```
sdcli snap unmount -d k
```

The preceding example disconnects the Snapshot copy mapped to K: on the local host.

```
sdcli snap unmount -d k -f
```

The preceding example forces disconnection of the Snapshot copy mapped to the K: drive on the local host.

`snap update_mirror` updates the LUN to a SnapMirror destination volume residing on the same or a different storage system.

Syntax:

```
sdcli snap update_mirror [-m MachineName] -d MountPoint
```

Example:

```
sdcli snap update_mirror -d l
```

The preceding example updates the SnapMirror destination for the LUN mapped to the L: drive on the local host. You don't need to specify the location of the SnapMirror destination because that information was entered when mirroring was set up for the LUN.

Operation

`snap restore_volume_check` verifies whether a restore operation can be performed on a volume.

Syntax:

```
sdcli snap restore_volume_check [-f StorageSystemName] -volume StorageSystemVolumeName
-s SnapshotCopyName [-m MachineName]
```

`-f StorageSystemName` is the name of the storage system on which the volume resides.

`-volume StorageSystemVolumeName` indicates the name of the volume on which the restore operation will be performed.

`-s SnapshotCopyName` indicates the name of the Snapshot copy from which the volume will be restored.

Example:

```
sdcli snap restore_volume_check -f clpubs-filer1 -volume vol3 -s my_snap
```

The preceding example checks whether a volume restoration from the Snapshot copy named `my_snap` can be performed on a volume called `vol3` that resides on a storage system called `clpubs-filer1`.

`snap restore_volume` runs the restore operation on a volume.

Syntax:

```
sdcli snap restore_volume [-f StorageSystemName] -volume StorageSystemVolumeName -s
SnapshotCopyName [-force] [-m MachineName]
```

`-f StorageSystemName` is the name of the storage system on which the volume resides.

`-volume StorageSystemVolumeName` indicates name of the volume on which the restore operation will be performed.

`-s SnapshotCopyName` indicates the name of the Snapshot copy from which the volume will be restored.

`-force` is an optional switch that you use to ensure the volume restoration is performed even when non-LUN files or newer Snapshot copies are found on the volume.

Example:

```
sdcli snap restore_volume -f clpubs-filer1 -volume vol3 -s my_snap
```

The preceding example restores a volume from the Snapshot copy named `my_snap` on a volume called `vol3` that resides on a storage system called `clpubs-filer1`.

SnapVault commands

The `sdcli` utility supports the following SnapVault-related operations: verify configuration, Snapshot copy rename, Snapshot copy delete, archive, relationship status, and list.

Operation
<code>snapvault verify_configuration</code> enables you to check the SnapVault configuration to ensure that it configured correctly. Syntax: <pre>sdcli snapvault verify_configuration [-m MachineName] {-D MountPoint -G guidlist}</pre> <code>-m</code> specifies the name of the remote system on which you want to execute the command. If no machine name is specified, the command is executed on the local system. <code>-D</code> specifies a list of mount points of disks on the primary system. <code>-G</code> specifies a list of GUIDs of disks on the primary system.
<code>snapvault snapshot_rename</code> enables you to rename an existing Snapshot copy on a secondary system. Syntax: <pre>sdcli snapvault snapshot_rename [-m MachineName] -o OldName -n NewName {-d MountPoint -G guidlist}</pre> <code>-o</code> specifies the name of the existing Snapshot copy that you want to change on the secondary system. <code>-n</code> specifies the new name of the Snapshot copy on the secondary system. The new name must not yet exist. <code>-d</code> specifies the mount point that identifies the disk on the primary system. <code>-G</code> specifies a list of GUIDs of disks on the primary system.
<code>snapvault snapshot_delete</code> deletes an existing Snapshot copy on a SnapVault secondary system. Syntax: <pre>sdcli snapvault snapshot_delete [-m MachineName] {-D MountPoint -G guidlist} -a SecondarySnapshotName</pre> <code>-D</code> specifies a list of mount points of disks on the primary system. <code>-G</code> specifies a list of GUIDs of disks on the primary system. <code>-a</code> specifies the name of the Snapshot copy that you want to delete.

Operation

`snapvault archive` archives a backup set to a secondary system.

Syntax:

```
sdcli snapvault archive [-m MachineName] [-force] -a SecondarySnapshotName -DS  
MountPointandSnapshotList [...]
```

`-force` forces the secondary Snapshot copy to be made, regardless of the possible failure of some qtree updates.

`-a` specifies the name of the Snapshot copy on the secondary system. This Snapshot copy name must not already exist.

`-DS` specifies a list of mount points and Snapshot copies to be archived.

`snapvault relationship_status` displays the relationship status of the primary system for the disk specified.

Syntax:

```
sdcli snapvault relationship_status [-m MachineName] {-D MountPoint | -G guidlist}
```

`-D` specifies a list of mount points of disks on the primary system.

`-G` specifies a list of GUIDs of disks on the primary system.

`snapvault snap_list` displays the Snapshot copies on the volume specified by the mount point or GUID on the SnapVault secondary system.

Syntax:

```
sdcli snapvault snap_list [-m MachineName] {-D MountPoint | -G guidlist}
```

`-D` specifies a list of mount points of disks on the primary system.

`-G` specifies a list of GUIDs of disks on the primary system.

The following list directs you to the various SnapDrive requirements and recommendations set out in this document.

Assumed competence: See [“Audience”](#) on page xiii.

Host requirements: See the following sections:

- ◆ [“Preparing hosts”](#) on page 33
- ◆ [“Recommendations for choosing a configuration”](#) on page 21

Storage system requirements: See [“Preparing storage systems”](#) on page 37.

SnapDrive service account requirements: See [“Preparing the SnapDrive service account”](#) on page 47.

Volume and storage system options: See [“Volume and storage system options set by SnapDrive”](#) on page 38.

Cluster recommendations: See [“Recommendations for choosing a configuration”](#) on page 21.

SnapDrive-specific limitations: See [“SnapDrive-specific limitations”](#) on page 39.

SnapDrive-specific cautions and recommendations: See [“Recommendations”](#) on page 39.

SnapDrive user interfaces: See [“SnapDrive user interfaces”](#) on page 49.

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