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HYPER-UNIFIED STORAGE

Nexsan Unity

Snapshots and Replication Guide

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About this document

This *Snapshots and Replication Guide* provides information and detailed procedures for configuring and managing file system and LUN snapshots, as well as managing data replication, using Nexsan Unity. This guide assumes that you have configured Unity according to the *Nexsan Unity Software User Guide*.

Audience

This guide has been prepared for the following audience:

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

Conventions

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

Convention	Description
underlined blue	Cross-references, hyperlinks, URLs, and email addresses.
boldface	Text that refers to labels on the physical unit or interactive items in the graphical user interface (GUI).
`monospace`	Text that is displayed in the command-line interface (CLI) or text that refers to file or directory names.
`monospace bold`	Text strings that must be entered by the user in the command-line interface or in text fields in the graphical user interface (GUI).
italics	System messages and non-interactive items in the graphical user interface (GUI) References to Software User Guides
▶ (arrow icon)	A visual cue to indicate an action carried out by the user to accomplish a given task, or to draw attention to key information. Also used to indicate the beginning of, a step within, or what's next after a procedure.

Contacting Nexsan

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

Service and support

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

Nexsan Unity Documents & Downloads page:
https://helper.nexsansupport.com/unt_downloads.html

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

Worldwide Web site:
www.nexsan.com

Notes, Tips, Cautions, and Warnings

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

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

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

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

Related documentation

The following Nexsan product manuals contain related information:

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

Safety notices

Always observe the following precautions to reduce the risk of injury and equipment damage:

- Computer components and disk drives are sensitive to static discharge. Take precautions to discharge any electrostatic charge from your person before and while handling components with your hands or any tools. Use an anti-static wrist-strap.
- The system only be installed in a clean, dry environment. The operating temperature is 10º to 35º C (50º to 95º F), with operating relative humidity at 20 to 95%, non-condensing.
- Do not install hardware in an enclosed cabinet or other small area without ventilation.
- Ensure correct lifting methods are used when handling hardware. Special care should be taken when removing hardware from its packaging and positioning it into its required location. When lifting hardware, two people at either end should lift slowly with their feet spread out to distribute the weight. Always keep your back straight and lift with your legs.
- When installing the system as a rack-mounted component, ensure that all Nexsan-supplied mounting fixtures are secure. All bolts and screws should be fully tightened. Failure to comply with this may result in the unit not being fully supported in the rack and could lead to the product falling from the rack causing personal injury or falling onto other rack components.
- Ensure that the rack is sufficiently stable by having wall anchors and/or stabilizing legs, and that the floor supporting the rack has sufficient strength for the overall weight loading.
- Only a fully-trained Service Engineer is authorized to disassemble any other part of the hardware, and then only when the hardware is powered off.
- The system has multiple power connections; as a result, you must remove all power leads to completely isolate the power and always use the IEC power cords which are supplied with the system.

CAUTION: All NexsanUnity Storage Systems are hot-pluggable. However, new expansions must be powered on AFTER you connect it to the existing system.

Chapter 1

Introduction

Snapshots and replication are two related technologies for further protecting the integrity of data on Unity.

This section includes these topics:

Introduction to snapshots 10
Snapshot concepts and terminology 11
Introduction to data replication 14

Introduction to snapshots

A snapshot is a read-only copy of a file system/LUN at a specific point in time. Think of a snapshot as a frozen image of the data in a file system/LUN at the time the snapshot is recorded. You can use snapshots to maintain a set of previous versions of all the files in a file system/LUN, which can serve as temporary backups of your data.

For example, if a set of files in a file system/LUN are accidentally (or maliciously) deleted or overwritten, you can easily restore individual files from a snapshot of the file system/LUN by browsing the snapshot (and accessing it from a Windows-based (CIFS) system and/or a UNIX/Linux-based (NFS) system). Or, if all the data in a file system/LUN becomes corrupted, you can restore the data to a specific point-in-time snapshot using the rollback function.

Unity enables you to take manual snapshots of a file system/LUN and also set a schedule for automatic snapshots. You can create a separate snapshots schedule for each file system/LUN on Unity.

Snapshot concepts and terminology

This table describes snapshots concepts and terminology used in Unity.

Table 1-1: Snapshot concepts and terminology

Snapshot terminology	Description
Snapshot	A snapshot is a read-only copy of a file system/LUN at a specific point in time. You can use snapshots to maintain a set of previous versions of all the files in a file system/LUN, which can serve as temporary backups of your data. The snapshot is created almost instantly, and initially consumes no additional disk space within the storage pool where the file system/LUN resides. When data within the file system/LUN changes—new data is added or existing data is updated—the snapshot maintains a reference to the previous copy of the data, and Unity updates the snapshot size accordingly. The Unity Storage System protects the file's original data blocks from being overwritten; it stores the new updates in a new location. The Unity Storage System maintains records and pointers to keep track of the data and file changes. This results in minimal disk space consumption and also allows for rapid recovery of data in case of a disk write error, a corrupted file, or a program malfunction.
Automatic snapshot, or scheduled snapshots	Unity takes periodic snapshots according to the schedule you define. Typically, you set a snapshot schedule when you initially create the file system or LUN. You can then modify or disable the schedule in Unity. ▶ **Related topics:** ● Setting a schedule for automatic file system snapshots on page 26 ● Setting a schedule for automatic LUN snapshots on page 57
Manual snapshot	You can take manual snapshots of a file system or LUN at any time, even if you have automatic snapshots enabled. Manual snapshots allow you to record a copy of the dataset contents at any point in time. ▶ **Related topics:** ● Taking a manual file system snapshot on page 28 ● Taking a manual LUN snapshot on page 50
Immutable snapshot	You can make a snapshot immutable, meaning it cannot be modified or deleted once set to immutable status, until the selected expiry date. ▶ **Related topics:** ● Taking an immutable snapshot for a file system on page 38 ● Taking an immutable LUN snapshot on page 60

Snapshot terminology	Description
Browsing a snapshot, or mounting a snapshot	Unity provides a mechanism that enables you to access a snapshot from a Windows-based system and/or a UNIX/Linux-based system and browse its contents—in the same way that you access a file system or a LUN. A snapshot that you browse is a read-only copy of its parent file system/LUN and its contents mirror the parent file system or LUN contents at the time the snapshot is recorded. You can use Unity's snapshot browsing mechanism to recover individual files from a snapshot in case the files are accidentally deleted or overwritten, or corrupted in the snapshot's parent file system/LUN. Unity maintains all of the parent file system or LUN access-level attributes with the snapshots to ensure any recovery is authorized. This means that you can safely authorize all users—that have access to the file system/LUN—to browse a snapshot and recover their own lost data from the snapshot. ▶ **Related topics:** ● Browsing a file system snapshot on page 30 ● Browsing a LUN snapshot on page 52 ● Browsing a VSS snapshot on page 83 ● Browsing replicated datasets and snapshots on page 123
Rollback	The Unity Storage System enables you to roll back all the data in a file system/LUN to a specific point-in-time snapshot of the file system/LUN. The rollback function reverts a file system or LUN contents to what they were at the time the snapshot was taken, including all file- and folder-level permission settings and file system/LUN-level access attributes. This function also automatically deletes all snapshots that are newer than the snapshot that you roll back to, including snapshots that have browsing enabled. Unity provides the rollback function for extreme circumstances: for example, if all the data in a file system/LUN is corrupted and can no longer be recovered. The rollback function overwrites all the existing data in the file system/LUN with the contents of the snapshot that you roll back to; any new data that was added after the snapshot is recorded, including updates to existing data, is lost during the rollback process. ▶ **Related topics:** ● Rolling back to a snapshot on page 32 ● Rolling back data in a LUN to a snapshot on page 54 ● Rolling back data to a VSS snapshot on page 87

Snapshot terminology	Description
VSS, or Microsoft Volume Shadow Copy Service, Volume Snapshot Service, Volume Shadow Copy Service	Microsoft Volume Shadow Copy is a technology included in Microsoft Windows that enables you to take manual or automatic backup copies or snapshots of data. If the Unity Storage System is joined to a Microsoft Active Directory domain, Unity automatically exposes all the snapshots for each file system/LUN on the Unity Storage System to Microsoft Windows (CIFS) clients that access the file system/LUNs—provided the Windows client computers support Microsoft VSS. You can then use Microsoft VSS on the Windows client computers to restore previous versions of files and folders from a snapshot of a file system/LUN, or roll back a file system/LUN to a specific point-in-time snapshot. ▶ **Related topics:** ● Using Windows VSS on page 67

Introduction to data replication

This section describes how to use Nexsan Unity's data replication functions, including features and usage implementations. This section also provides a description of replication terminology used in Unity.

Asynchronous data replication enables you to replicate data between two sites—a primary and a remote Unity—over a LAN or WAN connection.

This section includes these topics:

Data replication concepts and terminology below

Asynchronous data replication features on page 16

Data replication concepts and terminology

This table describes Unity replication concepts and terminology used.

Table 1-2: Replication concepts and terminology

Replication terminology	Description
primary, primary system, or primary Unity Storage System	A primary system refers to a Unity Storage System that contains the data to be replicated (to a secondary Unity Storage System). A Unity Storage System can be the primary system in a replicated environment and also perform double-duty as the secondary data replication system for another Unity System.
secondary system, replication system, or remote Unity Storage System	A secondary system represents the system to which data from the primary Unity is replicated. In a deployment where asynchronous replication is not implemented, a secondary Unity represents a system that is being managed remotely from another Unity Storage System.
source, source storage system source storage pool	Source storage pool refers to the storage pool that contains the data to be replicated to a *target*.
target, target storage system target storage pool	Target storage pool refers to the replica of the source storage pool on the target system.
peer, peer Unity system, peer system, or replication peer	A peer Unity Storage System represents a Unity System that you set up data replication to or from.
replica, pool's replica or storage pool replica	A replica, or a storage pool's replica, refers to the target storage pool that is created on the secondary Unity System. The replica is an exact copy of its source storage pool on the primary Unity System.

Replication terminology	Description
full replication	Full replication refers to a replication operation that sends all the data on the primary to the secondary Unity Storage System. Only the initial replication, when you first set up asynchronous data replication is a full replication.replication between two systems, is a full replication. All successive replications are incremental.
incremental replication, or incremental update	Incremental replication refers to a replication operation that sends only the data that changed since the last replication (whether that one was full or incremental).
scheduled or automatic replication	A scheduled replication refers to an automatic replication that occurs according to a schedule you define. You can configure a separate replication schedule for each storage pool on Unity.
offline or manual replication	An offline, or manual, replication is a replication process that you start manually on a storage pool. With offline replication, you can replicate the data in the storage pool to the secondary Unity Storage System, or to a USB storage device attached to the primary Unity Storage System.
scrubbing	Unity provides a disk scrubbing mechanism that checks the physical hard disks, which comprise the volumes in a storage pool on a Unity Storage System, for read or write errors. The storage pool scrubbing mechanism scans a storage pool to identify data integrity problems. It sequentially reads all the data on the hard disks, as well as the data's corresponding parity information, and rebuilds parity wherever needed. Performing routine scrubbing on a storage pool prevents parity errors and data corruption. You can enable/disable a pool scrub schedule on both the primary storage pool and on its replica on the secondary Unity Storage System. By default, the scrub schedule is enabled on the replica. See .

Asynchronous data replication features

The asynchronous data replication function includes these features:

- Incremental updates: Unity's asynchronous data replication function only replicates the data that changed since the last replication. This significantly reduces replication time and also reduces network bandwidth requirements for the replication process.
- Scheduled automatic updates: You can flexibly manage and automate data replication between two systems. You can automate replication updates based on a user-defined schedule, or perform manual replications of your data to either the secondary Unity System or to a USB-attached storage device (for offline replications).
- Failover mechanism: The asynchronous data replication function provides a failover mechanism that seamlessly transitions all system operations to the secondary system in case of system maintenance, or in the event of a disaster.
- Replication of storage pool and dataset configuration settings and access permissions: The asynchronous data replication replicates all file system- and file-level access permissions, as well as administrative role assignments for storage pools. It also replicates configuration settings for both storage pools and datasets (file systems and/or iSCSI LUNs).
- Remote access to replicated data: You can access read-only copies of replicated data on the secondary Unity System for off-site backup or data distribution.
- Security: The asynchronous data replication feature uses a secure file transfer protocol to transmit data streams between systems. This ensures that all your data, including file system- and file-level access permissions, are transferred securely to the secondary Unity System. In addition, a Unity System can only replicate to/from another Unity System that you manually add to its list of peer systems.

  Note The streams take additional space on Unity before they are replicated. That amount of space does not apply to the secondary system.
- Flexible configuration: You have the flexibility to replicate all the datasets (file systems and/or iSCSI LUNs) in a storage pool on Unity, or only a subset of datasets. Replication of compressed datasets is also supported.
- One-to-one topology: One source is copied to one destination. On Unity, you set up asynchronous data replication separately for each storage pool; the result being that the one-to-one configuration enables you to replicate one or more storage pools on the primary Unity System to a single secondary Unity System. Alternately, you can replicate each storage pool on Unity to a different secondary Unity system.

Usage implementations

You can use the asynchronous data replication for:

- Disaster recovery: You can set up data replication between two Unity systems—a primary and a secondary system—for disaster recovery. In the event of a disaster that impacts user access to the primary Unity System, you can activate the disaster recovery site—by *promoting* it to primary status; the disaster recovery site automatically takes over using the most recently replicated data. Once you restore the primary Unity System, you can then *demote* the disaster recovery Unity System back to secondary status. During the demotion process, the asynchronous data replication function automatically preserves any data that changed while the secondary Unity System was in service, and creates a *difference* file on the secondary Unity System listing the changes. This process is explained in detail in Failing over to a remote Unity Storage System for disaster recovery on page 128.
- Data backup: You can use the asynchronous data replication function as a backup solution in environments where tape backups are not feasible (for example, where the available bandwidth is insufficient or because the latency for recovery is too high).
- Data migration: You can use the asynchronous data replication function to migrate data and system configurations between Unity Systems when upgrading hardware or re-balancing storage.

1

Chapter 2

Snapshots

Snapshots

A snapshot is a read-only copy of a file system or LUN at a specific point in time. Think of a snapshot as a frozen image of the data in a file system or LUN at the time the snapshot is recorded. You can use snapshots to maintain a set of previous versions of all the files in a file system or LUN, which can serve as temporary backups of your data.

Related topics

Managing snapshots for file systems on the facing page

Managing snapshots for LUNs on page 43

2

Managing snapshots for file systems

Unity provides continuous data protection with the Snapshots feature, which enables you to capture, store, and access point-in-time copies of the data in Unity file systems.

This section includes these topics:

Viewing File System Snapshots

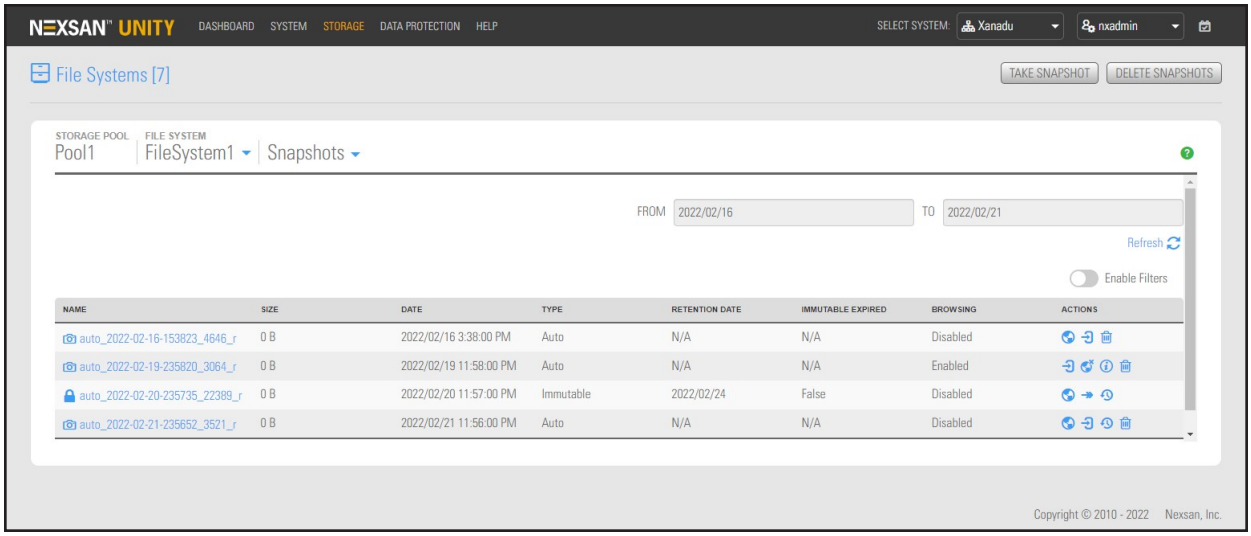
The File Systems Snapshots panel lists all the snapshots for the corresponding file system, and provides options and settings for the following actions:

- taking manual snapshots
- enabling and disabling snapshot browsing
- making snapshots immutable
- deleting snapshots
- rolling back snapshots

To access file system snapshots from the File Systems panel:

1. On the **Unity navigation bar**, select **Storage > File Systems**.
2. Click the link to the File System you would like to view snapshots for.
3. Select **Summary > Snapshots**.

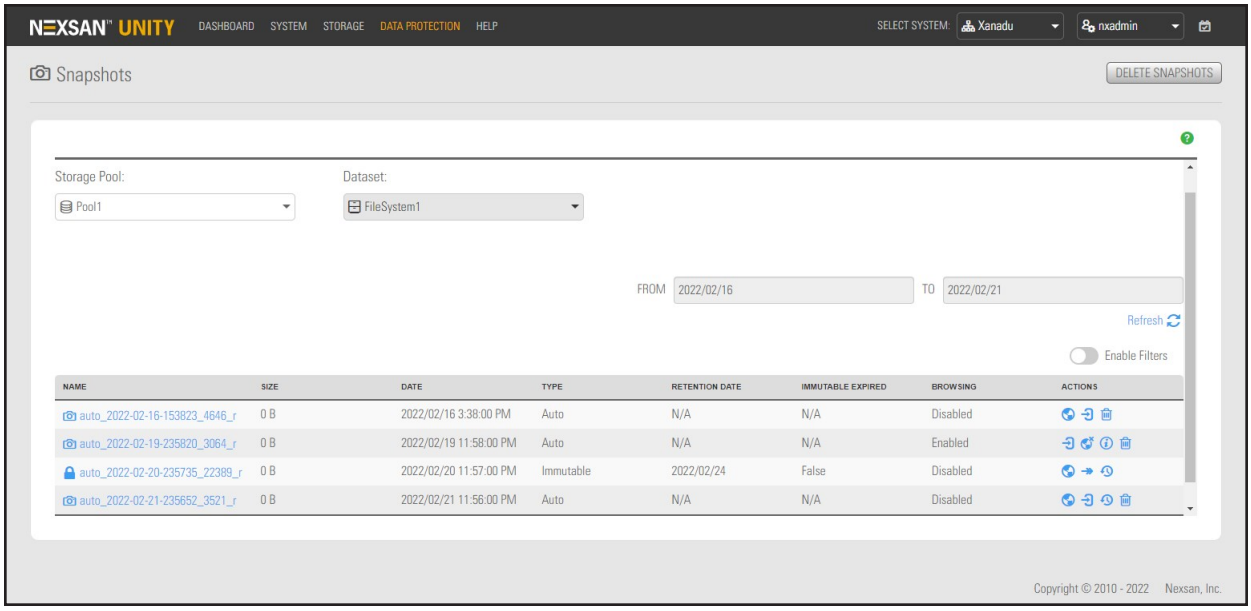
Figure 2-1: The File Systems Snapshots panel



To view File System snapshots from the main Snapshots panel:

1. On the **Unity navigation bar**, select **Data Protection> Snapshots**.
2. Select a **Storage Pool** and then select **Dataset > File System**, as shown.

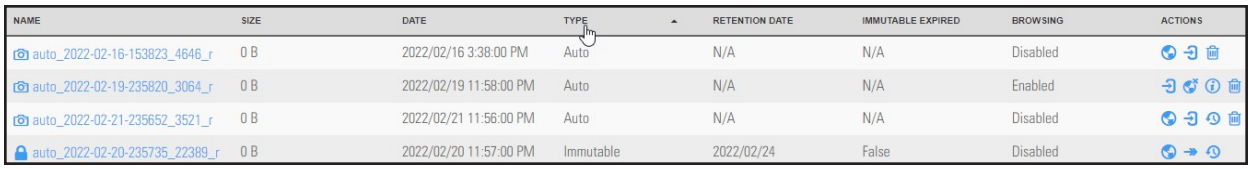
Figure 2-2: Snapshots panel with File Systems selected



From the panel, you can view LUN snapshots, or click the icons to **Manage Browsing**, **Change to Immutable**, **Roll back**, **or Delete** snapshots.

Sorting the list of snapshots

You can sort the list of snapshots displayed in the grid by clicking column headers.



▶ **To sort the list:**

- Click a column header.

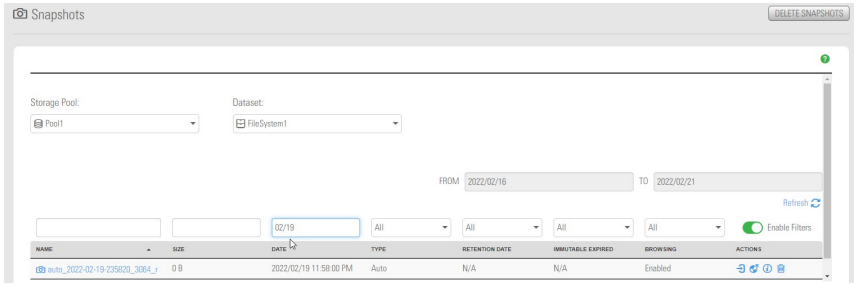
You can sort snapshots by individual columns **Name**, **Size**, **Date**, **Type**, **Retention Date**, **Immutable Expired**, and **Browsing** status.

Filtering snapshots in the grid

You can filter the snapshots displayed in the grid by **Browsing status**, **Name**, **Date**, **Time**, **Size**, and **Type**, and you can also filter the snapshots to only display snapshots recorded within a specific time period.

▶ **To filter the list of snapshots:**

1. On the **Unity navigation bar**, select **Data Protection > Snapshots**.
2. Select Enable Filters
3. Do any of the following, as required:

To...	Do this
only display snapshots recorded within a specific time period	1. Click the **From** date field above the snapshots grid, and select a starting date for the time period that you want to display snapshots from. 2. Click the **To** date field, and select an end date for the time period.
filter by alphanumeric string	Type text for any of the data types applicable in the column header boxes. For example: 
only display snapshots with a specific Browsing status	1. Open the drop-down list above the **Browsing** column heading in the grid. 2. Select the browsing status (**All**, **Disabled**, or **Enabled**) that you want to display snapshots for in the grid. The default filter setting is **All**.
only display snapshots of a specific type	1. Open the drop-down list above the **Type** column heading in the grid. 2. Select the type (**All**, **Auto**, **Immutable**, or **Manual**) that you want to display snapshots for in the grid. The default filter setting is **All**.
only display immutable snapshots of a specific type	1. Open the drop-down list above the **Immutable Expired** column heading in the grid. 2. Select the type (**All**, **N/A**, or **False**) that you want to display snapshots for in the grid. The default filter setting is **All**.
filter snapshots further	Combine filter settings. For example, if you only want to display snapshots that have **Browsing enabled**, of type **Auto**, and which were recorded between February 16, 2022 and February 21, 2022, set these filter settings in the grid: 1. Click the **From** date field above the snapshots grid, and select February 16 in the calendar. 2. Click the **To** date field, and select February 21 in the calendar. Unity filters the grid to only display snapshots recorded within the specified time period. 3. Open the drop-down list above the **Browsing** column heading in the grid and select **Enabled**. Unity filters the grid to only display snapshots that you enabled browsing for. 4. Open the drop-down list above the **Type** column heading in the grid and select **Auto**. Unity filters the grid again to only display scheduled (automatic) snapshots.

Searching for a specific snapshot in the grid

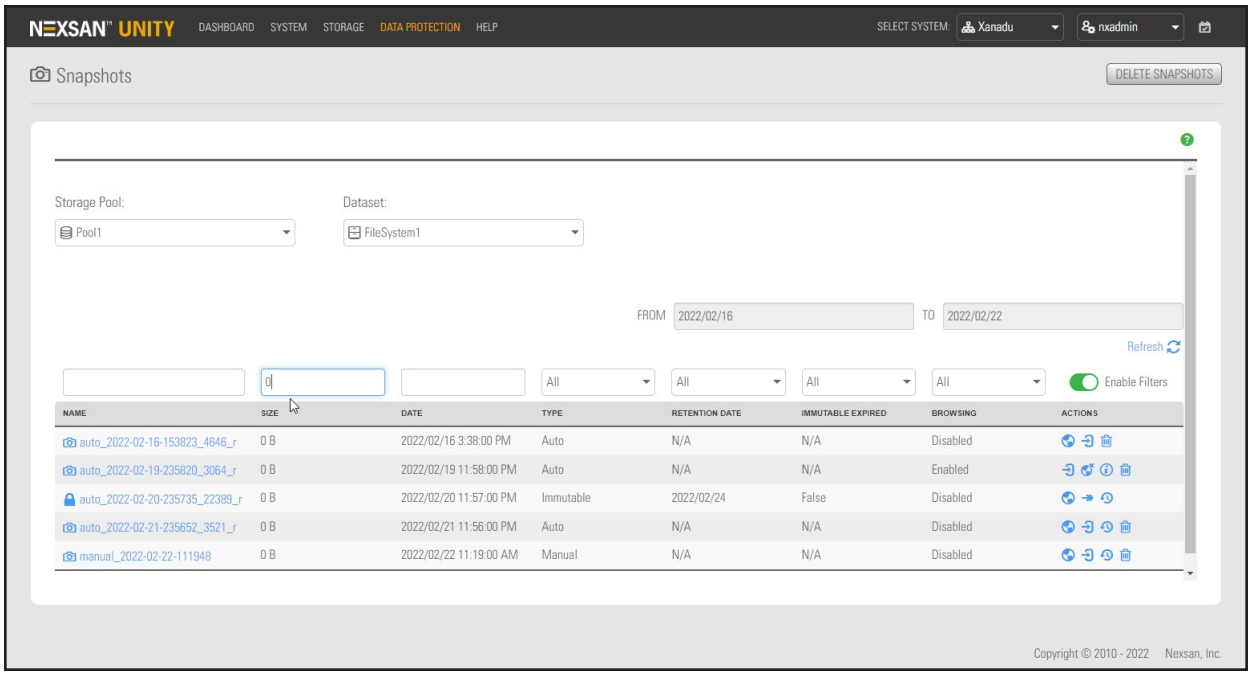
You can search for a specific snapshot in the grid by entering a search string in the text boxes above the corresponding column headings.

To search for a specific snapshot in the grid:

- Enter a search string in the text boxes above the column headings.

For example, if you want to search for all snapshots that are 0 B in size, simply enter 0 in the text box above the **Size** column heading.

Figure 2-3: File Systems Snapshots panel



Unity displays all snapshots matching your search criteria.

Using the File Systems Snapshot Settings panel

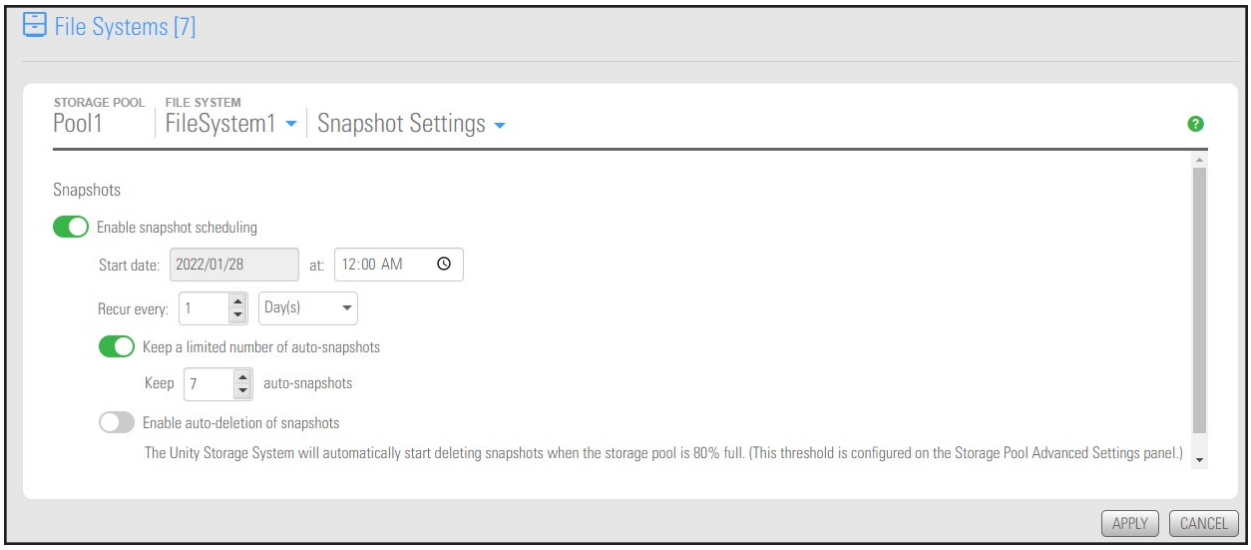
The **File Systems Snapshot Settings** panel provides options for configuring a snapshots schedule and for specifying auto-deletion settings for snapshots.

When you set a snapshots schedule, Unity automatically takes periodic snapshots of the file system according to the schedule you define; for more information, see Setting a schedule for automatic file system snapshots on page 26.

Note There can only be one snapshot schedule per file system.

Auto-deletion settings allow you to specify the maximum number of snapshots that you want Unity to retain for the corresponding file system. These settings only apply to scheduled (automatic) snapshots. For more information, see Configuring auto-deletion settings for file system snapshots on page 35.

Figure 2-4: File System Snapshot Settings panel



Setting a schedule for automatic file system snapshots

This section describes how to take automatic snapshots for file systems. For instructions about how to take manual snapshots, see Taking a manual file system snapshot on page 28.

When you set a snapshots schedule, Unity automatically takes periodic snapshots of the file system according to the schedule you define. Typically, you set a snapshots schedule when you initially create the file system. You can then modify or disable the schedule in the Snapshot Settings panel.

Note There can only be one snapshot schedule per file system.

To set or modify a schedule for automatic snapshots:

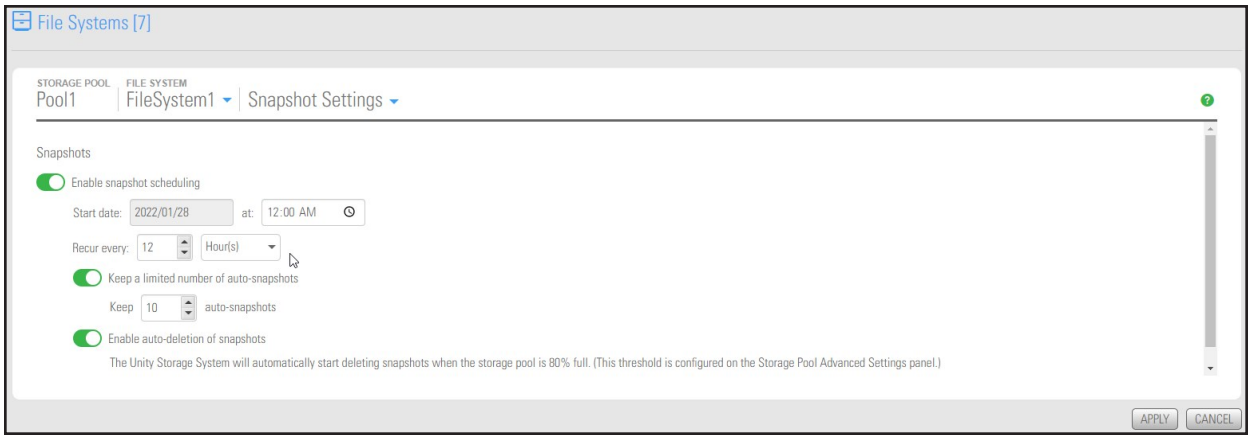
1. On the **Unity navigation bar**, select **Storage > File Systems**.
2. Select the link to the file system you need to update.
3. Select **Summary > Snapshot Settings**.

Figure 2-5: File Systems panel menu

4. In the **Snapshot Settings** panel, configure the snapshots schedule:
   a. **Enable snapshot scheduling** is selected by default. Clearing the check box disables snapshot scheduling.
   b. Adjust the snapshots schedule according to your preference. If you did not change the snapshots schedule when you initially created it, the default setting is once a day at 12 AM, with the start date set to the current date on Unity.
      - Specify the start date for the schedule by clicking the **Start date** field and selecting a date from the calendar.
      - Specify a recurrence pattern for the schedule by typing a value in the **Recur every** field.
      - Select the recurrence type from the drop-down list: **Minutes(s)**, **Hour(s)**, **Day(s)**, **Week(s)**, or **Month(s)**.
   c. Accept or change the value for the number of auto-snapshots to be kept. The default is 7.
   d. Click the **Enable auto-deletion of snapshots** button if you want Unity to start deleting snapshots when the storage pool is 80% full.
   e. Click the **Apply** button to save your settings.

      If you set the current date (or today's date) as the start date for the schedule, Unity takes an automatic snapshot immediately after you set the schedule. Thereafter, Unity takes an automatic snapshot according to the schedule you specify.

Figure 2-6: Snapshot Settings panel - configure a schedule



Note By default, Unity Storage System information refreshes every 5 minutes; as a result, a scheduled snapshot that Unity records may not be immediately visible in the snapshots grid. To force a refresh, click Refresh in the grid.

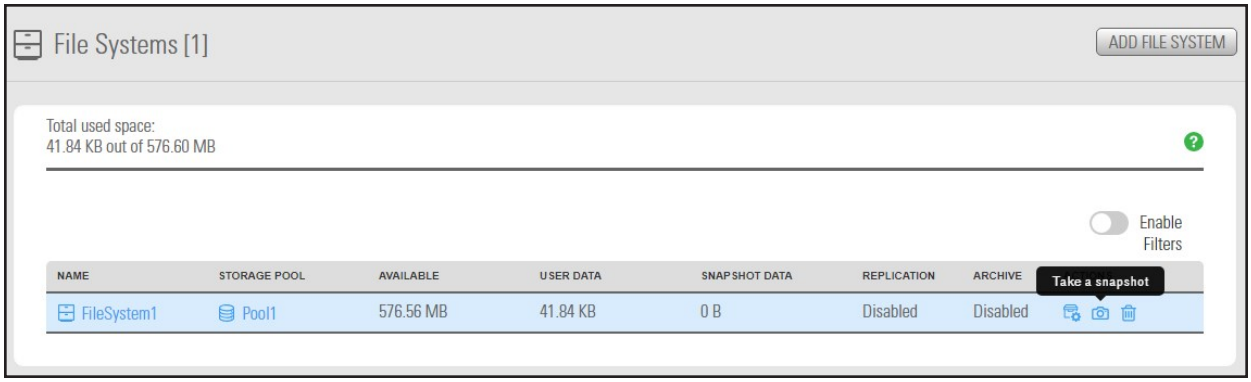
Taking a manual file system snapshot

You can take manual snapshots of a file system at any time, even if you have scheduled (automatic) snapshots enabled. This mechanism allows you record a copy of the contents of a file system.

To take a manual snapshot:

1. On the **Unity navigation bar**, select **Storage > File Systems**.
2. Under **Actions**, click the **Take Snapshot** button

Figure 2-7: File Systems panel



3. The **Take a Snapshot** window opens.

Figure 2-8: Take a snapshot pop-up window

Do one of the following:

To...	Do this
specify a name for the manual snapshot	a. Clear the **Automatically assign a name** option (selected by default). b. Type a name for the snapshot in the **Snapshot name** field. When setting a name for a manual snapshot, the same naming restrictions apply as when you specify a name for a LUN. c. Click the **Take a Snapshot** button to set the name and close the window. Unity immediately takes a snapshot and adds it to the snapshots grid.
allow Unity to automatically assign a name to the manual snapshot	a. Use the default name. b. Click the **Take Snapshot** button to close the window. Unity immediately takes a snapshot of the LUN and adds the manual snapshot to the snapshots grid. The snapshot is assigned a default name that is prefixed with `manual_` and includes the date and time the manual snapshot is recorded; for example: if you take a manual snapshot on February 22, 2022 at 3:03PM and 54 seconds, Unity assigns this name to the snapshot: `manual_2022-02-22-030354`
make the snapshot immutable	a. Click the **Enable immutability for this snapshot** button. b. Click the **Take Snapshot** button to close the window.

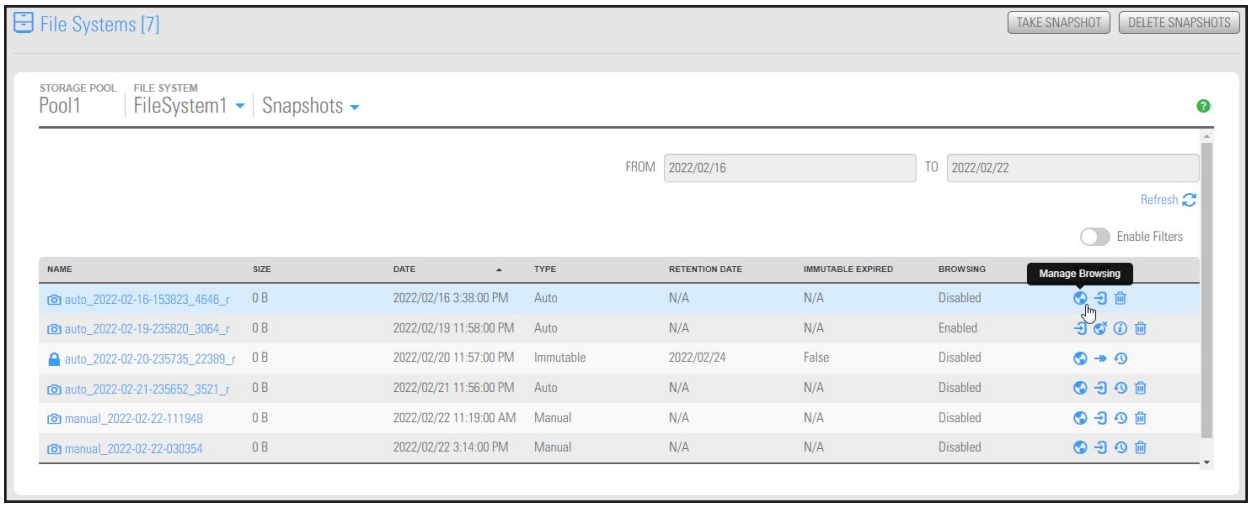
Browsing a file system snapshot

Setting browsing for a snapshot enables you to access the snapshot from a Windows-based (CIFS) system and/or a UNIX/Linux-based (NFS) system and browse its contents—in the same way that you access a file system. A snapshot that you browse is a read-only copy of its parent file system and its contents mirror the parent file system's contents at the time the snapshot is recorded.

To set browsing for a snapshot:

1. On the **Unity navigation bar**, select **Storage > File Systems**.
2. Select the file system where you want to browse snapshots.
3. Select **Summary > Snapshots**.
4. Click the **Manage Browsing** icon

Figure 2-9: File Systems Snapshots panel



5. Specify a browsing name for the snapshot and set the way Unity exposes it:
   a. In the **Manage Browsing** window, type a file system name for the snapshot.

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

      These characters are NOT allowed:

      ” / \ _ [ ] : ; | = , + * ? < >

   b. Select the sharing method that you want to use to expose the snapshot to client computers on the network:

To...	Do this
expose the snapshot to Windows-based systems over the CIFS protocol	Select **Enable CIFS** option.
make the snapshot a hidden CIFS file system	Select **Make this a hidden CFS file system**
expose the snapshot to UNIX/Linux-based systems over the NFS protocol	Select the **Enable NFS** option.
expose the snapshot to both Windows and UNIX/Linux-based systems (mixed-mode operation)	Select both the CIFS and NFS options.
gives all users on the network Read access to the snapshot, including the ability to display and traverse folders and read the contents of files in the snapshot	Select the **Enable Read-only anonymous access for everyone** option.

      Note To enable the read-only anonymous access options, you must first select either the CIFS sharing, NFS sharing, or both the CIFS and NFS sharing options.

   c. Click the **Browse** button to save your settings and close the **Manage Browsing** window.

Once Unity completes this process, the **Browsing** column in the snapshots grid displays the browsing enabled icon for the snapshot. If you mouse over the browsing enabled icon, Unity displays a ToolTip identifying the browsing name that you set for the snapshot.

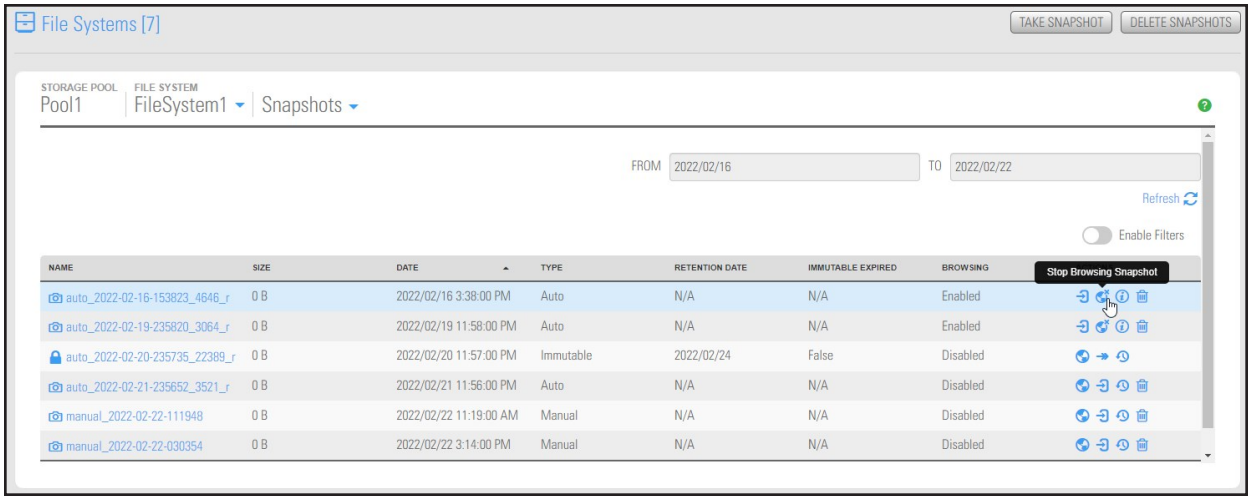
Note When you select a snapshot that has browsing enabled in the snapshots grid, the **Browse snapshot** button changes to **Stop browsing**.

Stopping file system snapshot browsing

To disable browsing for a snapshot:

1. On the **Unity navigation bar**, select **Storage > File Systems**.
2. Select the file system where you want to stop browsing the snapshot.
3. Select **Summary > Snapshots**.
4. Click the **Stop Browsing Snapshot** icon

Figure 2-10: File Systems Snapshots panel



5. Type **Stop** in the **Stop Browsing Snapshot** window to confirm.
6. Click the **Stop** button to complete the operation.

Note The **Stop browsing** button is only displayed if you select a snapshot in the grid that has browsing enabled.

Rolling back to a snapshot

The rollback function reverts the contents of a file system or LUN to what they were at the time the snapshot was taken, including all file- and folder-level permission settings and access-level attributes. This function also automatically deletes all snapshots that are newer than the snapshot that you roll back to, including all manual snapshots of the file system or LUN and snapshots that have browsing enabled.

CAUTION: Unity rolls back all the data in the file system to the contents of the snapshot. This includes all file- and folder-level permission settings and file system-level access attributes as they were when the snapshot was recorded. Additionally, Unity deletes all snapshots that are newer than the snapshot that you roll back to, including all manual snapshots of the file system and snapshots that have browsing enabled.

To roll back the data to a point-in-time snapshot:

1. On the **Unity navigation bar**, select **Storage > File Systems**.
2. Select the file system where you want to browse snapshots.
3. Select **Summary > Snapshots**.
4. Click the **Roll back Snapshot** icon

5. Type **Rollback** in the Stop Browsing Snapshot window to confirm.
6. Click the **Rollback** button to complete the operation.

Using the Windows Volume Shadow Copy service to roll back

If Unity is joined to a Microsoft Active Directory domain and Microsoft Windows client computers that use Microsoft Volume Shadow Copy (VSS), Unity automatically exposes all of its file system snapshots to Microsoft Windows (CIFS) clients that access them.

You can then use Microsoft VSS on the Windows client computers to restore previous versions of files and folders from a snapshot of a file system, or roll back a file system to a specific point-in-time snapshot.

CAUTION: The restore operation cannot be undone.

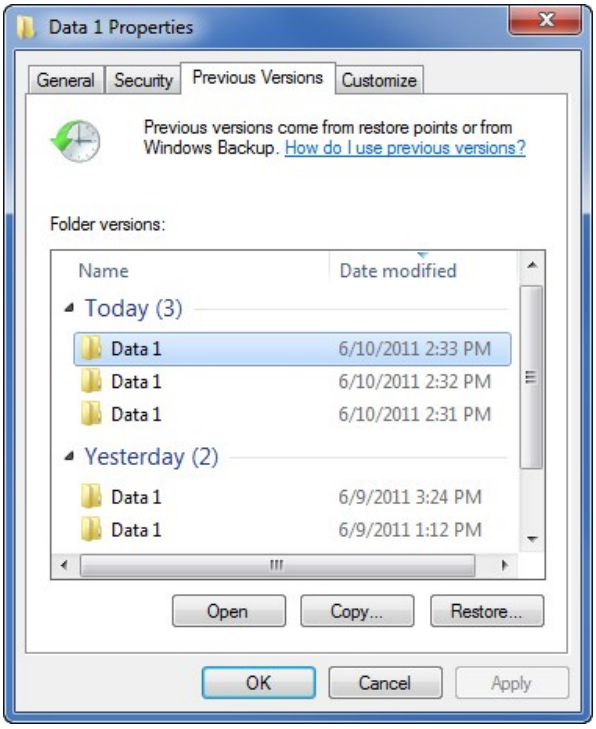
To use Microsoft VSS on a Windows client computer to roll back the data in a file system:

1. In Unity:
   a. Make sure the file system has CIFS sharing enabled.
   b. Make sure the file system has manual or automatic (scheduled) snapshots recorded; see Setting a schedule for automatic file system snapshots on page 26.
2. Access the file system from a Windows-based (CIFS) system.

3. On the Windows-based (CIFS) system: right-click the file or folder that you want to restore to a previous version or snapshot, and then click **Restore previous versions**. (Or, if you want to roll back all the contents of the CIFS share to a snapshot, right-click the CIFS share and then click **Restore previous versions**.)

   Microsoft Windows displays a list of available previous versions or snapshots of the file, folder, or file system.

Figure 2-11: Microsoft VSS, Restore previous version of file, folder, or file system



4. Before restoring a previous version of a file, folder, or file system, select the previous version in the list, and click **Open** to view it to make sure it's the version you want to roll back to.
5. To roll back to a previous version, select it in the list, and click the **Restore** button.

Similar to the roll back function in Unity, Microsoft VSS rolls back all the data in the file system to the contents of the snapshot you select—this includes all file- and folder-level permission settings and file system-level access attributes. However, unlike Unity's roll back function, Microsoft VSS does not delete any new files or folders that were added to the file system since the snapshot that you select as your restore point was recorded. The restore function only rolls back files and folders that exist in both the file system and the snapshot that you are rolling back to.

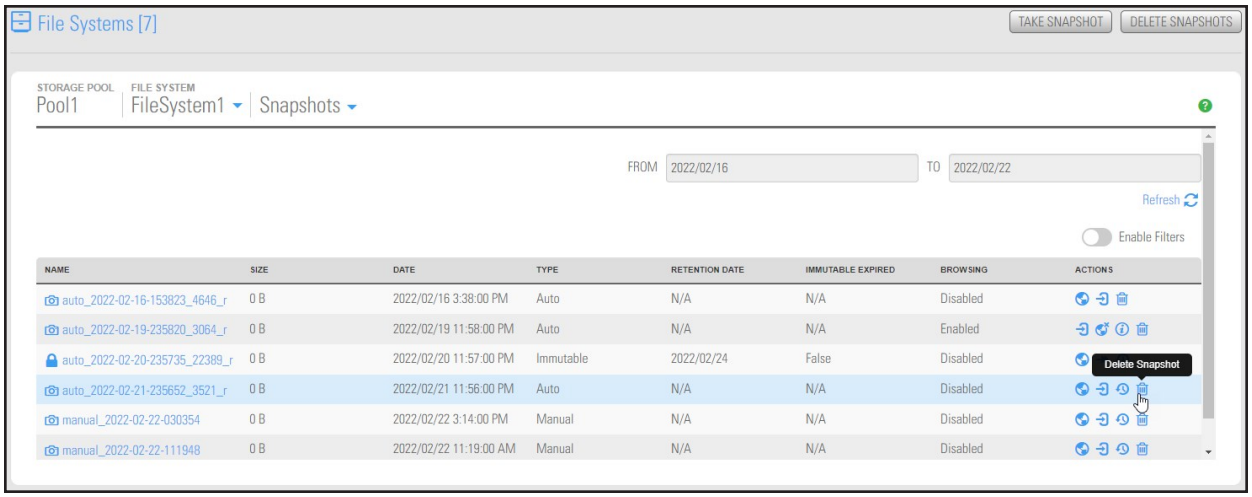
Manually deleting file system snapshots

This section describes how to delete snapshots for a file system. You can delete both manual snapshots and automatic (scheduled) snapshots.

To manually delete snapshots for a file system:

1. On the **Unity navigation bar**, select **Storage > File Systems**.
2. Select the file system where you want to delete the snapshot.
3. Select **Summary > Snapshots**.
4. Click the **Delete Snapshot** icon .

Figure 2-12: File Systems Snapshots panel



5. Type **Delete** in the **Delete Snapshot** window to confirm.
6. Click the **Delete** button to complete the operation.

Configuring auto-deletion settings for file system snapshots

Auto-deletion settings allow you to specify the maximum number of snapshots that you want Unity to keep on the system for the corresponding file system. For example, to keep only seven snapshots for the file system, set the auto-deletion setting to seven; Unity automatically deletes the first, or oldest snapshot on the system when it records the next scheduled (or eighth) snapshot.

You can also enable automatic deletion of snapshots when space usage in the storage pool reaches 80% of its total capacity. Auto-deletion settings only apply to scheduled (automatic) snapshots; Unity does not automatically delete manual snapshots. The snapshot auto-deletion threshold is configurable at the storage pool-level; see Modifying storage pool snapshot auto-deletion on page 92.

Note Snapshot auto-deletion settings are configured from the primary file system only. If the file system is replicated, the snapshots will also be automatically deleted from its replica using the same threshold, during a subsequent replication session.

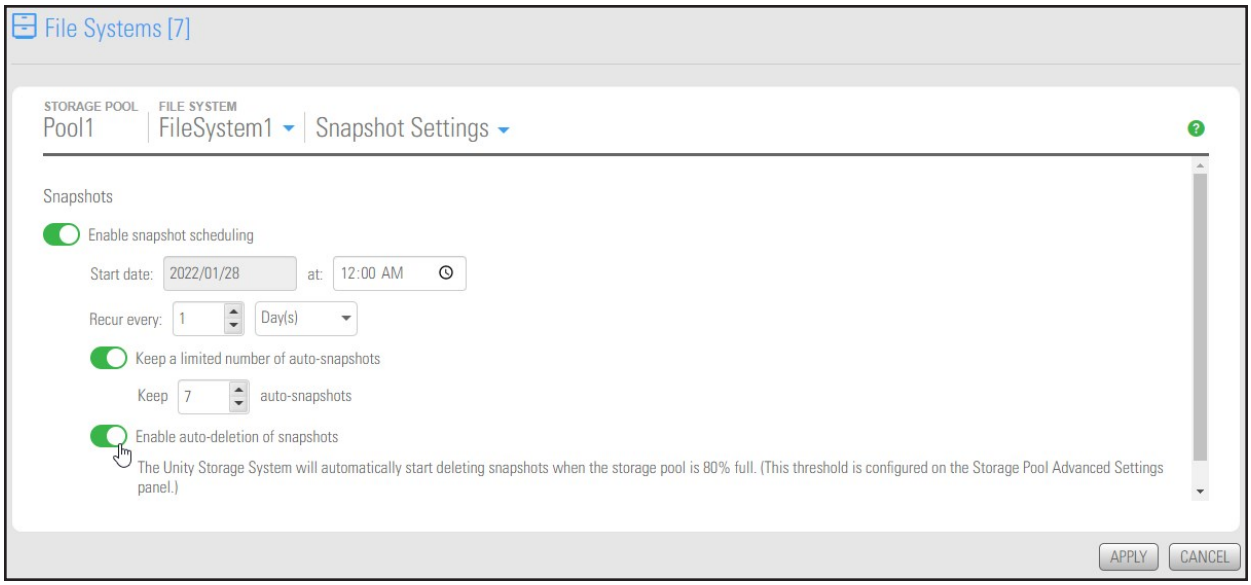
To set auto-deletion settings for snapshots:

1. On the **Unity navigation bar**, select **Storage > File Systems**.
2. Select the file system you need to update.

3. Select **Summary > Snapshot Settings**.

Figure 2-13: File Systems panel menu

4. Do either of the following:
   - Revise the default number of snapshots retained. The default is seven.
   - In the **Snapshot Settings** panel, click the Enable auto-deletion of snapshots button



5. Click the **Apply** button to save the changes.

Immutable snapshots for file systems

Use the topics in this section to create immutable snapshots for a file system, to make existing file system snapshots immutable, or to change the retention date of a file system snapshot.

A snapshot is immutable when it is locked for a specified period of time, and protected from modification or deletion. Having immutable snapshots ensures

- availability of snapshot data for disaster recovery, and,
- faster recovery compared to traditional recovery using backups

The File Systems Snapshots panel lists all the snapshots for the corresponding file system, and provides options and settings for immutable snapshots actions.

Taking an immutable snapshot for a file system 38
Changing an existing file system snapshot to make it immutable 39
Extending the retention date of an immutable snapshot 41

Taking an immutable snapshot for a file system

Use this topic to take an immutable snapshot for a file system.

Prerequisites

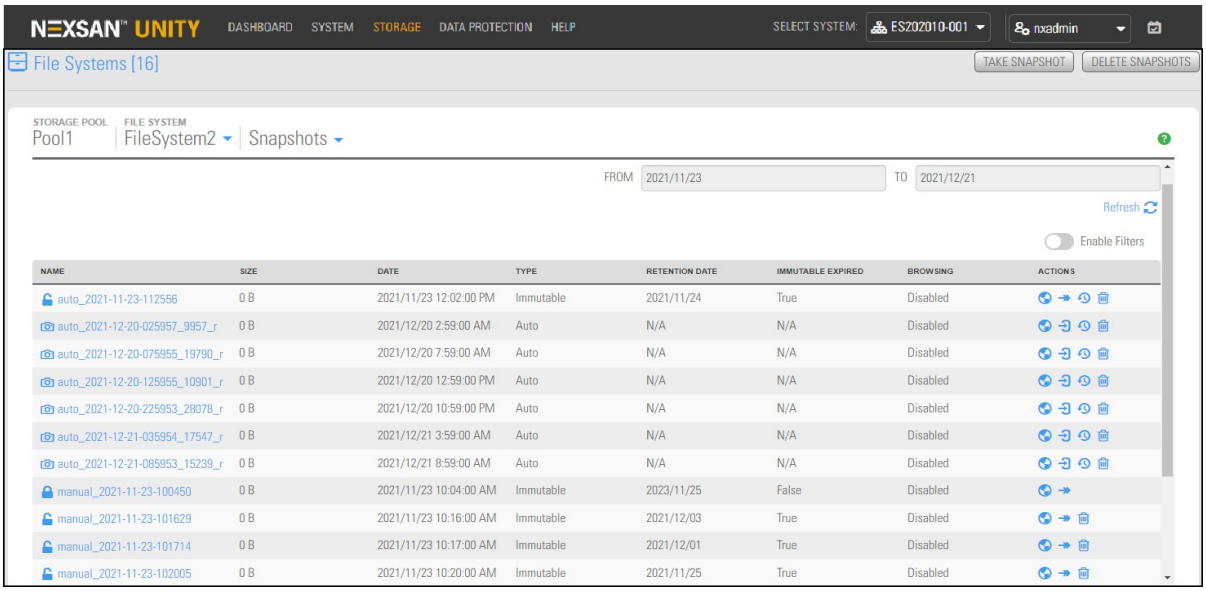
To complete this procedure, you'll need a Unity Storage System set up with storage pools, file systems, LUNs, and snapshots.

To take an immutable snapshot:

1. On the **Unity navigation bar**, select **Storage > File Systems**.
2. Click the link to the File System you would like to view snapshots for. **The File Systems Summary** page appears.

   Select **Summary > Snapshots**.The **File Systems Snapshots** panel appears.

Figure 2-14: The File Systems Snapshots panel



3. Click the **Take Snapshot** button on the upper right. The **Take a Snapshot** pop-up appears.

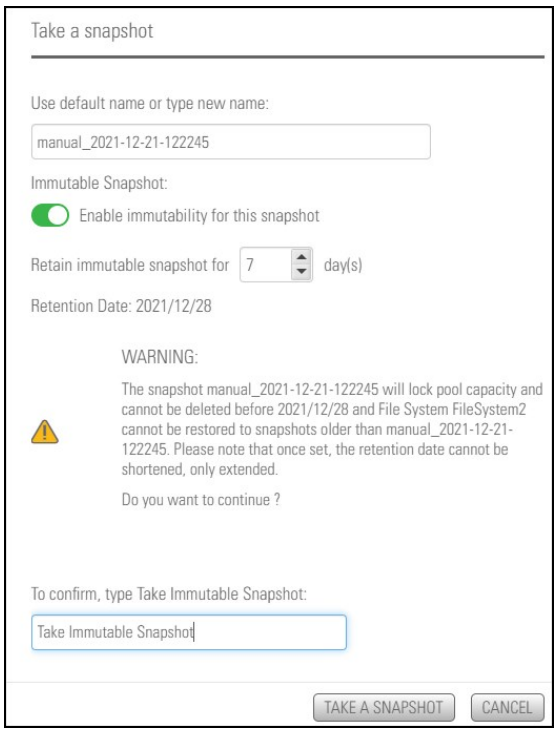
Figure 2-15: Take a snapshot pop-up window

4. Click the **Enable immutability for this snapshot** slider button . The subsequent **Take a snapshot** pop-up appears.

5. Use the default name or type a new name. The **Enable immutability for this snapshot** slider button appears green . Select the number of days to retain the immutable snapshot. The minimum number of days is one and the maximum number of days is 365. To confirm, type 'take immutable snapshot' (not case sensitive) and click the **Take a Snapshot** button.

CAUTION: Immutable snapshots lock pool capacity, cannot be deleted before the retention date, and the associated file system cannot be restored to a time before the immutable snapshot is created.

Figure 2-16: Take Immutable Snapshot confirmation pop-up window



Changing an existing file system snapshot to make it immutable

Use this topic to change an existing snapshot to make it immutable.

Prerequisites

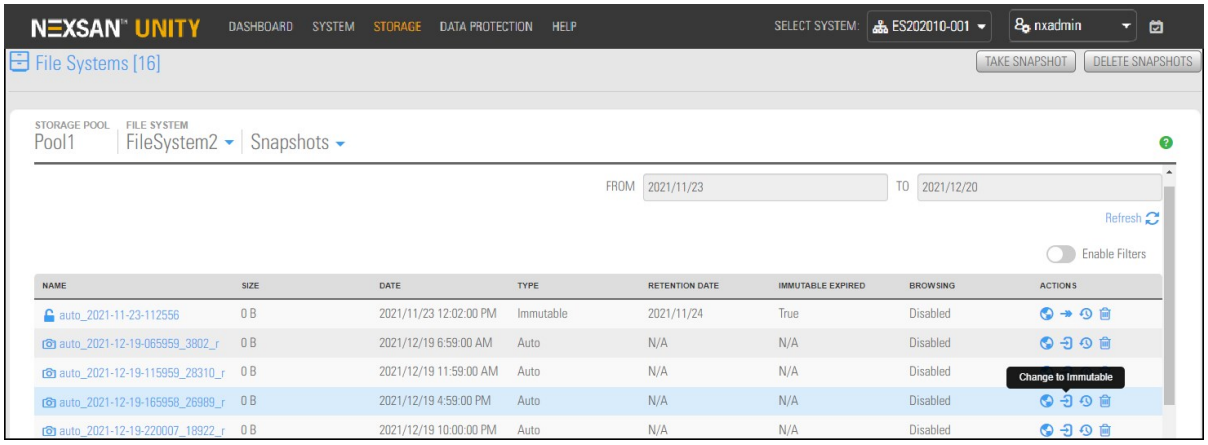
To complete this procedure, you'll need a Unity Storage System set up with storage pools, file systems, LUNs, and snapshots.

► **To change a snapshot to immutable:**

1. On the **Unity navigation bar**, select **Storage > File Systems**.
2. Click the link to the File System you would like to view snapshots for. **The File Systems Summary** page appears.
3. Select **Summary > Snapshots**. The **File Systems Snapshots** panel appears.

4. For the target snapshot, click the **Change to Immutable** icon . The **Change to Immutable Snapshot** pop-up appears.

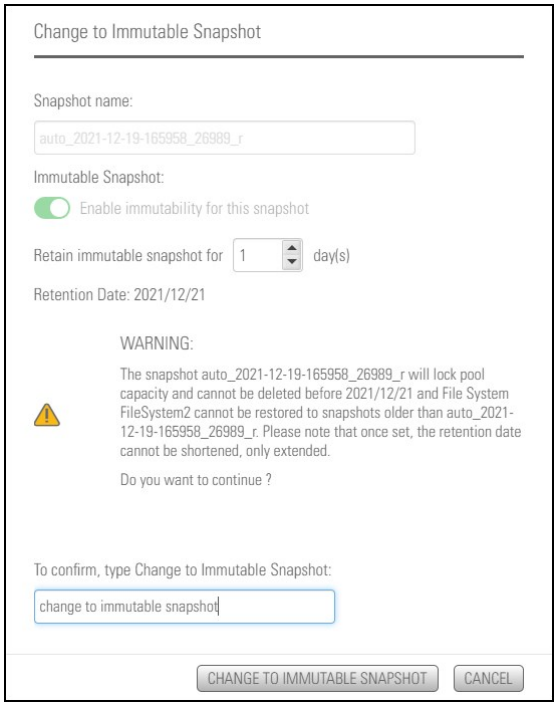
Figure 2-17: Change to immutable action icon in Snapshots panel



5. Select the number of days to retain the immutable snapshot. The minimum number of days is one and the maximum number of days is 365. To confirm, type 'change to immutable snapshot' (not case sensitive) in the confirmation field, then click the **Change to Immutable Snapshot** button.

CAUTION: Immutable snapshots lock pool capacity, cannot be deleted before the retention date, and the associated file system cannot be restored to a time before the immutable snapshot is created.

Figure 2-18: Change to Immutable Snapshot pop-up window



Extending the retention date of an immutable snapshot

Use this topic to extend the retention date of an immutable snapshot.

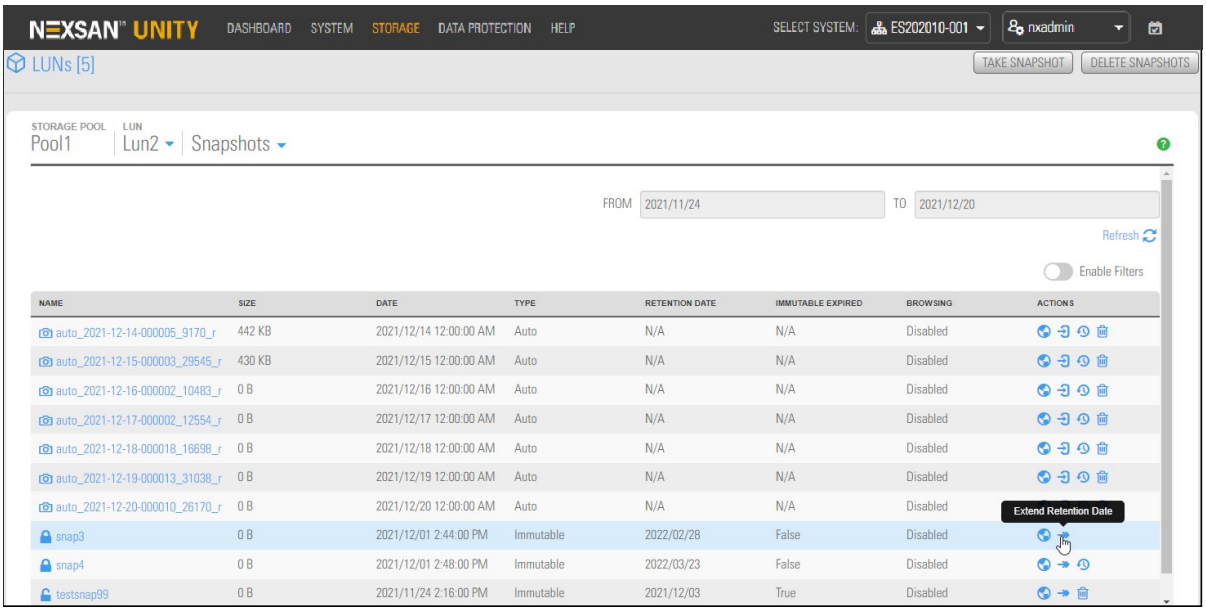
Prerequisites

To complete this procedure, you'll need a Unity Storage System set up with storage pools, file systems, LUNs, and snapshots.

To extend the retention date of an immutable snapshot:

1. On the **Unity navigation bar**, select **Storage > File Systems**.
2. Click the link to the File System you would like to view snapshots for **The File Systems Summary** page appears.
3. Select **Summary > Snapshots**.The **File Systems Snapshots** panel appears.
4. For the target snapshot, click the **Extend Retention Date** icon . The **Extend Retention Date** pop-up appears.

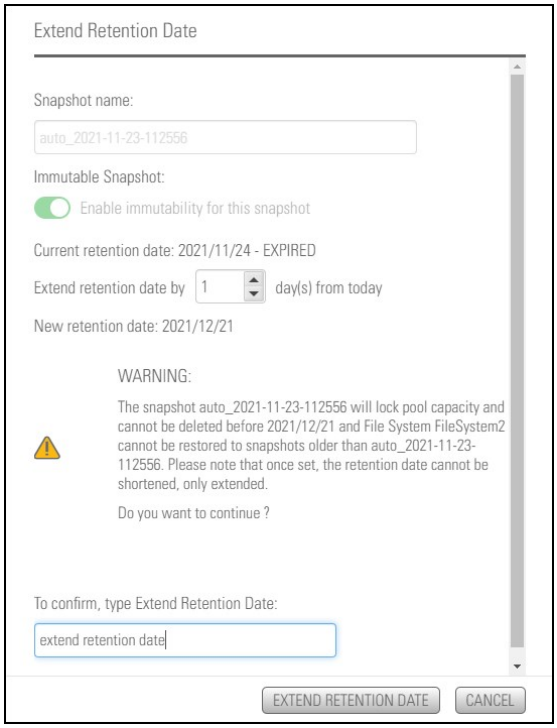
Figure 2-19: Extend Retention Date action icon in Snapshots panel



5. Select the number of days to extend the retention date. The minimum number of days is one and the maximum number of days is 365. Type 'extend retention date' (not case sensitive) in the confirmation field, then click the **Extend Retention Date** button.

CAUTION: Immutable snapshots lock pool capacity, cannot be deleted before the retention date, and the associated file system cannot be restored to a time before the immutable snapshot is created.

Figure 2-20: Extend Retention Date pop-up window



Managing snapshots for LUNs

Unity provides continuous data protection with the Snapshots feature, which enables you to capture, store, and access point-in-time copies of the data in your LUNs. Unity provides these methods of managing snapshots for LUNs:

- **Using the LUN Snapshots panel or Data Protection Snapshots panel:**

  You can enable browsing for a LUN snapshot and then mount the browsed snapshot as an iSCSI volume just like you would the parent LUN. You can only connect to a LUN snapshot using the corresponding storage pool's Management (mgmt) target, as opposed to the iSCSI target that you connect to the parent LUN through. For more information about the Management (mgmt) target, see Adding a CHAP user to the Management target on page 68.

  Once you connect to the browsed snapshot using the storage pool's Management (mgmt) target, you must set the corresponding volume as Online in Windows *Disk Management*.

- **Using the Unity VSS Hardware Provider:**

  The VSS Hardware Provider enables a VSS host to create and manipulate shadow copies (point-in-time snapshots) of the data in LUNs on Unity. The VSS Hardware Provider supports Windows Volume Snapshot Service (or Volume Shadow Copy Service).

See also: Understanding LUN snapshots below

This section includes these topics:

Introduction to snapshots on page 10

Viewing LUN snapshots on the next page

Using Windows VSS on page 67

Using Unity and VSS to manage LUN snapshots on page 91

Understanding LUN snapshots

A snapshot is a read-only copy of a LUN at a specific point in time. Think of a snapshot as a frozen image of the data in a LUN at the time the snapshot is recorded.

Snapshots browsing

Unity provides a mechanism that enables you to access a snapshot from a Windows-based system and/or a UNIX/Linux-based system and browse its contents—in the same way that you access a file system or a LUN. A snapshot that you browse is a read-only copy of its parent file system/LUN and its contents mirror the parent file system/LUN's contents at the time the snapshot is recorded.

You can use Unity's snapshot browsing mechanism to recover individual files from a snapshot in case the files are accidentally deleted or overwritten, or corrupted in the snapshot's parent file system/LUN. Unity maintains all of the parent file system/LUN's access-level attributes with the snapshots to ensure any recovery is authorized. This means that you can safely authorize all users—that have access to the file system/LUN—to browse a snapshot and recover their own lost data from the snapshot.

Rollback function

Unity enables you to roll back all the data in a file system/LUN to a specific point-in-time snapshot of the file system/LUN. The rollback function reverts a file system/LUN's contents to what they were at the time the snapshot was taken, including all file- and folder-level permission settings and file system/LUN-level access attributes. This function also automatically deletes all snapshots that are newer than the snapshot that you roll back to, including snapshots that have browsing enabled.

Unity provides the rollback function for extreme circumstances: for example, if all the data in a file system/LUN is corrupted and can no longer be recovered. The rollback function overwrites all the existing data in the file system/LUN with the contents of the snapshot that you roll back to; any new data that was added after the snapshot is recorded, including updates to existing data, is lost during the rollback process.

Microsoft Volume Shadow Copy Service

Microsoft Volume Shadow Copy (also referred to as Volume Snapshot Service or VSS), is a technology included in Microsoft Windows that enables you to take manual or automatic backup copies or snapshots of data.

If Unity is joined to a Microsoft Active Directory domain, Unity automatically exposes all the snapshots for each file system/LUN on Unity to Microsoft Windows (CIFS) clients that access the file system/LUNs—provided the Windows client computers support Microsoft VSS.

You can then use Microsoft VSS on the Windows client computers to restore previous versions of files and folders from a snapshot of a file system/LUN, or roll back a file system/LUN to a specific point-in-time snapshot.

Viewing LUN snapshots

The **Snapshots** panel lists all the snapshots for the corresponding LUN; it also provides options and settings for configuring the snapshots schedule, taking manual snapshots, enabling and disabling snapshot browsing, and deleting snapshots.

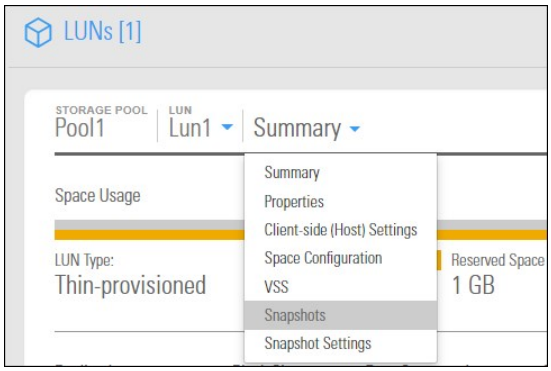
In the **LUN Snapshots** panel you can:

- Take a snapshot
- Delete all snapshots
- Manage the snapshot browsing method
- Make the snapshot immutable
- Delete snapshots
- Roll back a snapshot

To access LUN Snapshots from the LUNs panel:

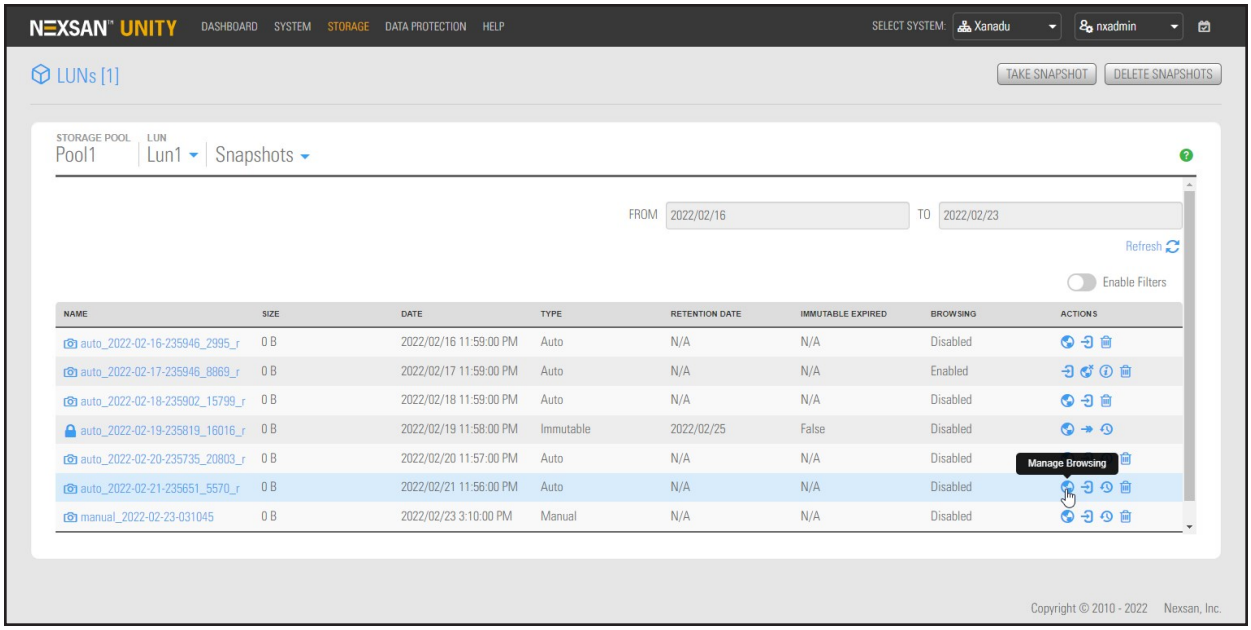
1. On the **Unity navigation bar**, select **Storage > LUNs**.
2. Click the link to the LUN that you want to access.
3. Select **Summary > Snapshots**.

Figure 2-21: LUNs Summary panel menu



The **LUN Snapshots** panel opens.

Figure 2-22: LUN Snapshots panel - Manage Browsing

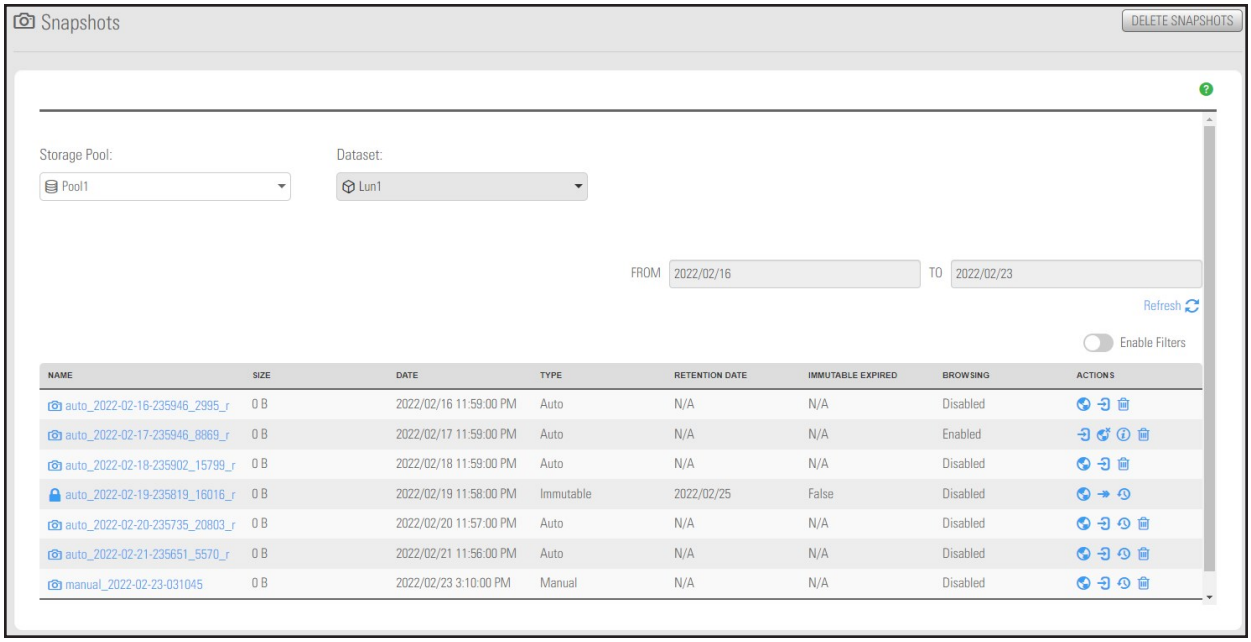


To manage LUN snapshots from the Snapshots panel:

1. On the **Unity navigation bar**, select **Data Protection > Snapshots**.
2. Select a **Storage Pool** and then select **Dataset > LUN**.
3. Click **Manage Browsing** to enable viewing of LUN Snapshots.

   You can also click **Change to Immutable**, **Roll back**, or **Delete** snapshots.

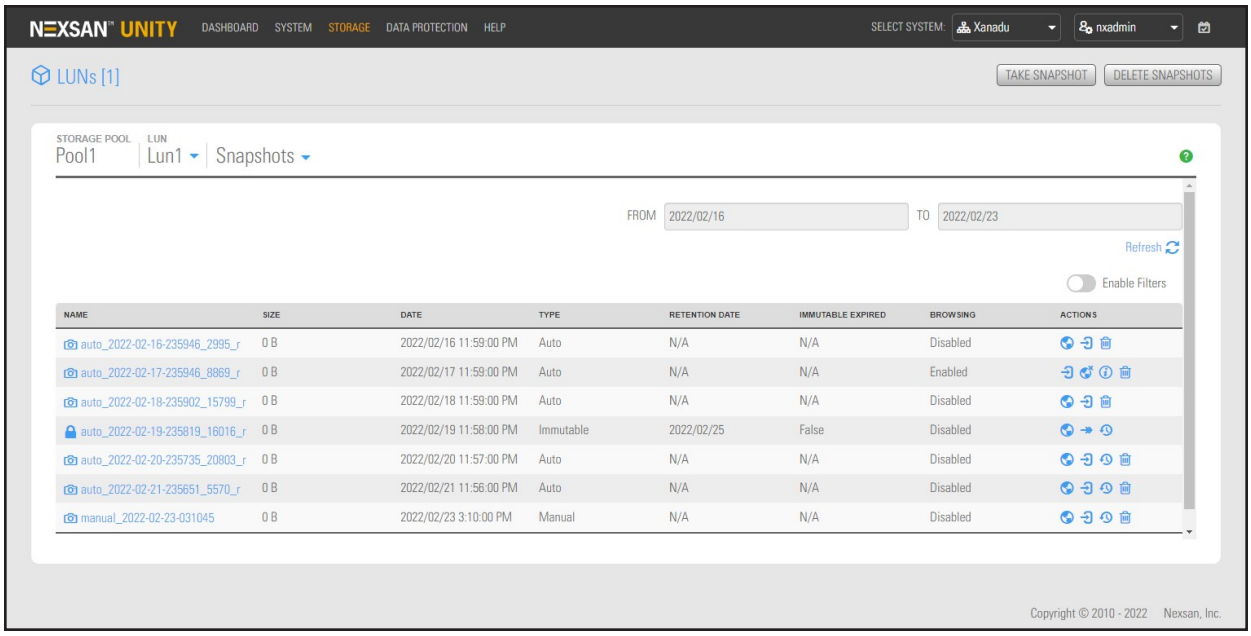
Figure 2-23: Snapshots panel with LUNs selected



LUNs Snapshots panel

The **LUNs Snapshots** panel displays a grid that lists all the snapshots recorded for the corresponding LUN.

Figure 2-24: LUNs Snapshots panel



The grid shows this information for each snapshot:

- Name: this column displays the snapshot's name; the name displayed in this column varies depending on whether the snapshot is a scheduled (automatic) snapshot or a manual snapshot:
  - For a scheduled (automatic) snapshot, the snapshot name is prefixed with `auto_` and includes the date and time the snapshot is recorded; for example: Unity assigns this name for a scheduled snapshot recorded on February 16, 2022 at 11:59 PM: `auto_2022-02-16-115900`.
  - For a manual snapshot, the name can be a value that you define when taking the snapshot, or if you use the default snapshots naming convention, the name is prefixed with `manual_` and includes the date and time the manual snapshot is recorded; for example: if you take a manual snapshot on February 23, 2022 at 3:10 PM and you use the default snapshots naming convention, Unity assigns this name to the snapshot: `manual_2022-02-23-151001`.

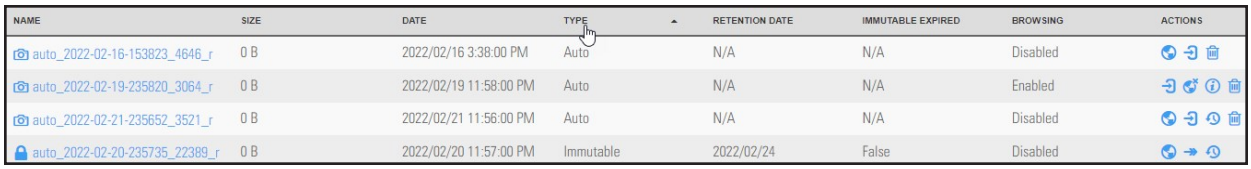
    If you are using VSS to manage your LUN snapshots, Unity displays the name with the `vss` prefix, as follows: `vss_client_FinancePool1`. For group snapshots, the naming convention adds `_grp`: `vss_grp_client_FinancePool1`. For information on VSS snapshots, see Using Windows VSS on page 67.
- Size: this column displays the size of the snapshot. When a snapshot is recorded it initially consumes no disk space; however, as data within the snapshot's parent LUN changes—for example, new data is added or existing data is updated—Unity updates the snapshot size accordingly.
- Date: this column displays the date and time the snapshot is recorded.

  Note Unity converts the date and time to local format; that is, the date and time on the system where Unity is currently running.
- Type: this column indicates whether the snapshot is an **Auto** (scheduled), **Manual**, or **Immutable** snapshot.

- Retention Date: this column displays the date until an immutable snapshot is retained.
- Immutable Expired: this column indicates whether the immutable snapshot retention date is expired.
- Browsing: this column indicates whether or not browsing is enabled for the snapshot.

Sorting the list of snapshots

You can sort the list of snapshots displayed in the grid by clicking column headers.



To sort the list:

- Click a column header.

You can sort snapshots by individual columns **Name**, **Size**, **Date**, **Type**, **Retention Date**, **Immutable Expired**, and **Browsing** status.

Searching for a specific snapshot in the grid

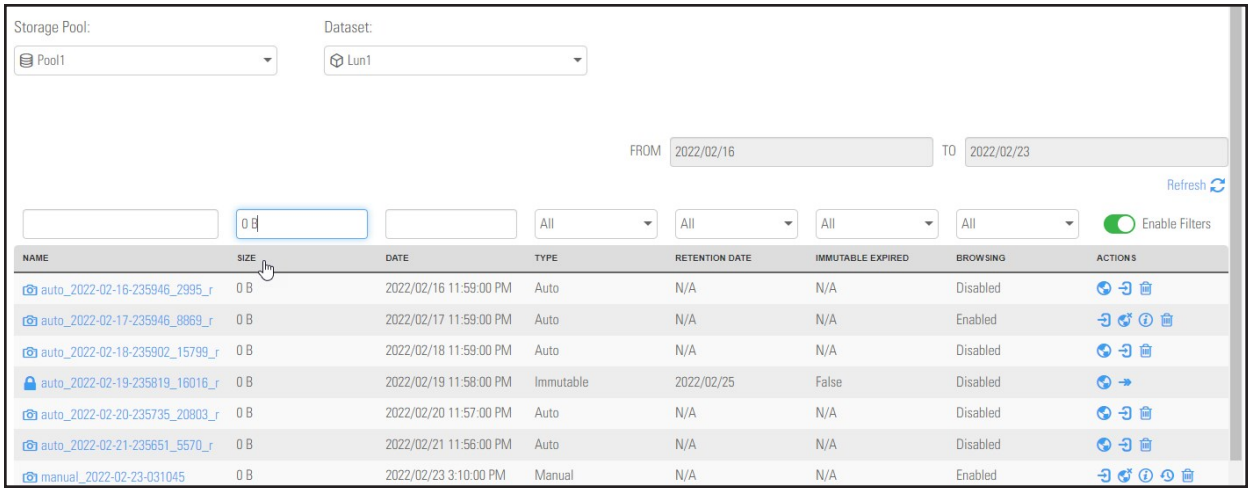
You can search for a specific snapshot in the LUN snapshots grid by **Name**, **Size**, or **Date**, by entering a search string in the text boxes above the corresponding column headings.

To search for a specific snapshot in the grid:

1. On the **Unity navigation bar**, select **Storage > LUNs**.
2. Click the link to the LUN that you want to search about.
3. Click **Summary > Snapshots**.
4. Click the **Enable Filters** button.
5. Enter a search string in the text boxes above the **Name**, **Size**, or **Date** column headings.

For example, if you want to search for all snapshots that are 0 B in size, simply enter 0 in the text box above the **Size** column heading.

Figure 2-25: LUNs Snapshots panel - searching

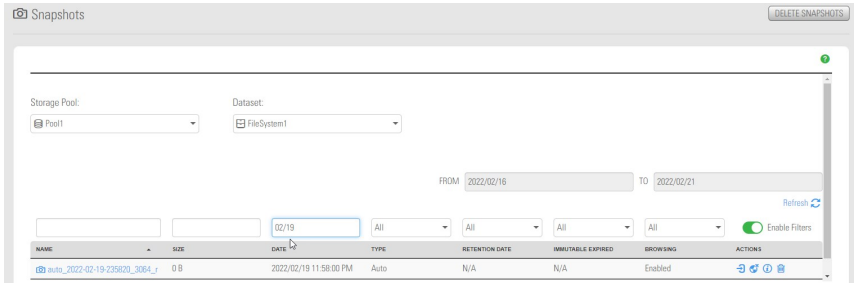


Filtering snapshots in the grid

You can filter the snapshots displayed in the grid by **Browsing status**, **Name**, **Date**, **Time**, **Size**, and **Type**, and you can also filter the snapshots to only display snapshots recorded within a specific time period.

To filter the list of snapshots:

1. On the **Unity navigation bar**, select **Data Protection > Snapshots**.
2. Select Enable Filters
3. Do any of the following, as required:

To...	Do this
only display snapshots recorded within a specific time period	1. Click the **From** date field above the snapshots grid, and select a starting date for the time period that you want to display snapshots from. 2. Click the **To** date field, and select an end date for the time period.
filter by alphanumeric string	Type text for any of the data types applicable in the column header boxes. For example: 
only display snapshots with a specific Browsing status	1. Open the drop-down list above the **Browsing** column heading in the grid. 2. Select the browsing status (**All**, **Disabled**, or **Enabled**) that you want to display snapshots for in the grid. The default filter setting is **All**.
only display snapshots of a specific type	1. Open the drop-down list above the **Type** column heading in the grid. 2. Select the type (**All**, **Auto**, **Immutable**, or **Manual**) that you want to display snapshots for in the grid. The default filter setting is **All**.

To...	Do this
only display immutable snapshots of a specific type	1. Open the drop-down list above the **Immutable Expired** column heading in the grid. 2. Select the type (**All**, **N/A**, or **False**) that you want to display snapshots for in the grid. The default filter setting is **All**.
filter snapshots further	Combine filter settings. For example, if you only want to display snapshots that have **Browsing enabled**, of type **Auto**, and which were recorded between February 16, 2022 and February 21, 2022, set these filter settings in the grid: 1. Click the **From** date field above the snapshots grid, and select February 16 in the calendar. 2. Click the **To** date field, and select February 21 in the calendar. Unity filters the grid to only display snapshots recorded within the specified time period. 3. Open the drop-down list above the **Browsing** column heading in the grid and select **Enabled**. Unity filters the grid to only display snapshots that you enabled browsing for. 4. Open the drop-down list above the **Type** column heading in the grid and select **Auto**. Unity filters the grid again to only display scheduled (automatic) snapshots.

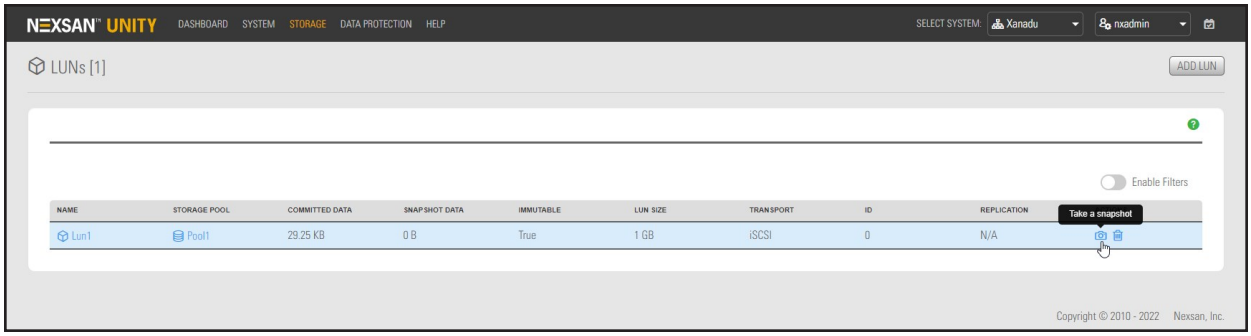
Taking a manual LUN snapshot

You can take manual snapshots of a LUN at any time, even if you have scheduled snapshots enabled. This mechanism enables you to record a copy of the contents of a LUN at any point in time.

To take a manual snapshot:

1. On the **Unity navigation bar**, select **Storage > LUNs**.
2. Under **Actions**, click the **Take a Snapshot** button in the row associated with the LUN you need the snapshot for.

Figure 2-26: LUN panel - Take a Snapshot button



3. The **Take a Snapshot** popup window opens.

Figure 2-27: Take a snapshot popup

Do one of the following:

To...	Do this
specify a name for the manual snapshot	a. Clear the **Automatically assign a name** option (selected by default). b. Type a name for the snapshot in the **Snapshot name** field. When setting a name for a manual snapshot, the same naming restrictions apply as when you specify a name for a LUN. c. Click the **Take a Snapshot** button to set the name and close the window. Unity immediately takes a snapshot and adds it to the snapshots grid.
allow Unity to automatically assign a name to the manual snapshot	a. Use the default name. b. Click the **Take Snapshot** button to close the window. Unity immediately takes a snapshot of the LUN and adds the manual snapshot to the snapshots grid. The snapshot is assigned a default name that is prefixed with `manual_` and includes the date and time the manual snapshot is recorded; for example: if you take a manual snapshot on March 1, 2022 at 7:35PM, Unity assigns this name to the snapshot: `manual_2022-03-01-193501`
make the snapshot immutable	a. Click the **Enable immutability for this snapshot** button. b. Click the **Take Snapshot** button to close the window.

Browsing a LUN snapshot

Setting browsing for a snapshot enables you to access the snapshot from a LUN and browse its contents in the same way that you access a LUN.

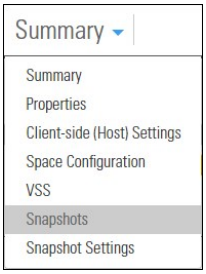
You can use Unity's snapshot browsing mechanism to recover individual files from a snapshot in case the files are accidentally deleted or overwritten, or corrupted in the snapshot's parent LUN. Unity maintains all of the parent LUN's access-level attributes with the snapshot to ensure any recovery is authorized. This means that you can safely authorize all users that have access to the LUN to browse a snapshot of the LUN and recover their own lost data from the snapshot.

CAUTION: When you browse a snapshot for a LUN, Unity makes the snapshot available to host systems of the LUN as a read/write clone. The host system can then both read from and write data to the clone, however Unity will NOT preserve direct changes to the clone. Therefore, it is important to ensure that you employ browsed LUN snapshots as read-only copies, and avoid writing new data to the snapshots.

Note If browsing for this snapshot is already enabled from the VSS Hardware Provider, the icon will display a status of browsing. For further details, see Browsing a VSS snapshot on page 83.

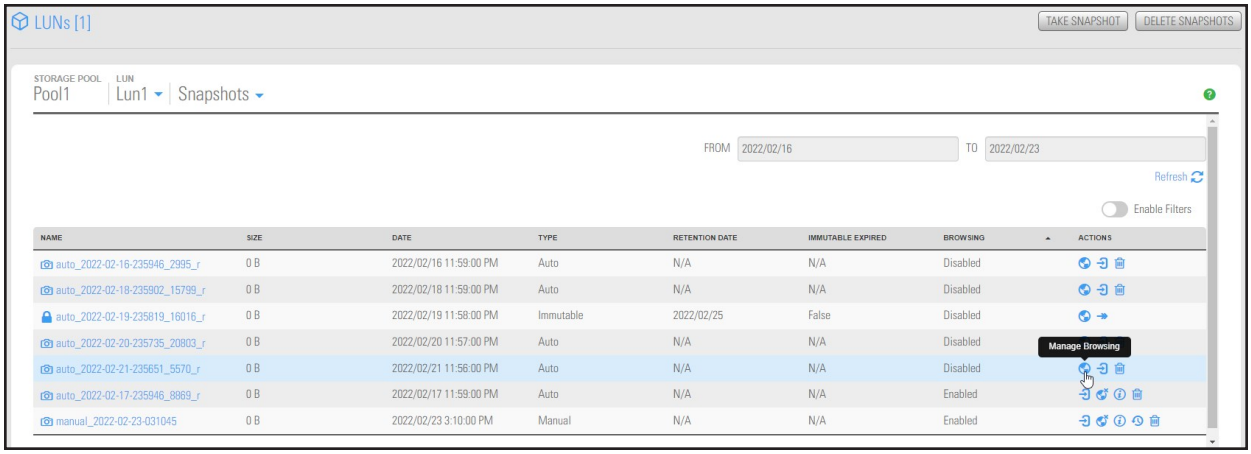
To set browsing for a snapshot:

1. On the **Unity navigation bar**, select **Storage > LUNs**.
2. Click the link to the LUN that you want to browse snapshots for.
3. Click **Summary > Snapshots**.



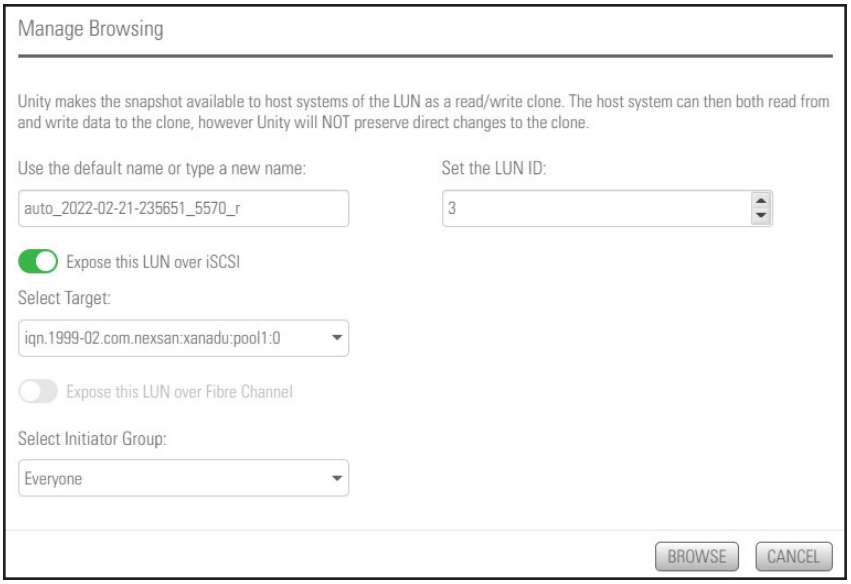
The **LUN Snapshots** panel opens.

Figure 2-28: LUN Snapshots panel - Manage Browsing



4. In the grid, click the **Manage Browsing** icon for the applicable snapshot. The Manage Browsing window opens.

Figure 2-29: LUN Snapshots - Manage Browsing window



5. Use the default or specify a new browsing name for the snapshot.
6. Review the other options displayed:
   a. Choose **Expose this LUN over iSCSI** or **Expose this LUN over Fibre Channel** as required.
   b. **Select Target**: Unity displays existing targets.
   c. **Select Initiator Group**: The default is **Everyone**, but you can choose others if defined.
   d. **Set LUN ID**: Choose another **LUN ID** if necessary.
   e. Click the **Browse** button to save your settings and close the **Browse Snapshot** window.

Unity enables browsing for the snapshot. The **Actions** column in the snapshots grid displays the following additional icons:

Icon	Description
	Browsing Properties icon: Browsing is enabled for the snapshot. Click the icon to stop browsing the snapshot.
	View Properties icon: Click to view the **Browsed Snapshot** properties.

Rolling back data in a LUN to a snapshot

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

CAUTION: Unity rolls back all the data in the LUN to the contents of the snapshot. This includes all file- and folder-level permission settings and LUN-level access attributes as they were when the snapshot was recorded. Additionally, Unity deletes all snapshots that are newer than the snapshot that you roll back to, including all manual snapshots of the LUN and snapshots that have browsing enabled.

Before you begin:

Before rolling back a LUN, you must set the corresponding volume as offline. The steps to do this differ depending on whether the LUN is managed by VMware or by a Windows host.

For a LUN managed by VMware:

1. Power off all virtual machines hosted on the LUN.
2. Roll back the snapshot.
3. Rescan the datastores.
4. Power on the virtual machines hosted on the LUN.

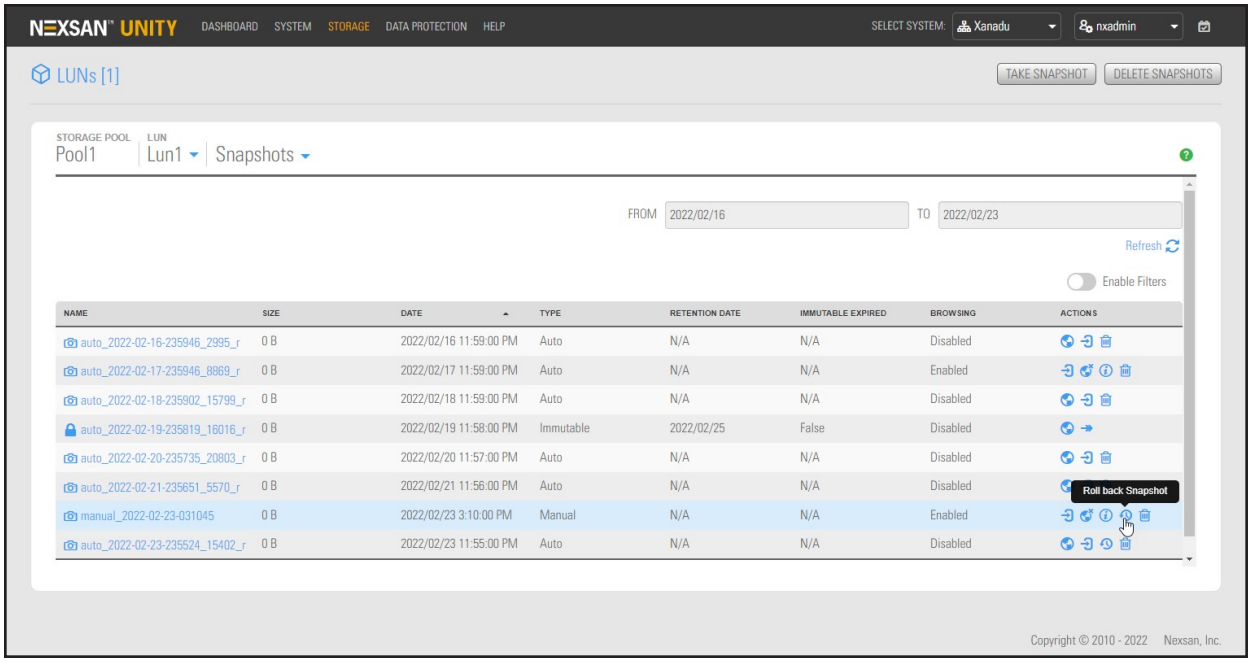
For a LUN managed by Windows, set the corresponding volume as offline in Windows.

To roll back the data to a point-in-time snapshot:

1. On the **Unity navigation bar**, select **Storage > LUNs**.
2. Click the link to the LUN that you want to roll back a snapshot for.

3. Click **Summary > Snapshots**. The **LUN Snapshots** panel opens.

Figure 2-30: LUN Snapshots panel - Roll back snapshot



4. In the grid, click the **Roll back Snapshot** icon for the applicable snapshot. The **Roll back Snapshot** window opens.
5. When you are ready to proceed, type **Roll back** in the text box and click the **Roll back** button.

Deleting LUN snapshots manually

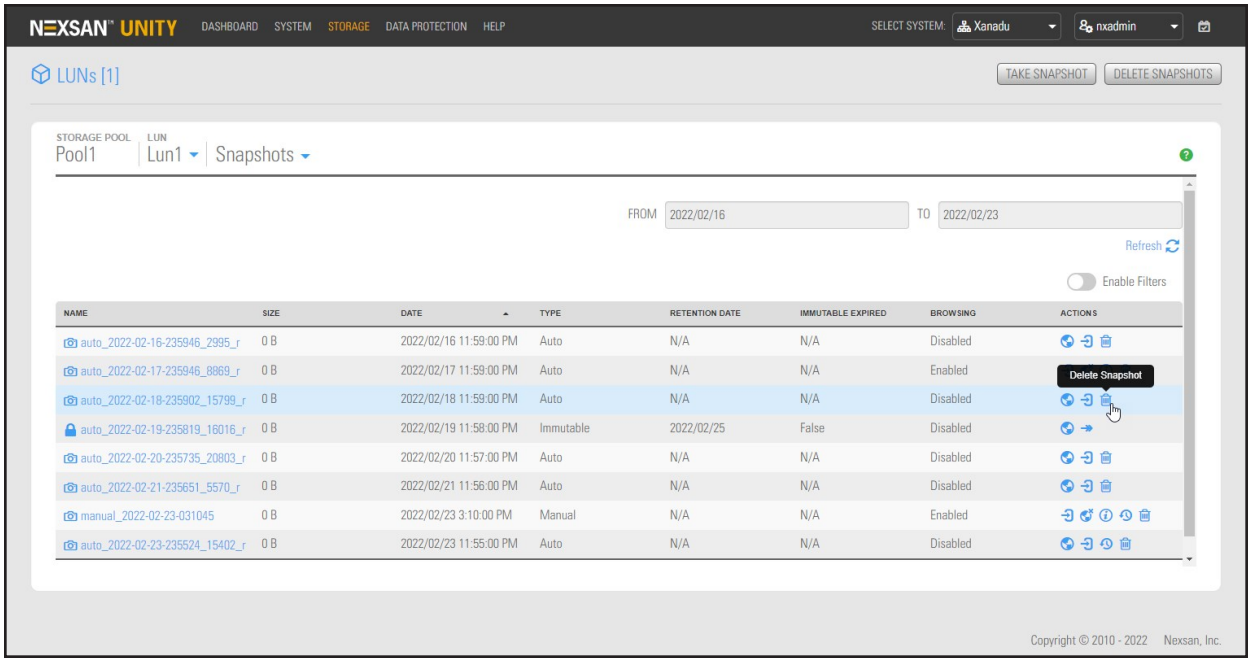
This section describes how to delete snapshots for a LUN. You can delete both manual snapshots and automatic snapshots. For instructions to delete snapshots automatically, see Setting a schedule for automatic LUN snapshots on page 57.

To manually delete snapshots for a LUN:

1. On the **Unity navigation bar**, select **Storage > LUNs**.
2. Click the **LUN** you want to delete snapshots for. The **LUN Summary** panel opens.

3. Click **Summary > Snapshots**. The **LUN Snapshots** panel opens.

Figure 2-31: LUN Snapshots panel - Delete Snapshot



4. In the grid, click the **Delete Snapshot** icon for the applicable snapshot.
5. In the **Delete Snapshot** popup window, type **Delete** to complete the operation.

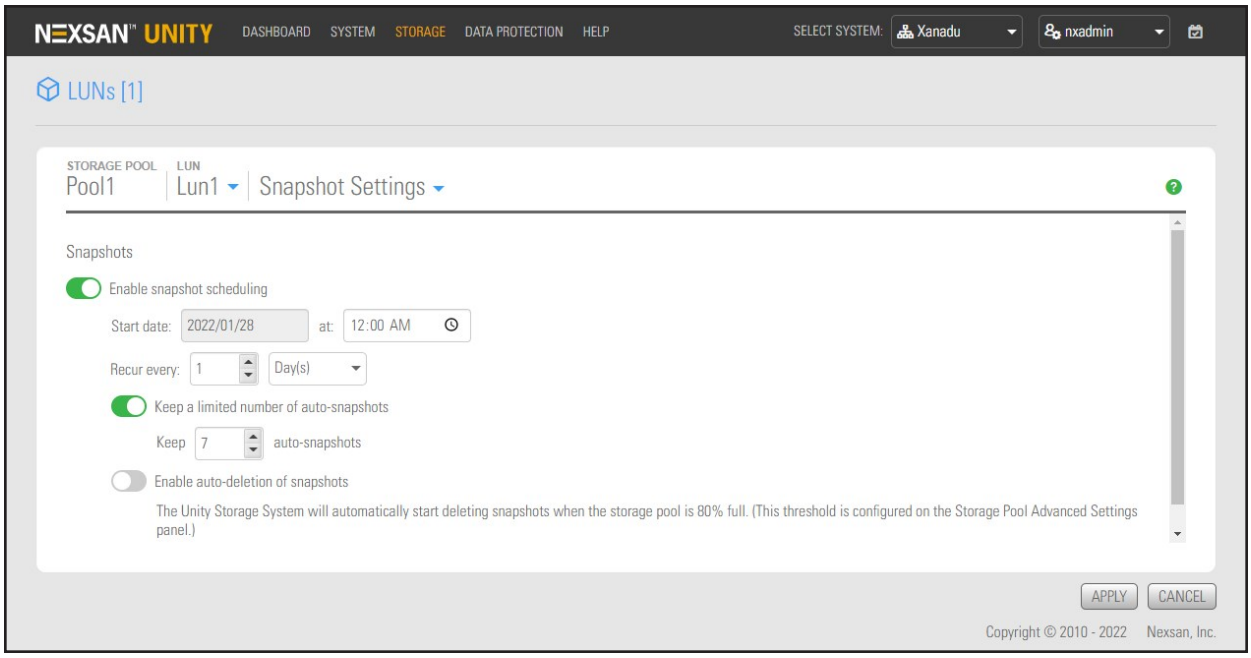
Managing LUN Snapshot scheduling

The **LUN Snapshot Settings** panel provides options for configuring a snapshots schedule and for specifying auto-deletion settings for snapshots.

When you set a snapshots schedule, Unity automatically takes periodic snapshots of the LUN according to the schedule you define; for more information, see Setting a schedule for automatic LUN snapshots on the facing page.

Auto-deletion settings allow you to specify the maximum number of snapshots that you want Unity to keep on the system for the corresponding LUN. These settings only apply to scheduled (automatic) snapshots.

Figure 2-32: LUN Snapshot Settings panel



Setting a schedule for automatic LUN snapshots

This section describes how to take automatic LUN snapshots. For instructions on taking a manual snapshot, see Taking a manual LUN snapshot on page 50.

When you set a snapshots schedule, Unity automatically takes periodic snapshots of the LUN according to the schedule you define. Typically, you set a snapshots schedule when you initially create the LUN. You can then modify or disable the schedule in the Settings tab of the Snapshots Properties panel.

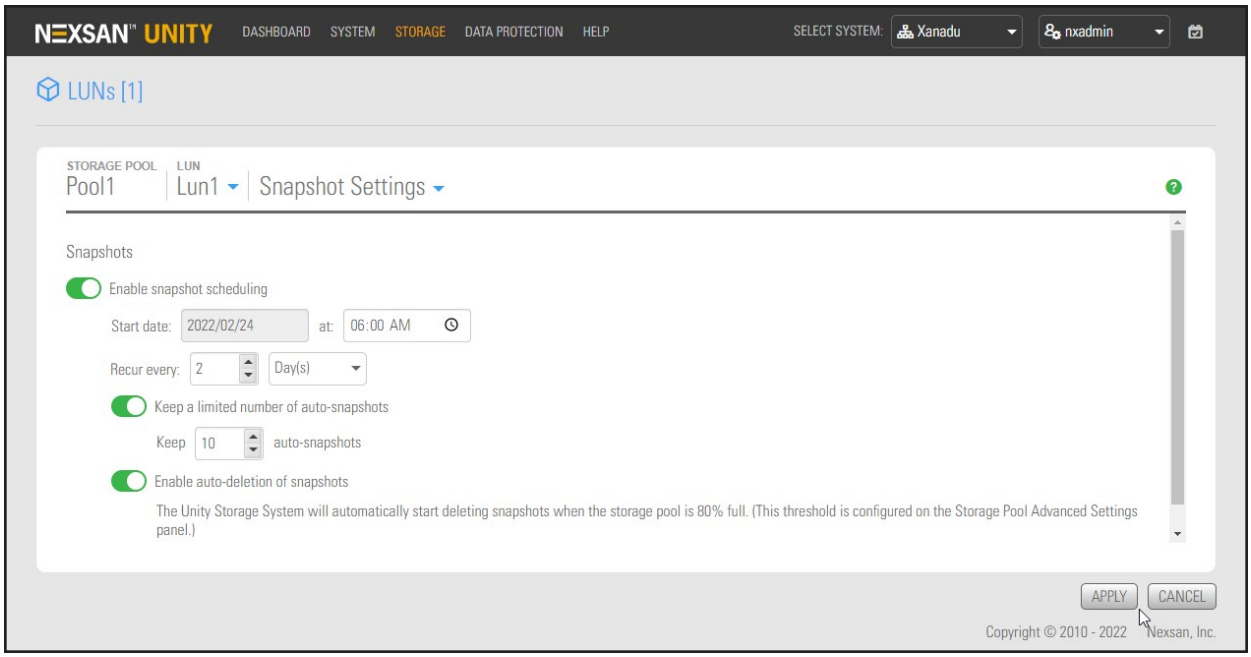
▶ **To set or modify a schedule for automatic snapshots:**

1. On the **Unity navigation bar**, select **Storage > LUNs**.
2. Click the link to the LUN that you want to schedule automatic snapshots for.
3. Select **Summary > Snapshot Settings**.

4. In the **Snapshot Settings** panel, configure the snapshots schedule for the LUN:
   a. **Enable snapshot scheduling** is selected by default. Clearing the check box disables snapshot scheduling.
   b. Adjust the snapshots schedule according to your preference. If you did not change the snapshots schedule for the LUN when you initially created the LUN, the default setting is once a day at 12 AM, with the start date set to the current date on Unity.
      - Specify the start date for the schedule by clicking the **Start date** field and selecting a date from the calendar.
      - Specify a recurrence pattern for the schedule by typing a value in the **Recur every** field.
      - Select the recurrence type from the drop-down list: **Minutes(s)**, **Hour(s)**, **Day(s)**, **Week(s)**, or **Month(s)**.
   c. Accept or change the value for the number of auto-snapshots to be kept. The default is 7.
   d. Select the **Enable auto-deletion of snapshots** button if you want Unity to start deleting snapshots when the storage pool is 80% full.
   e. Click the **Apply** button to save your settings.

      If you set the current date (or today's date) as the start date for the schedule, Unity takes an automatic snapshot of the LUN immediately after you set the schedule. Thereafter, Unity takes an automatic snapshot of the LUN according to the schedule you specify.

Figure 2-33: LUN Snapshot Settings panel - set a schedule



Note By default, Unity Storage System information refreshes every 5 minutes; as a result, a scheduled snapshot that Unity records may not be immediately visible in the snapshots grid. To force a refresh, click Refresh in the grid.

Immutable snapshots for LUNs

Use the topics in this section to create immutable LUN snapshots, to make existing LUN snapshots immutable, or to change the retention date of a LUN snapshot.

A snapshot is immutable when it is locked for a specified period of time, and protected from modification or deletion. Having immutable snapshots ensures

- availability of snapshot data for disaster recovery, and,
- faster recovery compared to traditional recovery using backups

The LUNs Snapshots panel lists all snapshots for the corresponding LUN, and provides options for the tasks you can perform with immutable snapshots.

Taking an immutable LUN snapshot 60
Making an existing LUN snapshot immutable 62
Extending the retention date of an immutable LUN snapshot 65

Taking an immutable LUN snapshot

Use this topic to take an immutable LUN snapshot.

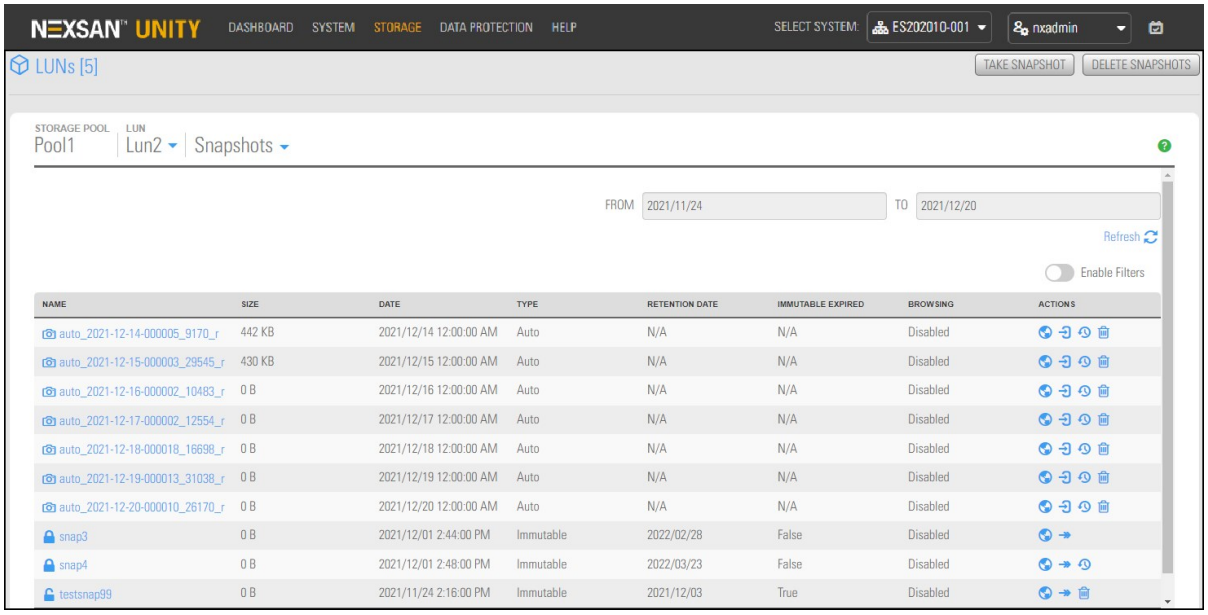
Prerequisites

To complete this procedure, you'll need a Unity Storage System set up with storage pools, file systems, LUNs, and snapshots.

To take an immutable LUN snapshot:

1. On the **Unity navigation bar**, select **Storage > LUNs**.
2. Click the link to the LUN you would like to view snapshots for. The **LUNs Summary** page appears.
3. Select **Summary > Snapshots**.The **LUNs Snapshots** panel appears.

Figure 2-34: The LUNs Snapshots panel



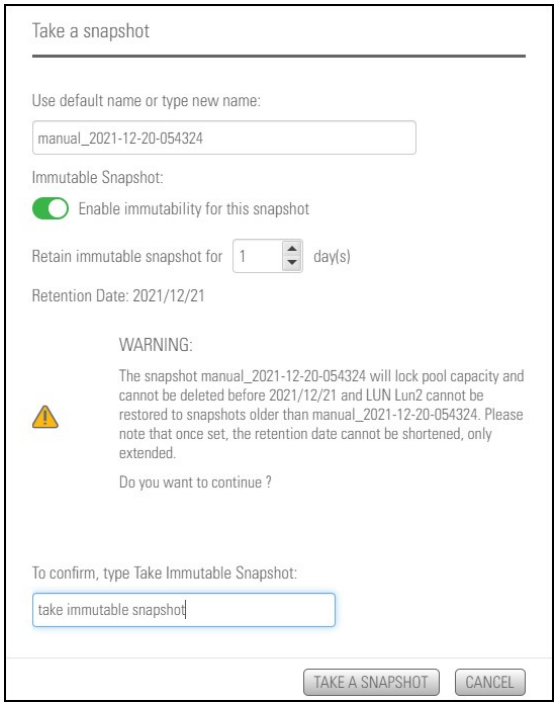
4. Click the **Take Snapshot** button on the upper right. The **Take a Snapshot** pop-up appears.

Figure 2-35: Take a snapshot pop-up window

5. Click the **Enable immutability for this snapshot** slider button . The subsequent **Take a snapshot** pop-up appears.
6. Use the default name or type a new name. The **Enable immutability for this snapshot** slider button appears green . Select the number of days to retain the immutable snapshot. The minimum number of days is one and the maximum number of days is 365. To confirm, type 'take immutable snapshot' and click the **Take a Snapshot** button.

CAUTION: Immutable snapshots lock pool capacity, cannot be deleted before the retention date, and the associated file system cannot be restored to a time before the immutable snapshot is created.

Figure 2-36: Take Immutable Snapshot confirmation pop-up window



Making an existing LUN snapshot immutable

Use this topic to make a LUN snapshot immutable.

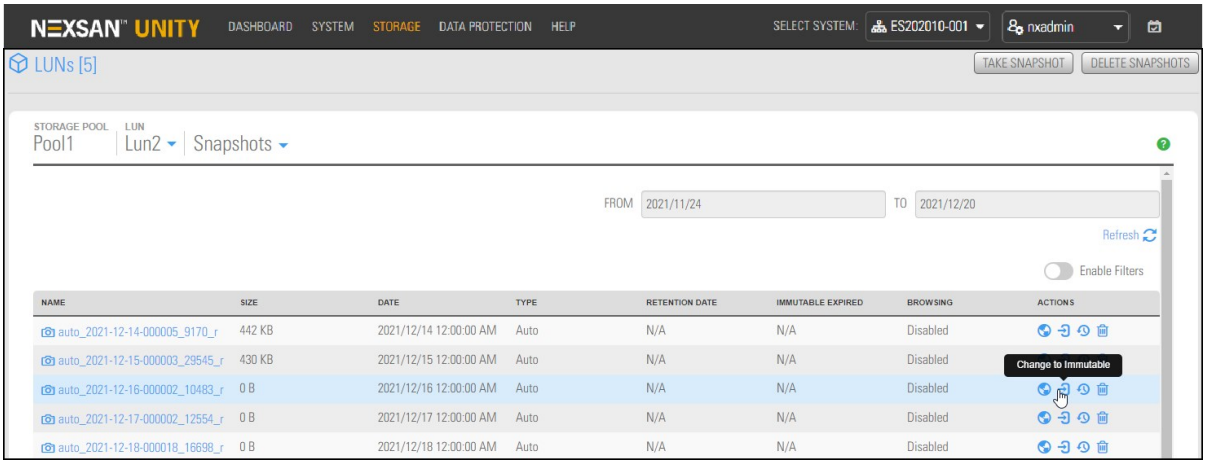
Prerequisites

To complete this procedure, you'll need a Unity Storage System set up with storage pools, file systems, LUNs, and snapshots.

To make a LUN snapshot immutable:

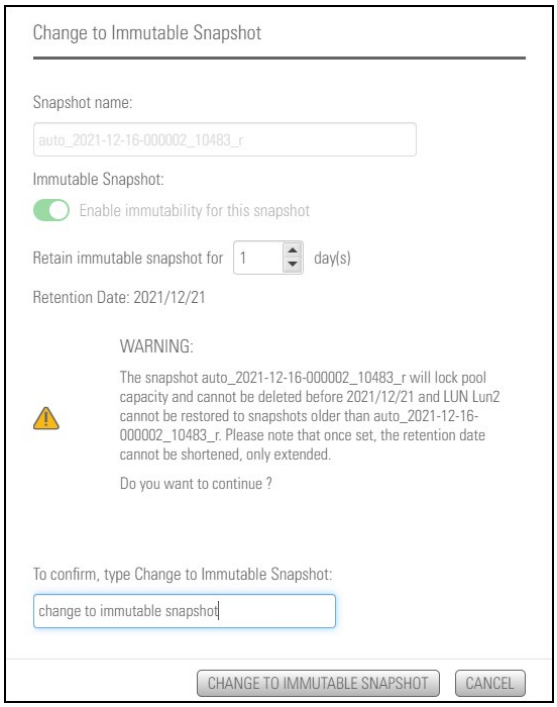
1. On the **Unity navigation bar**, select **Storage > LUNs**.
2. Click the link to the LUN you would like to view snapshots for. **LUNs Summary** page appears.
3. Select **Summary > Snapshots**. The **LUNs Snapshots** panel appears.
4. For the target snapshot, click the **Change to Immutable** icon . The **Change to Immutable Snapshot** pop-up appears.

Figure 2-37: Change to immutable action icon in LUNs panel



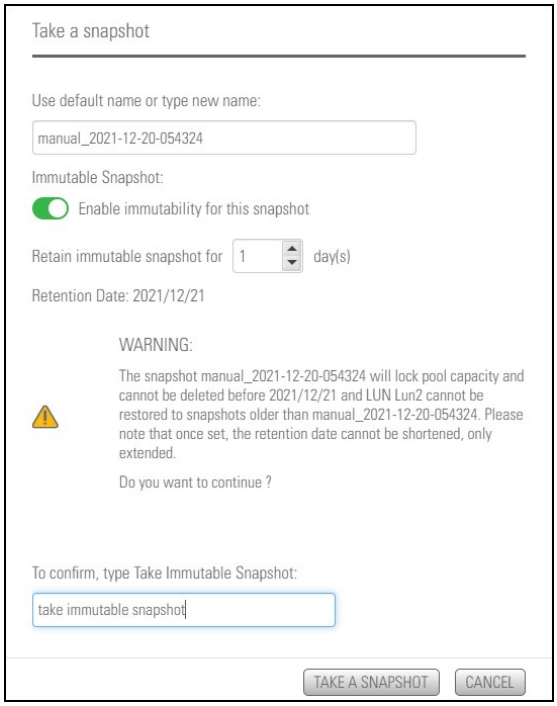
5. Select the number of days to retain the immutable snapshot. The minimum number of days is one and the maximum number of days is 365. To confirm, type 'change to immutable snapshot' in the confirmation field, then click the **Change to Immutable Snapshot** button.

Figure 2-38: Change to Immutable Snapshot pop-up window



CAUTION: Immutable snapshots lock pool capacity, cannot be deleted before the retention date, and the associated file system cannot be restored to a time before the immutable snapshot is created.

Figure 2-39: Take Immutable Snapshot confirmation pop-up window



Extending the retention date of an immutable LUN snapshot

Use this topic to extend the retention date of an immutable LUN snapshot.

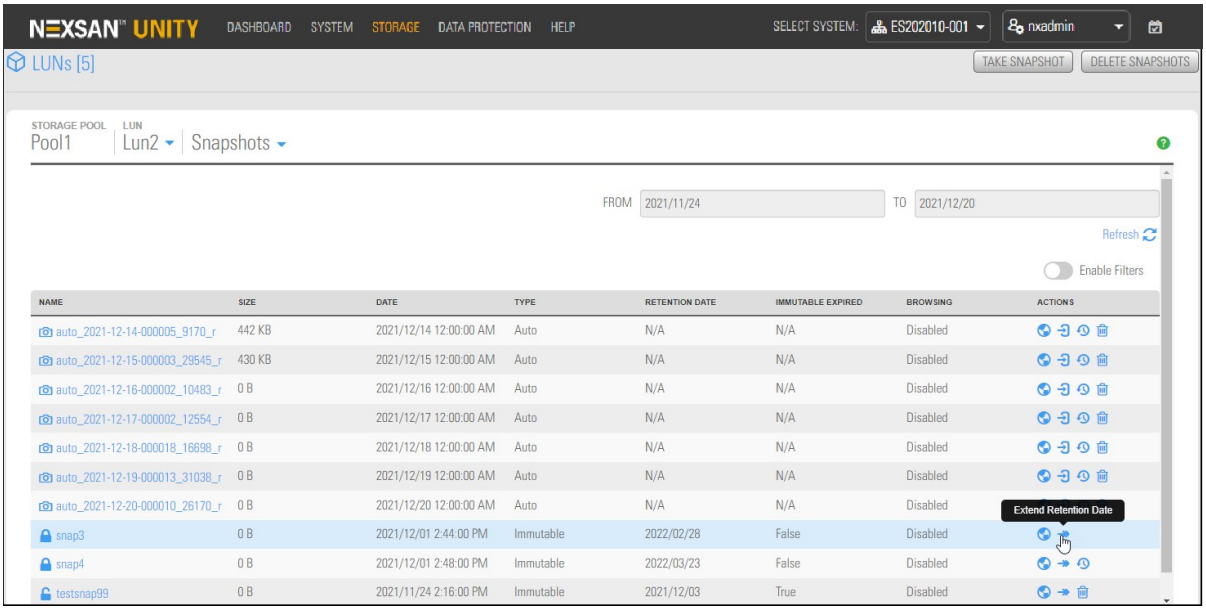
Prerequisites

To complete this procedure, you'll need a Unity Storage System set up with storage pools, file systems, LUNs, and snapshots.

To extend the retention date of an immutable LUN snapshot:

1. On the **Unity navigation bar**, select **Storage > LUNs**.
2. Click the link to the LUN you would like to view snapshots for. The **LUNs Summary** page appears.
3. Select **Summary > Snapshots**.The **LUNs Snapshots** panel appears.
4. For the target snapshot, click the **Extend Retention Date** icon . The **Extend Retention Date** pop-up appears.

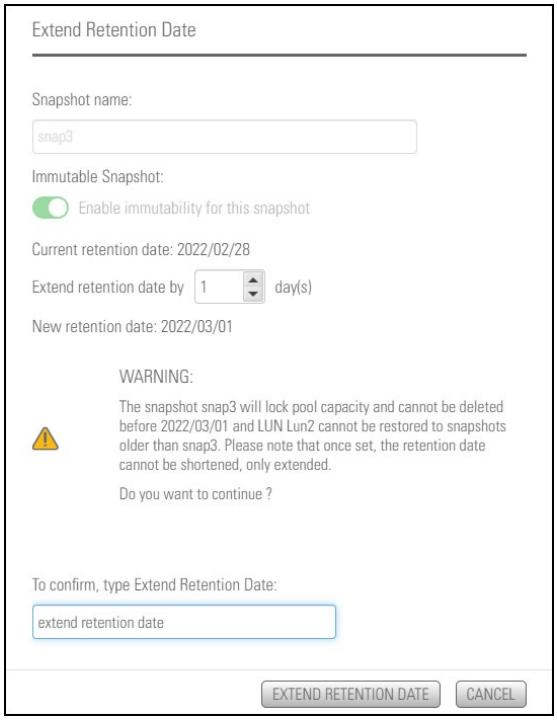
Figure 2-40: Extend Retention Date action icon in LUN Snapshots panel



5. Select the number of days to extend the retention date. The minimum number of days is one and the maximum number of days is 365. Type 'extend retention date' in the confirmation field, then click the **Extend Retention Date** button.

CAUTION: Immutable snapshots lock pool capacity, cannot be deleted before the retention date, and the associated file system cannot be restored to a time before the immutable snapshot is created.

Figure 2-41: Extend Retention Date pop-up window



Using Windows VSS

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

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

Prerequisites:

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

Supported Windows Server versions:

- Windows Server 2016
- Windows Server 2012, R2
- Windows Server 2012, R1
- Windows Server 2008 R2
- Windows Server 2008 x86 or x64, including:
  - Windows Server 2008 with Service Pack 1
  - Windows Server 2008 with Service Pack 2
- Window Server 2003 R2 x86 or x64

This section includes these topics:

Adding a CHAP user to the Management target

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

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

See "Users and Access Rights".

Installing the VSS Hardware Provider

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

Before you begin:

Make sure to review the list of supported operating systems in Using Windows VSS on the previous page.

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

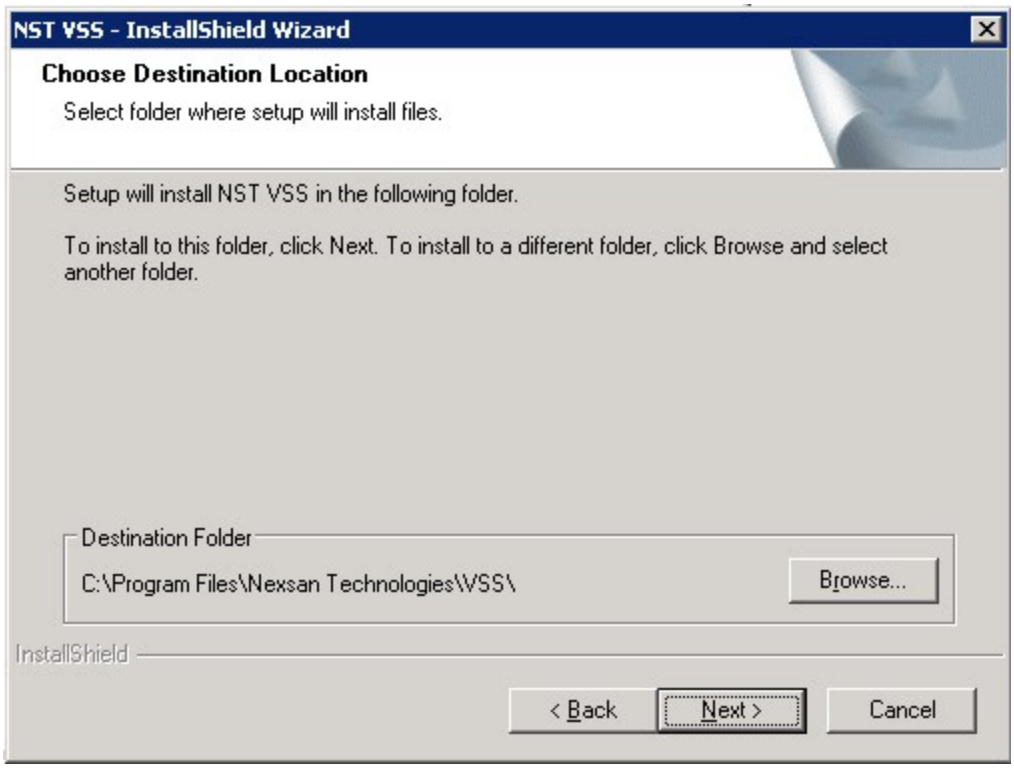
- For the **Run As** pop-up message, select **Current user** and uncheck the **Run this program with restricted access** option. This pop-up will appear multiple times. Perform the same steps as mentioned above each time.
- For any file replace warning, click **Yes**.
- For Windows logo verification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

To install the VSS hardware provider:

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

3. On the Choose Destination Location page:
   - To select the default installation folder, click **Next**.
   - To select another folder, click **Browse** and navigate to the desired folder. Click **Next**.

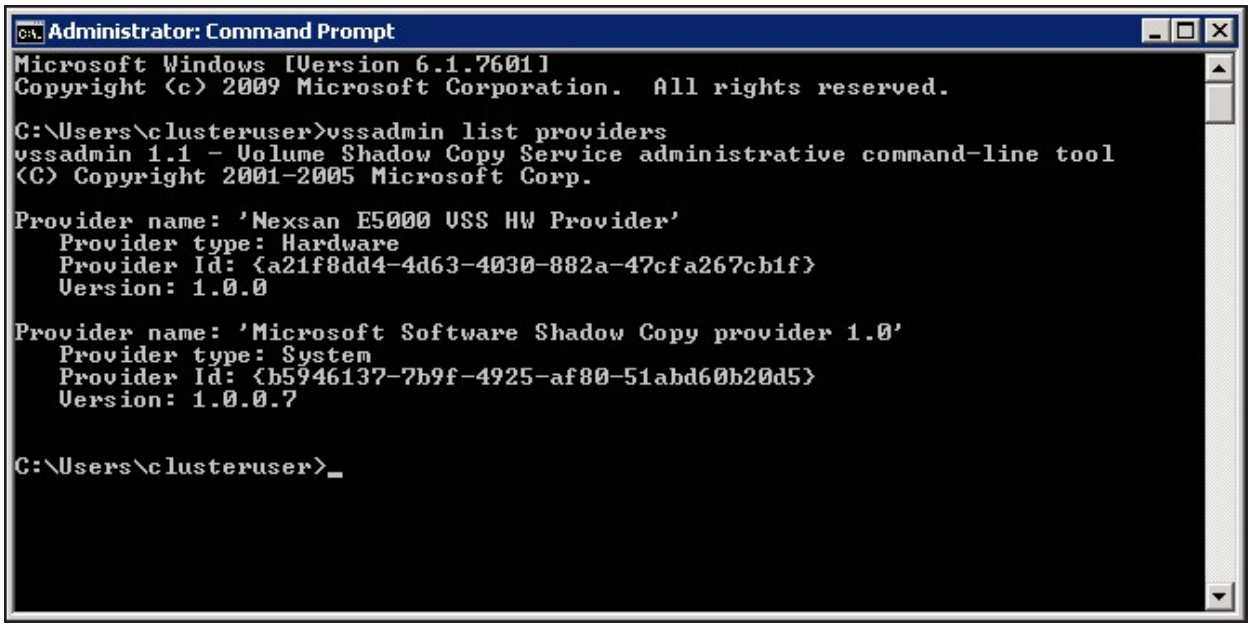
Figure 2-42: Installing VSS Hardware Provider



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

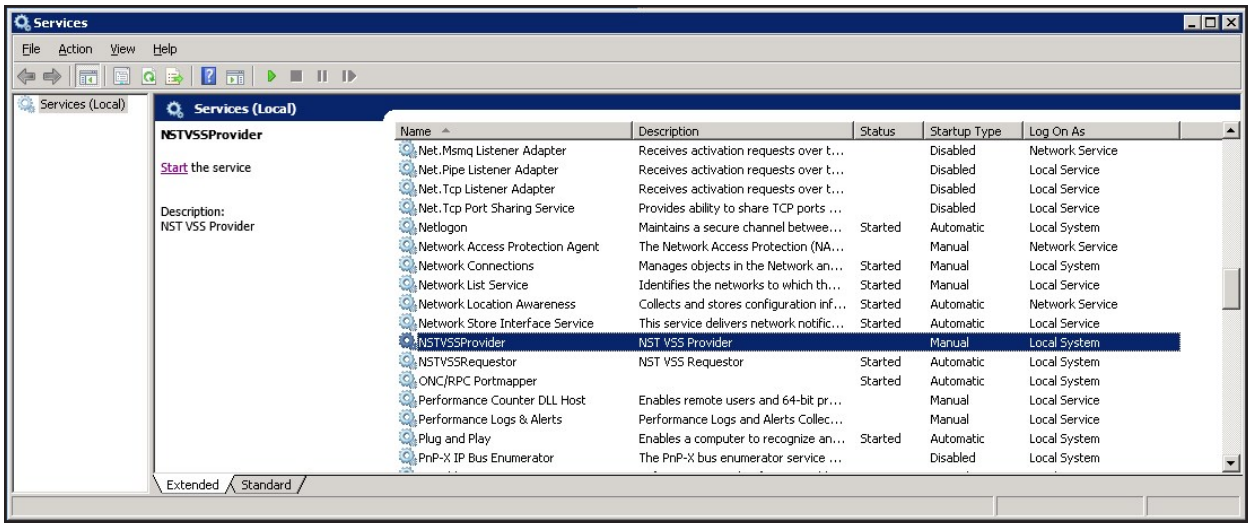
6. Verify the VSS Hardware Provider installation:
   a. Open a command prompt.
   b. Type this command: `vssadmin list providers`
   c. If the installation was successful, the list should display an entry for Nexsan VSS Hardware provider.

Figure 2-43: Verifying the VSS Hardware Provider installation



7. Start the VSS Hardware Provider service:
   a. Open the *Services* application.
   b. Locate and right-click the **NSTVSSProvider** service.

Figure 2-44: Starting the VSS Hardware Provider service



   c. Select **Start** from the context menu.
   d. Make sure the **NSTVSSProvider** service status indicates *Started*.
   e. Verify that the **NSTVSSRequestor** service status is *Started*.

► **What's next:**

Enabling the Microsoft VSS client for LUNs on the next page

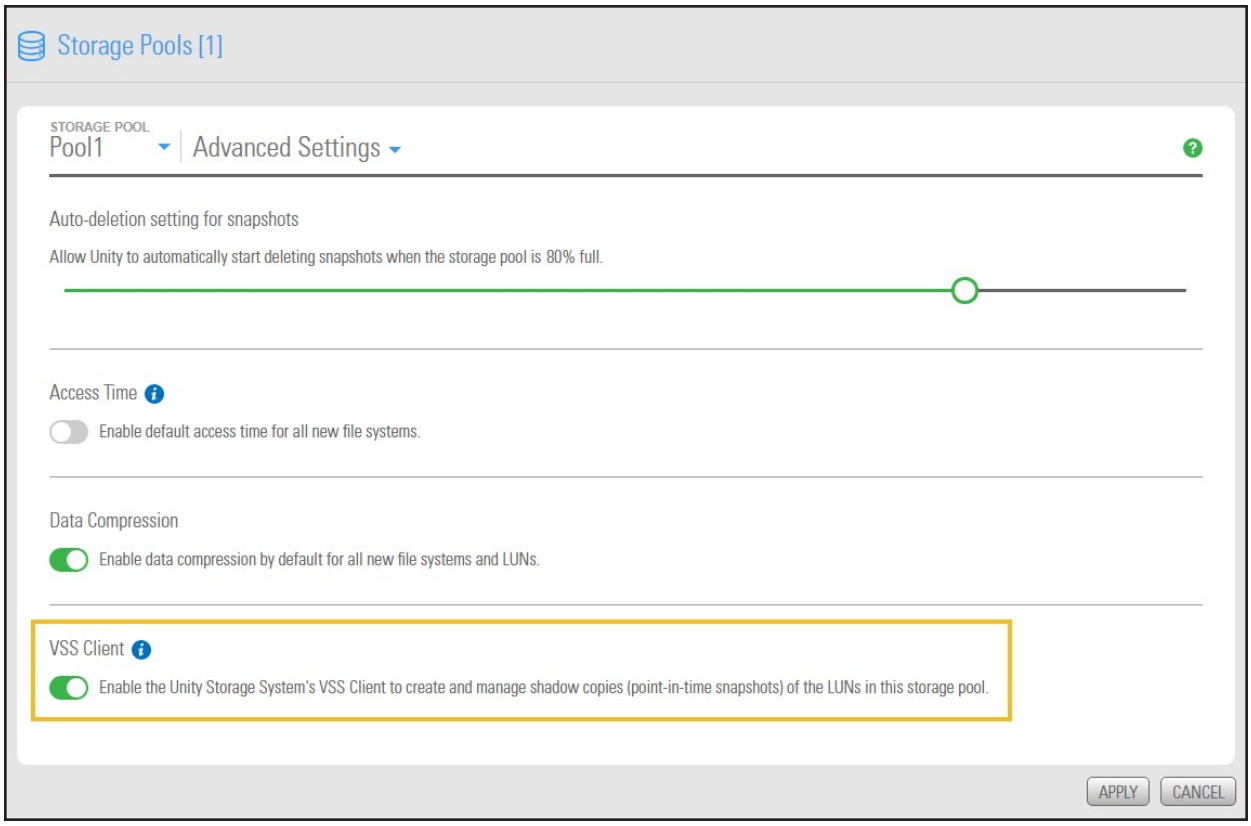
Enabling the Microsoft VSS client for LUNs

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

To enable the VSS Hardware Provider on a LUN:

1. On the **Unity navigation bar**, select **Storage > Storage Pools**.
2. Select the storage pool that you need to enable Microsoft VSS for. The **Pool Summary** panel opens.
3. Select **Summary > Advanced Settings**.
4. Click the Enable VSS client button to permit Unity's VSS Client to manage snapshots for LUNs hosted on this pool.

Figure 2-45: Storage Pool panel, Advanced Settings



5. Click the **Apply** button.

Related topics:

Installing the VSS Hardware Provider on page 68

Discovering your LUNs with the Windows iSCSI Initiator below

Discovering your LUNs with the Windows iSCSI Initiator

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

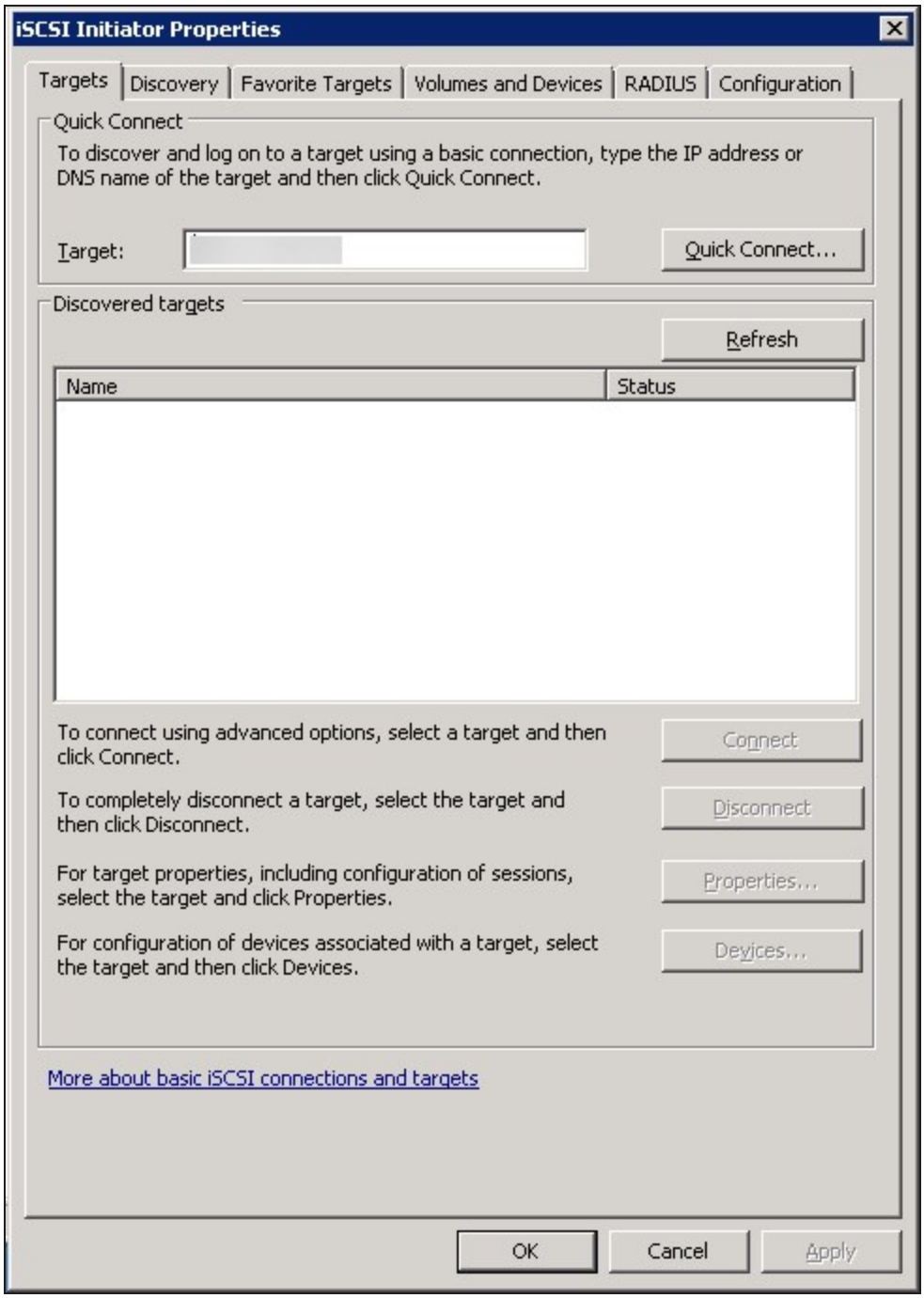
The VSS Hardware Provider connects to a storage pool's Management target via iSCSI to view, create, and manage snapshots of all LUNs in the storage pool. To discover the Management target, you must first enable the VSS feature in Unity; see Enabling the Microsoft VSS client for LUNs on the previous page.

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

To discover the LUNs using the Targets tab:

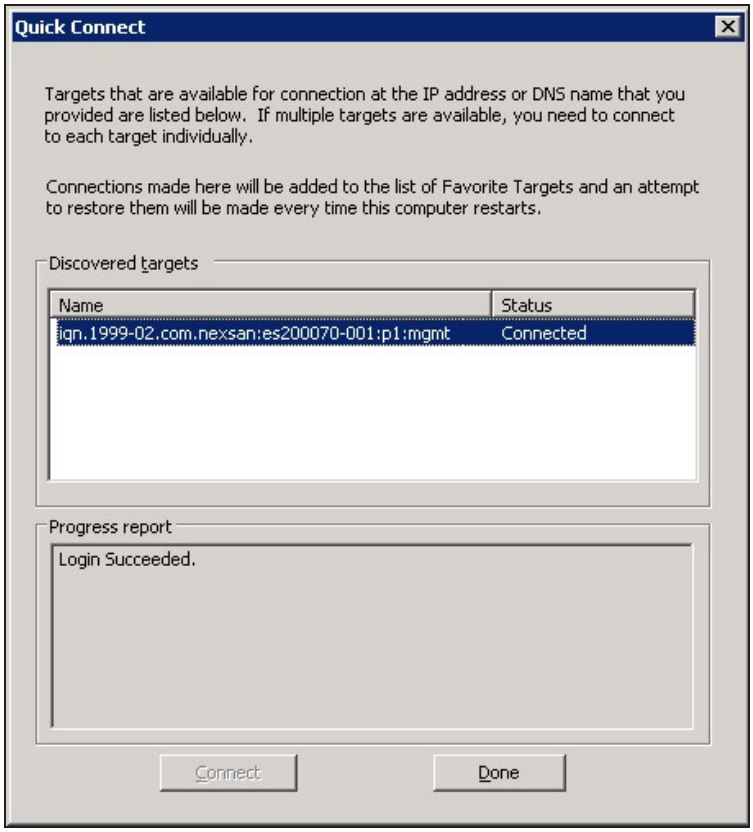
1. On the Windows server, select **Start > All Programs > iSCSI Initiator**.
2. In the **Target** field, type the Management virtual IP address of Unity.

Figure 2-46: iSCSI Initiator—Targets tab



3. Click **Quick Connect**. The discovered targets appear in the list.

Figure 2-47: iSCSI Initiator—Targets tab: Discovering targets



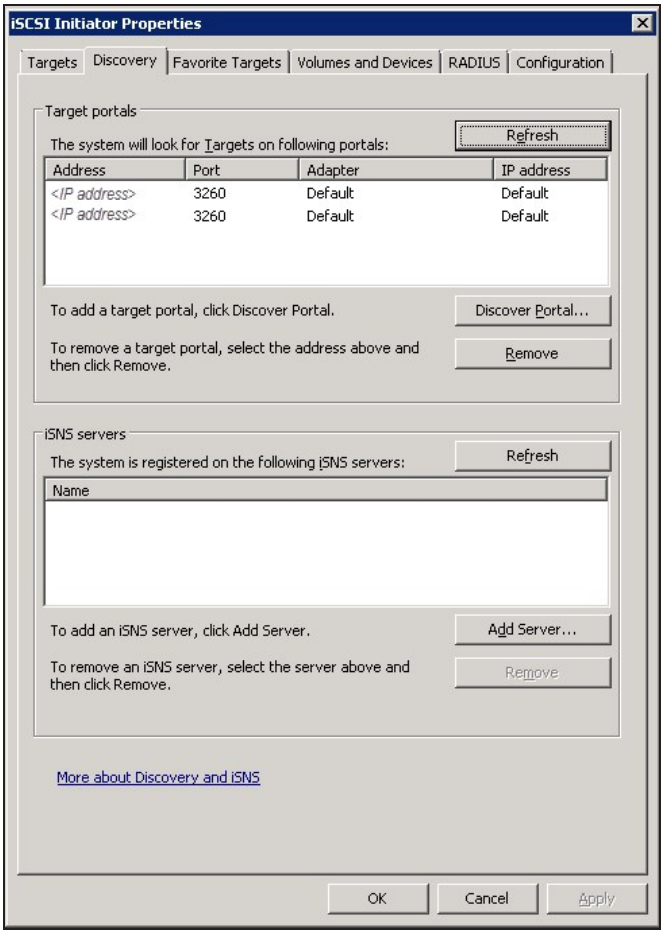
4. Click **Done** to close the Quick Connect dialog box.
5. The discovered target appears in the list. Click **OK** to exit the iSCSI Initiator.

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

1. On the Windows server, select **Start > All Programs > iSCSI Initiator**.
2. Select the **Discovery** tab.

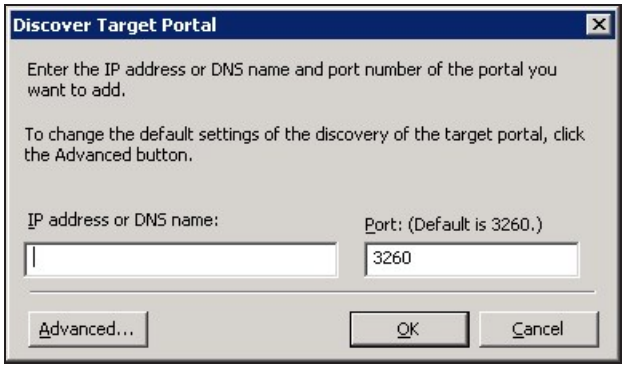
3. Click **Discover Portal**.

Figure 2-48: iSCSI Initiator—Discovery tab



4. In the **IP Address or DNS Name** field, type the Management virtual IP address of Unity and click **OK**.

Figure 2-49: iSCSI Initiator—Discovery tab: Discovering targets



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

► **Related topics:**

Configuring the LUNs in Disk Management on the facing page

Configuring the LUNs in Disk Management

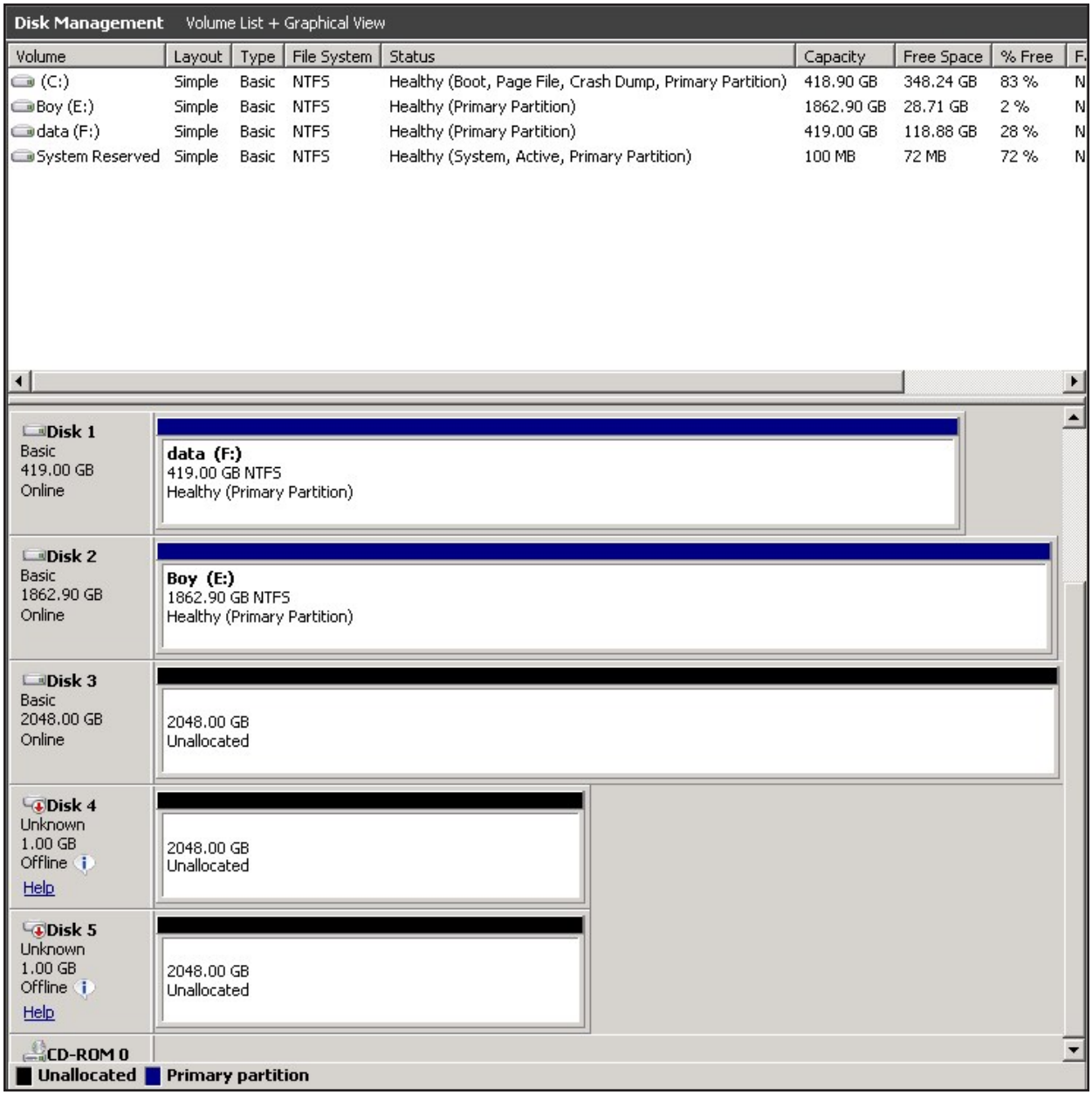
After discovering your LUNs with the Windows iSCSI Initiator, the LUNs appear as new disks, which you need to initialize and configure before you can use them.

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

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

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

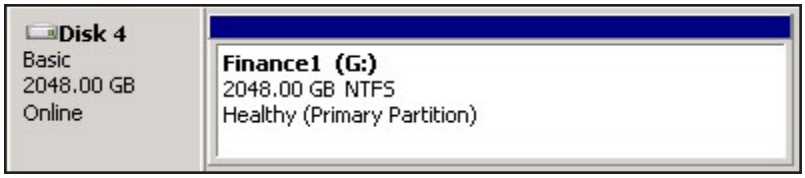
Figure 2-50: Discovered targets in Disk Management



2. Right-click a disk on the left-hand side and select **Online**. The status changes to *Not Initialized* and *Online*.
3. Right-click the same disk on the left-hand side and select **Initialize Disk**.
   - For disks bigger than 2 TB, select **GPT (GUID Partition Table)**.
   - For disks smaller than 2 TB, leave the default option set to **MBR (Master Boot Record)**.

   The status changes to *Basic*.
4. Right-click the initialized disk on the right-hand side. The context menu offers new options; select **New Simple Volume**.
5. Follow these steps in the New Simple Volume wizard:
   a. Assign a volume size.
   b. Assign a drive letter or mount the volume in an empty NTFS folder.
   c. Format the volume as NTFS.
   d. Give it a meaningful name.
   e. Perform a quick format.
6. The volume appears as *Healthy* and displays your configuration settings.

Figure 2-51: Configured volume in Disk Management

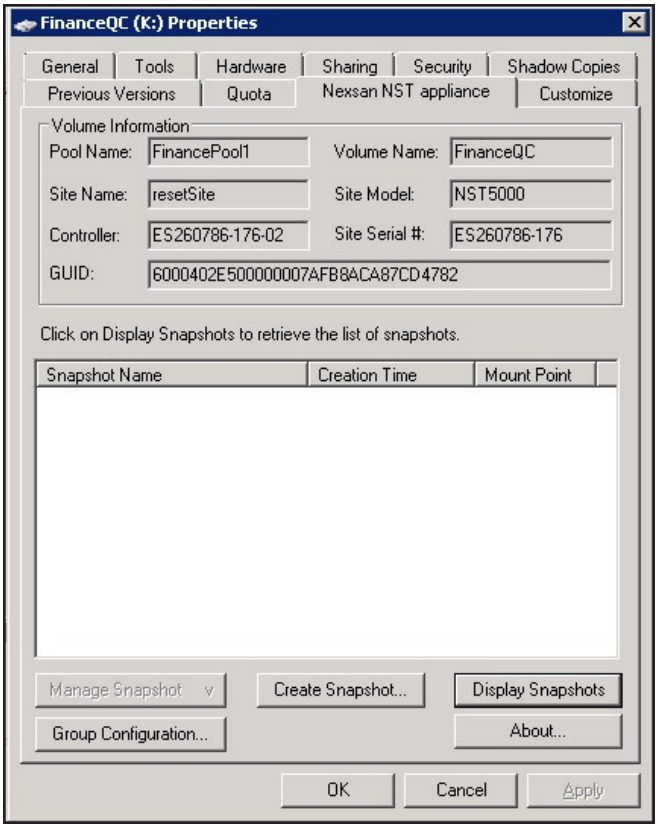


7. Repeat steps 2 to 5 for each discovered target disk.

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

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

Figure 2-52: Disk Properties—Nexsan Unity tab



Creating a VSS snapshot

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

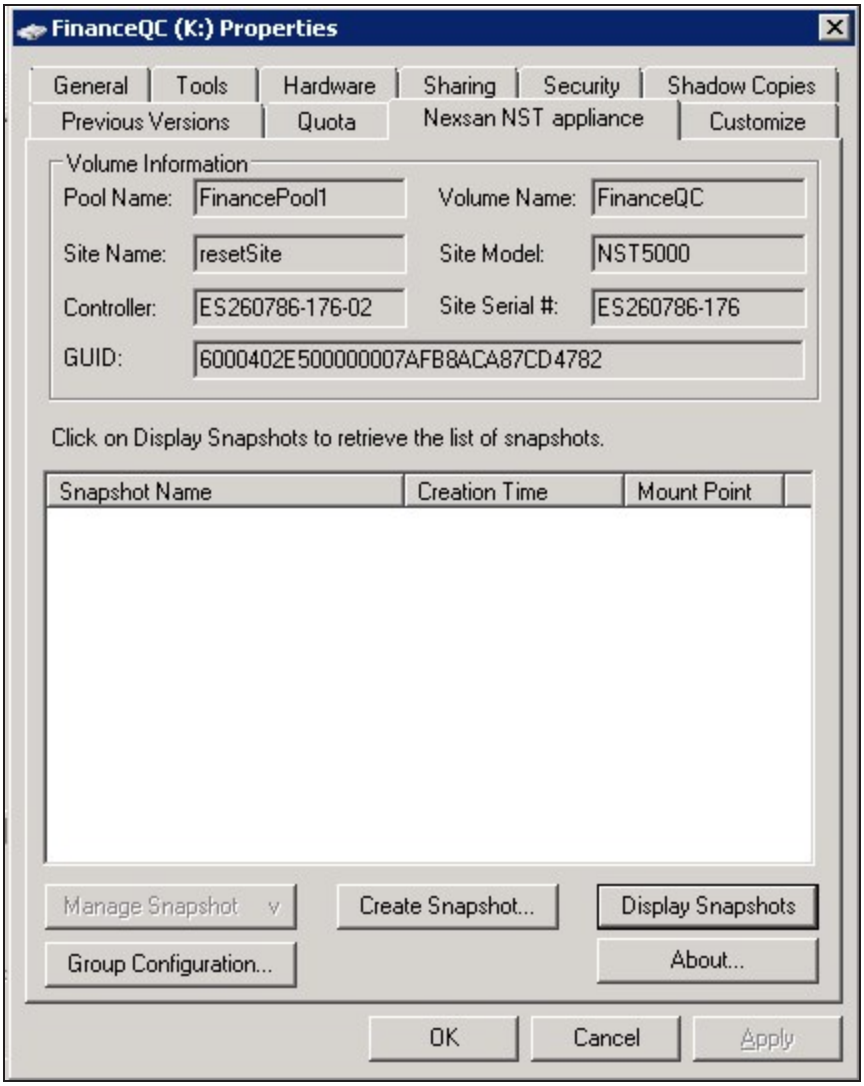
For applications running on multiple LUNs, such as an SQL Server database, you can create a snapshot of all the LUNs that are being used for the database. This enables you to restore the data residing on multiple LUNs at the same time, and not lose data integrity, such as database links.

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

1. On the Windows host, open *Explorer*.
2. Right-click a VSS-managed volume and select **Properties**.
3. Click the **Nexsan Unity** tab.

4. Click **Create Snapshot**.

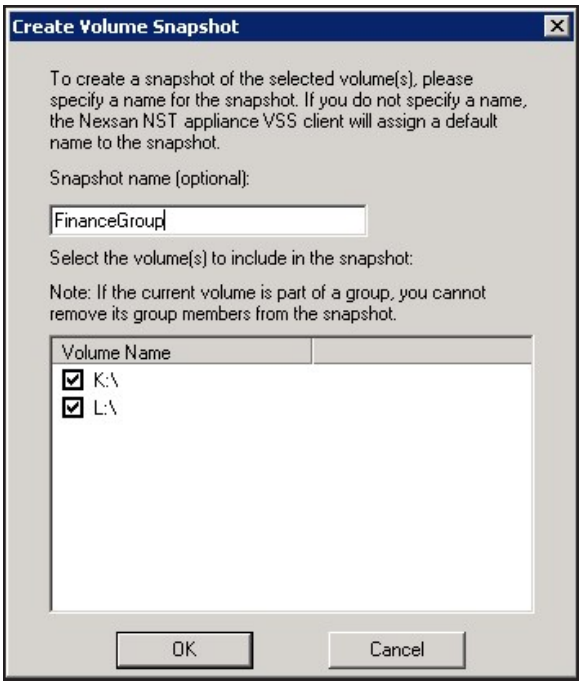
Figure 2-53: Creating VSS snapshots on the Windows host



5. By default, the volume from which you opened the Properties dialog box is selected. Optionally, enter a name for the snapshot. Do one of the following:
   - To take a snapshot of the current volume, click **OK**.
   - To take a snapshot of a group, select multiple LUNs from the list and click **OK**.

   In this example, we create a group snapshot.

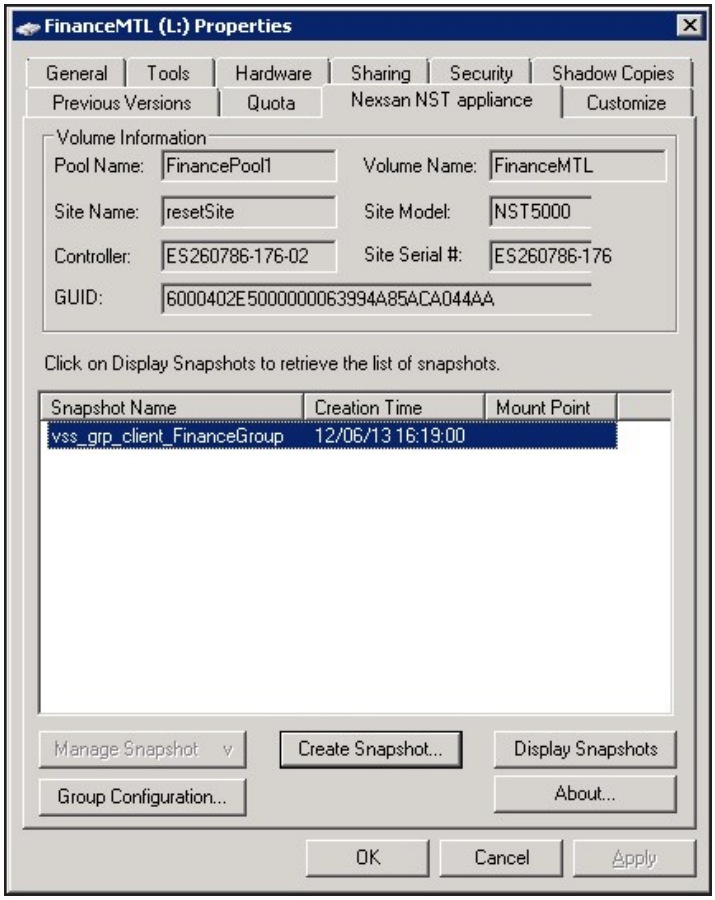
Figure 2-54: Creating a VSS group snapshot



6. After successful creation of the snapshot, you will see a confirmation message. Click **OK**.

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

Figure 2-55: Viewing a VSS snapshot on the Properties page



You can also view the VSS snapshot from Unity.

► **What's next:**

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

► **Related topics:**

Browsing a VSS snapshot on the facing page

Rolling back data to a VSS snapshot on page 87

Deleting a VSS snapshot on page 89

Browsing a VSS snapshot

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

Notes:

- The Management (mgmt) target must be connected for the **Manage Snapshot** button to be available and thus perform browsing.
- The VSS feature must be enabled for the storage pool in Unity.
- When you browse, or mount, a LUN snapshot using the VSS Hardware Provider on the Windows host, that same snapshot appears as *Browsing Enabled* in Unity.
- If the snapshot is already mounted in Unity, you will not be able to mount it with the VSS Hardware Provider.

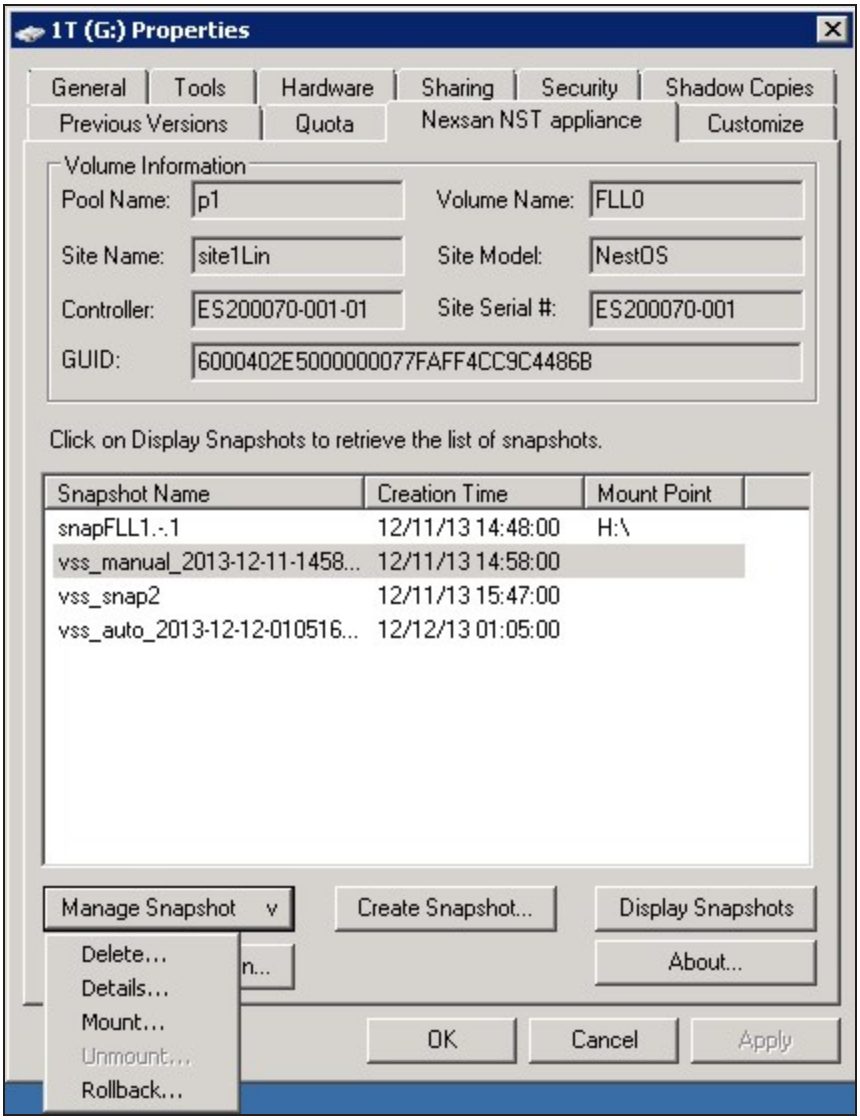
Note When browsing or mounting a LUN snapshot using the VSS Hardware Provider on Windows hosts, the disk is read-only. This applies to both iSCSI and Fibre Channel LUNs.

To mount a VSS snapshot:

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

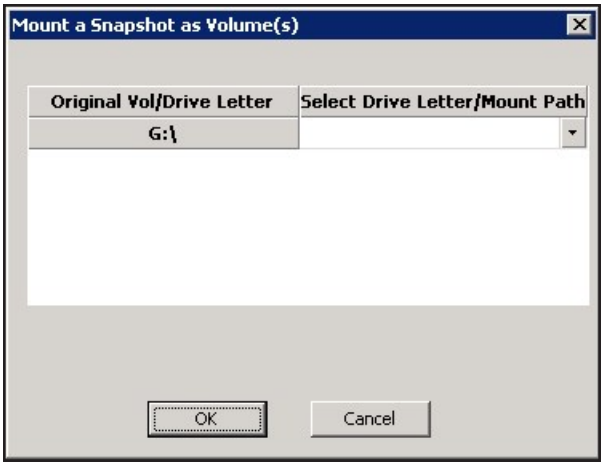
6. From the **Manage Snapshot** drop-down list, select **Mount**.

Figure 2-56: Browsing a VSS snapshot



7. A new window opens where you assign drive letter/mount path from the drop-down list. Click **OK**.

Figure 2-57: Assigning a drive letter to the VSS snapshot



8. Yo will see a confirmation message after successful mounting. Once refreshed, the list shows the Mount Point against the snapshot name.
   a. Check if a new volume appears under **Hard Disk Drives** with the drive letter you provided in the previous step.
   b. Verify that all files present in the original volume when the snapshot was taken are in the new volume.

► To unmount a VSS snapshot:

1. From the **Nexsan Unity** tab, select the snapshot you mounted.
2. From the **Manage Snapshot** drop-down list, select **Unmount**.
3. A confirmation message appears: *Snapshot successfully unmounted*. The volume that appeared with the assigned drive letter name under **Hard Disk Drives** is no longer present.

► Related topics:

Creating a VSS snapshot on page 79
Rolling back data to a VSS snapshot on page 87
Deleting a VSS snapshot on page 89

Viewing VSS client information

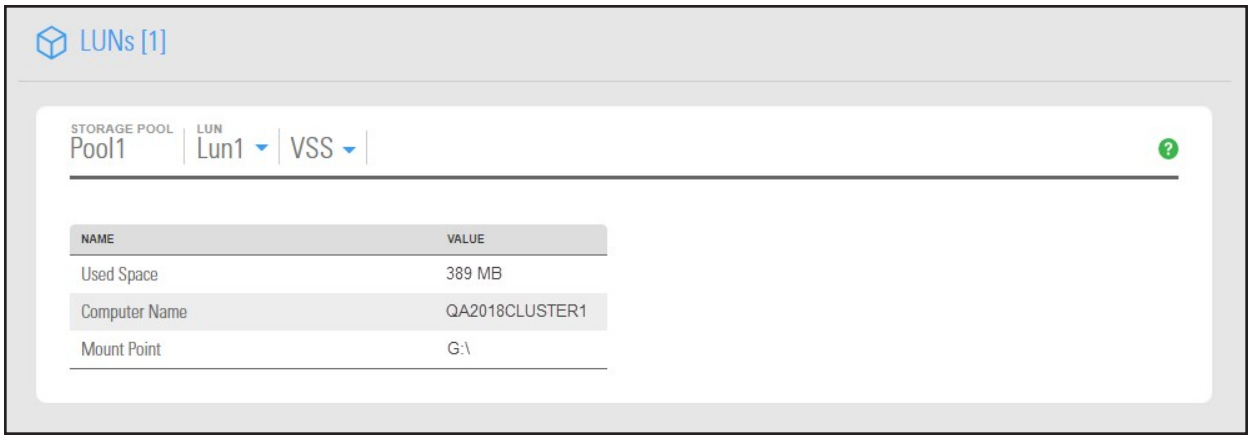
This section describes how to view the space currently used by LUN snapshots managed by the VSS Hardware Provider.

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

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

1. On the **Unity navigation bar**, select **Storage > LUNs**.
2. Click the link to the LUN you want to view VSS Information for.
3. Select **Summary > VSS**.

Figure 2-58: LUNs VSS panel



Rolling back data to a VSS snapshot

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

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

Notes:

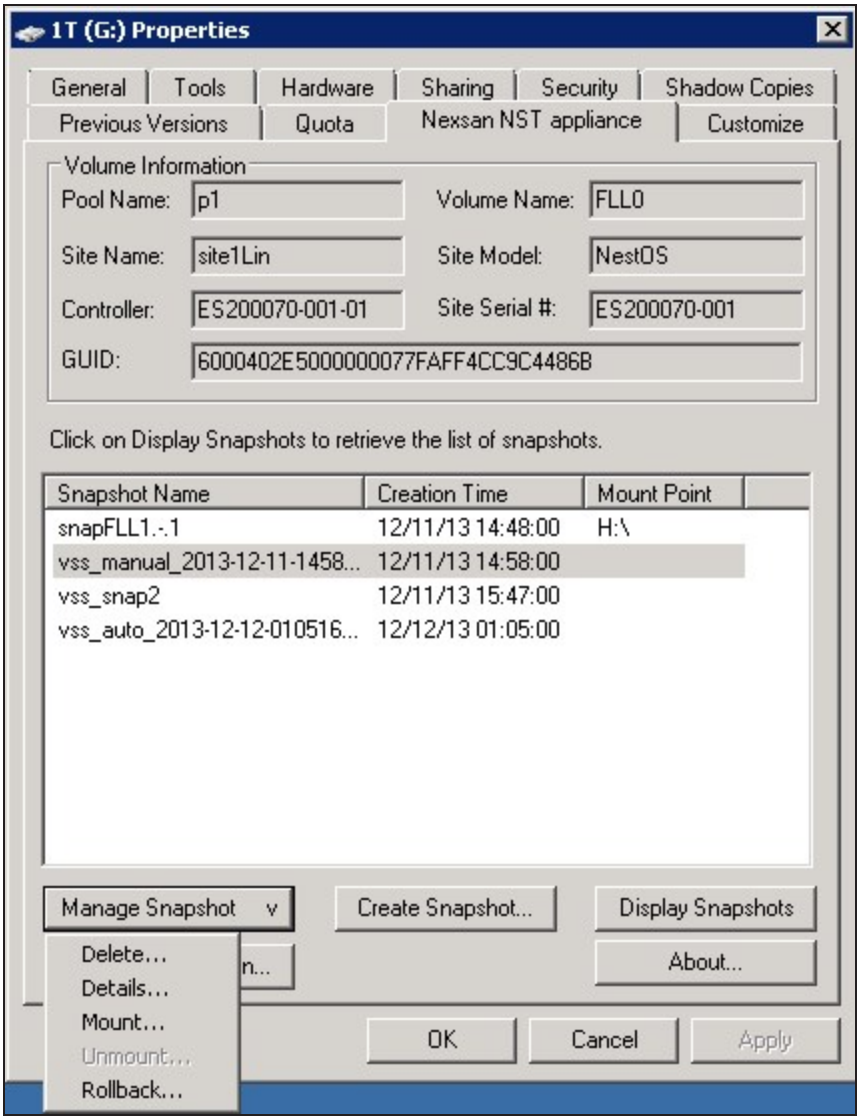
- The Management (mgmt) target must be connected for the **Manage Snapshot** button to be available and thus perform the rollback.
- The VSS feature must be enabled for the storage pool in Unity.

To roll back data to a VSS snapshot:

1. On the Windows Server host, open *Explorer*.
2. Right-click the volume where the snapshot to roll back to is hosted and select **Properties**.
3. Select the **Nexsan Unity** tab.
4. Click **Display Snapshots**.
5. Select the snapshot that you wish to use for data restore.

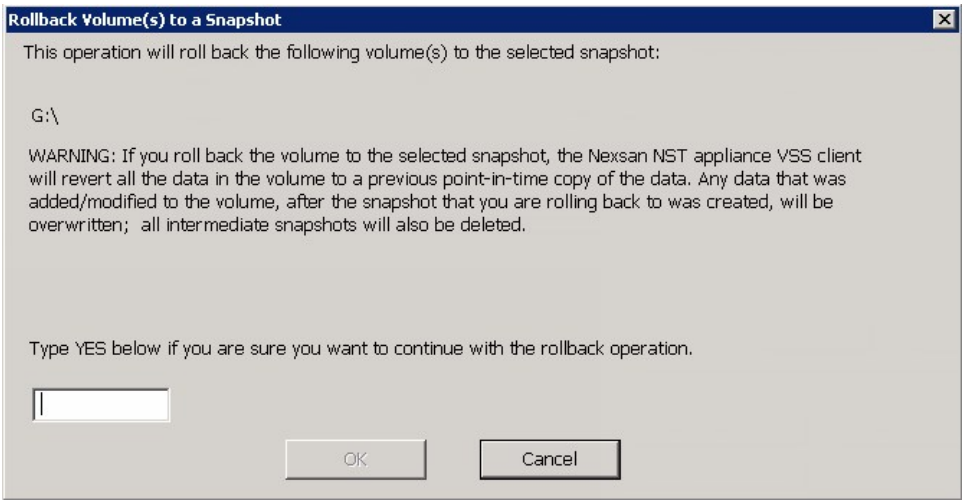
6. From the **Manage Snapshot** drop-down list, select **Rollback**.

Figure 2-59: Rolling back data to a VSS snapshot



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

Figure 2-60: Confirming the VSS snapshot rollback



8. Restart these services:
   - Volume Shadow Copy
   - NSTVSSProvider
   - NSTVSSRequestor
9. Verify that the data present in the volume correspond to the data in the snapshot.

Deleting a VSS snapshot

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

Notes:

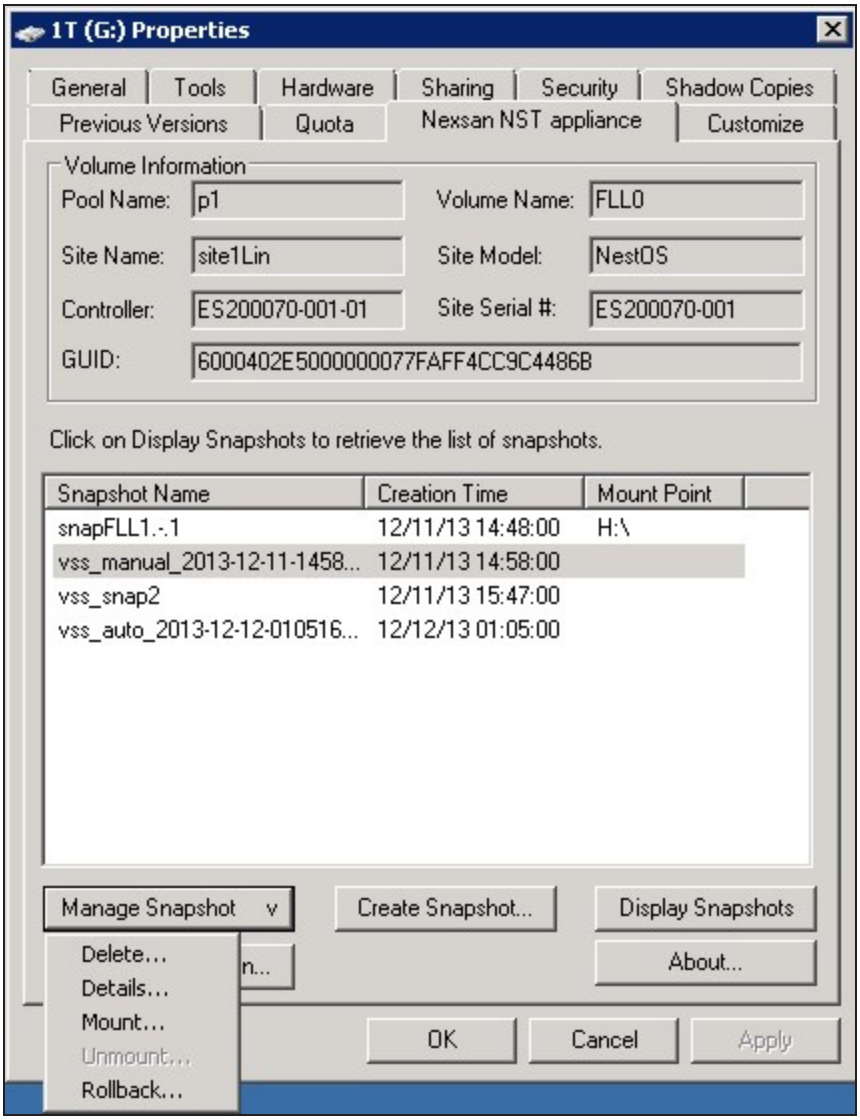
- The Management (mgmt) target must be connected for the **Manage Snapshot** button to be available and thus perform a deletion.
- The snapshot must be unmounted before it can be deleted; for steps to unmount a snapshot, see Browsing a VSS snapshot on page 83.
- The VSS feature must be enabled for the storage pool in Unity.
- You can also delete a LUN snapshot created by the VSS Hardware Provider from Unity.

▶ **To delete a VSS snapshot:**

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

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

Figure 2-61: Deleting a VSS snapshot



7. A warning message will appear. Click **Yes** to confirm the deletion and refresh.
   The snapshot is no longer listed under the **Nexsan Unity** tab.

► **Related topics:**

Enabling the Microsoft VSS client for LUNs on page 72

Using Unity and VSS to manage LUN snapshots

Unity provides two ways for managing snapshots for LUNs:

- Using Unity—see Viewing LUN snapshots on page 44
- Using the VSS Hardware Provider—see Using Windows VSS on page 67

You can also use a combination of both methods to manage LUN snapshots. This table describes the actions performed using both methods and how the results display in each interface. Since both methods are linked by Unity, actions performed on a snapshot in Unity are reflected on the Windows host. However, browsing a snapshot using one method prevents that action against the same snapshot with the other method.

Table 2-1: Managing LUN snapshots using both Nexsan Unity and the VSS Hardware Provider

Action performed	... in Nexsan Unity	... using VSS Hardware Provider on the Windows host
Create a snapshot	On the Windows host, the snapshot appears in the volume's properties when clicking **Display Snapshots**.	Prerequisites: 1. Install Unity's VSS Hardware Provider on the Windows host. 2. Enable the VSS Hardware Provider feature in Unity. In Unity, the snapshot appears under the **Snapshots** tab of the LUN.
Filter snapshots	Use the **LUN Snapshots** panel or **Data Protection Snapshots** panel.	You cannot filter snapshots on the Windows host.
Search for a snapshot	Use the **LUN Snapshots** panel or **Data Protection Snapshots** panel.	There is no search mechanism on the Windows host. In the volume's properties, you can only sort the names by clicking the **Snapshot Name** column.
Browse/mount a snapshot	When you enable browsing for a snapshot in Unity, the snapshot cannot be mounted using VSS.	When you mount a snapshot using VSS, that snapshot cannot be browsed in Unity; it will show as *Browsing Enabled*.
Disable browsing/unmount a snapshot	When you disable browsing for a snapshot in Unity, you can mount the snapshot on the Windows host.	When you unmount a snapshot using VSS, that snapshot can be browsed in Unity.
Roll back data to a snapshot	On the Windows host, newer data written to the disk is deleted.	In Unity, newer data written to the LUN is deleted.
Delete a snapshot	On the Windows host, the volume disappears from the list of drives in *Explorer* and *Disk Management*.	In Unity, the snapshot disappears from the grid in the **Snapshots** tab.

Modifying storage pool snapshot auto-deletion

The snapshot auto-deletion mechanism lets you specify a global setting for Unity to automatically start deleting snapshots for datasets (file systems and iSCSI LUNs) that have the snapshot auto-deletion function enabled. The global setting that you specify for snapshot auto-deletion is a disk space consumption threshold for a storage pool, using a percentage value.

Unity deletes snapshots—starting with the oldest automatic snapshot on the system—until used disk space capacity in the storage pool falls below the default 80 percent threshold.

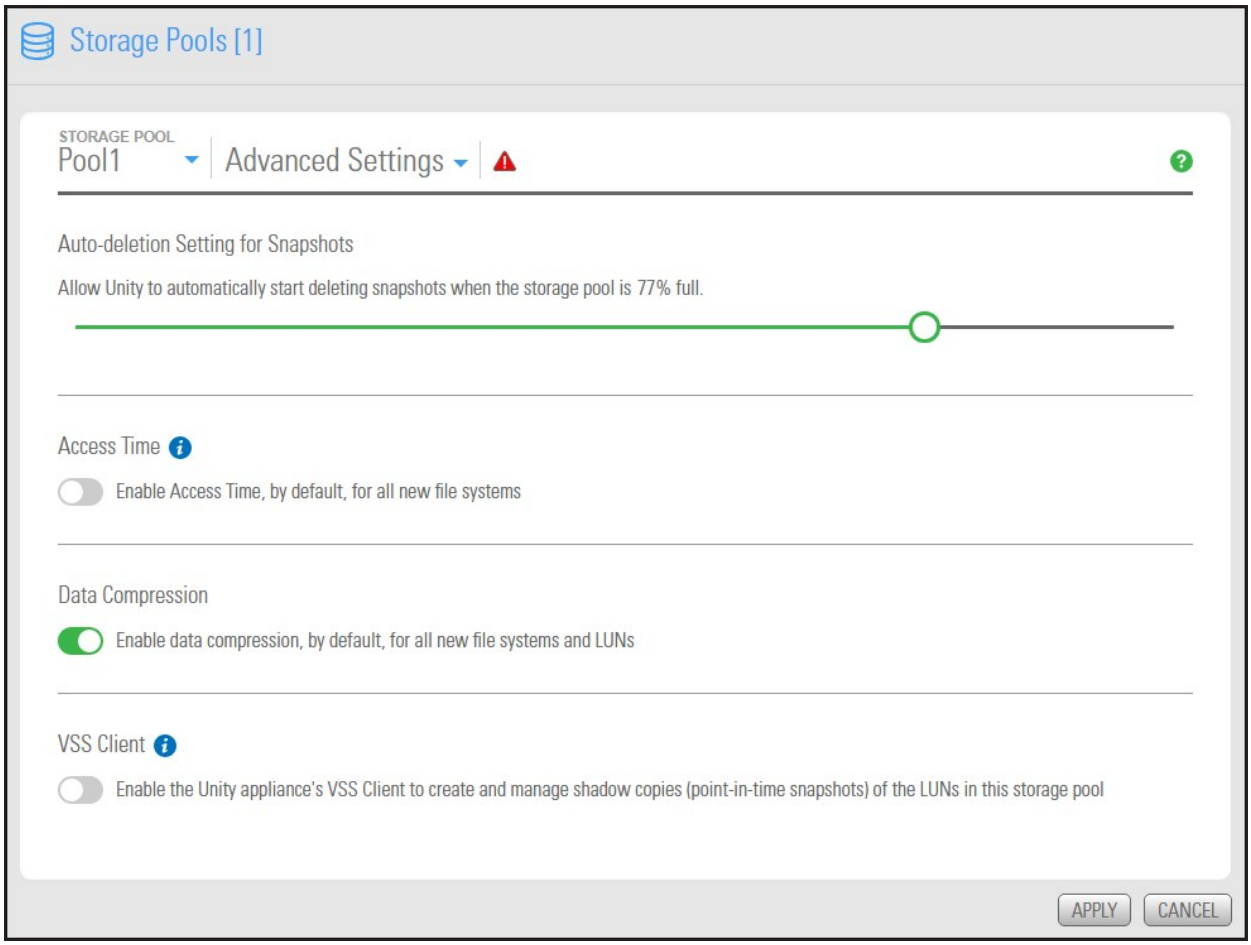
Unity ONLY deletes snapshots for datasets (file systems and iSCSI LUNs) that have the snapshot auto-deletion function enabled.

Note Snapshot auto-deletion settings are configured from the primary storage pool only. If the storage pool is replicated, the snapshots will also be automatically deleted from its replica using the same threshold, during a subsequent replication session.

To set or modify the snapshot auto-deletion setting for a storage pool:

1. On the **Unity navigation bar**, select **Storage > Storage Pools**.
2. Click the link to the pool that you want to update.
3. In the **Storage Pools** panel, click **Summary > Advanced Settings**.

Figure 2-62: Advanced Settings



4. Drag the slider to the left to decrease the percentage of the storage pool capacity at which snapshots will be auto-deleted or to the right to increase the percentage.
5. When you finish modifying the snapshot auto-deletion setting for a storage pool, click the **Apply** button.

2

Chapter 3

Data replication

Unity provides comprehensive data protection for your Unity deployment, including off-site disaster recovery and remote redundancy, through its replication functions.

Use the asynchronous data replication feature to designate a secondary Unity as the replication system for a storage pool. Once you set up data replication, Unity automatically creates a replica of the storage pool on the remote Unity System. Later, when you add file systems to the storage pool on the primary Unity System, you can enable or disable replication for each dataset (file systems and/or iSCSI LUNs) to the remote Unity System, as needed.

This section provides an overview of Unity's data replication functions, and describes how to set up and manage data replications for your Unity storage infrastructure.

Note Configuration of the synchronous data replication feature is not currently supported in the Unity HTML5 user interface, but is supported:

- in the Unity Classic user interface, if you have the appropriate hardware configuration. See Accessing features not yet in the new HTML5 interface on page 137
- using the NestOS `nxcmd SyncReplication` commands. Please refer to the *nxcmd Command Line Interface Reference Guide* on the Nexsan Unity Documentation & Downloads Web page.

This section includes these topics:

Asynchronous data replication 96
Synchronous data replication 139

Asynchronous data replication

Asynchronous data replication enables you to replicate data between two Unity Systems—a primary and a remote Unity—over a LAN or WAN connection.

This section covers these topics:

Asynchronous data replication features on page 16

Usage implementations on page 17

Before you begin

Before you set up asynchronous data replication for your Unity deployment, consider these points.

Element	What to do before creating a replication process
Network	These ports must remain open across the WAN (and/or LAN) links: • TCP ports **22** and **873** • UDP port **873** All switches, routers, and firewalls between each source Unity System and the remote/DR Unity System must be configured accordingly to allow the source and destination Unity Storage Systems to communicate. The network should also be secured using firewalls, VPN, encryption, or other means. Consider network bandwidth requirements for data replications and allocate bandwidth based on the amount of data that you intend to replicate, as well as the replication frequency. Also, since Unity uses port aggregates, you cannot connect systems directly. You must use a switch between systems.
Remote Unity System	• Make sure the system is properly configured using Unity. • The remote system must have the Data Replication feature installed. • Make sure the secondary Unity System is connected to the network and powered on. It should be accessible from the primary Unity System. • If the remote Unity System has any Nexsan storage enclosures connected to it, and you intend to allocate volumes on the storage systems to the replicated data, make sure the system is cabled properly and connected to the secondary Unity System, and that it is powered on and online. The Unity Storage System(s) must also be configured properly with Unity and added to the secondary system as a Unity System.
Disaster recovery	• Make sure to develop, document, and implement a clearly defined disaster recovery plan for your storage infrastructure. If you already have a disaster recovery plan in place, make sure you update the plan to include policies and procedures for recovering your Unity storage infrastructure.

Element	What to do before creating a replication process
Storage capacity	The Unity Storage System that you intend to use as your remote system should have adequate storage capacity to match the capacity on the primary system—although this is not a requirement for setting up asynchronous data replication for your system. For example, if the total disk space of the volumes allocated to the storage pool on the primary system is 100 TB, the remote system should also have a minimum of 100 TB of disk (volume) space available for the storage pool's replica. If the remote system does not have adequate disk space capacity, the replication process will fail. If you intend to only replicate a subset of the data or if you intend to add additional disk space capacity at a later time, you can continue with configuring data replication for the storage pool. For additional details on storage capacity, see Understanding disk space consumption on page 99.
Authentication	Make sure that you have the **nxadmin** password, or if applicable, the user name and password for a System Administrator on the remote system. When setting up data replication, if the user account you are currently logged on with on the primary system does not exist on the remote system, you will need the **nxadmin** password for the remote system, or optionally, the user name and password of a System Administrator configured on the remote system.
USB storage device	If you replicate the datasets to a USB storage device attached to the primary system, you will need to connect the USB device to one of the USB ports on the *active* node. To determine which node is *active* prior to starting the procedure, see Viewing cluster status on the next page.
Thick LUNs	If you intend to replicate thick LUNs, follow the recommendations mentioned in Understanding disk space consumption on page 99.

Element	What to do before creating a replication process
Data compression on file systems	If you turn on data compression for a file system, and then you turn it off, before you set up replication for the file system, part of the data is compressed and the other part is not. Since the file system has not been replicated yet, the compression settings are not inherited and data compression is off at the remote system. If you set a space quota on the file system and that quota is almost full, the file system on the remote system will not have enough space to accommodate data coming from the primary file system. As a result, replication will fail. Perform ONE of these actions before replication: ● Increase the quota to match the actual space used by data on the file system; see the *Nexsan Unity Software User Guide*. ● Set the quota to *Unlimited*; see the *Nexsan Unity Software User Guide*. ● Enable data compression on both systems; see Configuring compression settings for Asynchronous Replication on page 119.
Data compression on LUNs	If you turn on data compression for a LUN, and then you turn it off before you set up replication for the LUN, part of the data will be compressed and the other part will not. Since the LUN has not been replicated yet, the compression settings are not inherited and data compression is off at the remote system. This means that data is taking less space on the primary LUN than it will on the replica. As a result, replication may fail if the LUN on the remote system does not have enough space. In this instance, it is recommended to enable data compression on both systems before replication. For procedural steps, see the *Nexsan Unity Software User Guide*.

Viewing cluster status

This section explains how to view Unity cluster status information and access commands, including:

- cluster health
- controller node status (whether each node is up or down)
- controller restart and shutdown

► To view cluster status information:

1. Log on to the Unity System that you want to view cluster status information for. The **Dashboard** displays cluster health, controller node status, down or up time for the controllers, and a space overview.
2. Click **Cluster Status** to
   - View cluster status and location per controller
   - **Restart** or **Shut Down** controllers.

Note Unity prevents you from performing some tasks and operations when the cluster is an unhealthy state—that is, when one of its controller nodes is **Down** (non-responsive).

Understanding disk space consumption

This section describes how disk space is used when creating snapshots and replicating data. It also provides recommendations for setting up replication, especially if you are using thick LUNs. As opposed to thin-provisioned LUNs or file systems, which can use virtual space, thick LUNs use only the space allocated on disk. The amount of reserved space is the same as the disk's physical capacity.

▶ **When creating snapshots:**

- When the LUN or file system is almost full, a snapshot of either uses that same amount of space, which almost doubles the space used on disk for the LUN or file system and snapshot on the storage pool. In such cases, snapshots use space outside the LUN or file system reserved space.
- When creating multiple snapshots, any changes to the data (deletions, additions, and rewrites) between snapshots create additional copies of all used space on thick LUNs, so the total amount of space may exceed the LUN size.

▶ **When creating replications:**

Unity takes two snapshots:

1. A baseline snapshot that captures the data of last replication.
2. An incremental snapshot that captures the new data added after the last replication.

The total amount of space used by the two snapshots will be equivalent or greater than the amount of data on thick LUNs.

▶ **Recommendations:**

- When your data is replicated on LUNs, use thin-provisioned LUNs.

  Note If you already created thick LUNs, please contact Nexsan Technical Support to have them converted to thin LUNs.
- Make sure that there is enough disk space on your storage pool for the replication because snapshots and replications will use additional space, as explained above.
- Make sure data compression is turned on (the default).Open the storage pool, and click **Summary** > **Advanced Settings**.
- Use a shorter replication interval to save space and replication time.

Space comparison for Thin vs. Thick LUNs

This table compares the total space used by a thin-provisioned LUN and a thick LUN. Our example uses asynchronous replication on a LUN with a size of 2 TB. (File Systems use the same amount of disk space as thin-provisioned LUNs.)

#	Action	Data written	Data size	Baseline snapshot	Increm. snapshot	THIN LUN	THICK LUN
1	Create LUN	0	0	0	0	0	2 TB
2	Write 1 TB of data	1 TB	1 TB	0	0	1 TB	2 TB

#	Action	Data written	Data size	Baseline snapshot	Increm. snapshot	THIN LUN	THICK LUN
3	Replicate LUN (the first snapshot is taken)	0	1 TB	1 TB	0	1 TB	3 TB
4	Write 100 GB of data (new blocks)	100 GB	1.1 TB	1 TB	0	1.1 TB	3 TB
5	Write 100 GB of data (existing blocks)	200 GB	1.1 TB	1 TB	0	1.2 TB	3 TB
6	Replicate LUN: a. A new, second snapshot is taken.	0	1.1 TB	1 TB	200 GB	1.2 TB	3.2 TB
	b. The first snapshot is deleted and the updates are merged.	0	1.1 TB	1.1 TB[1]	0	1.1 TB	3.1 TB[2]
7	Delete 100 GB	0	1.0 TB	1.1 TB	0	1.1 TB	3.1 TB
8	Delete 100 GB	0	0.9 TB	1.1 TB	0	1.1 TB	3.1 TB
9	Write 1.1 TB of data (new blocks)	1.1 TB	2 TB	1.1 TB	0	2.2 TB	3.1 TB
10	Replicate LUN: a. A new, third snapshot is taken.	0	2 TB	1.1 TB	1.1 TB	2.2 TB	4.2 TB
	b. The second snapshot is deleted and the updates are merged.	0	2 TB	2 TB	0	2.0 TB	4.0 TB
11	Write 400 GB of data (existing blocks)	400 GB	2 TB	2 TB	0	2.4 TB	4.0 TB

[1] For the thick LUN, 1.1 TB is the value when existing blocks are **fully** reused.
[2] The same applies to the total used space.

#	Action	Data written	Data size	Baseline snapshot	Increm. snapshot	THIN LUN	THICK LUN
12	Replicate LUN: a. A new, fourth snapshot is taken.	0	2 TB	2 TB	400 GB	2.4 TB	4.4 TB
	b. The third snapshot is deleted and the updates are merged.	0	2 TB	2 TB	0	2.0 TB	4.0 TB

Configuring the network type for data replication

The Unity Storage System may terminate a replication session if the network response time falls below the acceptable threshold. This threshold may not be high enough for slow WAN links. The Unity Storage System provides a configuration setting that enables you to specify the network connection, or link type between a source system and the Disaster Recovery (DR) system: either a LAN or WAN connection.

Setting the network type to **WAN** increases the threshold for network response tolerance on slow WAN links. This setting also enables a checksum mechanism to ensure data integrity over the WAN link on both the outbound data stream (at the source system), and on the inbound data stream (at the remote or DR system).

Note The network type can also be set from Unity, as described in Configuring network settings for Asynchronous Replication on page 117.

To set the network type to WAN:

1. Access the nxadmin CLI:
   a. Connect to a controller node on the Unity Storage System via SSH (Putty), using the Management Virtual IP address.
   b. Log on using the nxadmin user and password.
2. When the nxadmin CLI prompt displays, type **menu**.
3. In the NestOS Admin Menu, type **1** (**Network Menu**) and then press Enter. This displays the **NestOS Network Menu**.
4. Type **3** (**Replication Settings**) and press Enter. This displays the **NestOS Replication Bandwidth Menu**.
5. Type **7** (**Show Replication Network Type Setting**), and press Enter.
   `The Current Network Type for replication is set to: lan`
6. Type **8** (**Change Replication Network Type Setting**), and press Enter.
7. At the prompt, type **2** to select the `wan` network type and press Enter.
8. Press any key at the confirmation message.

9. Verify that the new setting was applied. Type **7** (**Show Replication Network Type Setting**), and press Enter.

   The command should return:

   ```
   The Current Network Type for replication is set to: wan
   ```

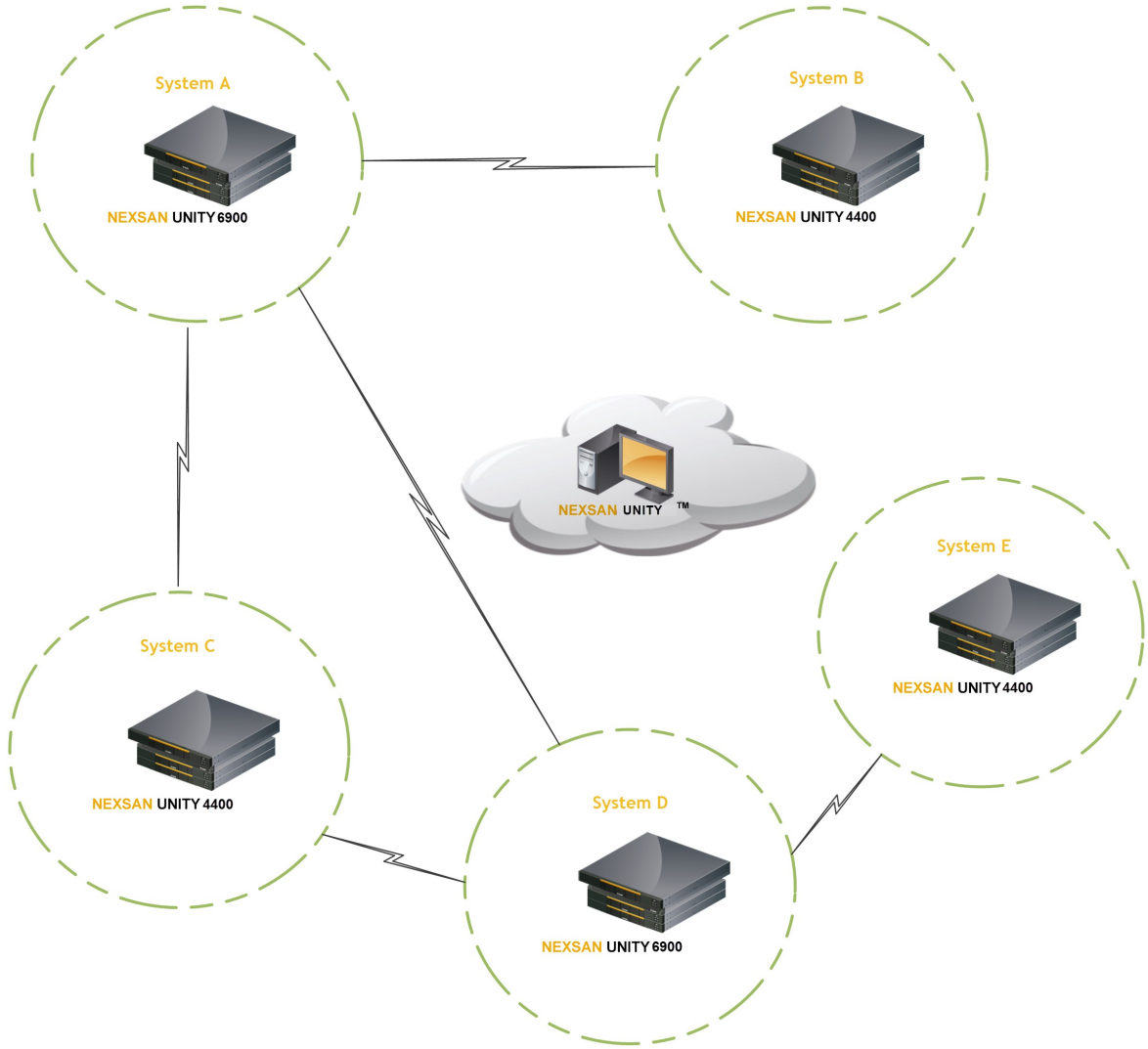
10. Repeat these steps the DR system, as well as on all source sites connected to the DR system over a WAN connection.

Disconnecting Unity Systems in a multi-system implementation

In a multi-Unity Storage System implementation, one system can be connected to two or more others. You can choose to remove a connection between two Unity Systems while keeping the connection between others. When you disconnect a Unity System from one remote system, connections to other remain intact. To completely remove a Unity System from your multi-system implementation, you must disconnect it from all systems to which it is connected. If a selected system is connected to only one system, it is removed from Unity immediately.

You must select the primary system from which a remote system was connected in order to disconnect the remote system.

Figure 3-1: An example multi-system implementation

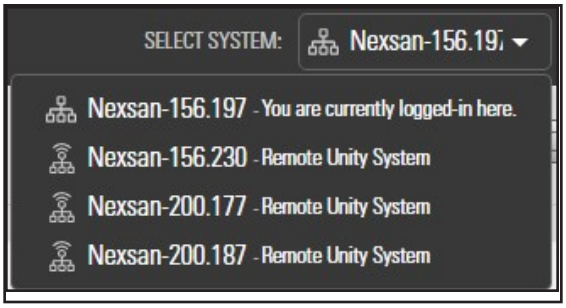


Prerequisites

- If the Unity System has replication set up, you must remove the replication for all storage pools on that system first, as described in .

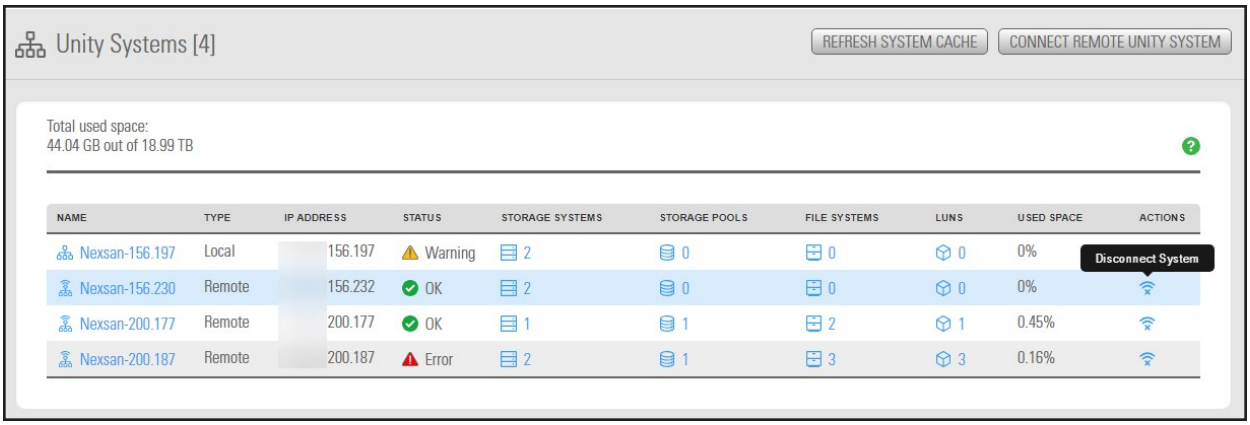
To disconnect sites in a multi-site implementation:

1. In the **Unity navigation bar**, select the primary system that you want to disconnect other systems from.



2. In the **Unity navigation bar**, select **System > Unity Systems**. Unity displays the list of Unity Storage Systems connected to the selected system.

Figure 3-2: A multi-system Unity configuration



3. Select the **Disconnect System** icon beside the Unity Storage System that you want to disconnect.
4. Unity displays the **Disconnect System** popup window.
5. Click the **Disconnect** button.

   Note If Unity displays an error message because the system is inaccessible, proceed only if you expect the system to be permanently inaccessible.

The selected Unity Storage Systems are no longer connected to the primary Unity Storage System.

Setting up asynchronous data replication

This section describes the process for setting up data replication for a storage pool on the primary Unity Storage System.

See Before you begin on page 96

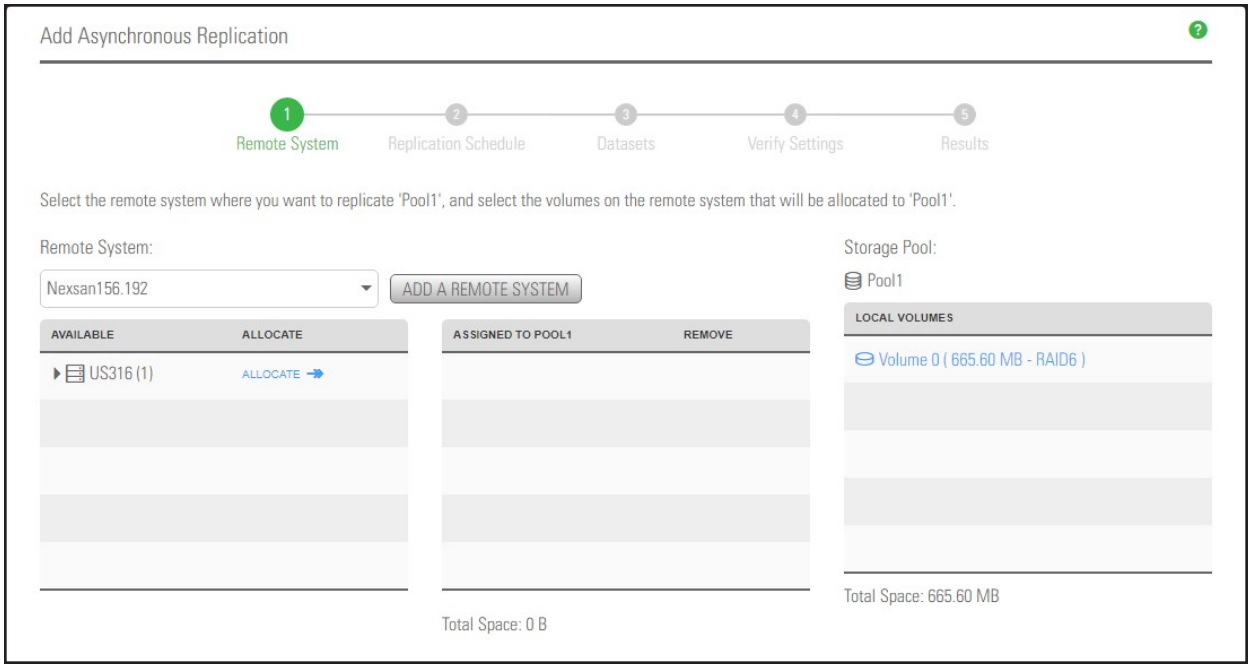
Prerequisites

- Define at least one storage pool on the primary Unity System. Replication of compressed pools is also supported.

To start the Asynchronous Data Replication wizard:

1. On the **Unity navigation bar**, select **Data Protection > Replications**.
2. In the **Replications** panel, click the **Add Asynchronous Replication** button.

Figure 3-3: Add Asynchronous Replication wizard, Step 1



Note The **Add Asynchronous Replication** wizard is available only when storage pools, file systems, and/or LUNs are defined in the storage pool.

This section includes these steps:

Adding a remote Unity System and assigning space 106
Configuring a replication schedule 108
Allocating FASTier cache devices to replication 109
Verifying settings 110
Viewing results 111

Adding a remote Unity System and assigning space

In *step 1* of the **Add Asynchronous Replication** wizard, you

- add a remote Unity Storage System where you want to replicate the storage pool, and
- select one or more volumes from a pool on the remote system to maintain the replica.

To add a remote site as the data replication site:

1. In the Asynchronous Replication wizard, click the **Add a Remote System** button.

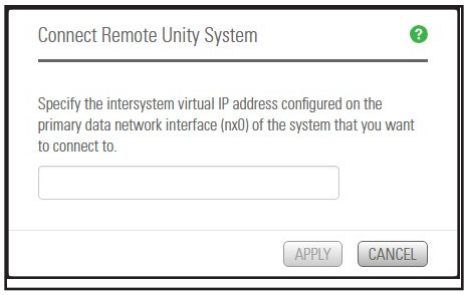
   Note If a remote site has already been added, select it from the Remote system box and skip to step 5, below.

   Unity automatically displays the storage systems connected to the remote site, along with their available volumes. If no volumes display, this means the remote system does not have any free volumes; they are all in use by one or more storage pools.

2. In the **Connect Remote Unity System** window, enter the **inter- system virtual IP address** for the **Primary Data Network (nx0) interface** of the remote Unity that you want to use.

   This IP address, configured when you set up your Unity System, enables connectivity between two or more sites for data replication and inter-site communication. See the *Unity Quick Start Guide* shipped with your system, and posted on the Nexsan Unity Documentation & Downloads Web page.

Figure 3-4: Connecting to a remote site



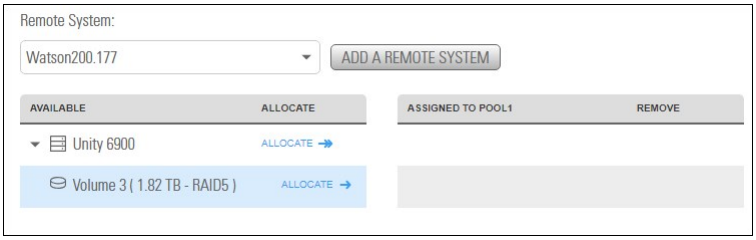
3. Click the **Apply** button to establish a connection to the remote Unity.

   Depending on the speed of your network connection, this process can take some time to complete.

   You must provide the Unity Administrator (**nxadmin**) credentials for the secondary Unity.

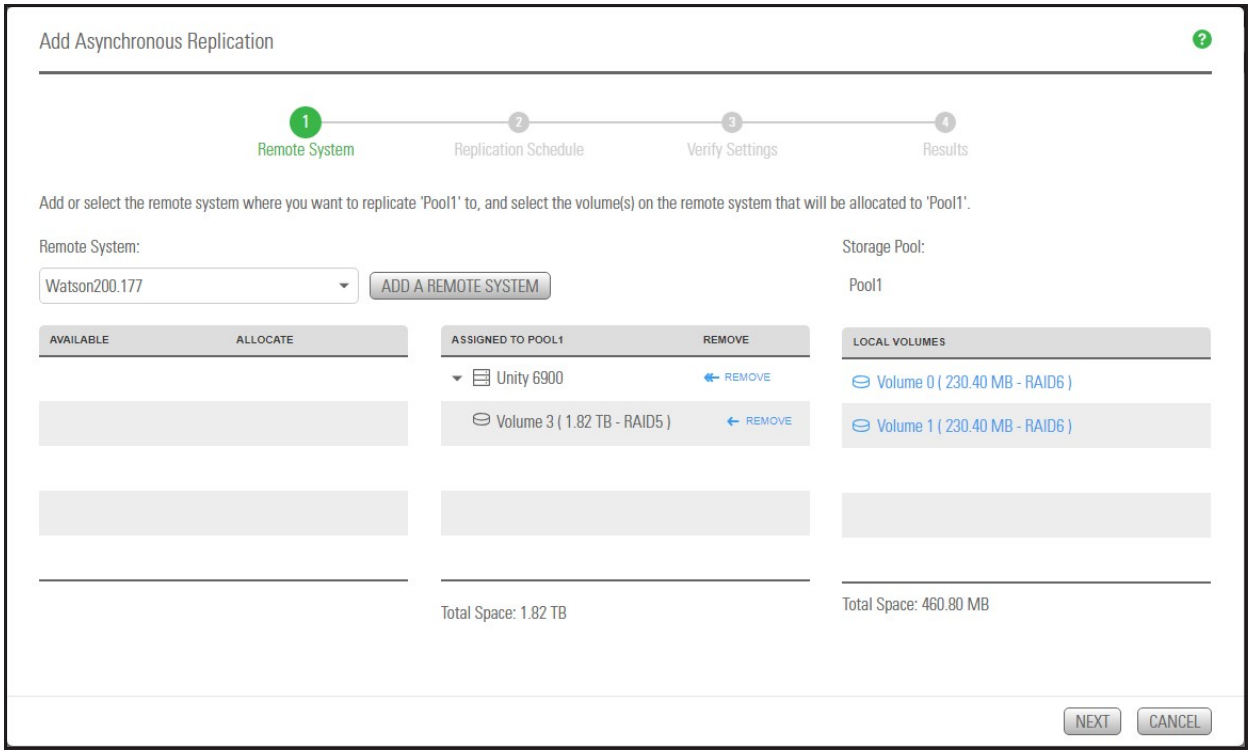
4. When the connection is established, click the **OK** button.
5. Expand the Unity Storage System displayed in the **Available** column.

Figure 3-5: Available systems



6. Click **Allocate** to assign a volume to an available pool on the remote system.

Figure 3-6: Assigning a volume to a remote system



Depending on its configuration, if the secondary Unity has multiple storage systems, including externally attached Nexsan storage, you may not be able to combine volumes from different storage systems to allocate to the replica.

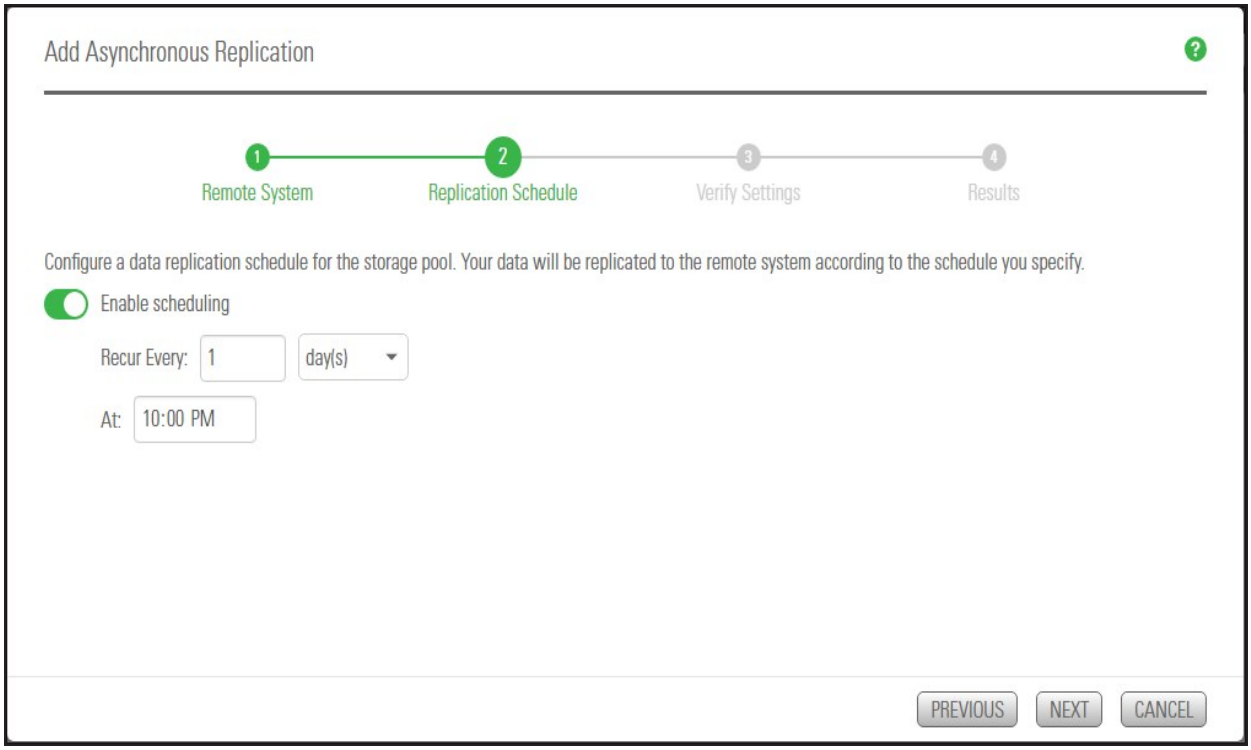
7. Click the **Next** button on the panel to continue to Configuring a replication schedule on the next page.

Configuring a replication schedule

In *step 2* of the Add Asynchronous Replication wizard, you configure the data replication schedule for the storage pool.

The default schedule for data replication is once a day at 10 PM, with the start date set to the current date on Unity. The default schedule assumes that 10 PM is an off-peak business hour. If you change the default schedule, we recommend that you schedule data replications during off-peak business hours to prevent network congestion, and to ensure Unity has sufficient access to network bandwidth to perform the replications.

Figure 3-7: Add Asynchronous Replication wizard, step 2: Replication schedule



3

To configure the replication schedule for the storage pool:

1. Optionally, revise any of the following defaults.
   - Disable scheduled replication. The default is enabled.
   - Specify a recurrence schedule by typing a value in the **Recur every** field. The default recurrence is once a day.
   - Change the recurrence period from the drop-down list. The default is 1 day. You can set the recurrence in **minutes**, **days**, **hours**, **weeks,** or **months**.
   - Specify the time of day when you want Unity to perform data replications. The default time is 10 PM.
2. When you finish configuring the data replication schedule for the storage pool, click the **Next** button on the panel.

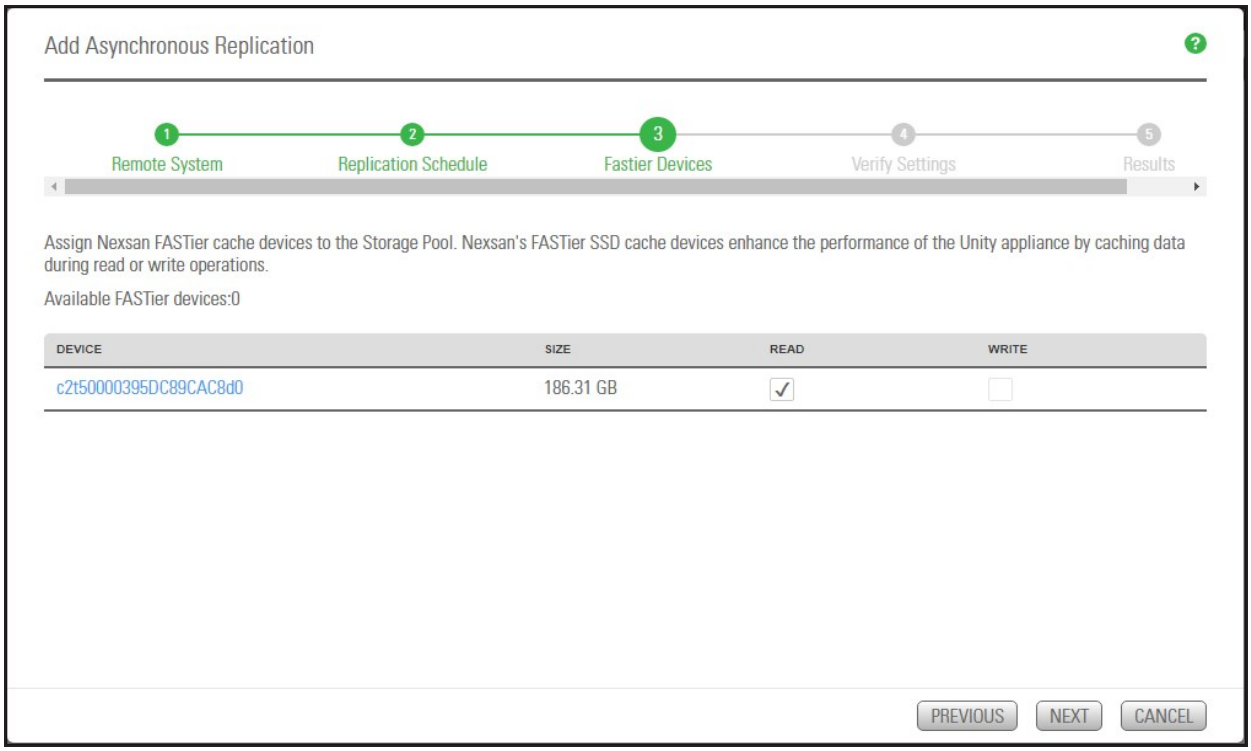
Allocating FASTier cache devices to replication

This step displays only if the remote Unity System has FASTier cache devices installed.

General guidelines for assigning FASTier cache devices:

- You assign a read/write cache device as either read cache OR write cache, not both.
- Unity only uses read cache devices once the RAM cache on the system is full. Read cache devices are filled only as files are read. This means that Unity uses read caching only on the second file access.
- Write-only cache devices aggregate smaller writes in one large write.

Figure 3-8: Add Asynchronous Replication wizard: FASTier devices



To allocate FASTier cache devices to the storage pool's replica:

1. Select which of the listed FASTier cache devices on the remote system should be used for **READ** only or **WRITE** access.

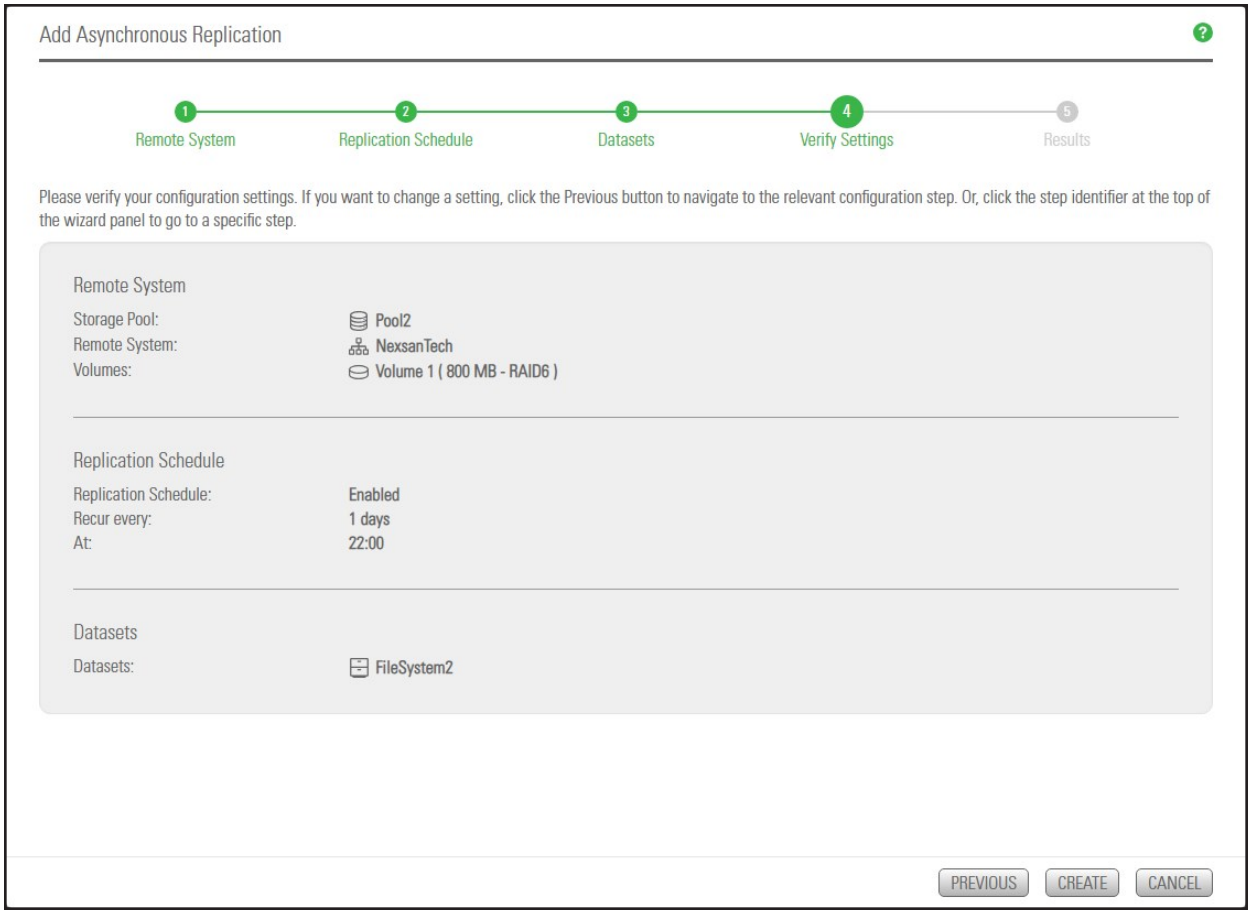
   As you select the number of read and write cache devices to allocate to the storage pool's replica, the **Available FASTier devices** section on the wizard panel automatically updates to display how your selections impact cache assignment on the remote site.

2. When you finish allocating FASTier cache devices to the storage pool's replica, click **Next** on the wizard panel to continue to Verifying settings on the next page.

Verifying settings

This step of the Asynchronous Data Replication Setup wizard summarizes the settings you selected for data replication and applies the settings when you click **Create**. Review the summary carefully before applying the data replication settings.

Figure 3-9: Add Asynchronous Replication wizard: Verifying settings



► **To change a configuration setting:**

- Click the back arrow to navigate back to the corresponding configuration step.

  Or

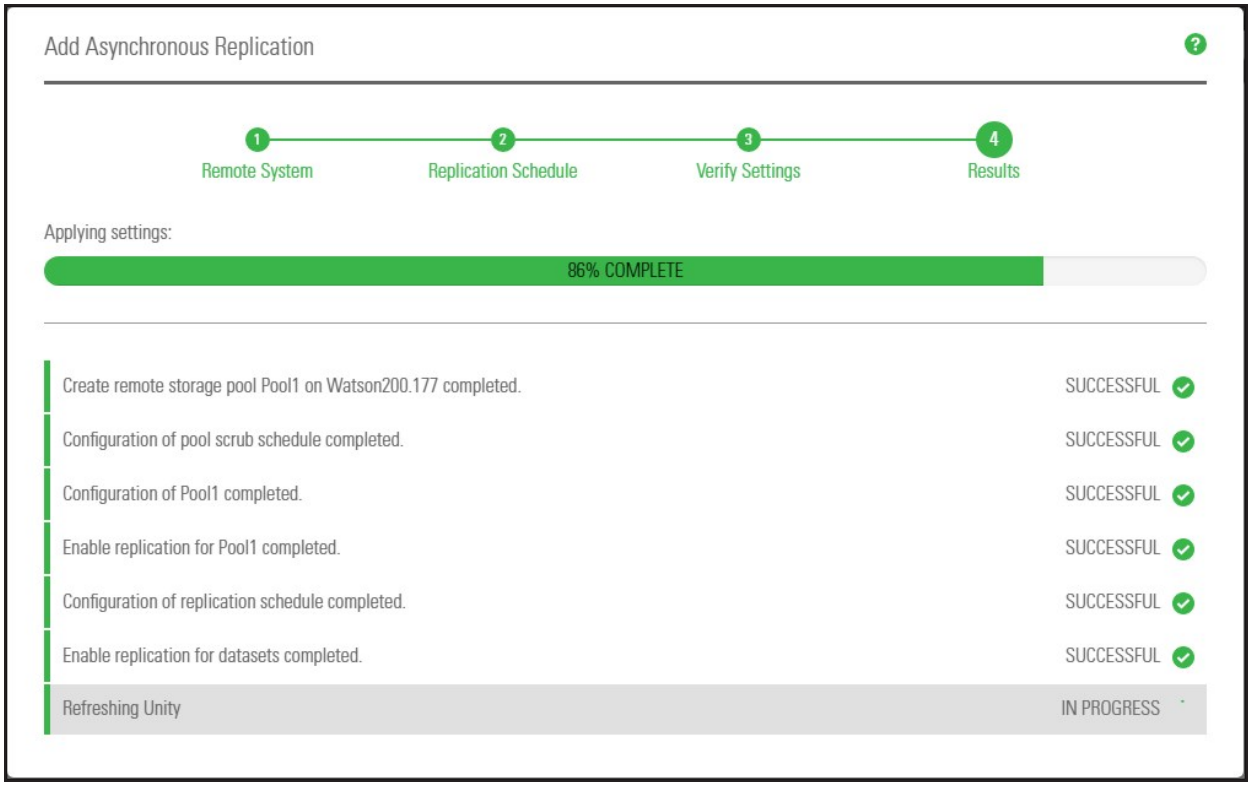
- Click the corresponding step identifier at the top of the wizard panel. For example, if you want to modify the replication schedule, click 2.

If you are satisfied with the configuration settings, click the **Create** button at the bottom of the panel. The wizard automatically proceeds to Viewing results on the facing page.

Viewing results

This step of the Add synchronous Replication wizard displays progress as Unity applies your replication configuration to the primary and secondary systems.

Figure 3-10: Add Asynchronous Replication wizard: Viewing results



The Asynchronous Data Replication Setup wizard displays the progress as the replication is configured. It also shows error events, if applicable, that the system encounters during the configuration process. You can view more details about an error event by expanding the corresponding entry.

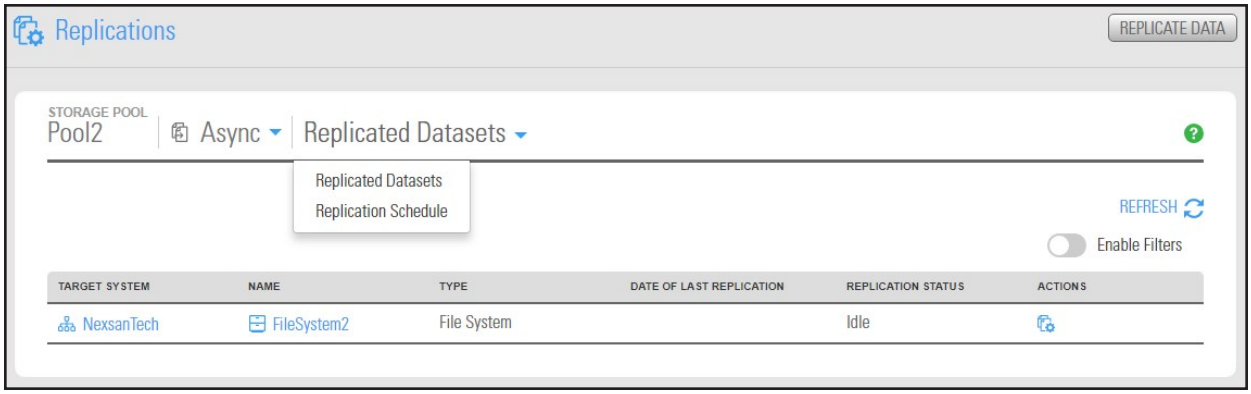
► **To view more details for an error event:**

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

Click the **Close** button to close the wizard.

The replications panel will now show the replication details and available actions. For example:

Figure 3-11: Replications panel



Icon	Name and description
	Replicate Data: Runs data replication immediately
	Remove Replication: Removes the configured replication schedule

The replication will start at the new replication schedule. To change the schedule, see Modifying a storage pool's replication schedule on the facing page.

Modifying asynchronous replication properties and configuration settings

This section describes how to view and modify asynchronous data replication properties and configuration settings for a storage pool.

Note Any configuration change of a replicated share does not affect its replica immediately; the new configuration will be applied at the next replication. For example, if the primary share is CIFS-only, the replica will be available to browse in CIFS mode only. When you change the sharing method to both NFS and CIFS, the replica will not be browsable in NFS until the next replication.

This section includes these topics:

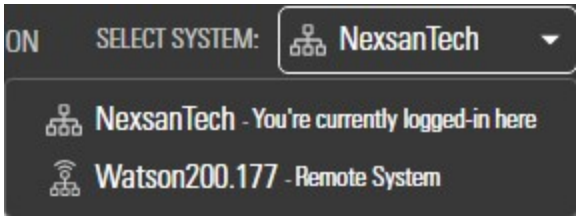
Modifying a storage pool's replication schedule 113
Disabling a storage pool replication schedule 114
Configuring asynchronous replication for a dataset 115

Modifying a storage pool's replication schedule

When you configure asynchronous data replication for a storage pool, you set a replication schedule for the pool. Unity then automatically replicates the data in the pool according to the schedule you define.

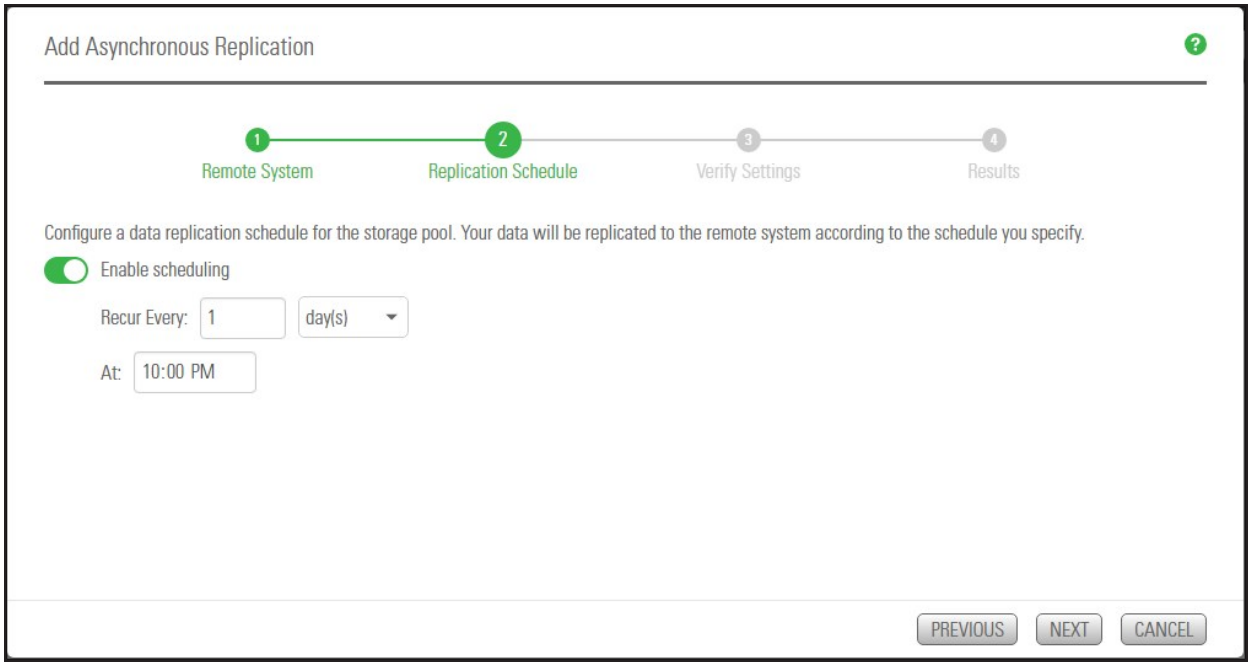
To modify a storage pool's replication schedule:

1. On the **Unity navigation bar**, select the primary Unity System.



2. Select **Data Protection > Replications**.

Figure 3-12: Replication schedule



3

3. Specify whether you want automatic replication. The default is enabled.
4. Specify a recurrence schedule by typing a value in the **Recur every** field.
5. Select the recurrence type from the drop-down list: the default is 1 day. You can set the recurrence in **minutes**, **days**, **hours**, **weeks,** or **months**.
6. Specify the time when you want Unity to perform data replications. The default time is 10 PM.
7. When you finish modifying the data replication schedule for the storage pool, click the **Apply** button to save the new schedule.

Disabling a storage pool replication schedule

If needed, you can temporarily disable the replication schedule for a storage pool. If you disable the replication schedule, Unity will not replicate the storage pool and its data at the next scheduled replication cycle.

Note If replication is currently in progress for the storage pool, disabling the schedule will NOT stop the replication.

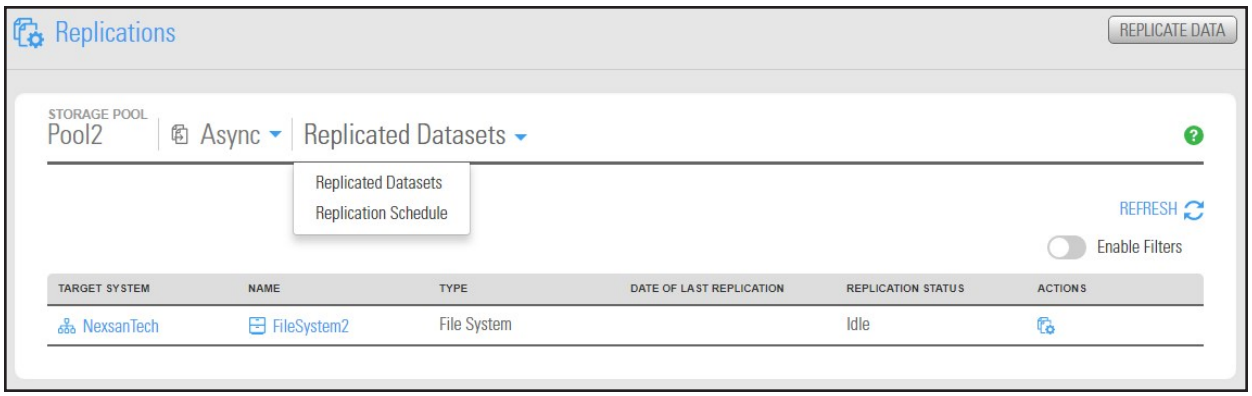
Prerequisites

- Replication must already be set up to a remote system.

To disable a storage pool replication schedule:

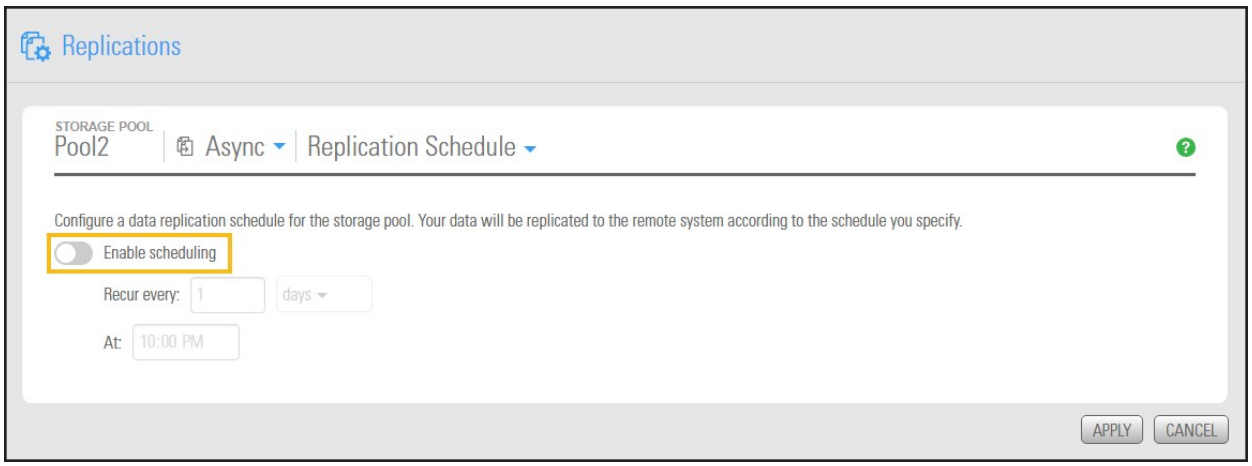
1. On the **Unity navigation bar**, click **Data Protection > Replications**. The **Replications** panel opens.

Figure 3-13: Replications panel



2. Click **Replicated Datasets > Replication Schedule**.
3. Click the **Enable scheduling** button to disable scheduled replication.

Figure 3-14: Replications panel



4. Click the **Apply button** to complete the operation.

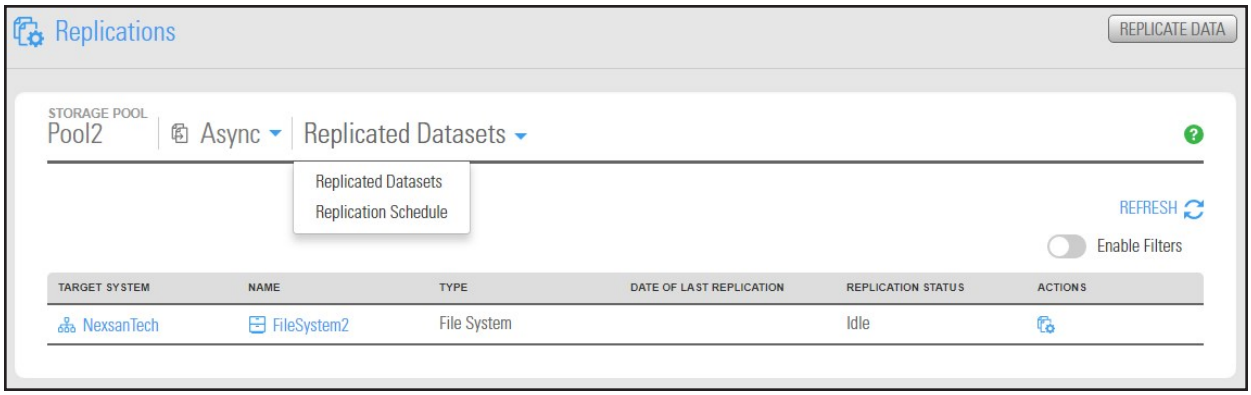
Configuring asynchronous replication for a dataset

Unity enables you to enable or disable asynchronous data replication for individual datasets (file systems and/or iSCSI LUNs) in a storage pool. This gives you the flexibility to choose the data that you want to replicate to the secondary Unity for disaster recovery. For example, if the storage pool on your primary Unity contains some datasets with non-critical data, such as test data, you may want to exclude those datasets from the data replication process. This will help you minimize network bandwidth consumption during data replications, and also save on storage capacity on the remote site.

To enable asynchronous data replication for a dataset:

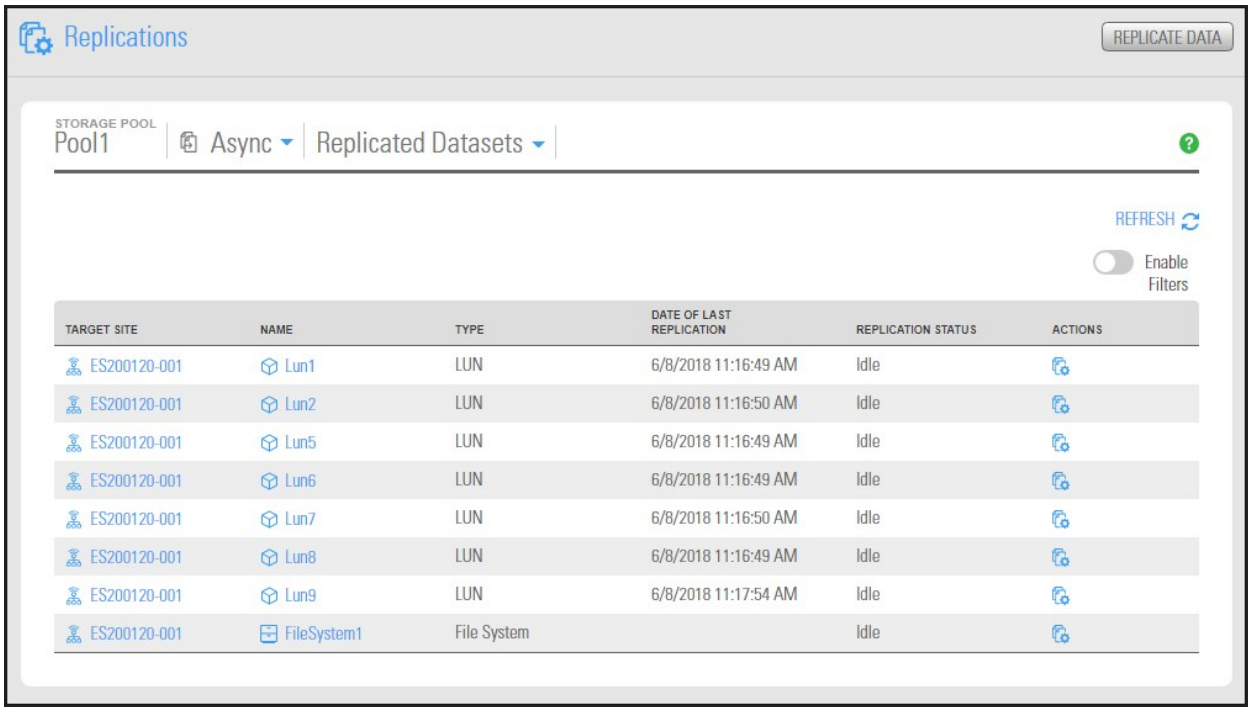
1. On the **Unity navigation bar**, click **Data Protection > Replications**.

Figure 3-15: Replications panel



2. Click the entry in the table to open the **Replicated Datasets** panel.

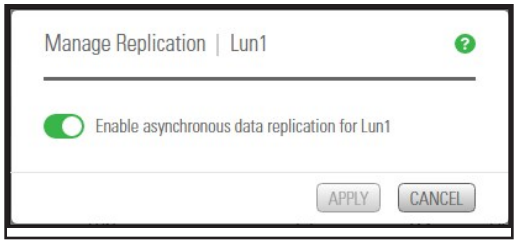
Figure 3-16: Replicated Datasets panel



3. To search for a specific dataset, **Enable Filters** and enter relevant search information in one of the text boxes. The grid automatically filters the list as you type.

4. Click the **Manage Replication** icon. The **Manage Replication** popup opens.

Figure 3-17: Manage Replication popup window



5. Click the **Enable asynchronous data replication** button for the dataset, as required.

Configuring Asynchronous Replication settings

You can configure the general settings for Asynchronous Replication at the Unity System level before or after configuring replication. The new settings are applied at the next replication if replication is already configured.

The **Replications** panel, you can configure:

- Network settings
- Compression settings
- Encryption settings

This section includes these topics:

Configuring network settings for Asynchronous Replication below

Configuring compression settings for Asynchronous Replication on page 119

Configuring encryption settings for Asynchronous Replication on page 120

Configuring network settings for Asynchronous Replication

You configure network settings for Asynchronous Replication at the Unity System level. All replication processes that will be created for each Unity System will inherit the same settings. You can specify the type of network connection between the primary and remote systems, as well as the network interface for the replication stream.

Note If you change a network setting while replication is in progress, the setting will take effect in the next replication process. For the setting to take effect immediately, you can use the `services` command in the nxadmin CLI and restart the `system.filesystem.nstfs.nest-async-replication` service. For details, see the *Nexsan Unity nxadmin Command-line Reference Guide*.

▶ Network type for data replication:

Unity may terminate a replication session if the network response time falls below the acceptable threshold. Unity provides a configuration setting that enables you to specify the network connection: either a LAN or WAN connection.

Setting the network type to **WAN** increases the threshold for network response tolerance on slow WAN links. This setting also enables a checksum mechanism to ensure data integrity over the WAN link on both the outbound data stream (at the source system) and on the inbound data stream (at the remote or DR system).

Network interface for data replication:

By default, Unity uses the primary data network interface (nx0) to replicate data, that is, for the outgoing replication stream. You can change this setting and choose the Management interface (nx99) instead, or choose another data network interface (for example, nx1).

CAUTION:

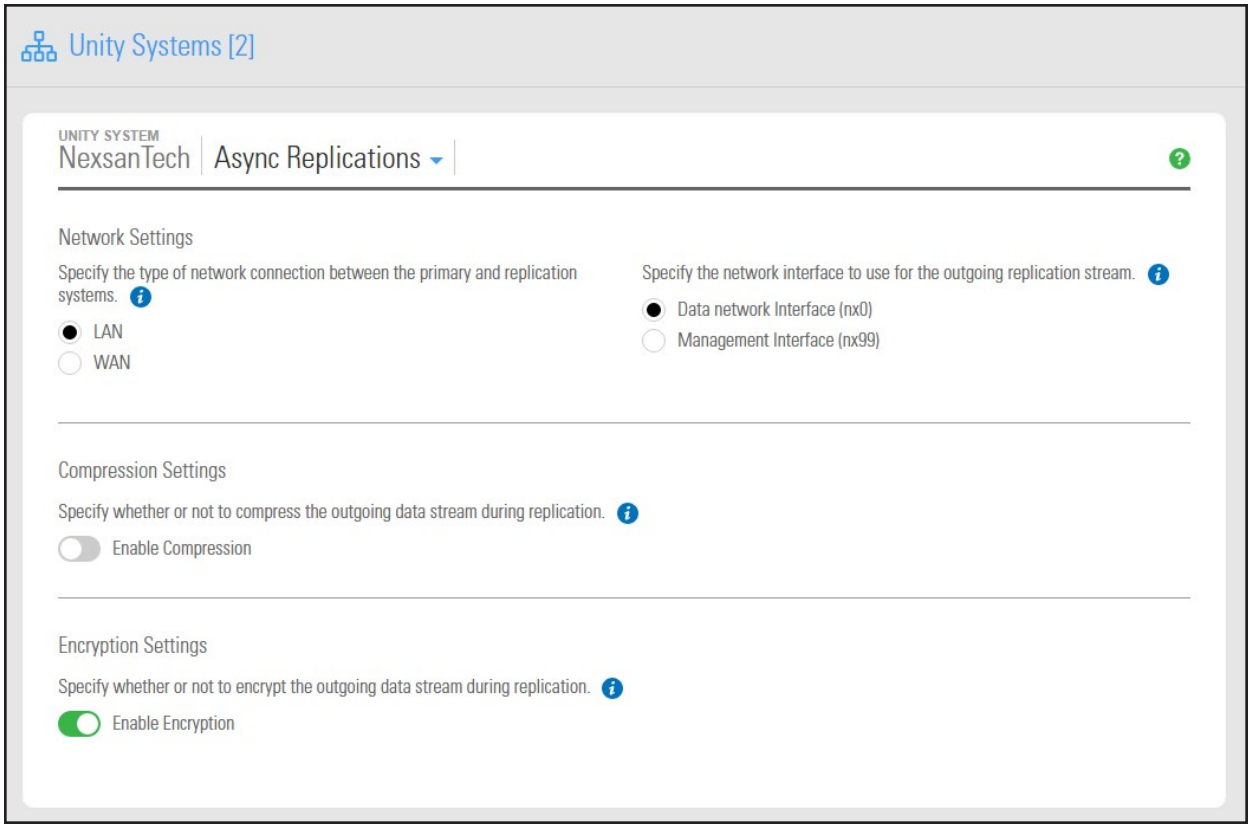
- The network interface that you set on the primary system (for the outgoing replication stream) must be the same as the one on the remote system (for the incoming replication stream).
- If you select nx99 for replication, nx0 still needs to be configured and reachable on your network. Using nx99 offers the advantage to separate the traffic, in which nx0 is used for the control flow and x99 is used for the data flow.

  To configure nx0, see Modifying IP configuration settings on page 121.

To configure network settings:

1. On the **Unity navigation bar**, select **System > Unity Systems**.
2. Select the system that you want to configure asynchronous replication for.
3. Select **Summary > Async Replications**. The **Unity Systems Async Replication panel** opens.

Figure 3-18: Async Replication panel



4. Under **Network Settings**, perform one or more of these actions:

To change the...	Do this
type of network connection between the primary and replication systems	Select **LAN** or **WAN**.
network interface for the replication stream	Select the desired network interface.

5. Click the **Apply** button.

► **What's next:**

If you changed the network interface, you must make the same change on the remote system.

Configuring compression settings for Asynchronous Replication

You configure compression settings for Asynchronous Replication at the system level. All replication processes that will be created for that system will inherit the same settings.

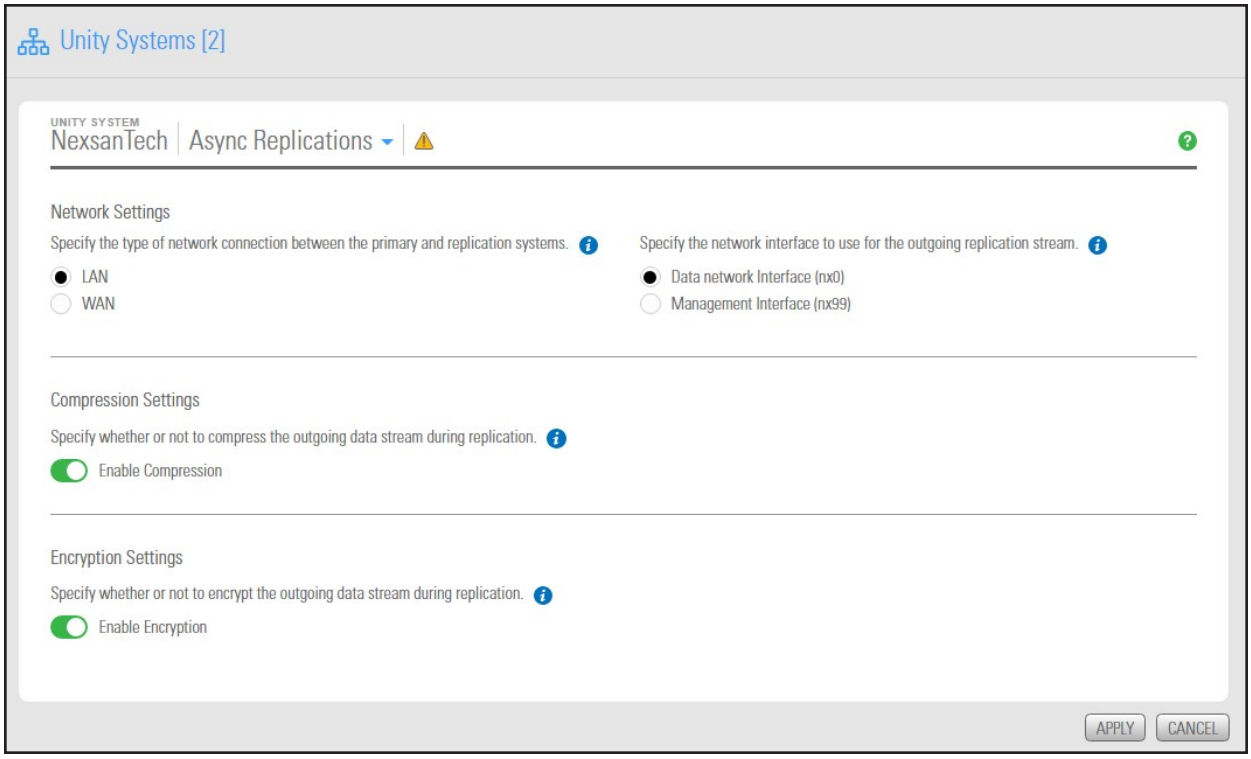
By default, data compression is disabled. If you enable this setting, the outgoing data stream will be compressed during replication to reduce network bandwidth consumption. This process can be CPU intensive. This compression setting only affects the outgoing data stream for replication. It does not affect local data on the storage pool and datasets.

► **To configure data compression for asynchronous replication:**

1. On the **Unity navigation bar**, select **System > Unity Systems**.
2. Select the system that you want to configure asynchronous replication for.

3. Select **Summary > Async Replications**. The **Unity Systems Async Replication panel** opens.

Figure 3-19: Async Replication panel



4. Under **Compression Settings**, click the **Enable Compression** button
5. Click the **Apply** button.

Configuring encryption settings for Asynchronous Replication

You configure encryption settings for Asynchronous Replication at the Unity System level. All replication processes that will be created for that Unity System will inherit the same settings. By default, data encryption is enabled. This allows the outgoing data stream to be encrypted during replication to provide an extra layer of data security. This process can be CPU intensive.

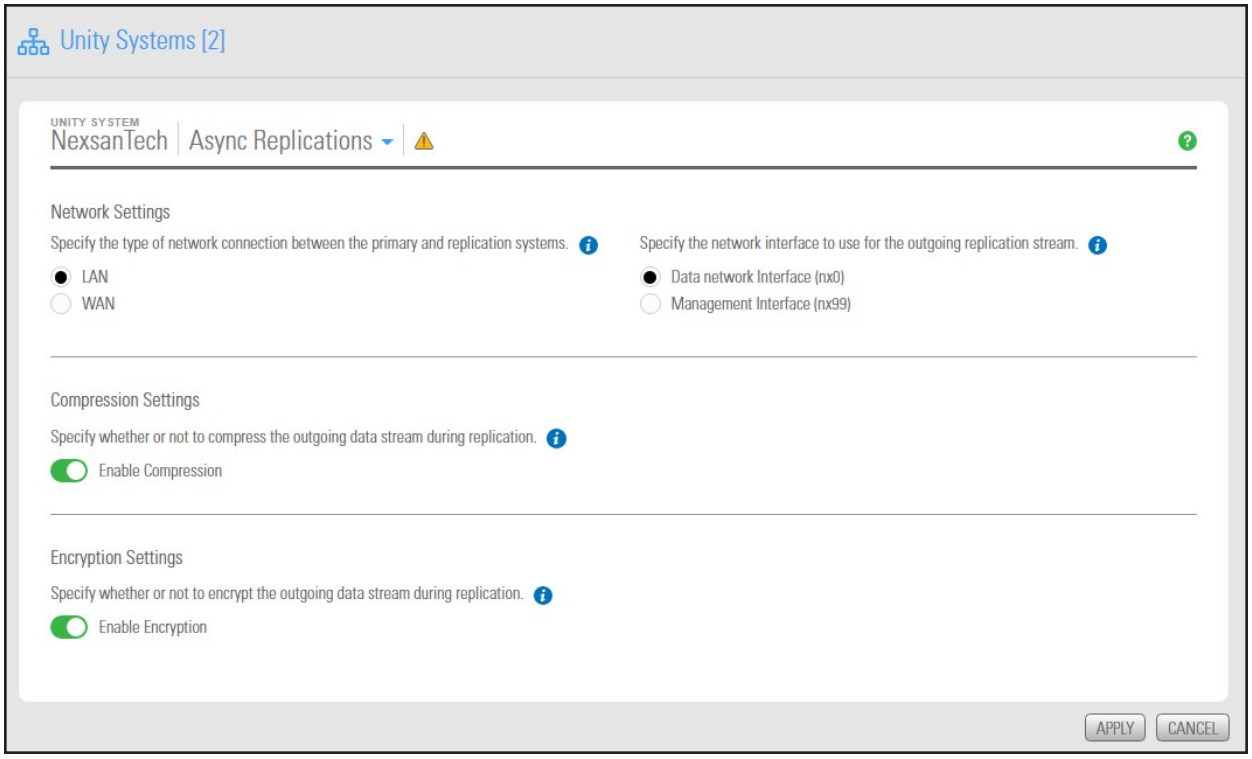
Note If one Unity System has encryption enabled, the data will be encrypted. If both Unity Systems have encryption disabled, the data will not be encrypted.

► **To configure encryption settings:**

1. On the **Unity navigation bar**, select **System > Unity Systems**.
2. Select the system that you want to configure asynchronous replication for.

3. Select **Summary > Async Replications**. The **Unity Systems Async Replication panel** opens.

Figure 3-20: Async Replications panel



4. Under **Encryption Settings**, make sure the **Enable Encryption** button is enabled (the default).
5. Click the **Apply** button.

Modifying IP configuration settings

This section describes the process for modifying Unity network settings. You can modify network settings for both the primary data network interface (nx0) and the management interface (nx99). For more information about nx0 and nx99, see the Nexsan Unity Software User Guide.

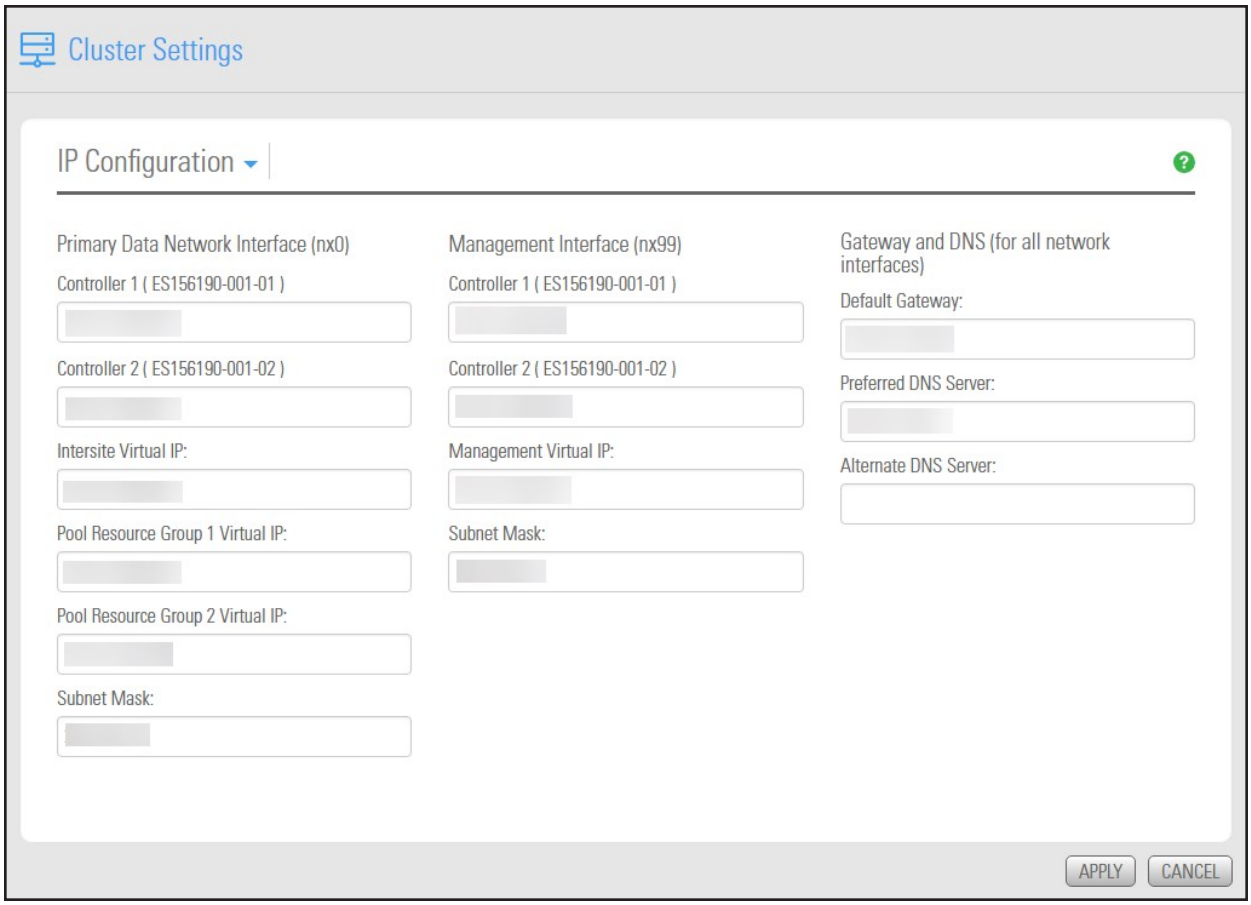
CAUTION: Client systems using these IP addresses will lose connection to Unity. Before modifying IP addresses, disconnect client systems, and quiesce any applications with an active connection to Unity.

If you modify Resource Group virtual IP addresses, you will need to manually update all file system and LUN mappings on client systems to reflect the new virtual IP addresses.

To modify network settings on Unity:

1. From the **Unity dashboard**, select **Cluster Settings**. The Cluster Settings panel opens.
2. Select **Status > IP Configuration**.

Figure 3-21: Cluster Settings IP Configuration panel



3. Modify the relevant IP address for the primary data network interface (nx0) by changing the values in the corresponding fields.
4. Optionally, modify IP address settings for the management interface (nx99).
5. If needed, modify IP address settings for the Default gateway for Unity, as well as for the preferred DNS server; and (optionally) the IP address of the alternate DNS server. These settings are applied globally to all network interfaces on the system.
6. If an E-Series storage system is connected to Unity, and you want Unity to automatically set the new IP addresses for the subnet mask, default gateway, and DNS server on the storage system, select the **Set the Subnet Mask, Default Gateway, and DNS on all externally-attached Unity Storage Systems** option; this option is only displayed if Unity has a Nexsan E18, Nexsan E48, or Nexsan E60 storage system attached to it via SAS (or Fibre Channel), and allocated to the site.
7. Click the **Apply** button to set the new IP and network settings on Unity, and if applicable, on any Nexsan E18, Nexsan E48, or Nexsan E60 storage system attached to Unity.

   Unitymodifies the network settings on Unity; it informs you once the process completes.
8. Depending on the network settings you modified, you may be required to restart Nexsan Unity.

Browsing replicated datasets and snapshots

Once you set up data replication for a storage pool on the primary Unity System, you can view and browse the storage pool's replicated datasets (file systems and LUNs) and snapshots on the remote Unity System, under the storage pool replica.

Enabling browsing of a replicated file system snapshot

Use this procedure for instructions about how to browse replicated file systems.

When you replicate a file system, Unity automatically enables sharing for the replicated dataset (file system or LUN) on the remote Unity System.

Unity makes the snapshot available to host systems of the LUN as a read/write clone. The host system can then both read from and write data to the clone, however Unity will NOT preserve direct changes to the clone.

Notes:

- To access and browse a replicated LUN, the replicated storage pool where the LUN resides must be the primary pool.
- You must configure LUN masking settings to allow host connectivity to the replicated LUN.
- You cannot browse a replicated file system using FTP sharing.

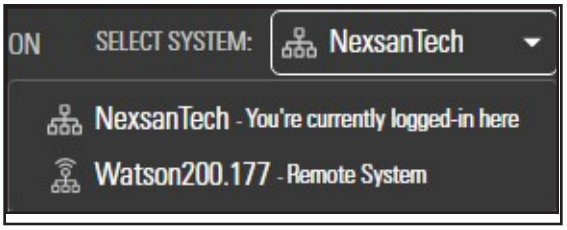
Prerequisites

- A primary Unity System and remote Unity System with replication set up.
- At least one file system snapshot must be available.

To enable browsing of a replicated file system snapshot:

1. On the **Unity navigation bar**, click the **Select System** box.

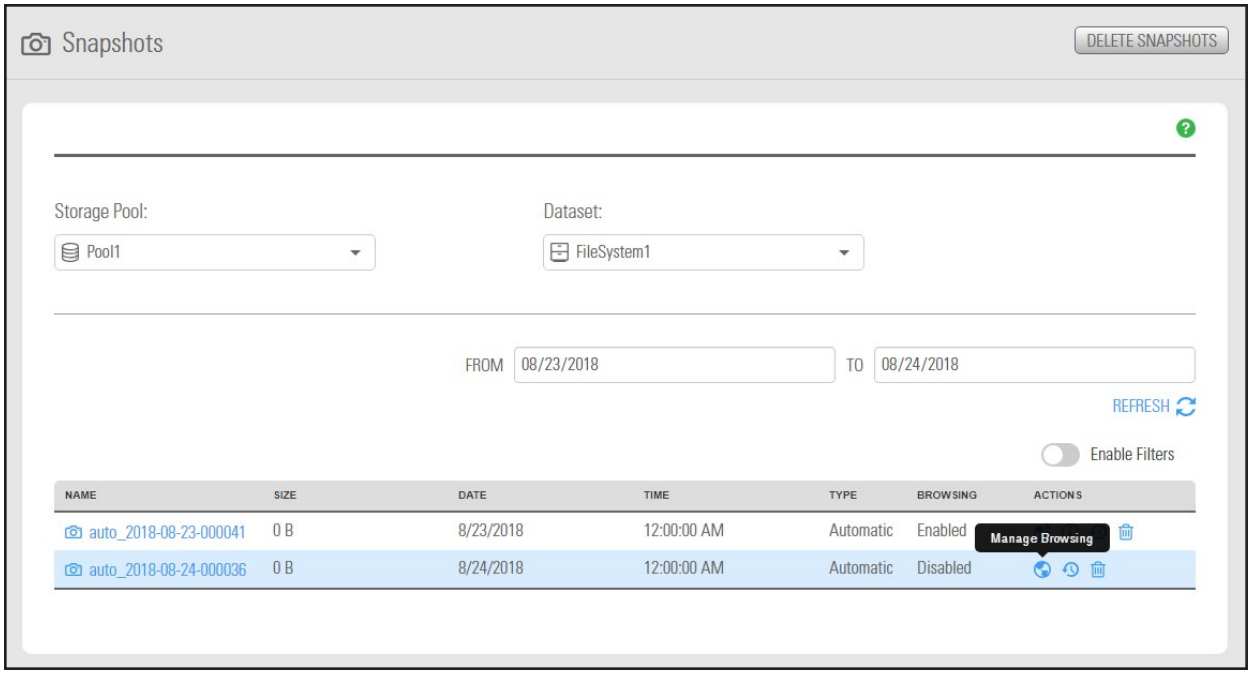
Figure 3-22: Select System



2. Select the system that has replications that you need to browse.

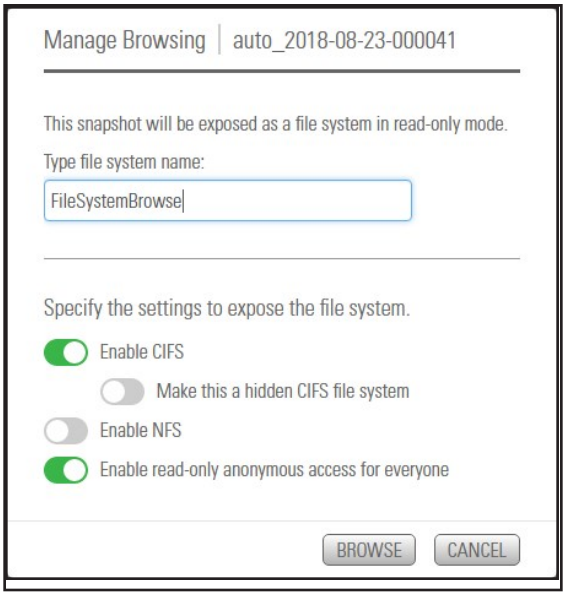
3. On the **Unity navigation bar**, select **Data Protection > Snapshots**.

Figure 3-23: Snapshots panel: Manage Browsing



4. Click the **Manage Browsing** icon next to the snapshot of the file system that you want to browse. The **Manage Browsing** popup opens.

Figure 3-24: Manage Browsing popup

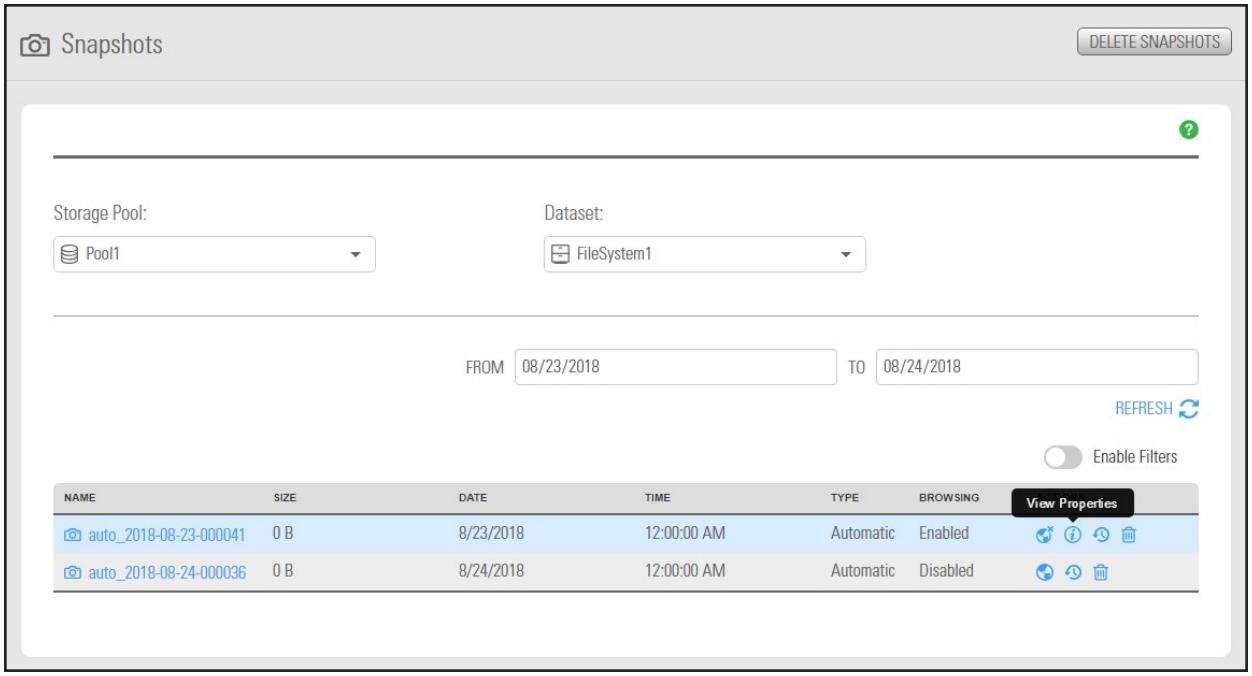


5. Apply the following settings as needed for File System Snapshot browsing.
   - Enable CIFS.
     - Make this a hidden CIFS file system
   - Enable NFS
   - Enable read-only anonymous access for everyone.
6. Click the **Browse** button to enable browsing.

▶ To browse the contents of a replicated dataset:

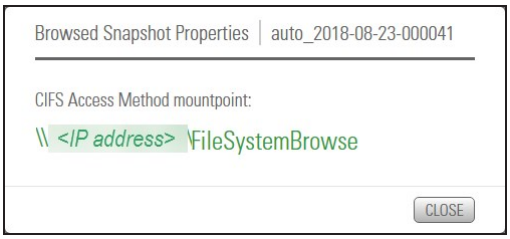
- In the **Snapshots panel**, click the **View Properties** icon .

Figure 3-25: Snapshots panel: View Properties



The **Browsed Snapshot Properties popup** opens.

Figure 3-26: Browsed Snapshot Properties popup



You browse a replicated dataset in the same way that you browse the source dataset on the primary Unity System, except that the replicated dataset is a read-only copy of the source File System (but with the same access permissions as the source dataset). Since the replicated dataset exists only on the remote site, you must set up a CIFS or NFS mapping to the remote site from the Windows-based (CIFS) system and/or UNIX/Linux-based (NFS) system from which you want to access the replicated dataset .

The process for accessing a File System and browsing its contents is described in detail in "Accessing an NFS file system from UNIX/Linux" in the *Nexsan Unity Software User Guide* or *Nexsan Unity Online Help.*

Performing a manual replication

This section explains how to perform a manual replication of the data in a storage pool to a remote Unity System configured as a replication target for a storage pool.

When replicating to a remote system, the system calculates disk space requirements based on incremental changes to the data. Depending on the size and number of datasets selected, the calculation process may take some time.

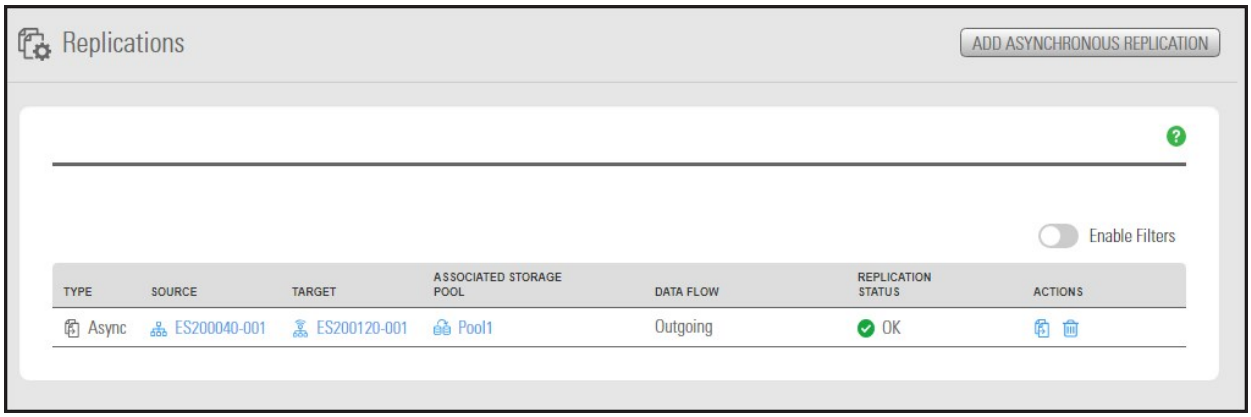
Prerequisites

- To perform this operation, you must have configured data replication for the storage pool and added at least a file system or a LUN to the storage pool.

To perform a manual data replication:

1. On the **Unity navigation bar**, select **Data Protection > Replications**.

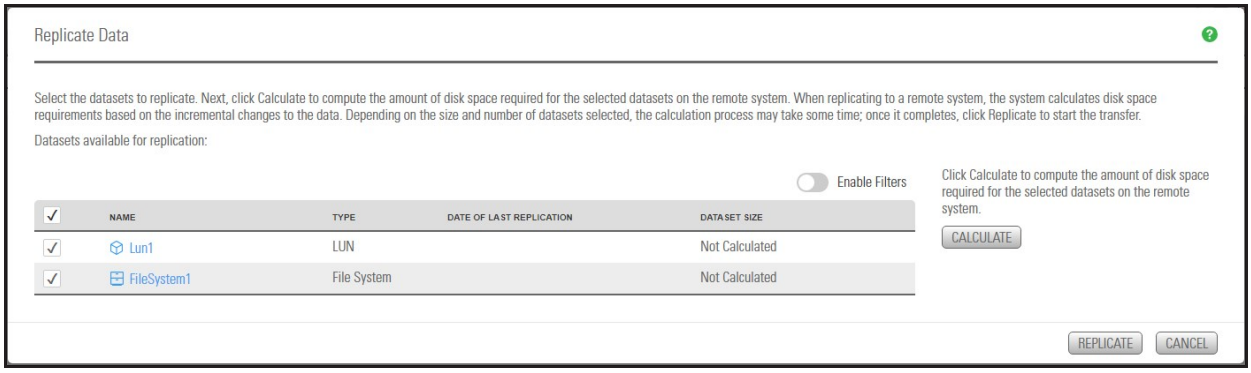
Figure 3-27: Replications panel



2. Do either of the following:
   - Click the **Replicate Data** icon
   - Click the link to the **Source** or **Target** Unity System where you want to perform the replication.

   The **Replicate Data** popup opens.

Figure 3-28: Replicate Data popup

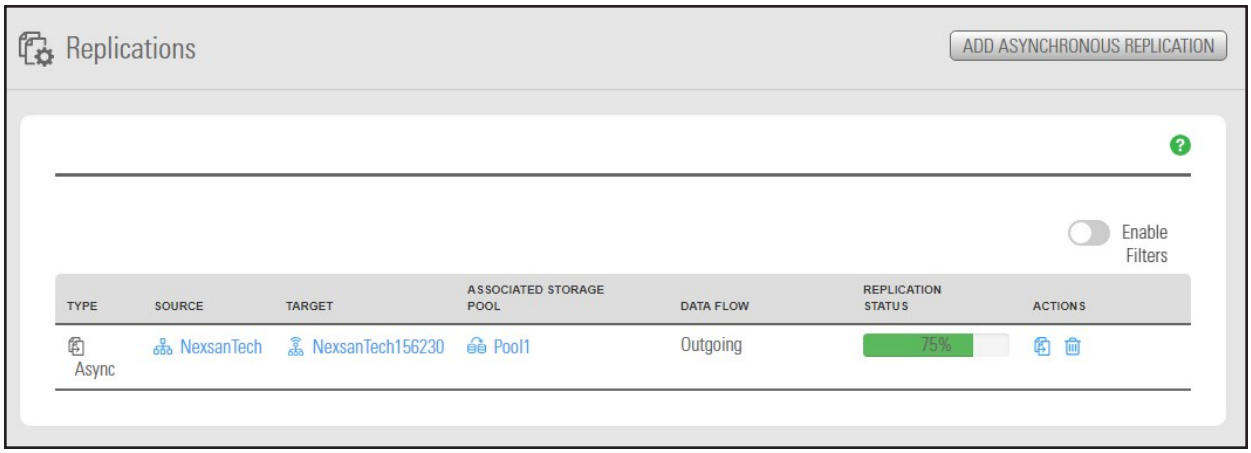


3. Select the datasets to replicate.

4. Click **Calculate** to compute the amount of disk space required for the selected datasets on the remote system.
5. Once the calculation completes, click **Replicate** to start the incremental replication.

Unity starts the replication and displays the replication progress in the **Replications** panel.

Figure 3-29: Replications panel: Replication in progress



Failing over to a remote Unity Storage System for disaster recovery

The Unity data replication function provides a failover mechanism for your Unity deployment that enables you to automatically switch over all data and system operations on the primary Unity Storage System to a standby remote Unity Storage System.

This section includes these topics:

Failover vs. promote 128
Performing a failover of the entire Unity Storage System 131
Performing a failover of a storage pool 134

Failover vs. promote

This table identifies the scenarios in which you should use the failover and promote functions, and it also describes what each function entails:

Function	When to use it...	What it does...
Failover	• System maintenance on the primary system, including hardware component upgrade or replacement • Imminent system failure • Data migration • Load balancing	When you start the failover function, it first performs an incremental replication to update the data on the remote system. It then promotes the remote system to primary status in your deployment, and demotes the primary system to secondary status. If you only fail over a storage pool, or a subset of pools on the primary system, the failover function promotes the storage pool's replica on the remote system to primary status, and demotes the storage pool on the primary system to secondary status. After the failover completes, all storage pools that you failed over and their datasets are now accessible on the remote system. If the primary system has only one storage pool, failing over the storage pool has the same result as failing over the entire system. **Note** Only datasets that have replication enabled are failed over to the remote system. Datasets that do not have replication enabled remain on the primary system.
Promote	• Complete system failure on the primary system (primary system is non-responsive)	When you promote the remote system, the promote function changes the status of the secondary system to primary. The promote function does not replicate data from the primary system to the remote system. If you only promote a storage pool, or a subset of pools on the remote system, the promote function changes the status of the secondary storage pool to primary. After the promote completes, all storage pools that you promoted and their datasets are now accessible on the remote system. If the remote system has only one storage pool, promoting the storage pool to primary status has the same result as promoting the entire system. **Note** Only datasets that are replicated to the remote system are available after a promotion. When you restore the primary system, your deployment will have 2 primary systems or storage pools; you must then *demote* one of the systems or pools to secondary status.

Unity System failover vs. pool failover

The failover functionality enables you to fail over a single storage pool, or only a subset of the storage pools, to the corresponding remote Unity Systems. Alternately, you can fail over an entire Unity System to remote systems. Pool or System failover of a pool that has a compressed dataset is supported.

For example, on a primary Unity—System A—with two storage pools, Pool 1 and Pool 2:

- Pool 1 is replicated to secondary system B
- Pool 2 is replicated to secondary system C

You can:

- Fail over each pool separately to its corresponding remote system;
- Fail over the entire system. Each storage pool is failed over to the remote system where the pool is replicated.

Similarly, if both Pool 1 and Pool 2 on System A are replicated to the same remote system, System B, you can:

- Fail over each pool separately to System B;
- Fail over the entire system. Both storage pools are failed over to System B.

On a system with only one storage pool, failing over the storage pool has the same result as failing over the entire Unity System.

Performing a failover of the entire Unity Storage System

This section describes the process for performing a failover of a primary Unity Storage System to the remote system where the storage pools from the primary system are replicated.

CAUTION: The failover process can take from several minutes to several hours, depending on the number of datasets and the amount of data to transitioned to the replicated system. During this time, all LUNs to be transitioned will be inaccessible and file systems will be accessible in read-only mode. In addition, you will be unable to perform any other operation in Nexsan Unity.

CAUTION: Both the primary and remote systems are unavailable during the failover process. To prevent data loss, close any applications that access data on the primary system and also terminate any active connections to the system.

Prerequisites

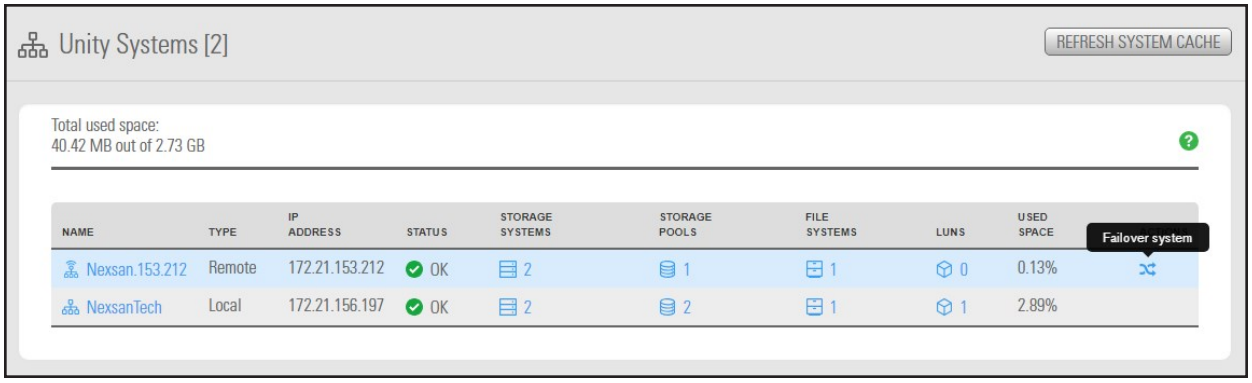
- The primary site must be connected to a remote site.
- At least one replication to a secondary system must have already been performed.

Note Datasets that do not have replication enabled remain on the primary system, and are only accessible from that system.

To failover the primary system to the remote system:

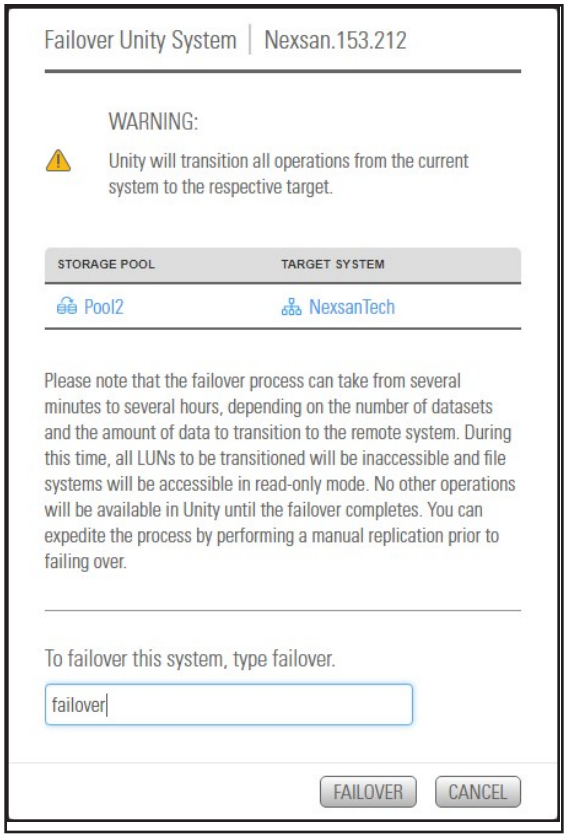
1. On the **Unity navigation bar**, select **System**.

Figure 3-30: Unity Systems panel: Failover System



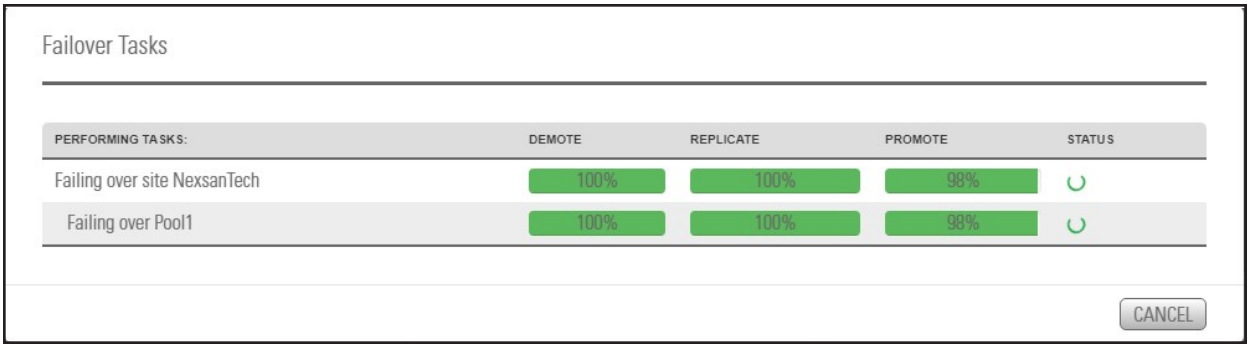
2. Click the **Failover System** icon in the table showing the primary and remote Unity Systems.
3. Unity displays the storage pool to be failed over and target system name, prompting you to confirm the action. Type **Failover** in the text box to continue.

Figure 3-31: Failover Unity System popup



Unity starts the failover process, starting with demoting the primary site, then replicating it and promoting it to the remote site.

Figure 3-32: Failover Tasks window



If the primary system has multiple storage pools replicated to different remote systems, the failover function fails over each pool to its corresponding remote system.

On the remote system, Unity moves all replicated storage pools from the **Incoming Replications** node to the **Storage Pools** node. On the primary system, Unity moves the replicated pools from the **Storage Pools** node to the **Incoming Replications** node. Any dataset that was not included in the replication remains under the **Storage Pools** node on the primary system.

If the failover of the primary system is unsuccessful, you will be prompted to retry the failover or cancel it. Click **Retry** to try the failover again or **Cancel** to abort the failover. If you retried the failover and it is still unsuccessful, you can either:

- fail over the storage pools on the primary system individually, or
- promote the remote system, or
- promote the storage pools on the remote system individually.

What's next:

You will need to update all relevant DNS mappings on the DNS server. This will allow your users and applications to access their data without the need to remap their connections to the datasets on Unity.

Performing a failover of a storage pool

This section describes the process for performing a failover of a storage pool from the primary Unity Storage System to the corresponding remote system where the storage pool is replicated.

If you fail over a storage pool, the failover function promotes the storage pool's replica on the remote system to primary status, and demotes the storage pool on the primary system to secondary status.

Datasets that do not have replication enabled remain on the primary system, and are only accessible from that system.

Prerequisites

- The primary site must be connected to a remote site.
- At least one secondary storage pool must be available on the remote system to failover to.

Note You cannot perform a failover of a storage pool if the pool is in an unhealthy state.

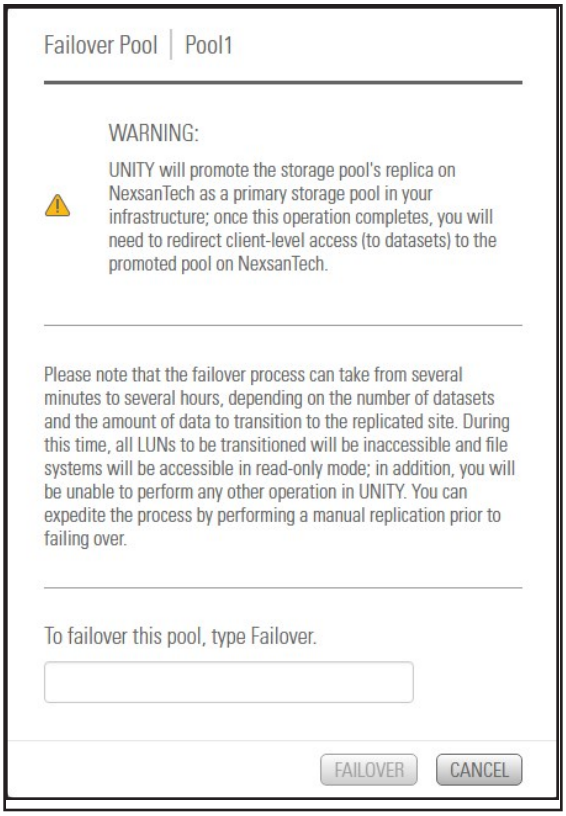
To start the failover process:

1. On the **Unity navigation bar**, select **Storage > Storage Pools**.
2. Perform of these actions:

To...	Do this
use the **Failover Pool** icon	• Click the **Failover Pool** icon in the grid.
use the storage pool's Properties panel	a. Click the node representing the storage pool that you want to fail over to its corresponding secondary system b. Click the **Failover Pool** button.

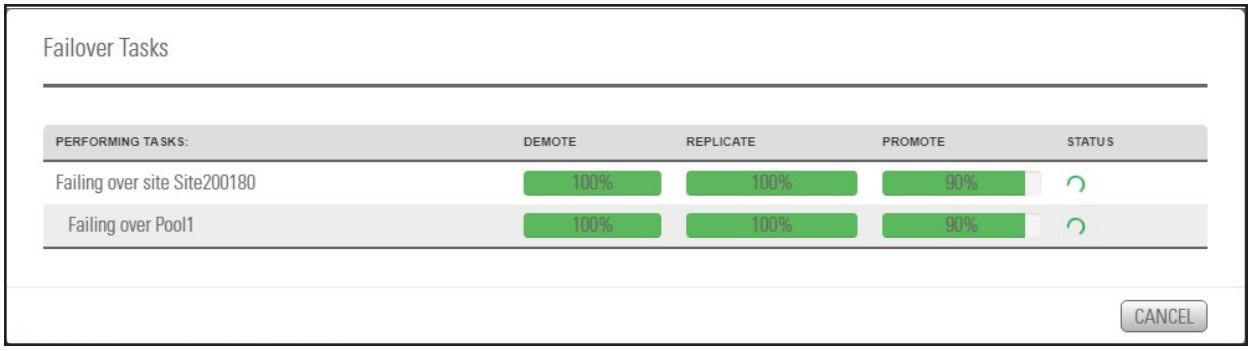
3. In the **Failover Pool popup window**, read the warning and type **Failover**.

Figure 3-33: Failover Pool popup window



Unity starts the failover process, starting with demoting the primary site, then replicating it and promoting it to the remote site.

Figure 3-34: Failover Tasks window



► **What's next:**

You will need to update all relevant DNS mappings on the DNS server. This will allow your users and applications to access their data without the need to remap their connections to the datasets on Unity.

Removing asynchronous data replication for a storage pool

This process terminates replication for a storage pool. You may want to remove asynchronous data replication for a storage pool to (temporarily or permanently) migrate the data on the primary system to the remote system, or for load balancing, where each system manages a specific set of storage pools in your deployment.

CAUTION: The remove operation does not replicate data before terminating asynchronous replication between the primary storage pool and its replica. Prior to terminating asynchronous data replication for a storage pool, perform a manual data replication to the pool replica. This ensures that the replica contains the most recent data when the remove operation promotes it to primary status. For more information.

When removing asynchronous replication, you can choose to promote or delete the storage pool's replica:

- Promoting the replica on the remote site makes it a primary storage pool in your deployment. Your deployment will then have two primary storage pools containing exactly the same data.
- Deleting the replica will keep data on the primary storage pool only.

CAUTION: If you promote the replica first and THEN remove asynchronous data replication, deleting the replica deletes the former primary pool. All datasets belonging to the replica (former primary pool) will be deleted. Any LUNs or file systems on the replica that were NOT previously replicated to the remote site will be deleted, resulting in data loss.

3

Prerequisites

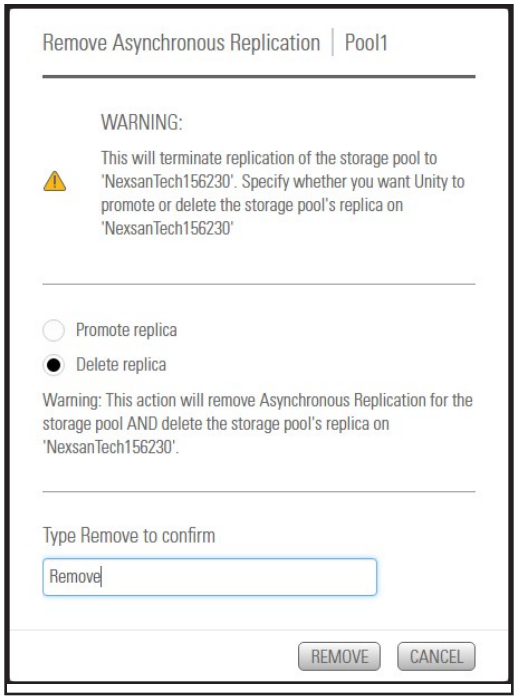
- To perform this operation, at least one replication must be in place.

To remove asynchronous data replication for a storage pool:

1. On the **Unity navigation bar**, select **Data Protection > Replications**.
2. In the **Replications** panel, click **Remove Replication**

   Unity displays a pop-up asking you whether you want to promote or delete the replica.

Figure 3-35: Removing asynchronous replication



3. Do one of the following:

- If you want to promote the replica, leave the default **Promote replica** option selected to promote the replica to be a primary pool, or
- Select **Delete replica** to remove the replicated pool from the remote Unity.

4. Type **Remove** where indicated to confirm the action, then click the **Remove** button.
5. If you chose to promote the replica, another pop-up displays to ask you to provide new names for the replica and any replicated datasets. Enter the names and click **OK**.

Accessing features not yet in the new HTML5 interface

This table lists infrequently used features not yet available directly in the new Unity HTML5 interface and how to access them using the Unity v. 7.0 classic interface or from the Unity command line. To switch to the Unity classic UI, select **Help > Open Classic UI**, or use the nxadmin command `ui -c set_legacy`

Feature	Where to find it
n-Way Sync	► **To access the feature:** - Using the Unity classic interface, under the **Site** node, click the **n-Way Sync** node. - Using the nxcmd command-line interface, for command information enter `nxcmd sync` For detailed instructions, see - "Synchronous data replication," in the Unity classic online help and user guide. - "Sync" in the *nxcmd Command-Line Interface Reference Guide*.
Reports	► **To access the feature:** In the Unity classic interface, select **System Monitoring > Generate Reports** from the Unity toolbar. See "Reports" in the Unity classic online help and user guide.
Role-based user administration	► **To access the feature:** - In the Unity classic interface, expand the **Unity Storage System** node, and select **User Authentication** from the properties panel. For detailed instructions, see - "User authentication modes" in the Unity classic online help and user guide. - the "Site" and "Pool" sections in the *nxcmd Command-Line Interface Reference Guide*.
Synchronous replication (mirroring)	► **To access the feature:** - Using the Unity classic interface, click the **Site node**, then the **Synchronous** tab. - Using the nxcmd command-line interface, for command information enter `nxcmd syncreplication` For detailed instructions, see - "Synchronous Replication" in the Unity classic online help and user guide. - "SyncReplication" in the *nxcmd Command-Line Interface Reference Guide*. Synchronous replication is available for systems configured with the appropriate hardware.

Synchronous data replication

Use the synchronous data replication feature to simultaneously replicate a storage pool between two Nexsan E-Series storage systems that are connected in a standard fashion to one Nexsan Unity Storage System. The feature mirrors all the data contained in a storage pool between a *source* and a *target* Unity Storage System—both of which are connected to Nexsan E-Series storage expansions via SAS (or Fibre Channel). You can also use synchronous data replication to migrate data when upgrading hardware or re-balancing storage. You designate the storage system to use as the *source*—that is, the system on which you create the storage pool and store your data—and the *target*, where the source data is mirrored.

If either the source or target system fails for any reason, your users and applications can continue to access their data on the storage system that is currently online. When you restore the second system, Unity automatically reestablishes the synchronous link between the two systems.

In addition, you can later promote the mirror (storage pool) on the target system to an independent storage pool in your Unity deployment. Promoting the mirror (storage pool) severs the synchronous link between the source and mirror, and creates a second, independent copy of the storage pool—with both copies containing exactly the same data.

This feature enables you to create an exact copy of your production data for testing and validation, or to migrate data when upgrading hardware or re-balancing storage.

Note Synchronous data replication is available ONLY:

- from the Unity classic interface and `nxcmd` command-line interface.
- for systems configured with the appropriate hardware.

To configure Synchronous data replication:

- Using the Unity classic interface, click the **Site node**, then the **Synchronous** tab, or
- Using the nxcmd command-line interface, for command information enter

```
nxcmd syncreplication
```

For detailed instructions, see

- "Synchronous Replication" in the Unity classic online help and user guide.
- "SyncReplication" in the *nxcmd Command-Line Interface Reference Guide*.

This section includes these topics:

Synchronous data replication features on the next page

Usage implementations on the next page

Before you begin

Before you set up synchronous data replication for a storage pool, consider these points:

- You must have two Nexsan E-Series systems connected to Unity via SAS (or Fibre Channel); both systems must also be configured with Unity and allocated to the site.
- The target system, where the storage pool from the source system will be mirrored, must have a matching set of volumes, both in quantity and size, to match the volumes on the source system. For synchronous data replication, Unity requires one-to-one volume matching between the source and the target. This means that for every volume you allocate to the source storage pool, there must be a volume of equal or greater size on the target system.
- You must have, at least, one storage pool configured on the source E-Series system.

- Consider future capacity requirements on both the source and target E-Series systems. Specifically, if you allocate more volumes to the storage pool on the source system, you must likewise increase storage capacity on the target system.

Synchronous data replication features

The synchronous data replication function includes these features:

- Zero data loss and downtime: The synchronous data replication function ensures that the data on Unity is always current. If the source E-Series system experiences a disruption in operation, client access to data on Unity automatically reverts to the target, or mirror, E-Series system. When you restore access to the source E-Series system, the synchronous data replication function synchronizes the source system's data with the target system, thereby ensuring that both the source and target E-Series systems contain accurate and consistent data at all times.
- Mirror promotion to create a current and accurate copy of production data for non-disruptive testing: The synchronous data replication feature enables you to promote the mirrored storage pool on the target E-Series system to an independent pool in your Unity deployment. The promote process terminates synchronous replication between the source and target E-Series systems, and creates two independent storage pools containing identical copies of your data. You can then use the copy for testing and validation.

Usage implementations

You can use synchronous data replication for:

- Data backup for disaster recovery: In environments where tape backups are not feasible (for example, where the available bandwidth is insufficient or because the latency for recovery is too high), you can use the synchronous data replication function as a backup solution to mirror the data between a source and target Nexsan E-Series system. Once the mirror is created and the data between the source and target E-Series systems is synchronized, you can terminate synchronous replication and move the target system off site for disaster recovery.
- Testing on non-production E-Series systems: You can use the synchronous data replication function to create an exact copy of production data for testing and validation. You simply mirror production data from a source Nexsan E-Series system to a target Nexsan E-Series system. Once the mirror is created and the data between the source and target E-Series systems is synchronized, you can promote the mirror storage pool, which terminates the link between the source and the target, and then perform any tests with the copy of your production data.
- Data migration: You can use the synchronous data replication function to migrate data from one E-Series system to another when upgrading hardware or re-balancing storage.

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NEXSAN

A StorCentric Company

Nexsan Headquarters

1289 Anvilwood Avenue
Sunnyvale, CA 94089
United States of America

Nexsan Canada

1405 Trans Canada Highway, Suite 300
Dorval, QC H9P 2V9
Canada

Nexsan UK

Units 33–35, Parker Centre, Mansfield Road
Derby, DE21 4SZ
United Kingdom

Nexsan Unity Documents & Downloads page:
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Worldwide Web
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