NEXSAN
A StorCentric Company

BEAST and E-Series

Snapshots and Replication User Guide

Part Number: P0450145, Rev. C

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Contents

About this manual

This user guide provides detailed procedures for setting up and using the Snapshots and Replication functions of the Nexsan E-Series and Nexsan BEAST Storage Systems, using both Nexsan Storage Tools and the Web-based graphical user interface (GUI).

Note While Nexsan makes every effort to ensure the accuracy of technical documentation, screen images and procedures may change after publication. In case of discrepancy, please check for the latest updates on the E-Series and BEAST Documents and Downloads page. Also, refer to the latest Release Notes.

Conventions

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

Convention	Description
underlined blue	Cross-references, hyperlinks, URLs, and email addresses.
boldface	Labels on the physical Nexsan Storage System or interactive items in the graphical user interface (GUI).
italics	System messages and non-interactive items in the GUI. References to software user guides.
`monospace`	Command-line interface (CLI) text or text that refers to file or directory names.
`monospace bold`	Text strings that must be entered by the user in the CLI or in text fields in the GUI.

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 Nexsan Storage System or result in mild injury to the user, or both. In software manuals, cautions alerts the user to situations which may cause data corruption or data loss.

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

Contacting Nexsan

For questions about Nexsan products, please visit the Nexsan support Web page, and the E-Series and BEAST 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.

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Related documents

The following Nexsan product manuals contain related information:

- *Nexsan E18 and Nexsan E32 Storage Systems Installation Guide*
- *Nexsan E48 and Nexsan E60 Storage Systems Installation Guide*
- *Nexsan BEAST BT60 and BT60X Storage Systems Installation Guide*
- *Nexsan High-Density Storage User Guide*

Safety notices

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

Revision history

This section lists updates and new material added to the *Nexsan Snapshots and Replication User Guide*.

P0450145, Rev. C, March 2022

Updated for technical accuracy, applied new Nexsan template and branding.

NXS-BESR-UG Rev. 03, November 2015

- Changed name of document to *Nexsan High-Density Storage Snapshots and Replication User Guide*.
- Made changes throughout to include the new Nexsan BEAST line of RAID storage systems.

NXS-ESSR-UG Rev. 02, July 2014

Added section Clone a snapshot on page 39, describing the new snapshot cloning feature and how to use it.

NXS-ESSR-UG Rev. 01, May 2014

Changed formatting throughout to reflect Nexsan as an Nexsan brand; changed name of document to *Nexsan E-Series Snapshots and Replication User Guide*.

Chapter 1

Introduction

Snapshots and replication are two related technologies for further protecting the integrity of data on Nexsan High Density Storage Systems.

This chapter contains the following sections:

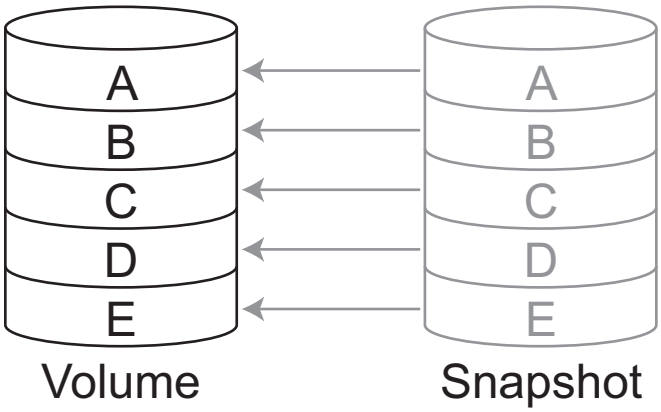
Introduction to snapshots

What is a snapshot?

A snapshot is a “picture” of the data and state of a volume at a particular point in time using a copy-on-write function to capture only data that has changed since the snapshot was taken. A snapshot is not itself a copy or duplicate of the volume data. Rather, at the time the snapshot is made, it contains pointers to the data in the original volume. “Copy-on-write” means that, when data in the volume changes, the old data is copied to the snapshot and preserved.

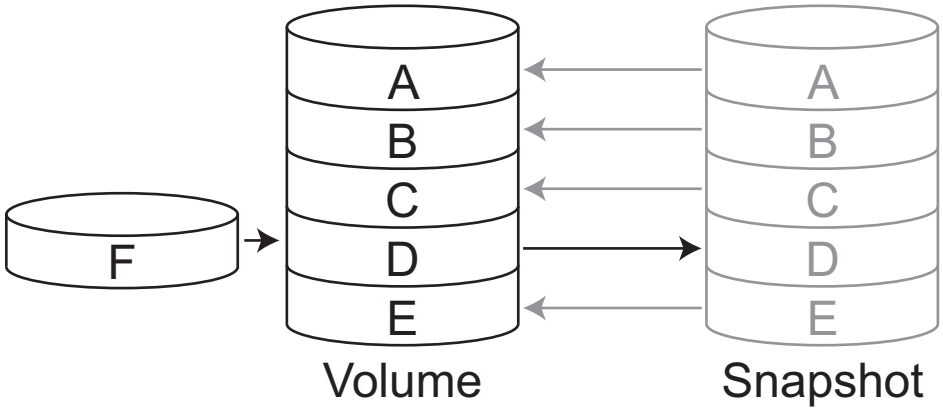
For example, say a volume contains five files, which we will call A, B, C, D, and E. When a snapshot is made of this volume, the snapshot contains pointers to the files A through E, like this:

Figure 1-1: Initial snapshot of a volume



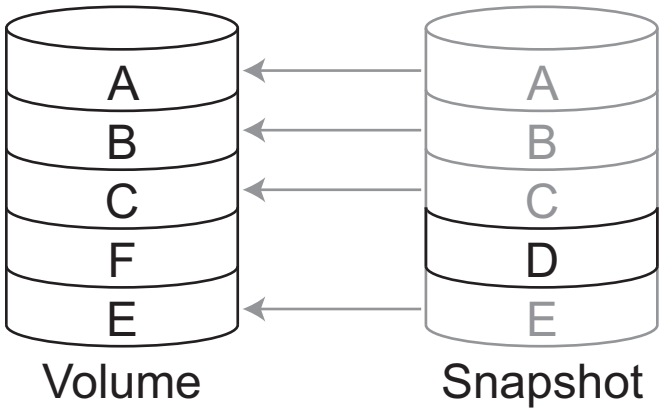
Later, file F is introduced, replacing file D. File D then gets copied to the snapshot, preserving it, while the pointers to the other files remain in place.

Figure 1-2: File D copied when overwritten



When the snapshot is later accessed, although it only contains file D, it acts exactly as the volume did at the time the snapshot was made because of the pointers back to the original volume.

Figure 1-3: Files A–E accessible from snapshot



How are snapshots useful?

There are three basic scenarios in which snapshots are useful: as part of a backup plan, as a way of restoring to a known good configuration, and as a way of testing new software or configurations without affecting the original data.

Backups

In many backup situations, I/O to and from the volume must be stopped while the backup is taking place, a process which can take many hours. By backing up using a snapshot instead of directly from the volume, host volume access can continue, uninterrupted, while the backup is being made. In order for this to work, the snapshot must be mounted. See Mount a snapshot on page 41.

Note Snapshots are NOT backups. Although a snapshot can be used to restore a volume to a previous state, it is not a copy of all of the volume's data and thus cannot be relied upon in the event of volume, data, or system failure.

Restoring

Sometimes, data is lost or becomes otherwise unusable in storage volumes due to problems such as malicious software or accidental deletion. By restoring the volume from a snapshot that was taken at a time when data was known to be good, access to the data can be restored. See Restore volume from a snapshot on page 34 for more information.

Sandboxing

Sometimes, you may want to test a new software application or a new configuration of existing software or data in a working environment, but without the possibility of damaging your data. By mounting a snapshot, you can "sandbox" your development, testing it against the known conditions at the time the snapshot was taken, then discard the altered snapshot when testing is complete. See Mount a snapshot on page 41 for more information.

Introduction to replication

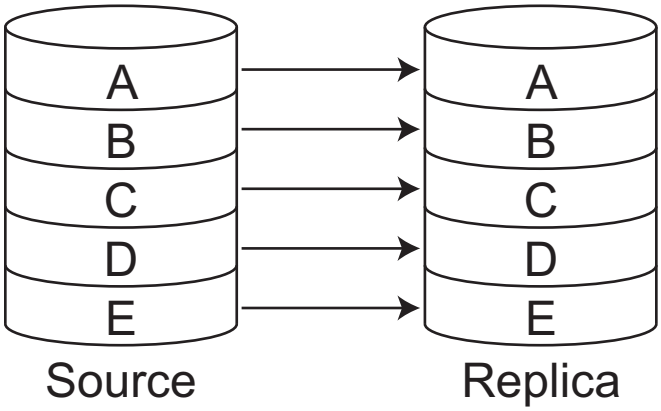
What is replication?

The replication function enables you to make copies (replicas) of a volume onto another Nexsan High Density Storage System to protect data in the event of system failure or as part of a backup and restore architecture. A given volume is always replicated to a single replica volume.

Replications must be set up from the source partner, but data synchronization can be manually initiated from either the source or the destination partner.

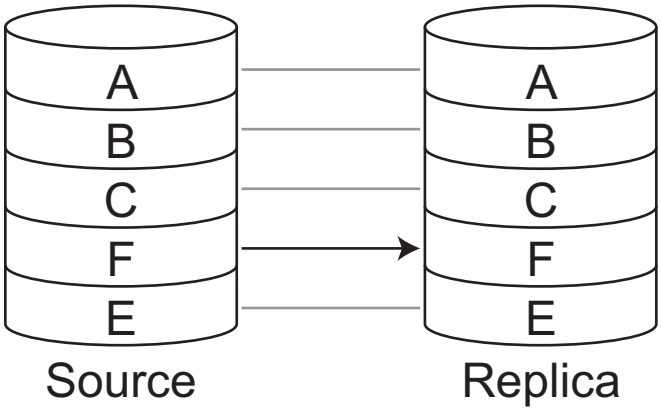
For example, say a volume contains five files, which we will call A, B, C, D, and E. When a replica is made of this volume, initially all five files are copied over.

Figure 1-4: Initial replication



Thereafter, only the changed files are copied to the replica. So if, for instance, file D is replaced by file F, but the other files are unchanged, then during the next replication, only file F is copied.

Figure 1-5: Subsequent replications only copy changed data



Note Because the initial sync copies all files in the volume, it is recommended that initial sync be performed over a local area network (LAN) or a direct connection. Then the replica disks or volume can be taken to the off site location for regular operation.

How is replication useful?

Replication provides a means of backing up volume data on another Nexsan Storage System, either locally or (as is recommended) at another site. If a source volume fails, the replica of that source can be “promoted” to full volume status, allowing the data to be accessed. Although the replica reflects the state of the volume at the last replication, a snapshot taken prior to the last replication can be mounted to view previous states (see Mount a snapshot on page 41). Replication can be used as part of an overall backup or disaster recovery solution.

1

Chapter 2

Enabling Snapshots and Replication

RAID sets and volumes on Nexsan Storage Systems must be configured to allow for snapshots and replication.

This chapter contains the following sections:

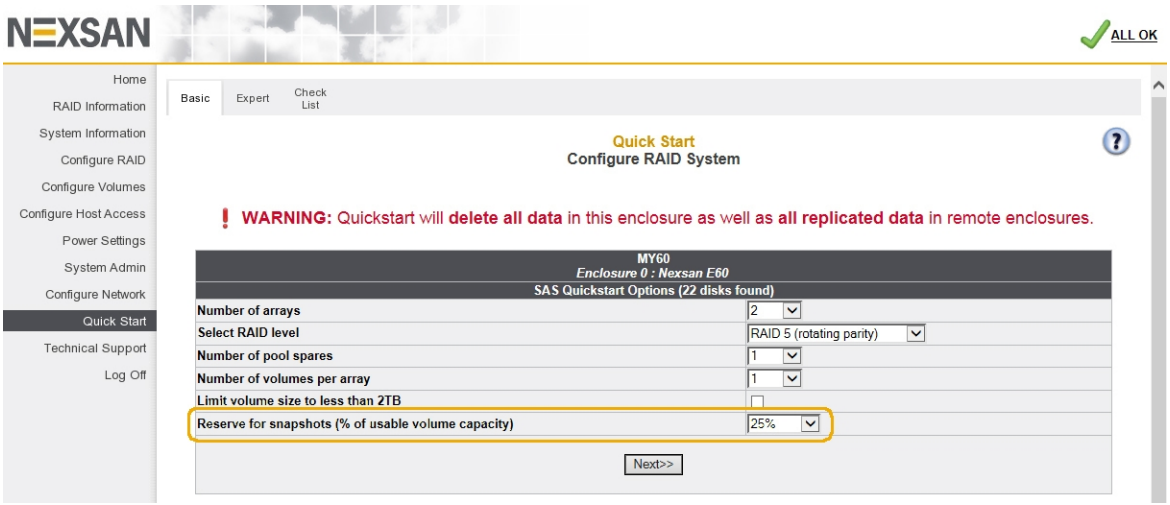
Configure arrays at initial setup

Note This section deals with software setup only. Snapshots do not require special hardware setup, but replication does. See Hardware and network setup on page 51.

During initial unit configuration (see *RAID Array Configuration* in *Chapter 1*, *Basic Setup* in the *Nexsan High Density Storage User Guide*), there is an option on both the Basic and Expert *Quick Start* pages that enables you to configure the RAID sets and volumes for snapshots and replication.

Note Enabling snapshots and replication creates two hidden volumes per array, one for the snapshot reservation and one for metadata. These volumes count towards the per-unit maximum of 254 volumes.

Figure 2-1: Basic *Quick Start* page, with snapshot reservation highlighted



In the **Reserve for Snapshots (% of total volume capacity)** drop-down list, select the amount of each volume's total capacity that you wish to reserve for snapshots. The default setting is **25%**. You can select **10%**, **25%**, **50%**, or **100%**. Enabling snapshots also enables replication. See Snapshot reservation size on page 22 for more information.

Notes:

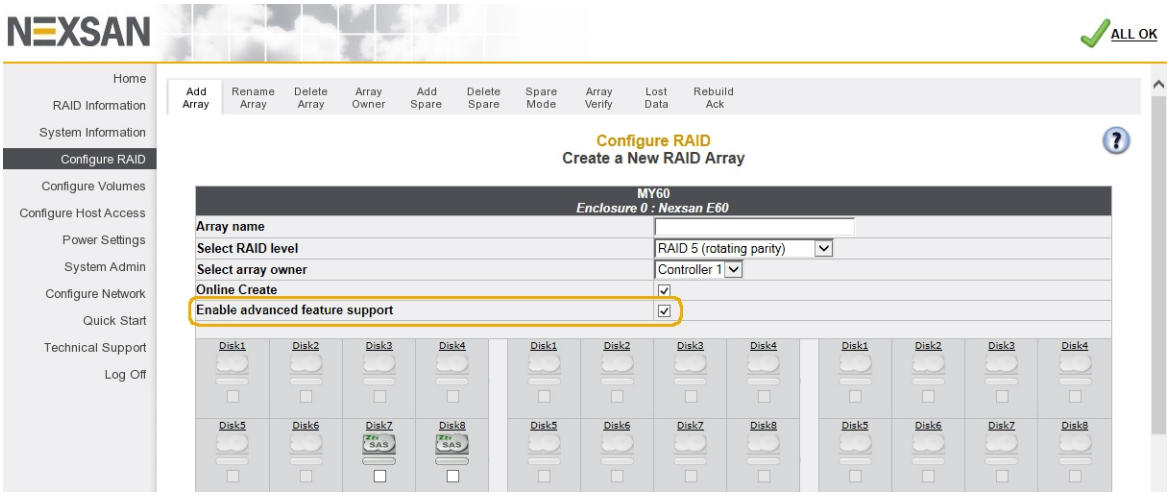
- Selecting **Disabled** will cause the Quick Start operation to use all available space in the array for volumes. To enable snapshots and replication later, you will need to delete at least one volume to free up space for the snapshot reservation.
- If you don't know how much space to set aside for snapshots, it is suggested that you select **25%**. The amount of space reserved for snapshots can be changed at any time using the **Snapshot Reservation (GB)** setting on the *Configure Volume Snapshots* page (see Configure volumes on page 18). See Snapshot reservation size on page 22 for more information.

Configure arrays during creation

RAID sets on Nexsan High Density Storage Systems must be configured for snapshots and replication when they are first created. They cannot be configured for snapshots and replication at any later time. When configuring new RAID sets after unit setup (see *Create a New RAID Array* in *Chapter 3*, *The Graphical User Interface* of the *Nexsan High Density Storage User Guide*), ensure that the **Enable advanced feature support** check box is checked. This enables both snapshots and replication.

Note Enabling snapshots and replication creates two hidden volumes per array, one for the snapshot reservation and one for metadata. These volumes count towards the per-unit maximum of 254 volumes.

Figure 2-2: *Create a New RAID Array* page, with **Enable advanced feature support** highlighted



Note This setting is NOT CHANGEABLE. If you deselect **Enable advanced feature support**, volumes on this RAID set will NEVER have the ability to make snapshots or replications. Even if you don't think you want to use these features now, if there is any chance that you may want to in the future, leave **Enable advanced feature support** selected.

Configure volumes

Volumes on Nexsan High Density Storage Systems must also be configured for snapshots and replication, but unlike RAID sets, they can be configured after creation.

Note The volume must be created on a RAID set that has advanced feature support enabled (see Configure arrays during creation on the previous page).

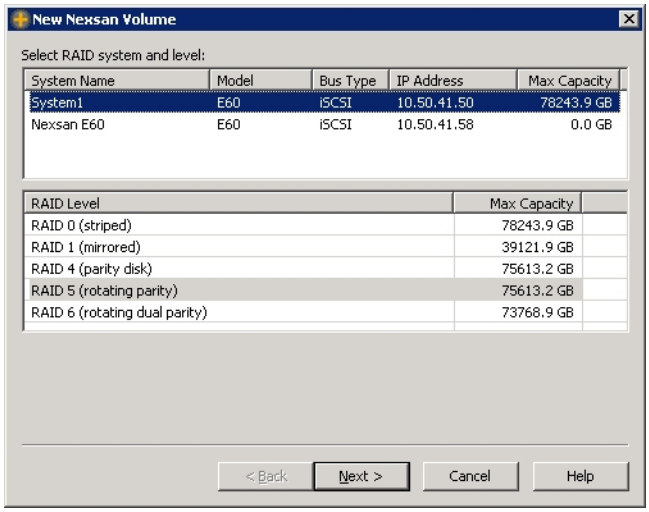
Configure volumes from Nexsan Storage Manager

To enable snapshots on a volume using Nexsan Storage Manager, perform one of the following procedures.

► To enable snapshots at volume creation using Nexsan Storage Manager:

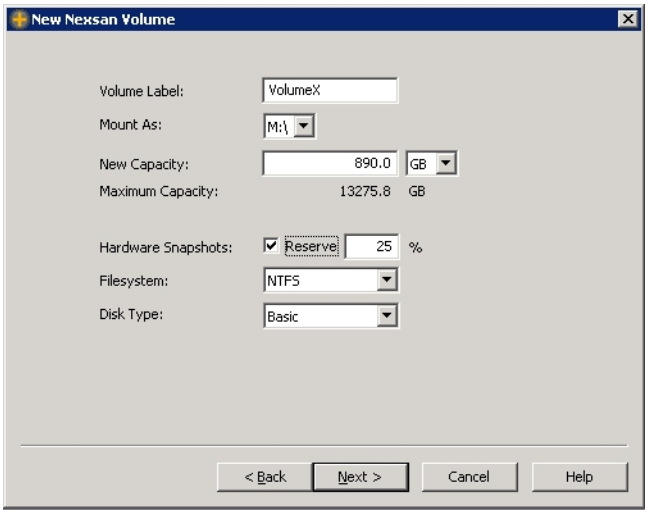
1. In the first *New Nexsan Volume* dialog, select the Nexsan Storage System that you wish to create the RAID set on in the top list, select the RAID level in the bottom list, then click **Next**.

Figure 2-3: *New Nexsan Volume* dialog, initial array creation



2. In the second *New Nexsan Volume* dialog, next to **Hardware Snapshots**, select the **Reserve** check box and enter a percentage in the **%** field. The default (and recommended) percentage is **25**. Enabling snapshots also enables replication. To use replication, it must be configured through the graphical user interface (GUI) after the volume has been created. See Chapter 4, Replication on page 51.

Figure 2-4: *New Nexsan Volume* dialog, new volume options

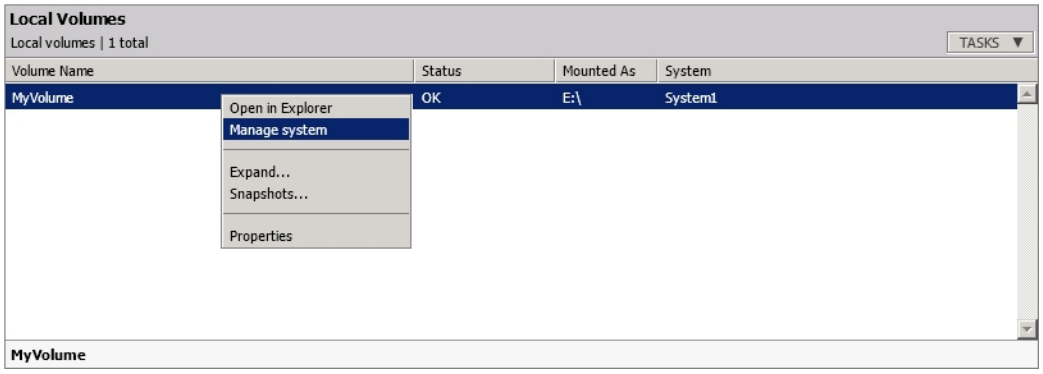


Note The amount of space reserved for snapshots can be changed at any time using the **Snapshot Reservation (GB)** setting on the *Configure Volume Snapshots* page. See Snapshot reservation size on page 22 for more information.

► To enable snapshots for an existing volume using Nexsan Storage Manager:

1. Right-click the volume in the *Local Volumes* list.

Figure 2-5: Nexsan Storage Manager *Local Volumes* list



2. Select **Manage System**.

   The system's *Login* page displays.

3. Follow the instructions for enabling snapshots for an existing volume under Configure volumes from Nexsan Storage Manager on the previous page.

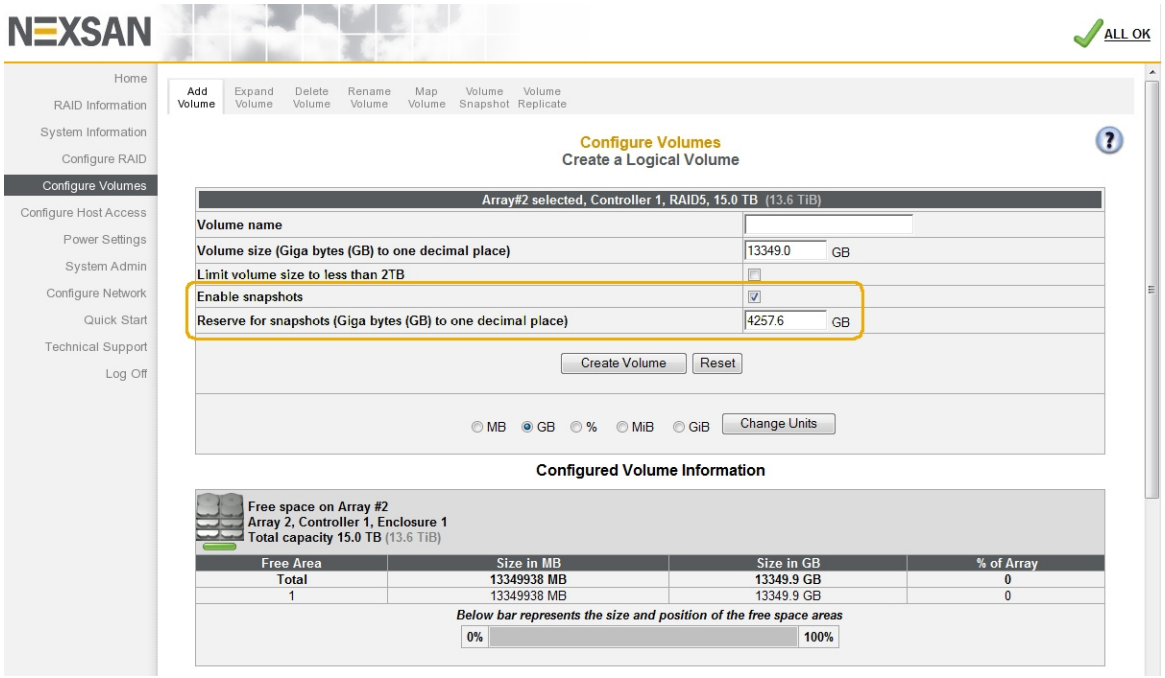
Configure volumes from the graphical user interface

To enable snapshots on a volume using the graphical user interface (GUI), perform one of the following procedures.

► To enable snapshots at volume creation from the graphical user interface:

1. On the *Create a Logical Volume* page, make sure that the **Enable snapshots** check box is checked.

Figure 2-6: *Create a Logical Volume* page, with snapshot options highlighted



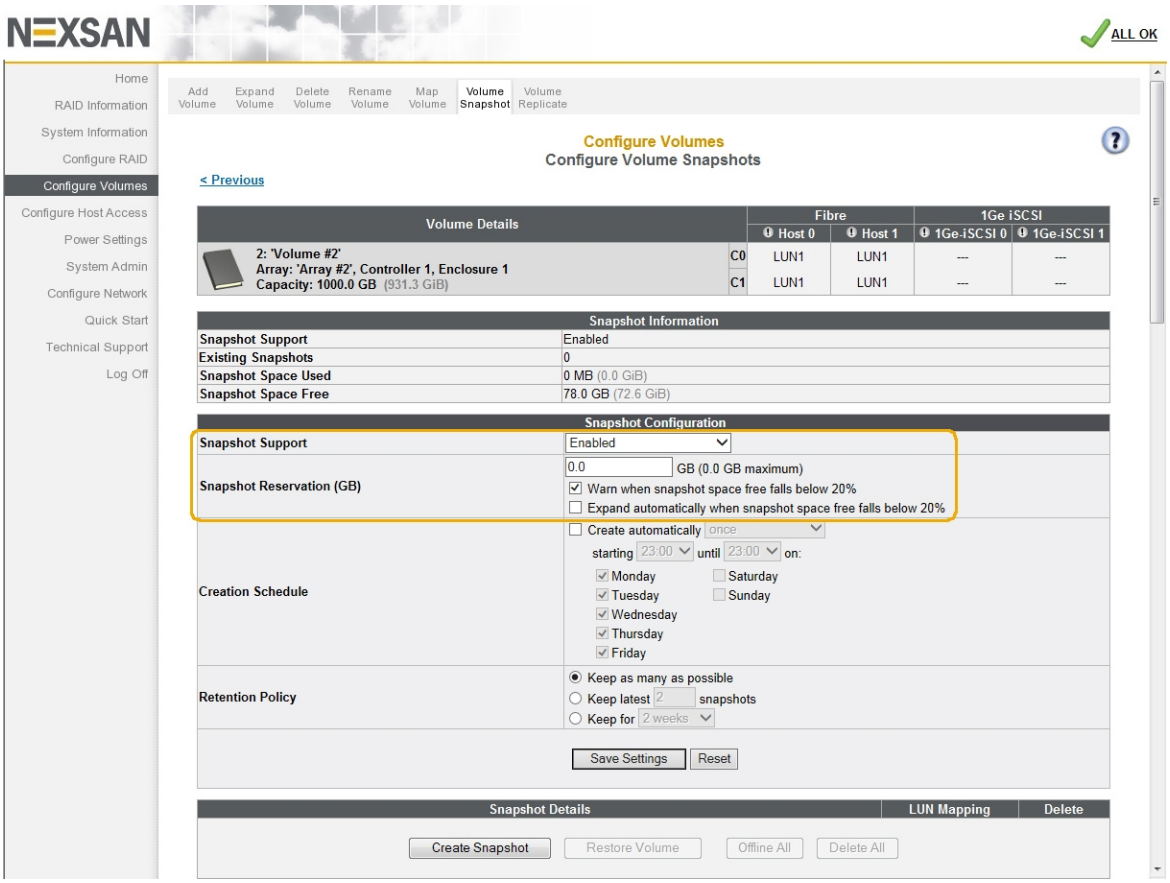
2. Enter a numeric value in the **Reserve for snapshots (Giga bytes (GB) to one decimal place)** field.

Note The amount of space reserved for snapshots can be changed at any time using the **Snapshot Reservation (GB)** setting on the *Configure Volume Snapshots* page. However, it is recommended that this number be set to approximately 25% of the **Volume Size**. See Snapshot reservation size on page 22 for more information.

► To enable snapshots for an existing volume from the graphical user interface:

1. Click **Configure Volumes > Volume Snapshots** to open the *Volume Snapshots* page.
2. Click the **Next** button next to the desired volume to open its *Configure Volume Snapshots* page.

Figure 2-7: *Configure Volume Snapshots* page with snapshot enabling options highlighted



3. Select **Enabled** in the **Snapshot Support** drop-down list.

   Note You can also select **Enabled (Replication only)** if you only wish to enable replication on this volume and not snapshots. Snapshots can always be enabled later by selecting **Enabled** and entering a value in the **Snapshot Reservation (GB)** field.

4. Enter a numerical value (in GB) in the **Snapshot Reservation (GB)** field (25% of total volume space recommended, can be changed at any time). Enabling snapshots also enables replication. See Snapshot reservation size on the next page for more information.

5. If you want the snapshot reservation to be automatically expanded (enlarged) when its remaining space drops below 20%, check the box next to **Expand automatically when snapshot space free falls below 20%**.

   Note It is STRONGLY RECOMMENDED that you leave the **Warn when snapshot space free is below 20%** check box checked. This setting causes a warning to be displayed when the reservation space is more than 80% full, allowing you to delete snapshots or expand the reservation size before the reservation is completely full.

Snapshot reservation size

There are several factors to consider when determining the right snapshot reservation size for your installation.

- **Snapshot frequency and lifespan**: The rate at which snapshots are taken and the length of time that they are retained contribute to how quickly snapshot reservation space is used. If snapshots are taken frequently, and the retention period is long (see Set snapshot retention policy on page 33), a larger snapshot reservation may be desirable.
- **Amount of volume data**: If the volume contains enough data that it is close to its total capacity, then snapshots can be commensurately larger, possibly requiring more snapshot reservation space.
- **Rate of volume data change**: Even if the amount of data in the volume is relatively small, if it is changing rapidly, then snapshots will be larger, as more changes occur between them. This can also require the snapshot reservation to be larger.
- **Replication frequency and bandwidth**: The snapshot reservation is also used to store data for replication (see Chapter 4, Replication on page 51). If replication occurs infrequently, or over a low-bandwidth connection, more snapshot reservation space may be required on the source partner. Conversely, if replication occurs frequently with high throughput, more snapshot reservation space may be required on the destination partner.

There are no hard and fast rules for determining the correct snapshot reservation size for every situation. The default recommended initial value is 25% of the total volume space, but you are encouraged to try different reservation sizes to see what works best for you.

The amount of space reserved for snapshots can be changed at any time using the **Snapshot Reservation (GB)** setting on the *Configure Volume Snapshots* page (see Configure volumes on page 18). It can also be set to automatically expand by checking the **Expand automatically when snapshot space free falls below 20%** check box. There are two limitations to this, however:

- Expanding the snapshot reservation requires unused space on the RAID array. If there is no unused space, consider reducing the snapshot reservation size of another volume to free up the necessary space.
- Reducing the snapshot reservation size is always possible, but if you reduce it to a size that is smaller than what the snapshots in the reserve take up, the oldest snapshots will be permanently deleted.

Chapter 3

Snapshots

A volume snapshot is a “picture” of the data and state of a volume at a particular point in time using a copy-on-write function to capture only data that has changed since the last snapshot.

This chapter contains the following sections:

Create a volume snapshot

The most common way for snapshots to be created is by specialized applications, such as Backup Exec or Simpanna, that run on Microsoft Windows servers. These third-party software packages can take advantage of snapshot features on the RAID system using the Volume Shadow Copy Service (VSS) but may require configuration (see the application’s documentation for details). Nexsan also provides for creating snapshots through Windows Shell Extensions (part of the Nexsan Storage Tools), through the Nexsan Storage Manager (part of the Nexsan Storage Tools), and through the unit’s graphical user interface (GUI).

Note Because of the nature of the way snapshots work (see Introduction to snapshots on page 10), it is recommended that you do NOT defragment any volumes that have snapshots.

Create a volume snapshot using Windows Shell Extensions

Shell Extensions for Windows allow you to manage your Nexsan Storage Systems directly from Windows rather than through the Nexsan Storage Manager. This is the preferred method for taking and managing snapshots on Windows systems. Shell Extensions are installed by default when the Nexsan Storage Tools suite is installed.

Note Shell Extensions are only available for Microsoft Windows platforms. Shell Extensions cannot be used to take snapshots of multi-partition or “dynamic” disks.

► To create a snapshot using Windows Shell Extensions:

1. From either **Server Manager > Disk Management** or **Start > Computer**, right-click the volume and select **Properties**.

Figure 3-1: Accessing volume properties from Server Manager

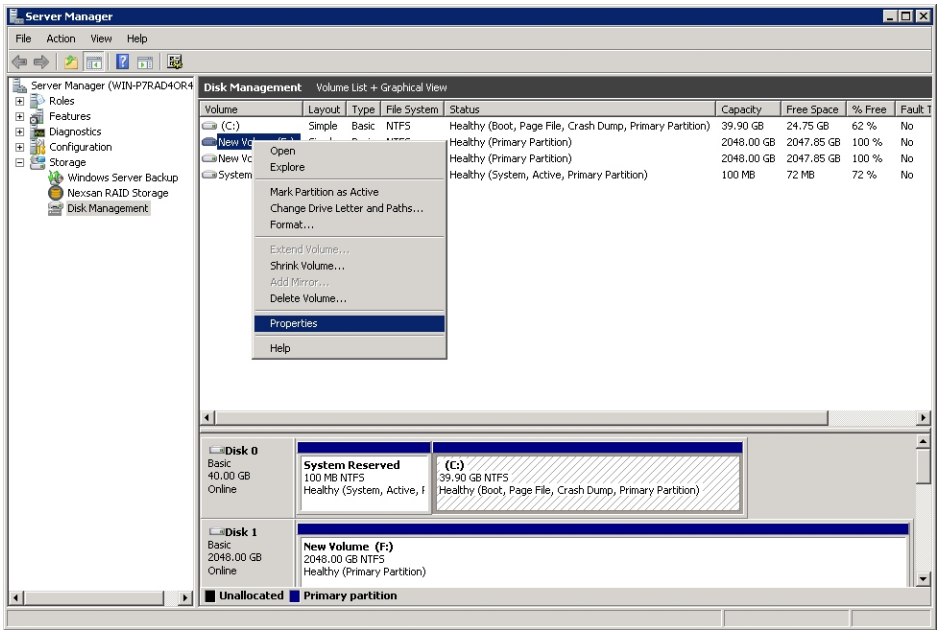
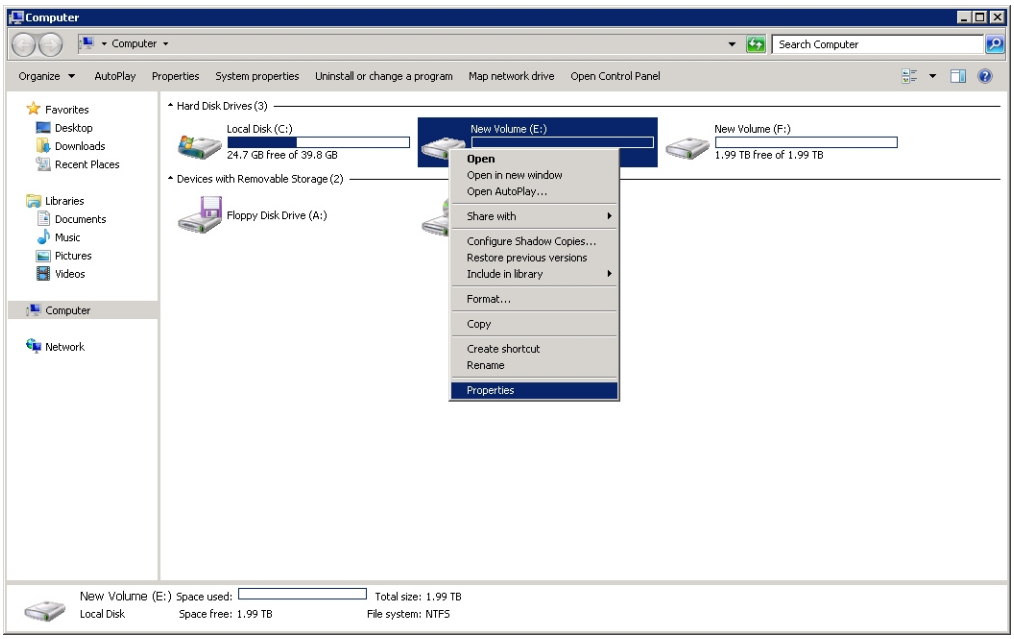


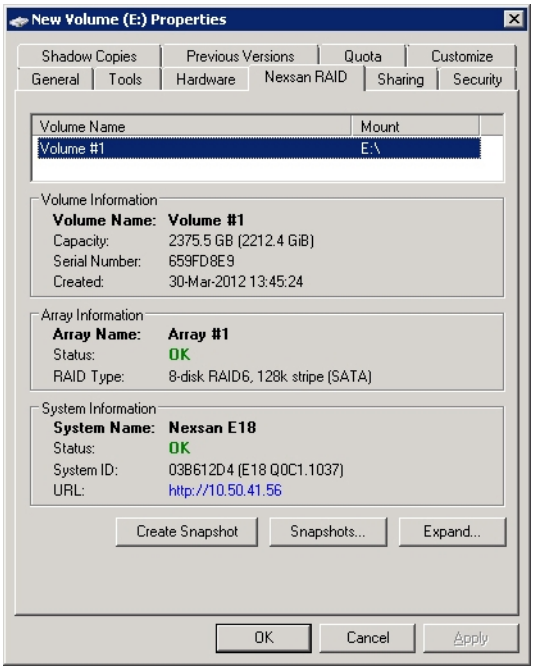
Figure 3-2: Accessing volume properties from the hard drive list



The *Properties* dialog opens.

2. Select the **Nexsan RAID** tab to display the Nexsan volume properties and the snapshot creation and management buttons.

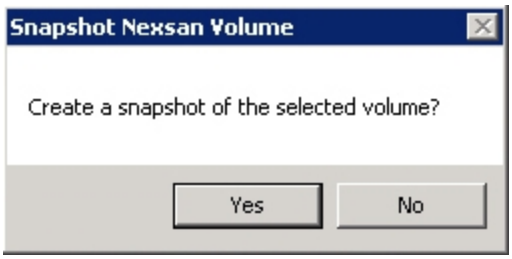
Figure 3-3: **Nexsan RAID** tab in the *Properties* dialog



3. Click the **Create Snapshot** button.

   A confirmation dialog opens, asking if you want to create the snapshot.

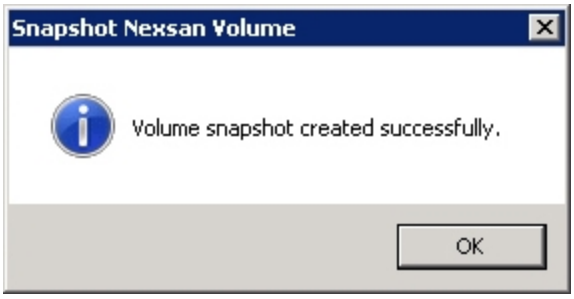
Figure 3-4: Snapshot creation confirmation dialog



4. Click **Yes**.

   It takes a few seconds for the snapshot to be created. When snapshot creation is finished, the system displays another dialog, informing you of the successful completion of the operation.

Figure 3-5: Snapshot created successfully



5. Click **OK** to close the dialog, then click **OK** again to close the *Properties* dialog.

Create a volume snapshot using Nexsan Storage Manager

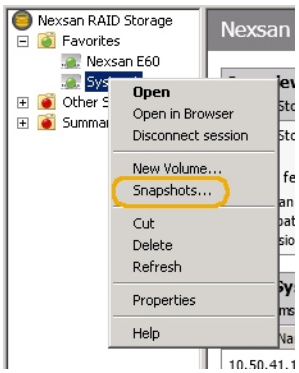
Notes:

- Nexsan Storage Manager is only available for Microsoft Windows platforms. Nexsan Storage Manager cannot be used to take snapshots of multi-partition or “dynamic” disks.
- Microsoft Windows does not support using Nexsan Storage Manager to take snapshots of volumes that are exposed through VMware ESX Server.

► To create a snapshot of a volume from Nexsan Storage Manager:

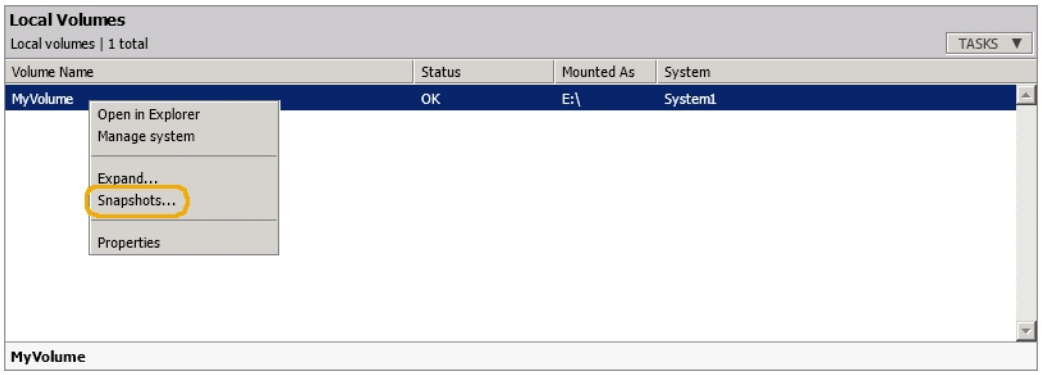
1. Do one of the following:
   - Right-click the unit in the left navigation pane, then select **Snapshots**.

Figure 3-6: Selecting **Snapshots** from the left navigation pane



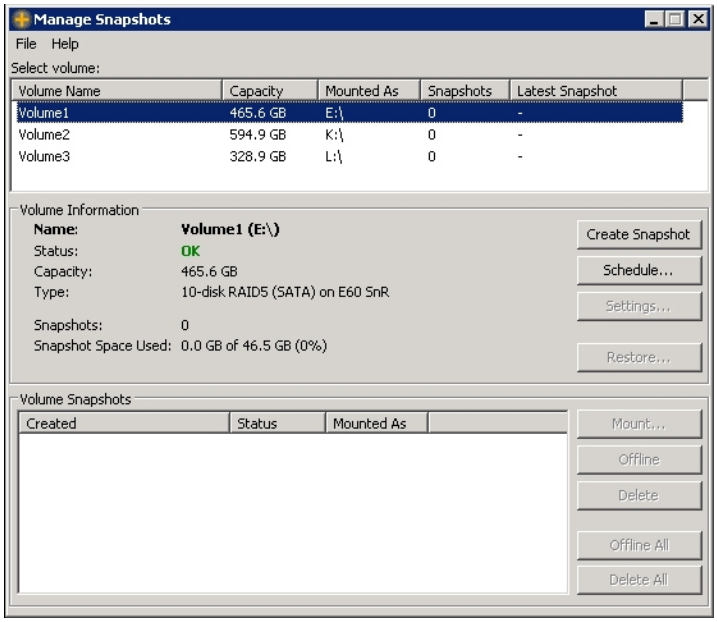
- In the *Local Volumes* section, right-click the volume and select the **Snapshots** link.

Figure 3-7: Selecting **Snapshots** from the *Local Volumes* section



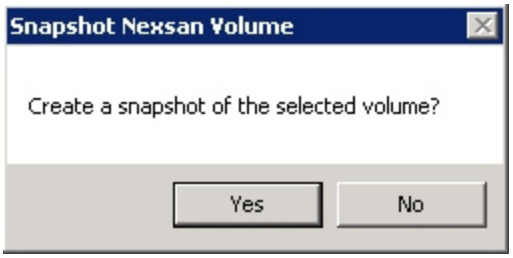
The *Manage Snapshots* dialog box opens.

Figure 3-8: *Manage Snapshots* dialog



2. In the *Select Volume* list, select the volume that you wish to create a snapshot of.
3. Click the **Create Snapshot** button in the *Volume Information* section.

Figure 3-9: *Snapshot Nexsan Volume* dialog



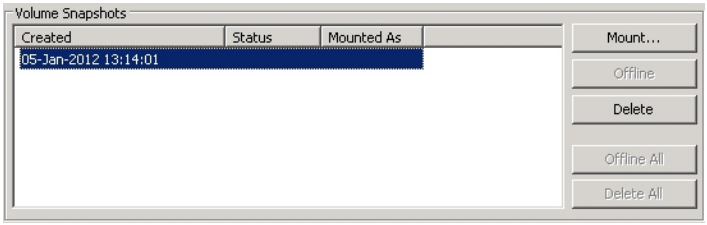
4. Click **Yes**.

   It takes a few seconds for the snapshot to be created. When snapshot creation is finished, the message *Snapshot created successfully* appears.

5. Click **OK**.

   The snapshot is now displayed in the *Volume Snapshots* section.

Figure 3-10: *Volume Snapshots* section displaying new snapshot



Schedule volume snapshots using Shell Extensions or NSM

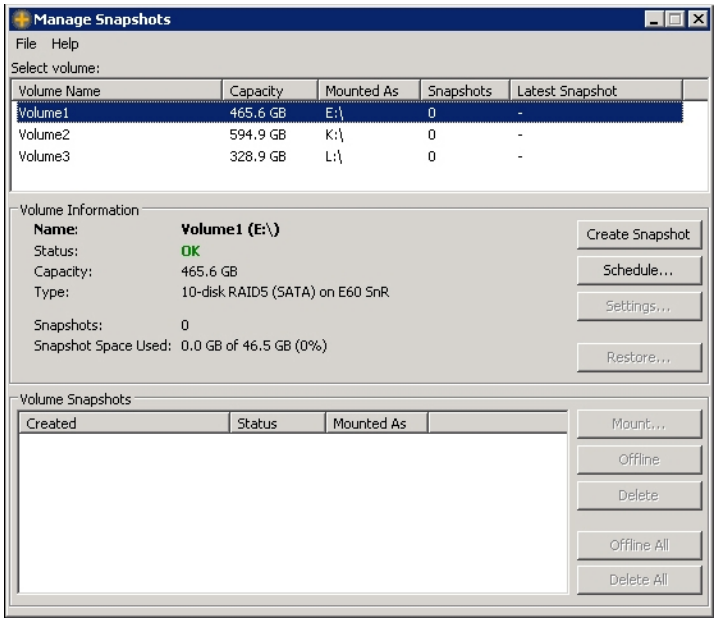
To create a schedule for taking snapshots:

1. Do one of the following:
   - From *Disk Management* or the hard drive list, right click the volume and select **Properties**, then select the **Nexsan RAID** tab, then click the **Snapshots** button.
   - In Nexsan Storage Manager, right-click the unit in the left navigation pane, then select **Snapshots**.
   - In the *Local Volumes* section of Nexsan Storage Manager, right-click the volume and select the **Snapshots** link.

   The *Manage Snapshots* dialog box opens.

2. If more than one volume displays in the *Select Volume* list, select the desired volume.

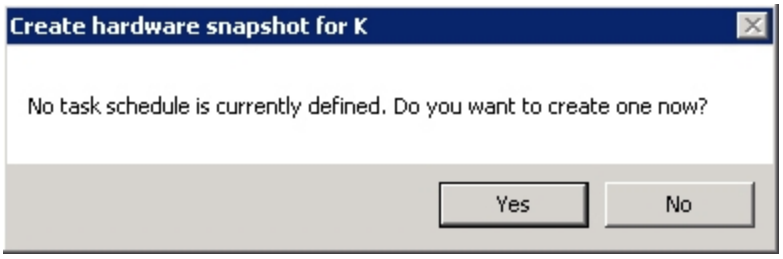
Figure 3-11: Manage Snapshots dialog with volume selected



3. Click the **Schedule** button in the *Volume Information* section.

   The *Create hardware snapshot for X* dialog appears.

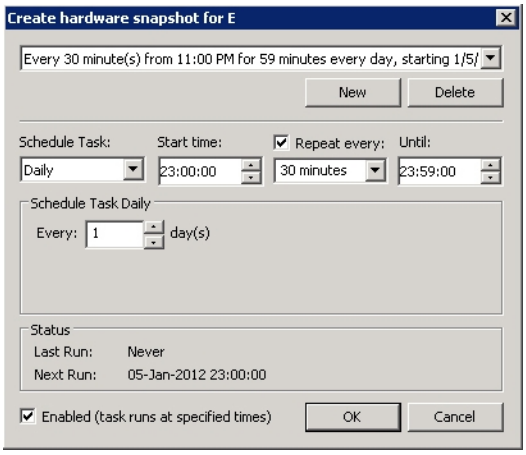
Figure 3-12: *Create hardware snapshot for X* dialog (example)



4. Click **Yes**.

   The scheduling tools display.

Figure 3-13: Snapshot scheduling tools dialog

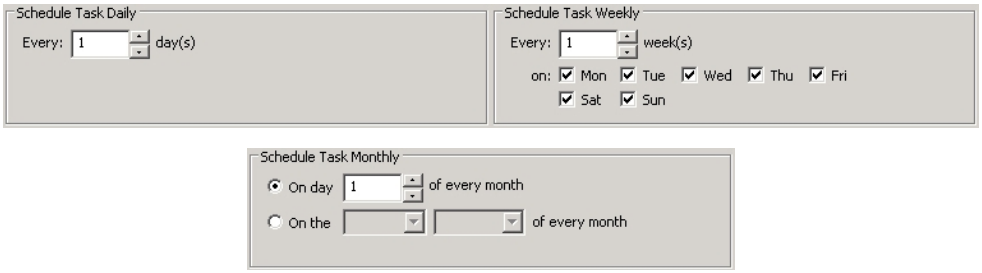


5. In the **Schedule Task** drop-down list, select a frequency. You can select **Daily** (the default), **Weekly**, or **Monthly**.
6. In the **Start time** field, enter a time of day that you wish the snapshot to be created, or use the up and down arrows to select the time.
7. If you wish to create multiple snapshots over a period of time, select the **Repeat every** check box, select a frequency (**15 minutes**, **30 minutes**, **1 hour**, **2 hours**, **4 hours**, **6 hours**, or **12 hours**), and enter or select a time in the **Until** field.

   Note You are not limited to the choices in the **Repeat every** drop-down list. For instance, you can enter `8 hours` or `20 minutes`, and the schedule will follow accordingly.

8. Make additional schedule refinements in the *Schedule Task Daily/Weekly/Monthly* section.

Figure 3-14: *Schedule Task Daily*, *Schedule Task Weekly*, and *Schedule Task Monthly* sections.



9. Ensure that the **Enabled (task runs at specified times)** check box is checked.
10. Click **OK**.

The schedule is set, and the unit will create snapshots at the times specified in the schedule.

Create a volume snapshot through the graphical user interface

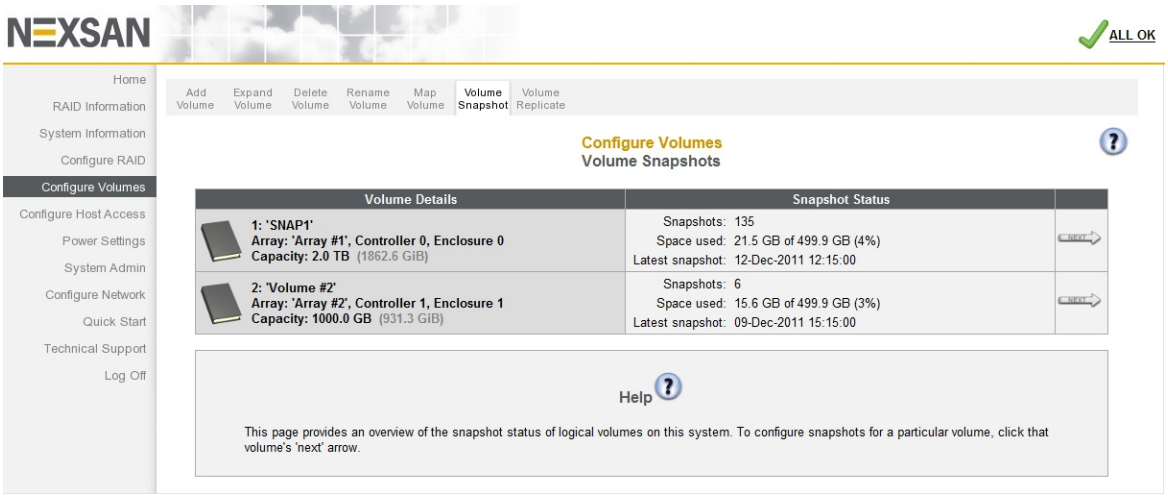
If you do not have a Microsoft Windows host server, or if you cannot use Shell Extensions or Nexsan Storage Manager for some other reason, you must create snapshots using the graphical user interface (GUI).

Note Snapshots created through the graphical user interface (GUI) may not contain information that is still in the host's internal cache and not written to the RAID array, which may cause data to become corrupted. For this reason, it is strongly recommended that all host I/O be halted when taking a volume snapshot through the graphical user interface (GUI).

▶ **To create a snapshot of a volume through the graphical user interface (GUI):**

1. Click **Configure Volume > Volume Snapshots** to go to the *Volume Snapshots* page.

Figure 3-15: *Volume Snapshots* page

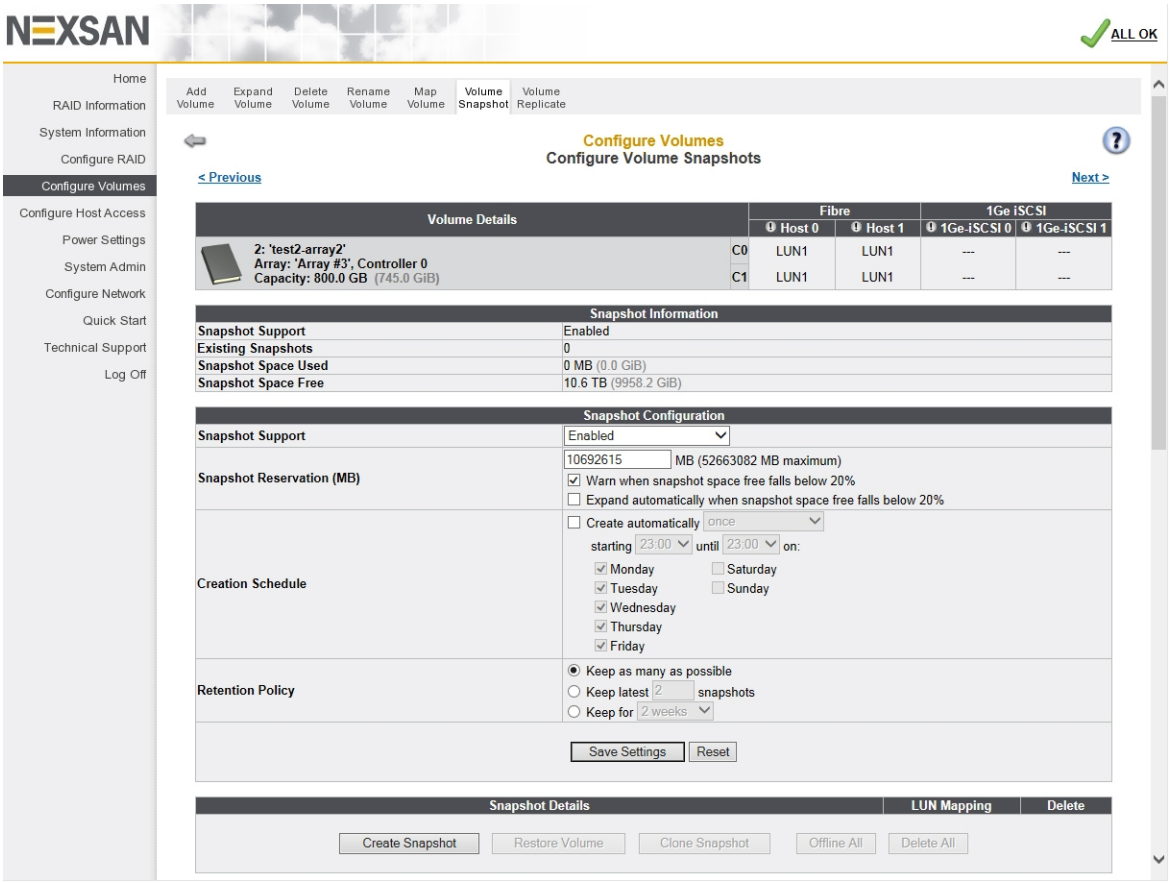


Each *Volume Details* section lists the volume number, current volume name, the RAID set that the volume belongs to, the controller that the RAID set is assigned to, the enclosure, and the volume's capacity.

Each volume's *Snapshot Status* section displays the number of snapshots, the amount of hard disk space that the snapshots take up, and the date of the most recent snapshot.

2. Click the **Next** button next to the volume that you want to create a snapshot of to go to the volume's snapshot management tools.

Figure 3-16: *Configure Volume Snapshots* page



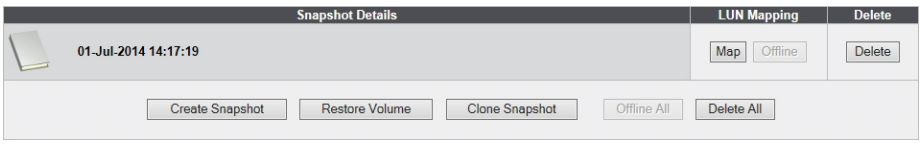
The *Volume Details* section lists the volume number, current volume name, the array the volume belongs to, the controller that the array is assigned to, the enclosure, the volume's capacity, and the volume's host port assignments (see *Configured Logical Volumes* in *Chapter 3* of the *Nexsan High Density Storage User Guide*).

The *Snapshot Information* section displays whether snapshots are enabled for the volume. If they are, then it also shows the number of snapshots, the amount of hard disk space used by existing snapshots, and the amount of space available for additional snapshots.

3. Click the **Create Snapshot** button in the *Snapshot Details* section.

The message *Snapshot created successfully* appears, and the details of the snapshot can be seen in the *Snapshot Details* section of the page.

Figure 3-17: *Snapshot Details* section with snapshot displayed



The snapshot can now be used to restore the volume (see Restore volume from a snapshot on the next page), be mapped to a LUN (see Mount a snapshot on page 41), or be deleted (see Delete snapshots on page 47).

Schedule volume snapshots through the graphical user interface

▶ **To schedule volume snapshots through the graphical user interface (GUI):**

1. Click **Configure Volume > Volume Snapshots** to go to the *Volume Snapshots* page.
2. Click the **Next** button next to the volume that you want to set a snapshot schedule for to go to the volume's *Configure Volume Snapshots* page.
3. Click the check box next to **Create automatically**, then select a value in the drop-down list. The possible values are:

   once (the default)
   every 15 minutes
   every 30 minutes
   every hour
   every 2 hours
   every 4 hours
   every 6 hours
   every 12 hours
4. Use the **starting** and **until** drop-down lists to set the start and end times that the unit should create snapshots of the volume. Between these times, the unit will create a snapshot at the frequency selected in the **Create automatically** drop-down list.

   Note If the frequency selected is **once**, then the **until** drop-down list is grayed out.
5. Check the boxes next to the days of the week that you want the unit to create snapshots of this volume.
6. Click the **Save Settings** button.

The schedule is set, and the unit will create snapshots at the times specified in the schedule.

Set snapshot retention policy

If the snapshot reservation space for a volume is filled, snapshots may be deleted automatically and the volume performance may be temporarily degraded. To avoid filling the snapshot reservation, set retention policies to limit the number of snapshots that are kept for each volume. You can set up snapshot retention policies based on maximum snapshot count or snapshot lifetime.

Note Setting the snapshot retention policy is only possible through the graphical user interface (GUI).

▶ **To set a retention schedule for volume snapshots:**

1. Click **Configure Volume > Volume Snapshots** to go to the *Volume Snapshots* page.
2. Click the **Next** button next to the volume that you want to set the snapshot retention policy for to go to the volume's *Configure Volume Snapshots* page.
3. In the **Retention Policy** section, select and configure the retention policy using one of these three possible selections:
   - **Keep as many as possible** retains as many snapshots as there is room for in the snapshot reservation.

- **Keep latest *N* snapshots** enables you to set the number of snapshots that will be kept. The maximum number for this setting is **255**.
- **Keep for *N amount of time*** enables you to set the time period for snapshot retention. Select the time period from the drop-down list. The possible values are:

  1 day
  1 week
  2 weeks (the default)
  1 month
  2 months
  6 months
  1 year

4. Click the **Save Settings** button.

The retention policy is set, and the unit will retain snapshots based on the settings selected.

Restore volume from a snapshot

Volumes can be returned to the state they were in at the time of a given snapshot by using the Restore function.

Notes:

- All host access to the volume should be shut down prior to performing a volume restoration from a snapshot.
- Volume restoration from a snapshot can take a considerable amount of time. Unit performance may be affected during the restoration process.
- Restoring a volume from a mounted snapshot (see Mount a snapshot on page 41) does NOT include any data that was changed since the snapshot was mounted.

Restore volume using Shell Extensions or NSM

Note Shell Extensions and Nexsan Storage Manager are only available for Microsoft Windows platforms.

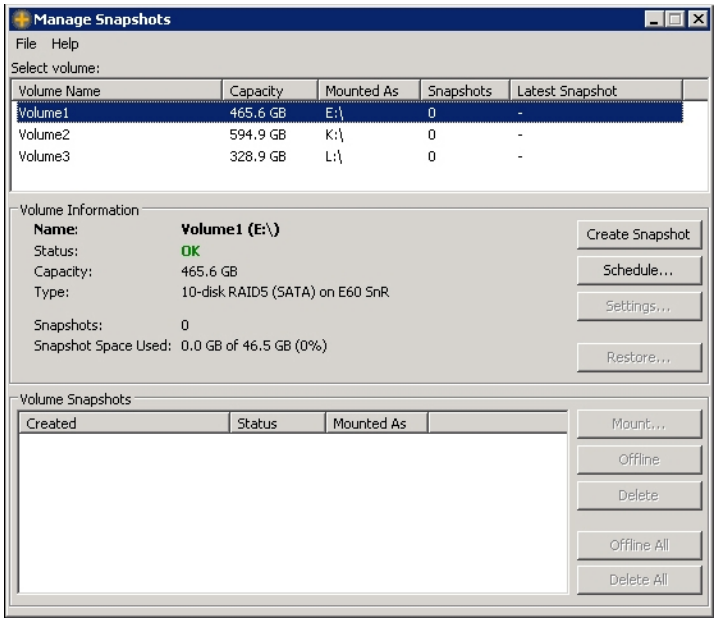
► **To restore a volume from a snapshot using Shell Extensions or Nexsan Storage Manager:**

1. Do one of the following:
   - From *Disk Management* or the hard drive list, right click the volume and select **Properties**, then select the **Nexsan RAID** tab, then click the **Snapshots** button.
   - In Nexsan Storage Manager, right-click the unit in the left navigation pane, then select **Snapshots**.
   - In the *Local Volumes* section of Nexsan Storage Manager, right-click the volume and select the **Snapshots** link.

   The *Manage Snapshots* dialog box opens.

2. If more than one volume displays in the *Select Volume* list, select the desired volume.

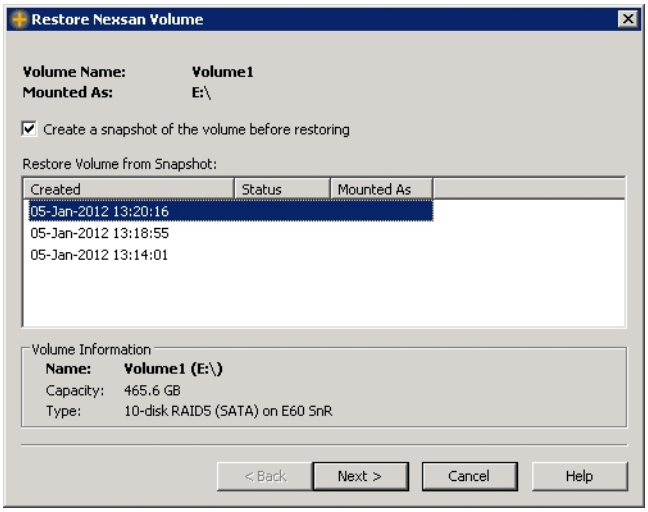
Figure 3-18: Manage Snapshots dialog with volume selected



3. Click the **Restore** button in the *Volume Information* section.

   The *Restore Nexsan Volume* dialog box appears.

Figure 3-19: *Restore Nexsan Volume* dialog

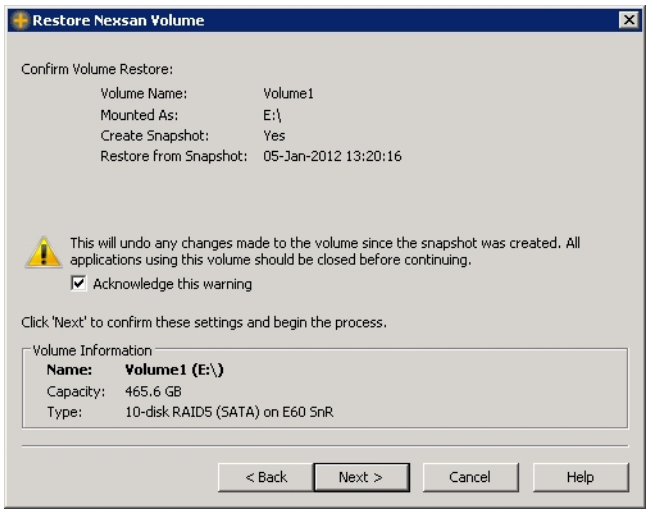


4. Do one of the following:
   - If you wish to create a snapshot of the volume as it currently exists before restoring it, leave the **Create a snapshot of the volume before restoring** check box checked.
   - If you do not wish to create a snapshot of the volume as it currently exists before restoring it, uncheck the **Create a snapshot of the volume before restoring** check box.

5. In the *Restore Volume from Snapshot* list, select the snapshot that you wish to use to restore the volume.
6. Click **Next>**.

   The *Confirm Volume Restore* dialog appears.

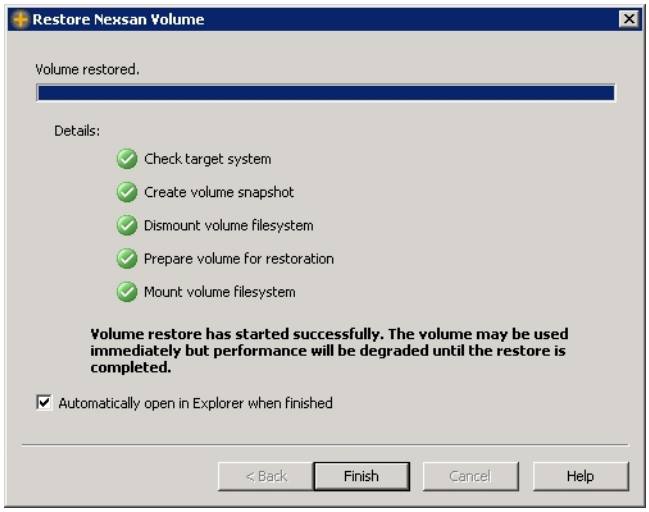
Figure 3-20: *Confirm Volume Restore* dialog



7. Under *Confirm Volume Restore*, make sure that the information is correct. If it isn't click **<Back** and make corrections.
8. Read the warning regarding undoing changes, then click the **Acknowledge this warning** check box.
9. Click **Next>**.

   The volume restoration process begins. A list of items appears, and a progress bar shows the progress of the restoration. When the volume can once again be accessed, the message *Volume restore has started successfully...* appears.

Figure 3-21: *Restore Nexsan Volume* dialog, showing that the volume has been restored



10. Do one of the following:
    - If you wish to automatically open the volume in Windows Explorer, leave the **Automatically open in Explorer when finished** check box checked.
    - If you do not wish to automatically open the volume in Windows Explorer, uncheck the **Automatically open in Explorer when finished** check box.
11. Click **Finish**.

After the volume has been restored, additional steps may be required on the host to mount and access the volume data. See your operating system's or application's documentation for details.

Restore volume from the graphical user interface

If you do not have a Microsoft Windows host server, or if you cannot use Shell Extensions or Nexsan Storage Manager for some other reason, you must perform the volume restoration through the graphical user interface (GUI).

To restore a volume from a snapshot through the graphical user interface (GUI):

1. Click **Configure Volume > Volume Snapshots** to go to the *Volume Snapshots* page.
2. Click the **Next** button next to the volume that you want to restore to go to the volume's *Configure Volume Snapshots* page.
3. Under *Snapshot Details*, click **Restore Volume** to go to the *Restore Volume from Snapshot* page.

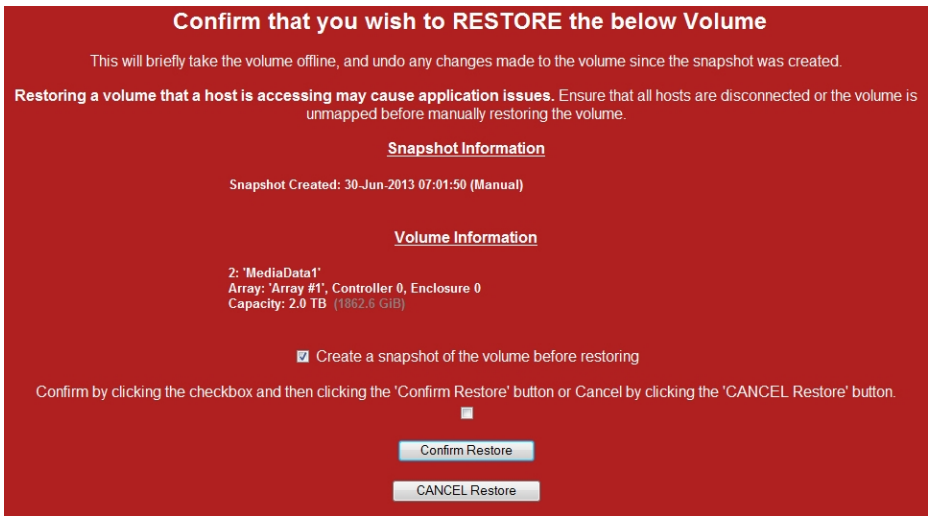
Figure 3-22: *Restore Volume from Snapshot* page

4. Select a snapshot from the list by clicking the button in the *Select* column.

5. Click **Restore Volume**.

   A confirmation screen appears:

Figure 3-23: Restore volume confirmation and warning screen



   Note If you want to create a snapshot of the volume as it exists before restoring, make sure that the box next to **Create a snapshot of the volume before restoring** is checked.

6. Do one of the following:

   - To cancel the restoration, click **CANCEL Restore**.

     A message displays, stating that the operation has been cancelled. Click the **Back** button to return to the *Configure Volume Snapshots* page.

   - To restore the volume from the snapshot, click the check box and then click **Confirm Restore**.

     A message displays, stating that the volume restoration is successful. Click the **Back** button to return to the *Configure Volume Snapshots* page.

3

After the volume has been restored, additional steps may be required on the host to mount and access the volume data. See your operating system's or application's documentation for details.

Clone a snapshot

"Cloning" a snapshot creates a new, separate volume based on the state that the original volume was in when the snapshot was taken. This enables you to examine a volume's previous state without having to revert it and therefore lose all subsequent changes. The "clone" volume can be on the same RAID array or on a different RAID array in the same Nexsan Storage System.

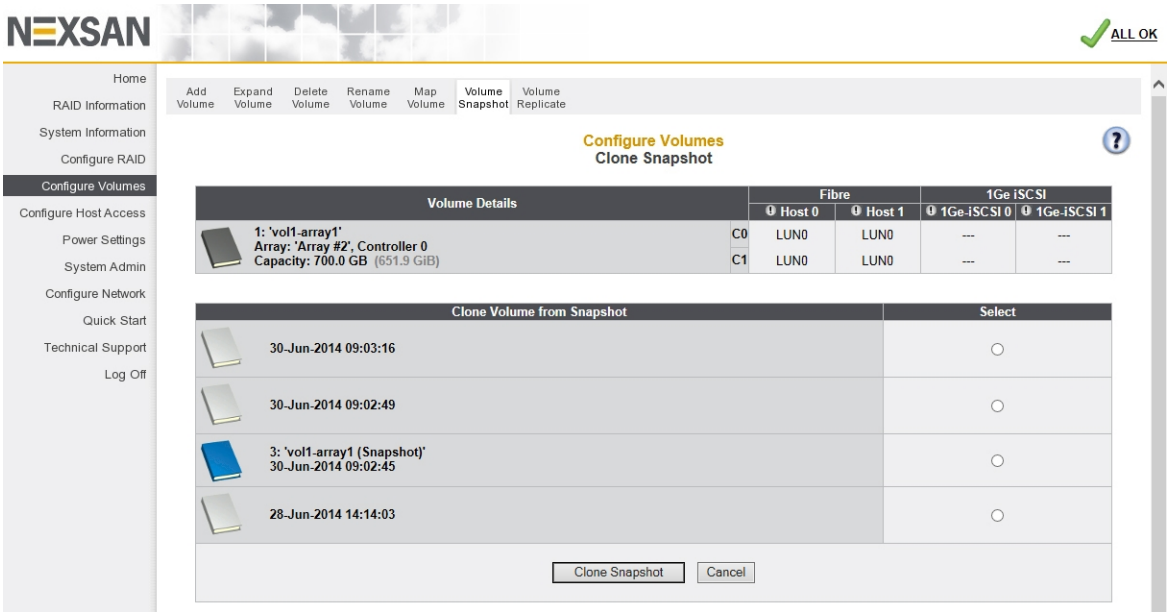
Cloning a snapshot differs from mounting a snapshot (see Mount a snapshot on page 41) in two important ways:

- It does not change the original snapshot in any way. The snapshot is only used as a template from which to create the clone volume.
- The clone volume takes up as much space in its RAID array as the original volume did at the time the snapshot was made. Therefore, the RAID array where the clone volume is to be created must have enough room for all of the data that was in the original volume at the time the snapshot was taken.

To clone a snapshot:

1. Click **Configure Volume > Volume Snapshots** to go to the *Volume Snapshots* page.
2. Click the **Next** button next to the volume that you want to set a snapshot schedule for to go to the volume's *Configure Volume Snapshots* page.
3. In the *Snapshot Details* section, click the **Clone Snapshot** button. This takes you to the *Clone Snapshot* page.

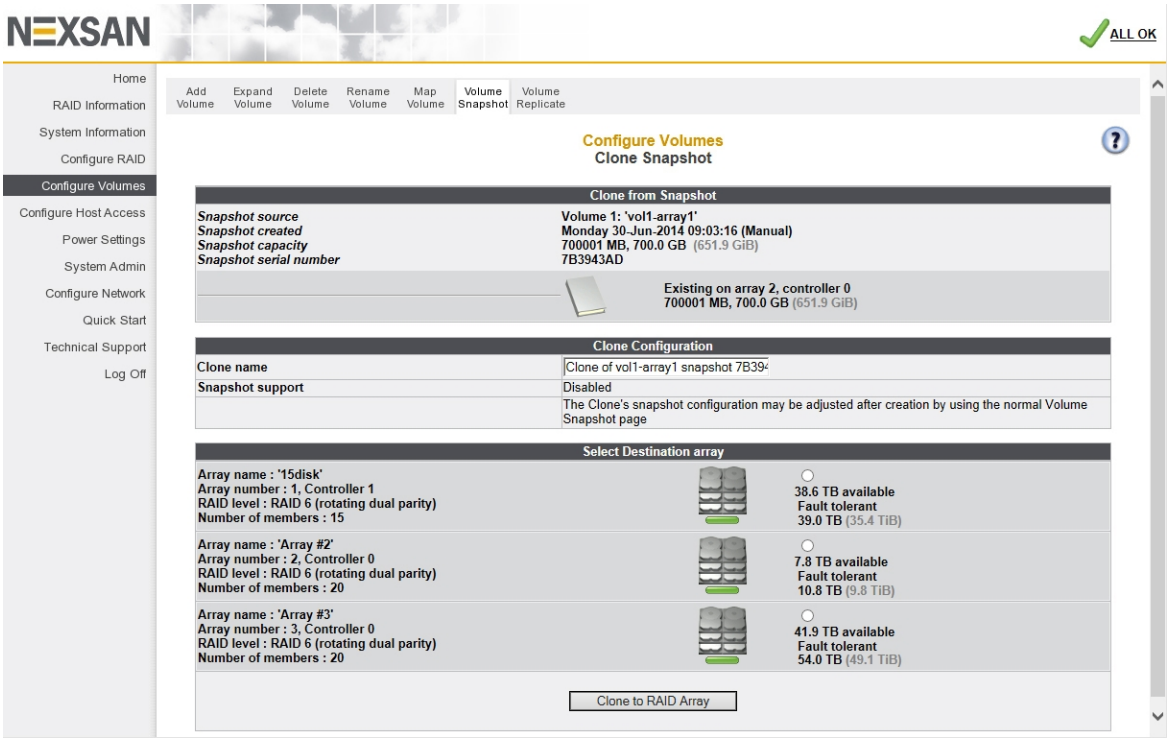
Figure 3-24: First *Clone Snapshot* page



The *Volume Details* section displays information about the source volume (volume number, volume name, array name, controller number, and capacity), plus its LUN mapping.

4. In the *Clone Volume* from Snapshot section's *Select* column, click the selection button for the snapshot that you wish to clone, then click **Clone Snapshot**. This takes you to the snapshot cloning tools page.

Figure 3-25: Second *Clone Snapshot* page



The *Clone from Snapshot* section displays information about the snapshot that is being cloned, including its source, creation date and time, capacity, serial number, array name, controller number, and capacity.

Note If you are cloning a mounted snapshot, the changes made to the snapshot since it was mounted are NOT copied to the new clone volume.

5. In the *Clone Configuration* section, type a name for the volume in the **Clone name** field.
6. In the *Select Destination array* section, click the selection button for the RAID array that you wish to create the clone on, then click **Clone to RAID Array**.

   A message appears indicating that the cloning process has begun.

   Note The amount of time it takes for the clone volume to be created depends on how much data there was on the original volume when the snapshot was taken.
7. Click the **Back** button to be taken to the *Configure Volume Snapshots* page for the newly cloned volume. See Configure volumes from the graphical user interface on page 20.

Mount a snapshot

Mounting a snapshot makes it accessible as a normal volume (including read/write access).

Note Writing data to a mounted snapshot consumes additional snapshot reservation space. Ensure that the snapshot reservation size is sufficient before writing large amounts of data to a mounted snapshot. When you are finished, take the snapshot offline (see Take mounted snapshots offline on page 44) to delete any written data and reclaim the snapshot reservation space.

Mount a snapshot from Shell Extensions or NSM

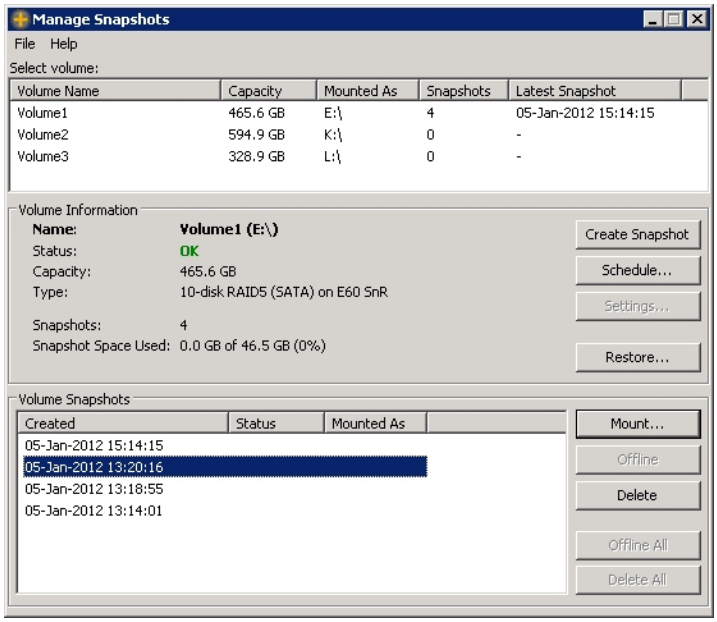
Note Shell Extensions and Nexsan Storage Manager are only available for Microsoft Windows platforms.

► To mount a snapshot using Windows Shell Extensions or Nexsan Storage Manager:

1. Do one of the following:
   - From *Disk Management* or the hard drive list, right click the volume and select **Properties**, then select the **Nexsan RAID** tab, then click the **Snapshots** button.
   - In Nexsan Storage Manager, right-click the unit in the left navigation pane, then select **Snapshots**.
   - In the *Local Volumes* section of Nexsan Storage Manager, right-click the volume and select the **Snapshots** link.

   The *Manage Snapshots* dialog box opens.
2. If more than one volume displays in the *Select Volume* list, select the volume that is associated with the snapshot that you wish to mount.
3. In the *Volume Snapshots* list, select the snapshot that you wish to mount.

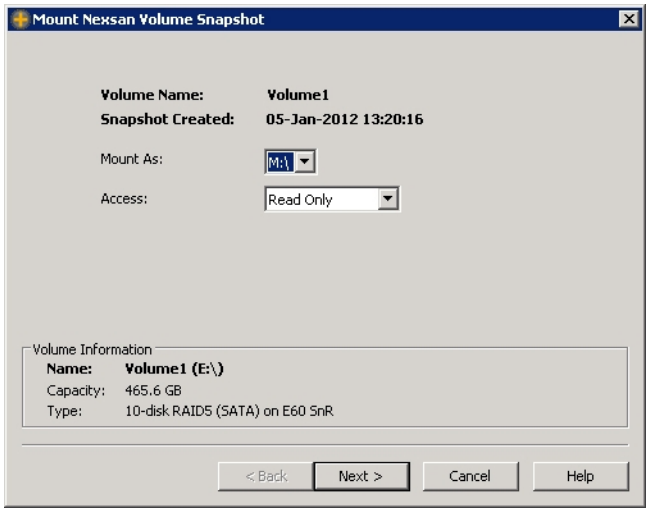
Figure 3-26: Manage Snapshots dialog, with volume selected



4. Click the **Mount** button.

   The *Mount Nexsan Volume Snapshot* dialog box opens.

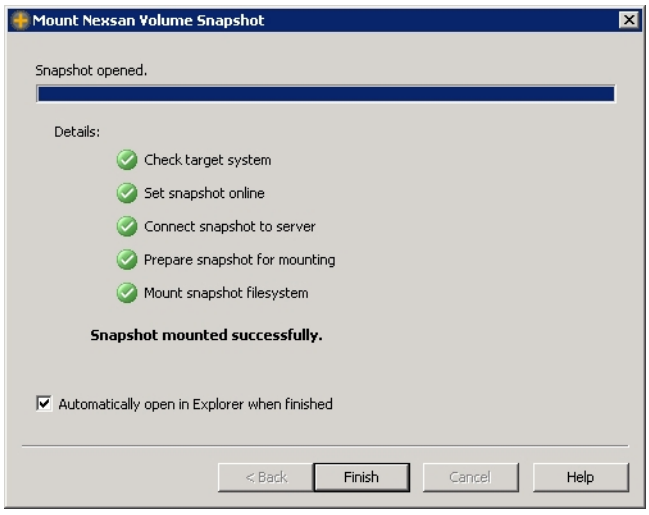
Figure 3-27: *Mount Nexsan Volume Snapshot* dialog



5. Select the drive letter you wish the mounted snapshot to use in the **Mount As** drop-down list.
6. In the **Access** drop-down list, select either **Read Only** or **Read/Write**.
7. Click **Next>**.
8. Confirm your settings on the next page and click **Next>** again.

   The snapshot mounting process begins. A list of items appears, and a progress bar shows the progress of the mount operation. When the process is finished, the message *Snapshot mounted successfully* appears.

Figure 3-28: *Mount Nexsan Volume Snapshot* dialog, showing snapshot successfully mounted



9. Do one of the following:
   - If you wish to automatically open the mounted snapshot in Windows Explorer, leave the **Automatically open in Explorer when finished** check box checked.

- If you do not wish to automatically open the mounted snapshot in Windows Explorer, uncheck the **Automatically open in Explorer when finished** check box.

10. Click **Finish**.

Mount a snapshot from the graphical user interface

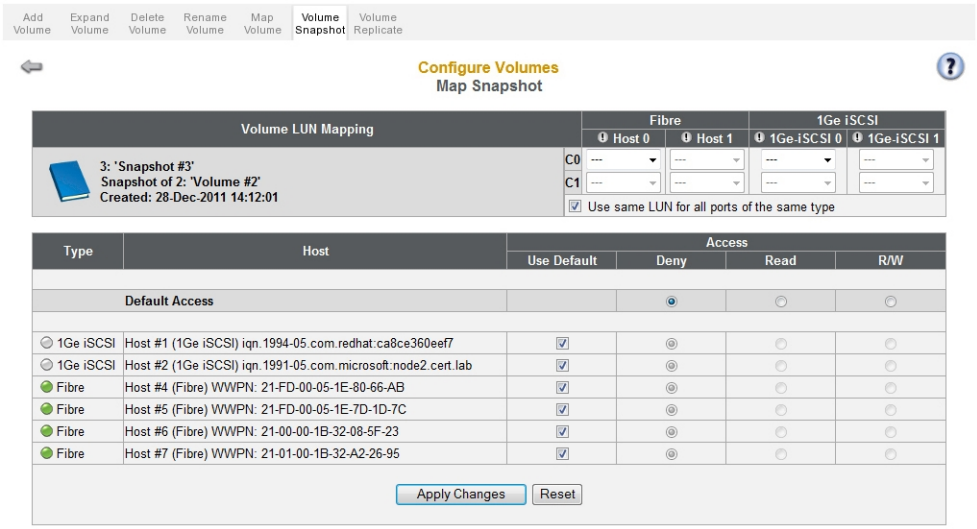
If you do not have a Microsoft Windows host server, or if you cannot use Shell Extensions or Nexsan Storage Manager for some other reason, you must mount the snapshot through the graphical user interface (GUI).

To mount a snapshot through the graphical user interface (GUI):

1. Click **Configure Volume > Volume Snapshots** to go to the *Volume Snapshots* page.
2. Click the **Next** button next to the volume that is associated with the snapshot you wish to mount to go to the volume's *Configure Volume Snapshots* page.
3. In the *LUN Mapping* column of the *Snapshot Details* section, click the **Map** button next to the snapshot that you wish to mount.

   The *Map Snapshot* page displays.

Figure 3-29: Map Snapshot page



4. In the *Volume LUN Mapping* section, assign a logical unit number (LUN) for each port that the volume will be accessed through. Check the **Use same LUN for all ports of the same type** check box to have all Fibre Channel, SAS-to-Host, 10GbE, or iSCSI ports use the same LUN mapping.
5. Set the **Default Access** (applied to new or unknown hosts) by selecting **Deny**, **Read**, or **R/W**:
   - Select **Deny** to prevent all new or unknown hosts from accessing the volume. This is the default setting.

     Note It is recommended to leave the **Default Access** setting as **Deny** and then grant access to specific hosts as necessary. This prevents unconfigured hosts from reading or modifying existing data.
   - Select **Read** to allow read-only access to the volume for all new or unknown hosts.
   - Select **R/W** to allow read/write access to the volume for all new or unknown hosts.

6. Set access privileges for individual hosts by checking or unchecking the box in the **Use Default** column:
   - If **Use Default** is checked (the default), the host or host group will use the **Default Access** setting.
   - If **Use Default** is unchecked, this setting overrides the **Default Access** setting. Select **Deny**, **Read**, or **R/W** to set the access privileges for the specific host.
7. When you have finished assigning host access privileges, click **Apply Changes**. A message displays, indicating that the settings have been saved.

Take mounted snapshots offline

Note Taking a snapshot offline undoes all changes made to the snapshot while it was mounted. Be sure that you do not need this data before you take the snapshot offline.

Take a mounted snapshot offline using Shell Extensions or NSM

Note Shell Extensions and Nexsan Storage Manager are only available for Microsoft Windows platforms.

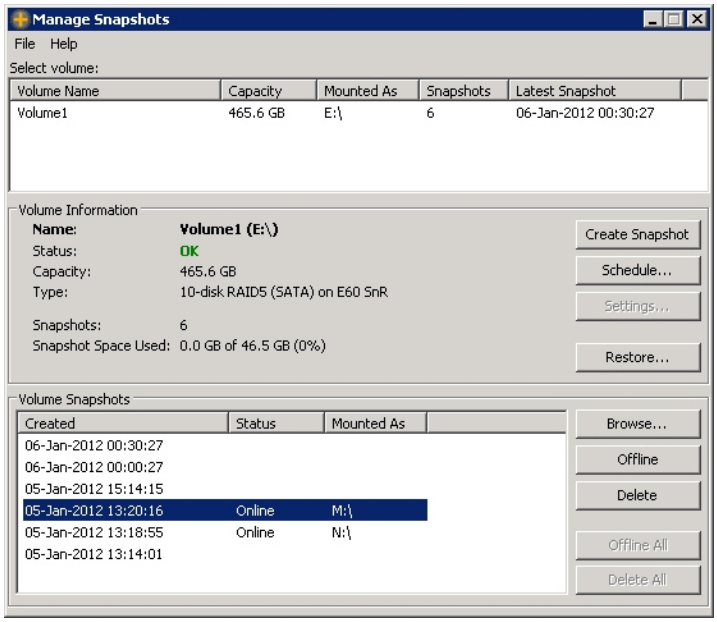
► **To take a single mounted snapshot offline:**

1. Do one of the following:
   - From *Disk Management* or the hard drive list, right click the volume and select **Properties**, then select the **Nexsan RAID** tab, then click the **Snapshots** button.
   - In Nexsan Storage Manager, right-click the unit in the left navigation pane, then select **Snapshots**.
   - In the *Local Volumes* section of Nexsan Storage Manager, right-click the volume and select the **Snapshots** link.

   The *Manage Snapshots* dialog box opens.
2. If more than one volume displays in the *Select Volume* list, select the volume associated with the snapshot that you wish to take offline.

3. In the *Volume Snapshots* list, select the snapshot that you wish to take offline.

Figure 3-30: *Manage Snapshots* dialog, with a mounted snapshot selected



4. Click the **Offline** button.

   The *Offline Nexsan Snapshot* dialog appears, warning you that all changes made to the snapshot while it was mounted will be lost.

5. Do one of the following:
   - To cancel taking this snapshot offline, click **No**. The *Offline Nexsan Snapshot* dialog closes.
   - To continue taking this snapshot offline, click **Yes**. After a short while, the *Rewind Nexsan Snapshot* dialog appears, letting you know that the snapshot is now offline.

Take all mounted snapshots offline using Shell Extensions or NSM

► **To take all mounted snapshots offline:**

1. Do one of the following:
   - From *Disk Management* or the hard drive list, right click the volume and select **Properties**, then select the **Nexsan RAID** tab, then click the **Snapshots** button.
   - In Nexsan Storage Manager, right-click the unit in the left navigation pane, then select **Snapshots**.
   - In the *Local Volumes* section of Nexsan Storage Manager, right-click the volume and select the **Snapshots** link.

   The *Manage Snapshots* dialog box opens.

2. If more than one volume displays in the *Select Volume* list, select the volume associated with the snapshot that you wish to take offline.

3. Select any mounted snapshot in the *Volume Snapshots* list and click **Offline All**.

   The *Offline Nexsan Snapshots* dialog appears, warning you that all changes made to the snapshots while they were mounted will be lost.

4. Do one of the following:
   - To cancel taking all snapshots offline, click **No**. The *Offline Nexsan Snapshots* dialog closes.
   - To continue taking all snapshots offline, click **Yes**. After a short while, the *Rewind Nexsan Snapshots* dialog appears, letting you know that the snapshots are now offline.

Take a mounted snapshot offline through the graphical user interface

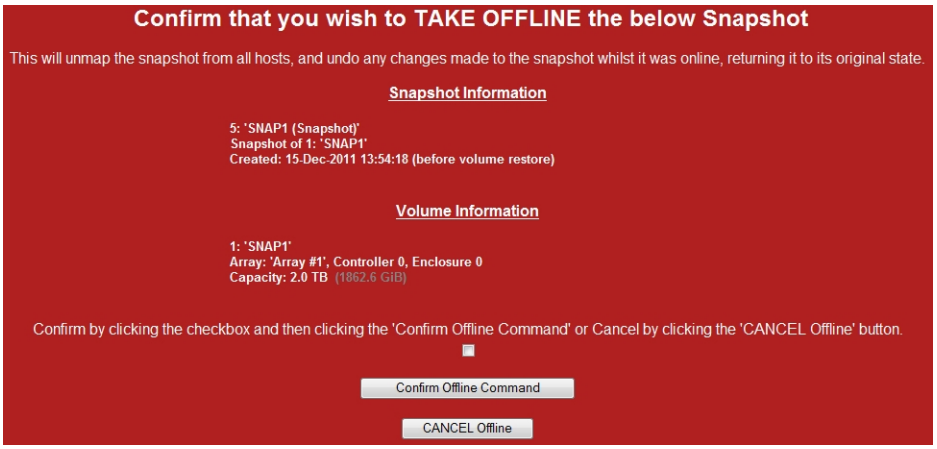
If you do not have a Microsoft Windows host server, or if you cannot use Nexsan Storage Manager for some other reason, you must take mounted snapshots offline through the graphical user interface (GUI).

To take a single snapshot offline through the graphical user interface (GUI):

1. Click **Configure Volume > Volume Snapshots** to go to the *Volume Snapshots* page.
2. Click the **Next** button next to the volume that is associated with the mounted snapshot you wish to take offline to go to the volume's *Configure Volume Snapshots* page.
3. In the snapshot's *LUN Mapping* column, click the **Offline** button.

   A confirmation screen appears:

Figure 3-31: Snapshot unmapping warning and confirmation screen



4. Do one of the following:
   - Click **CANCEL Offline** to cancel the action. A message appears, indicating that the action has been cancelled. Click **Back** to return to the *Configure Volume Snapshots* page.
   - Check the check box and click **Confirm Offline Command** to take the mounted snapshot offline. A message appears, indicating that the snapshot has been taken offline. Click **Back** to return to the *Configure Volume Snapshots* page.

Take all mounted snapshots offline through the graphical user interface

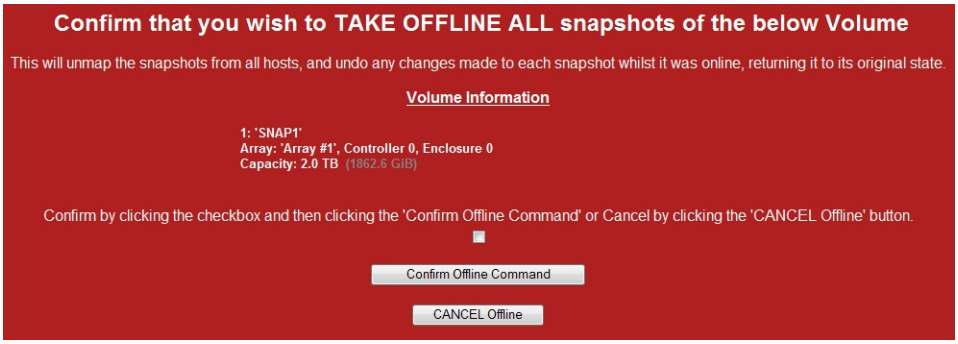
To take all snapshots for this volume offline through the graphical user interface (GUI):

1. Click **Configure Volume > Volume Snapshots** to go to the *Volume Snapshots* page.
2. Click the **Next** button next to the volume that is associated with the snapshots you wish to take offline to go to the volume's *Configure Volume Snapshots* page.

3. Click the **Offline All** button.

   A confirmation screen appears:

Figure 3-32: Unmapping all snapshots warning and confirmation screen



4. Do one of the following:
   - Click **CANCEL Offline** to cancel the action. A message appears, indicating that the action has been cancelled. Click **Back** to return to the *Configure Volume Snapshots* page.
   - Check the check box and click **Confirm Offline Command** to take all mounted snapshots offline. A message appears, indicating that the snapshots have been taken offline. Click **Back** to return to the *Configure Volume Snapshots* page.

Delete snapshots

Note Deleting a snapshot is permanent. Be absolutely certain that you do not need the snapshot before deleting it.

Delete a snapshot using Shell Extensions or NSM

Note Nexsan Storage Manager is only available for Microsoft Windows platforms.

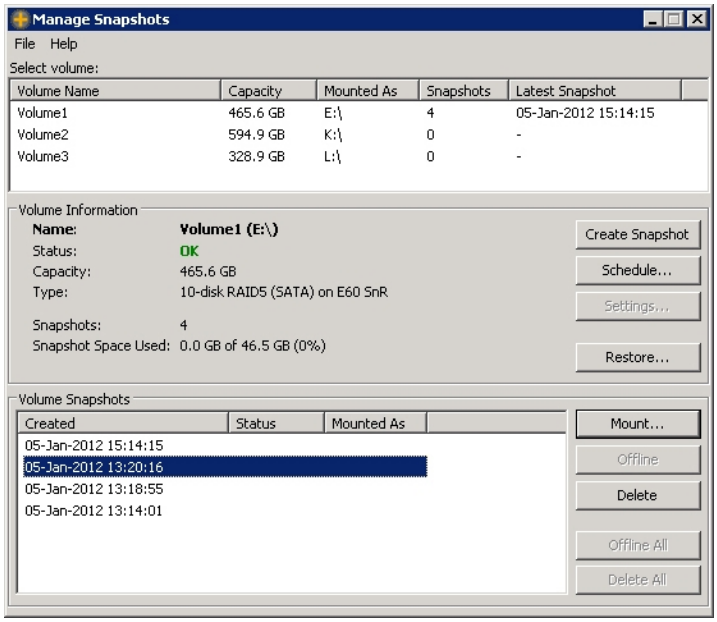
► **To delete a single snapshot:**

1. Do one of the following:
   - From *Disk Management* or the hard drive list, right click the volume and select **Properties**, then select the **Nexsan RAID** tab, then click the **Snapshots** button.
   - In Nexsan Storage Manager, right-click the unit in the left navigation pane, then select **Snapshots**.
   - In the *Local Volumes* section of Nexsan Storage Manager, right-click the volume and select the **Snapshots** link.

   The *Manage Snapshots* dialog box opens.
2. If more than one volume displays in the *Select Volume* list, select the volume associated with the snapshot you wish to delete.

3. In the *Volume Snapshots* list, select the snapshot that you wish to delete.

Figure 3-33: Manage Snapshots dialog box, with snapshot selected



4. Click the **Delete** button.

   The *Delete Nexsan Snapshot* dialog box opens, asking if you are sure you want to delete the snapshot.

5. Do one of the following:
   - To cancel the delete operation, click **No**. The *Delete Nexsan Snapshot* dialog closes.
   - To delete the snapshot, click **Yes**. After a short while, the message *Snapshot deleted successfully* appears. Click **OK** to close the dialog.

Delete all snapshots using Shell Extensions or NSM

► **To delete all snapshots:**

1. Do one of the following:
   - From *Disk Management* or the hard drive list, right click the volume and select **Properties**, then select the **Nexsan RAID** tab, then click the **Snapshots** button.
   - In Nexsan Storage Manager, right-click the unit in the left navigation pane, then select **Snapshots**.
   - In the *Local Volumes* section of Nexsan Storage Manager, right-click the volume and select the **Snapshots** link.

   The *Manage Snapshots* dialog box opens.

2. If more than one volume displays in the *Select Volume* list, select the volume that contains the snapshots you wish to delete.
3. Select any snapshot in the *Volume Snapshots* list and click **Delete All**.

   The *Delete Nexsan Snapshots* dialog appears, asking if you are sure you want to delete the snapshots.

4. Do one of the following:

- To cancel the delete operation, click **No**. The *Delete Nexsan Snapshots* dialog closes.
- To delete all snapshots, click **Yes**. After a short while, the message *Snapshots deleted successfully* appears. Click **OK** to close the dialog.

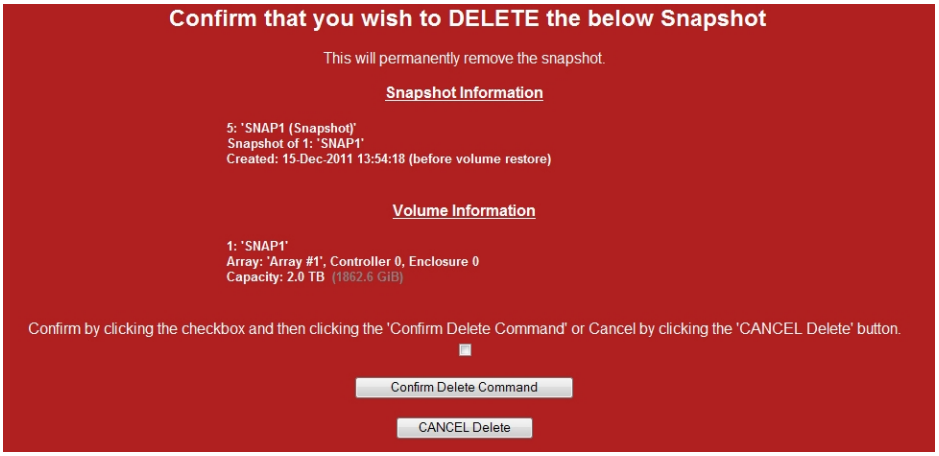
Delete a snapshot using the graphical user interface

To delete a single snapshot:

1. Click **Configure Volume > Volume Snapshots** to go to the *Volume Snapshots* page.
2. Click the **Next** button next to the volume that is associated with the snapshot you wish to delete to go to the volume's *Configure Volume Snapshots* page.
3. In the snapshot's *Delete* column, click the **Delete** button.

   A confirmation screen appears:

Figure 3-34: Delete snapshot warning and confirmation screen



4. Do one of the following:
   - Click **CANCEL Delete** to cancel the action.

     A message appears, indicating that the action has been cancelled. Click **Back** to return to the *Configure Volume Snapshots* page.
   - Check the check box and click **Confirm Delete Command** to delete the snapshot.

     A message appears, indicating that the snapshot has been deleted. Click **Back** to return to the *Configure Volume Snapshots* page.

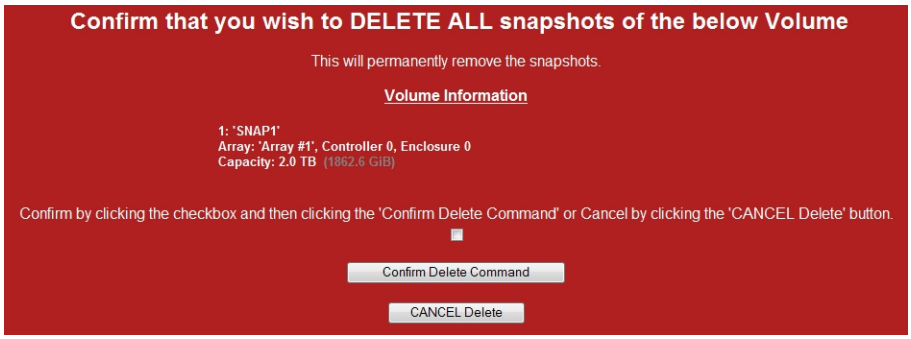
Delete all snapshots using the graphical user interface

To delete all of a volume's snapshots:

1. Click **Configure Volume > Volume Snapshots** to go to the *Volume Snapshots* page.
2. Click the **Next** button next to the volume that is associated with the snapshots you wish to delete to go to the volume's *Configure Volume Snapshots* page.
3. Click the **Delete All** button.

   A confirmation screen appears:

   Figure 3-35: Delete all snapshots warning and confirmation screen



4. Do one of the following:
   - Click **CANCEL Delete** to cancel the action.

     A message appears, indicating that the action has been cancelled. Click **Back** to return to the *Configure Volume Snapshots* page.
   - Check the check box and click **Confirm Delete Command** to delete all snapshots.

     A message appears, indicating that the snapshots have been deleted. Click **Back** to return to the *Configure Volume Snapshots* page.

Chapter 4

Replication

The replication function enables you to make copies of a volume onto another Nexsan High Density Storage System to protect data in the event of system failure, or as part of a backup and restore architecture. A given volume is always replicated to a single replica volume. Replications must be set up from the source partner, but can be performed from either the source or the destination partner.

Note Replication between Nexsan Storage Systems only works over 1Gb iSCSI connections.

This chapter contains the following sections:

Set up a replication pair

Note Preconfigured RAID sets on the destination partner must have sufficient free space to house the replica. Existing volumes on the destination partner cannot be used as replicas.

Hardware and network setup

For a replication pair to be established, the following hardware and network setup must be performed:

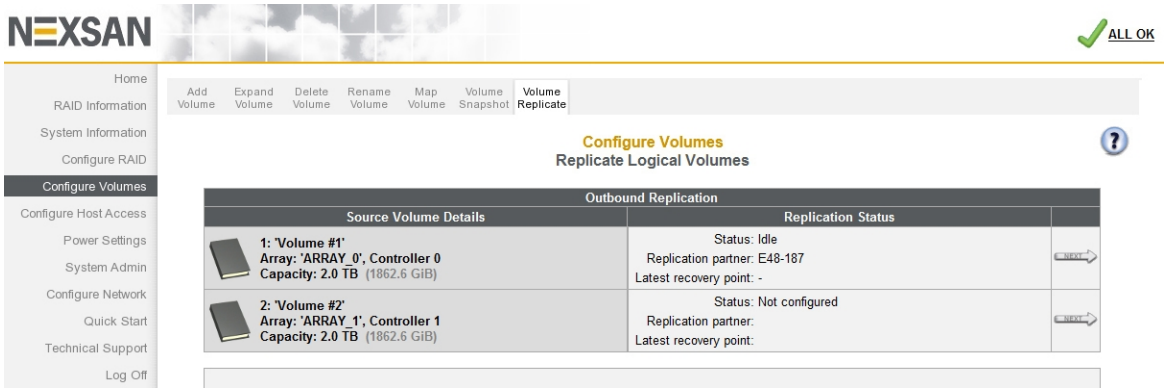
- Ports 44844 and 44846 in the firewall at both the source and replica sites must be open.
- Both management ports must be connected.
- At least one iSCSI port on each controller of each partner must be connected to the other partner, preferably on the same network.

Note It is strongly recommended that you perform the initial replication setup and initial sync over a local area network (LAN) or through a direct connection.

► To set up replications between a source and destination partner:

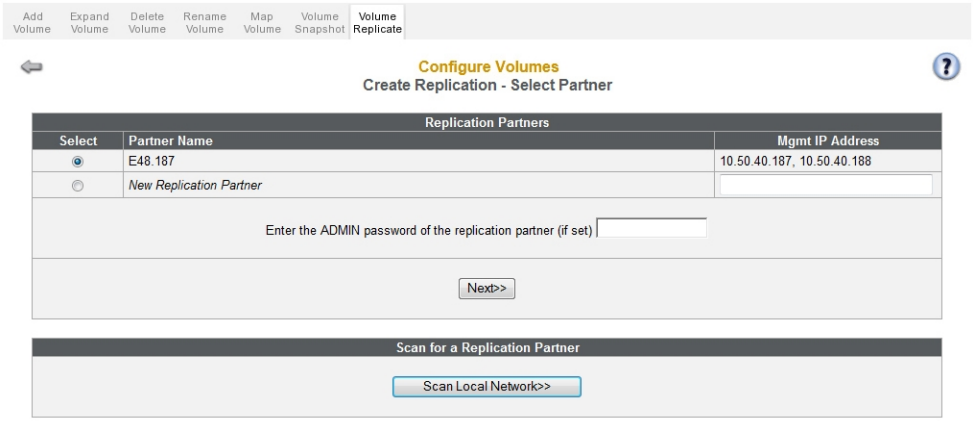
1. On the unit which has the volumes you wish to replicate (the source partner), click **Configure Volumes > Volume Replication** to go to the *Replicate Logical Volumes* page.

Figure 4-1: *Replicate Logical Volumes* page on the source partner



2. Click the **Next** button next to the volume you wish to replicate to go to the *Create Replication - Select Partner* page.

Figure 4-2: *Create Replication - Select Partner* page on the source partner

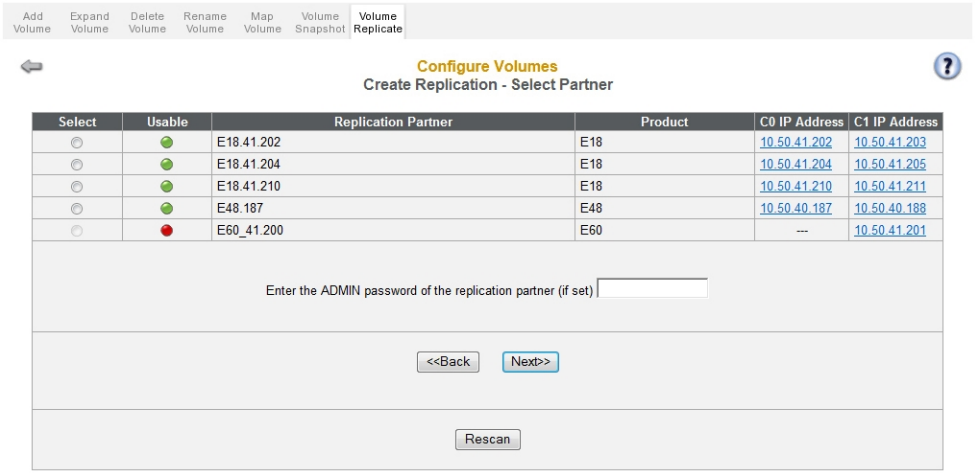


3. Do one of the following:
   - If known replication partners exist, select one in the list by clicking its **Select** button; enter the ADMIN password (if there is one) in the **Enter the ADMIN password of the replication partner (if set)** field; then click **Next**.
   - Click the **Select** button next to *New Replication Partner*; enter the IP address of the desired destination partner into the **Mgmt IP address** field; enter the ADMIN password (if there is one) in the **Enter the ADMIN password of the replication partner (if set)** field; then click **Next**.

- Click the **Scan Local Network** button.

  After a moment, a list of available replication partners displays.

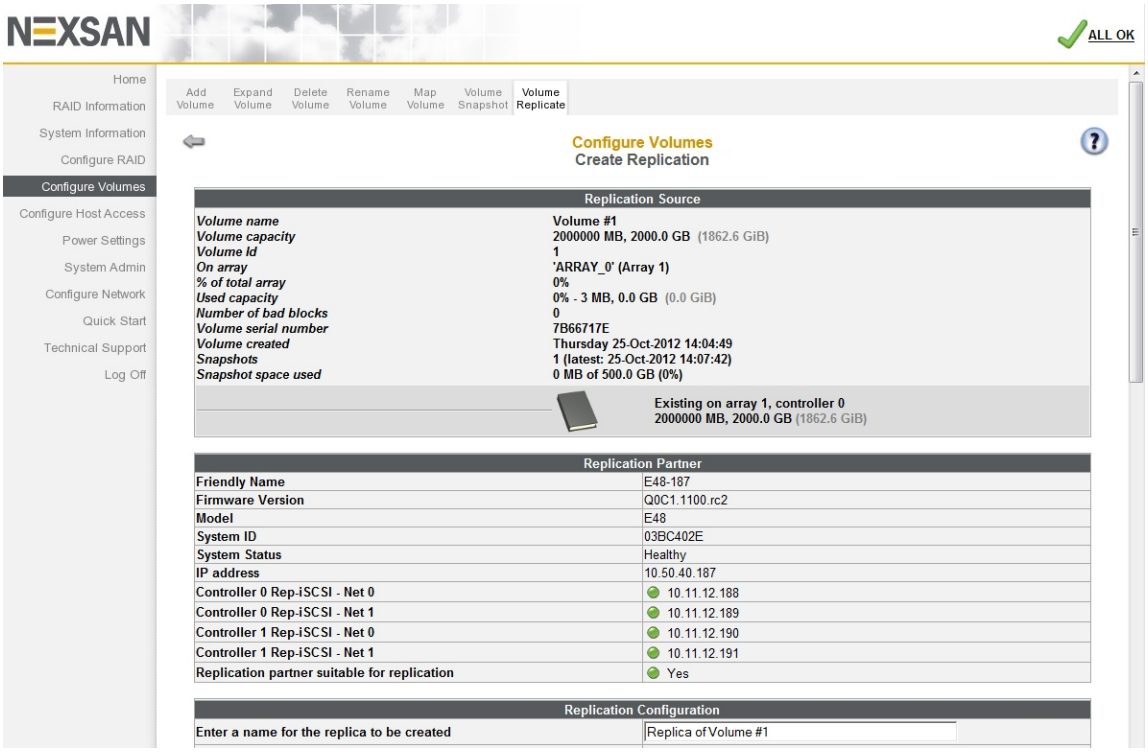
Figure 4-3: Local network scan results



Click the **Select** button next to the desired Replication Partner, enter the ADMIN password (if any) in the **Enter the ADMIN password of the replication partner (if set)** field, then click **Next**.

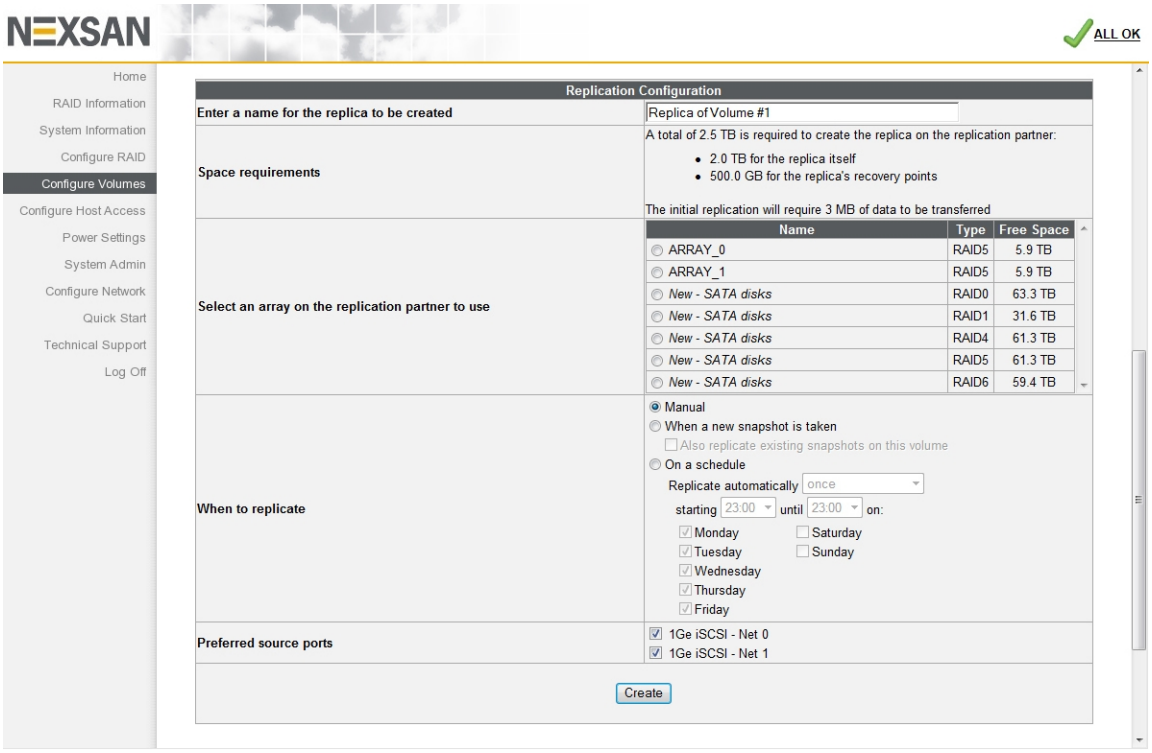
The *Create Replication* page displays.

Figure 4-4: *Create Replication* page



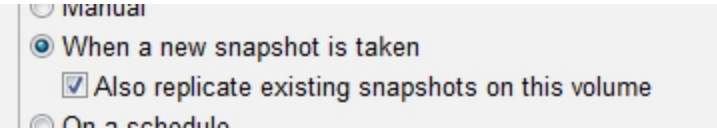
4. Scroll down until the *Replication Configuration* section is completely visible.

Figure 4-5: *Replication Configuration* section



5. Enter a name for the replica in the **Enter a name for the replica to be created** field.
6. Next to **Select a Pool on the replication partner to use**, click the selection button next to the disk pool that you wish to use for the replication.
7. Next to **When to replicate**, set up a schedule by which the unit will create new replicas. Do one of the following:
   - If you wish to replicate volume data manually, select **Manual**.
   - If you wish to replicate volume data whenever a snapshot of the volume is taken (see Create a volume snapshot on page 23), select **When a new snapshot is taken**.

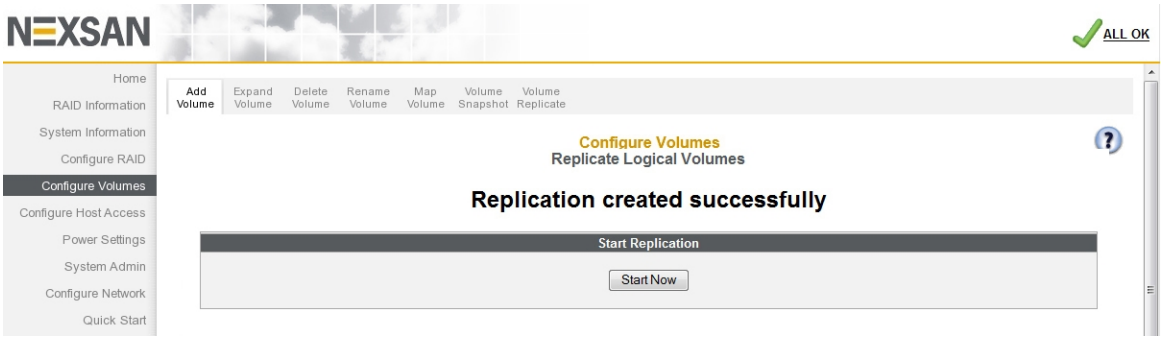
     Note If you want all existing snapshots of the volume to be replicated as well as the volume itself, you must select **Also replicate existing snapshots of this volume**.

   - If you wish to replicate volume data on a specific schedule, select **On a schedule**, then set the options under **Replicate automatically**, **starting**, **until**, and the days of the week. (See Set replication schedule on page 57.)

8. Click **Create**.

   A message appears, indicating that the replication pair has been set up successfully.



9. Click **Start Now** to perform the initial sync.

Note The snapshot reservation space of the replica volume is set at creation to be equal to that of the source volume. However, this setting is unchangeable on the replica volume. It is therefore strongly recommended that you not expand or reduce the size of the source volume's snapshot reservation.

Optimizing Replication

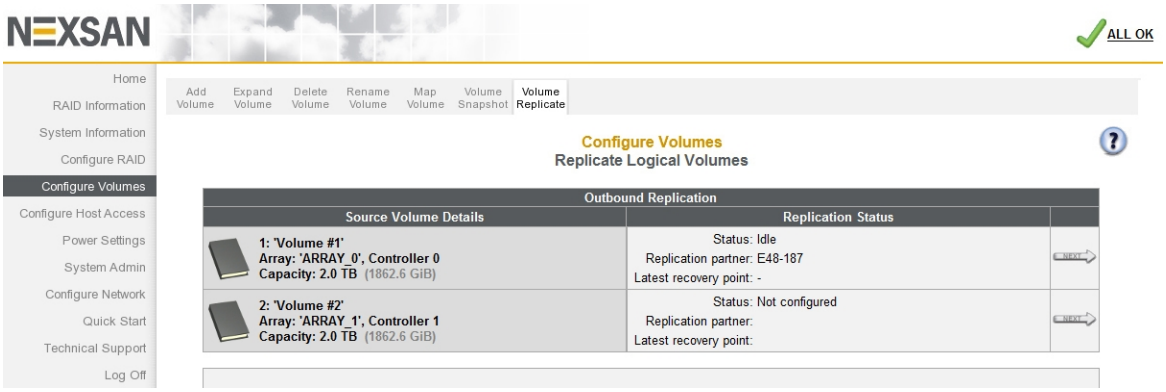
There are a few things that you can do to make sure that replication occurs smoothly.

- Whenever possible, perform the initial sync over a direct connection or a LAN using jumbo frames. This will reduce the initial sync's total time to a manageable length.
- Perform replications frequently to avoid creating too much of a data backlog.
- Make certain that the replication data change rate does not exceed the bandwidth of the WAN pipeline. For example, if you change 10GB of data per day, but you can only replicate 5GB per day during your replication window, then the reservation space on the source partner will eventually fill up, and replication will stop working.

Manage outbound replications

On units with source volumes and a destination pairing, the *Replicate Logical Volumes* page looks like this:

Figure 4-6: Replicate Logical Volumes page, with outbound replications



The *Outbound Replication* section contains the following information:

- The *Source Volume Details* column displays the volume number, volume name, the RAID set to which it is assigned, the number of the controller to which the RAID set is assigned, and the total capacity of the volume.
- The *Replication Status* column displays one of the following:
  - The message *Not configured*.
  - The replication status, the replication partner, and the time and date of the latest recovery point.

Clicking a volume's **Next** button takes you to the *Configure Replication* page.

Figure 4-7: *Configure Replication* page, outbound replication

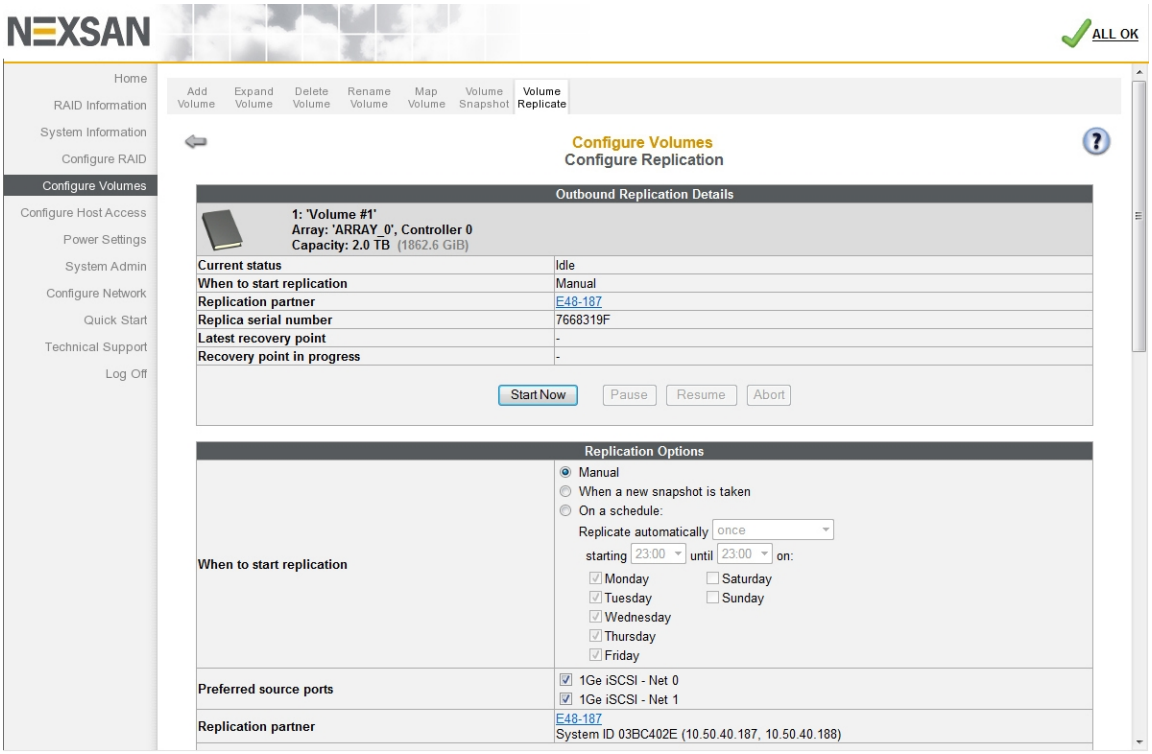


Table 4-8: Outbound Replication Details

Item	Contents
Volume name	The user-defined name of the volume.
Array	The user-defined name of the array that the volume is on, the controller which controls that array, and (if the unit has attached expansion units) the enclosure on which the volume resides.
Capacity	Displays the total data storage space of the volume, in terabytes (TB) and binary gigabytes (GiB).
Current status	Displays the current replication status. Possible values are Created, Idle, Running, Aborted, and Reference Snapshot is Missing.

Item	Contents
When to start replication	Displays when replication is performed: Manual, On Snapshot, or the schedule that is configured in Replication Options (see Setting Replication Schedule on page 43).
Replication partner	Displays a link to the Nexsan Storage System that the volume is being replicated to.
Replica serial number	Displays the unique serial number of the volume replica.
Latest recovery point	Displays the date and time of the latest recovery point, formatted as "Day of Week DD-Mon-YYYY HH:MM". If no replications have yet been made, this field displays a single dash (-).
Recovery point in progress	Displays the date and time of the replication that is currently in progress, formatted as "Day of Week DD-Mon-YYYY HH:MM". If there is no replication currently in progress, this field displays a single dash (-).

The section also contains four buttons: **Start Now**, **Pause**, **Resume**, and **Abort**.

- **Start Now**: When the replication status is *Idle* or *Aborted*, clicking **Start** begins replication.
- **Pause**: When a replication is in progress, clicking **Pause** pauses the replication.
- **Resume**: When a replication is paused, clicking **Resume** resumes the replication.
- **Abort**: When a replication is running, clicking **Abort** stops the replication.

A message appears, indicating that the change either has been cancelled or has been made, depending on your selection. Click the **Back** button to return to the *Replicate Logical Volumes* page, then click the volume's **Next** button to return to the *Configure Replication* page.

Manually start replication

▶ **To start replication manually:**

- Click the **Start Now** button.

A message appears, indicating that the replication has started. Click the **Back** button to return to the *Replicate Logical Volumes* page, then click the volume's **Next** button to return to the *Configure Replication* page.

Note While a replication is being made, the **Pause** and **Abort** buttons become active.

Set replication schedule

The *Replication Options* section enables you to set a schedule for replication to occur.

▶ **To set a replication schedule:**

1. Under **When to start replication** in the *Replication Options* section, select when you want replication of the data on volume to be performed. The possible values are:
   - **Manual** (only begins replication when the **Start Now** button is pressed)
   - **When a new snapshot is taken** (data is replicated when snapshots are made)

- **On a schedule**

If **On a schedule** is selected, do the following:

a. Click the check box next to **Replicate automatically**, then select a value in the drop-down list. The possible values are:

once (the default)
every 15 minutes
every 30 minutes
every hour
every 2 hours
every 4 hours
every 6 hours
every 12 hours

b. Use the **starting** and **until** drop-down lists to set the start and end times that the unit should trigger replication of the volume data. Between these times, the unit will replicate volume data at the frequency selected in the **Create automatically** drop-down list.

Note If the frequency selected is **once**, then the **until** drop-down list is grayed out.

c. Check the boxes next to the days of the week that you want the unit to trigger replication of this volume data.

Note When replications are triggered manually or on a schedule, a hidden snapshot is taken of the source volume and stored in the snapshot reservation. This may result in the *Snapshot Space Used* value on the *Configure Volume Snapshots* page showing a positive value even if the snapshot reserve is otherwise empty.

2. Click the **Save Settings** button.

A message appears, indicating that the replication settings have been updated. Click the **Back** button to return to the *Replicate Logical Volumes* page, then click the volume's **Next** button to return to the *Configure Replication* page.

4

Select preferred ports

Near the bottom of the *Replication Options* section, you can select the preferred ports for replicating data between the source volume and the replica.

Note This setting does not disable any ports. Rather, it indicates which ports are to be used in preference to others. Non-preferred ports can still be used if preferred ports are offline. To actually enable or disable ports, see *Configure 1GbE iSCSI Host Access* in *Chapter 3* of the *Nexsan High Density Storage User Guide*.

▶ **To select preferred ports:**

1. Check the boxes next to the ports that you want the system to use in preference over others.
2. Click the **Save Settings** button.

A message appears, indicating that the settings have been updated. Click **Back** to return to the *Replicate Logical Volumes* page, then click **Next** to return to the *Configure Replication* page.

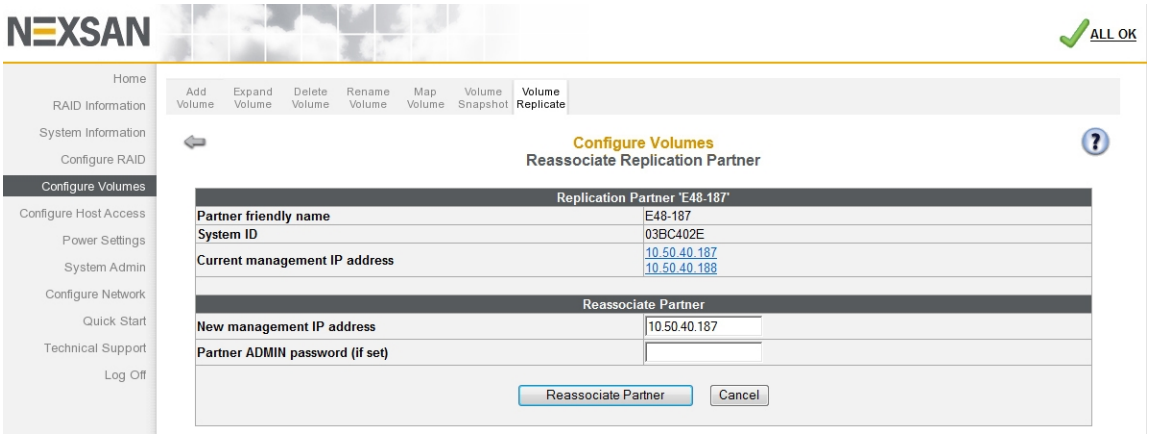
Modify partner information

The bottom of the *Replication Options* section displays the user-configured name, system ID, and IP addresses of the replication partner.

► To modify partner information:

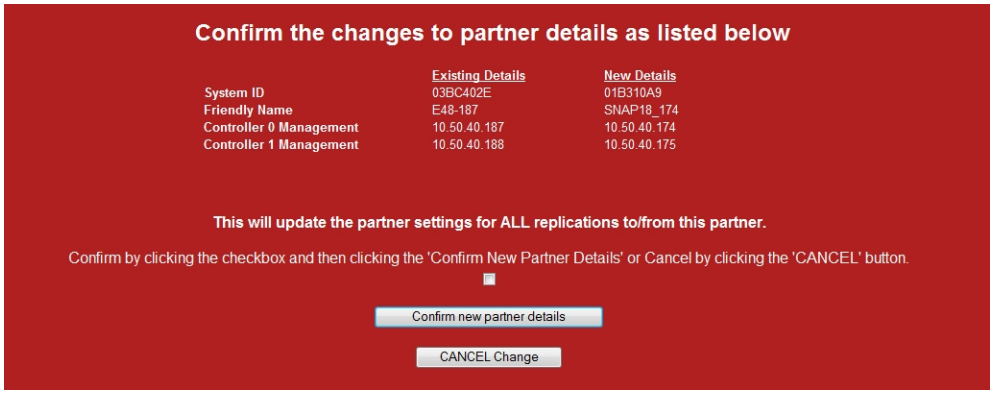
1. Click the **Reassociate Partner** button to go to the *Reassociate Replication Partner* page.

Figure 4-9: Reassociate Replication Partner page



2. Enter the IP address of the desired replication partner in the **New management IP address** field.
3. If the replication partner has an ADMIN password, enter it in the **Partner ADMIN Password** field.
4. Click the **Reassociate Partner** button. A confirmation message appears:

Figure 4-10: Partner reassociation warning and confirmation screen



5. Do one of the following:
   - To cancel the change, click **CANCEL change**.
   - To confirm the change, click the confirmation check box and then click **Confirm new partner details**.

A message appears, indicating that the change either has been cancelled or has been made, depending on your selection. Click the **Back** button to return to the *Replicate Logical Volumes* page, then click the volume's **Next** button to return to the *Configure Replication* page.

Break replication

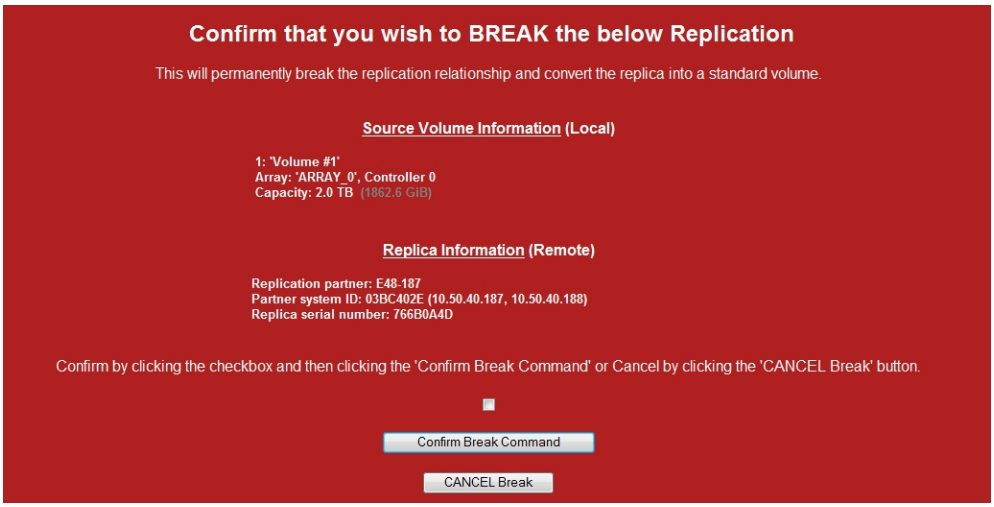
The Break Replication action severs the link between the source volume and the replica and promotes replica on the destination partner.

► To break replication:

1. Click the **Break Replication** button in the *Modify Replication* section to remove the replication partner association.

   A confirmation message appears:

Figure 4-11: Break replication warning and confirmation screen



2. Do one of the following:
   - To cancel the action, click **CANCEL Break**.
   - To confirm that you wish to remove the association and promote the replica, click the confirmation check box and then click **Confirm Break Command**.

A message appears, indicating that the either replication pairing has been broken or the action has been cancelled, depending on your selection. Click the **Back** button to return to the *Replicate Logical Volumes* page, then click the volume's **Next** button to return to the *Configure Replication* page.

Promote a replica

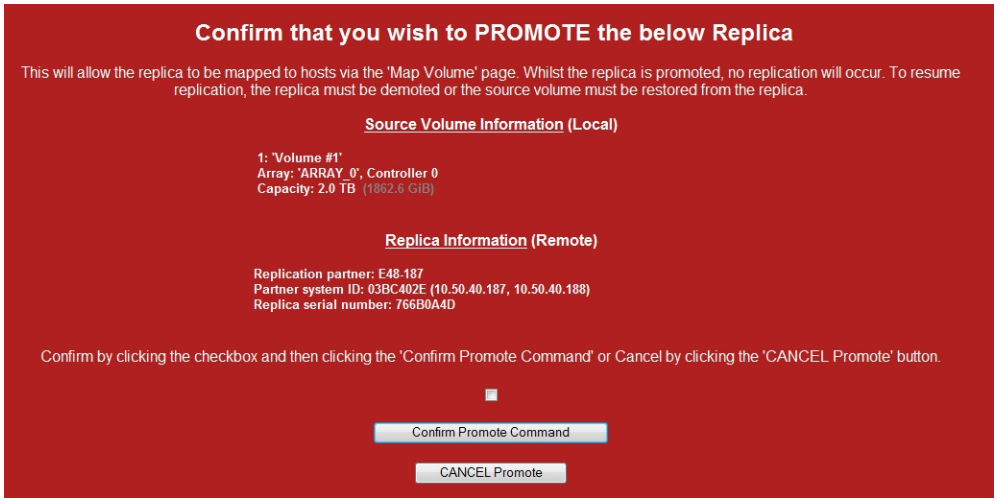
In the event that the source volume becomes inaccessible, the replica can be “promoted” and accessed like a normal volume.

To promote a replica:

1. Click the **Promote Replica** button in the *Modify Replication* section to make the replica a usable volume.

   A confirmation message appears:

   Figure 4-12: Replica promotion warning and confirmation screen



2. To confirm that you wish to break the replication pairing and promote the replica to a usable volume, click the confirmation check box and then click **Confirm Promote Command**.

   A message appears, indicating that the promotion has been performed. Data on both the source and replica volumes remain intact.

3. Click the **Back** button to return to the *Configure Replication* page.

   The *Current Status* is now *Replica promoted*.

4. In the *Replication Details* section, click the **Replication partner** link to go to the destination partner’s *Home* page. This page opens in a new browser window.

5. Click **Configure Volumes > Map Volume** to go to the *Map Logical Volumes* page.

6. Click the **Next** button next to the promoted replica.

7. Map the volume according to the instructions under *Map Logical Volumes* in *Chapter 3* of the *Nexsan High Density Storage User Manual*.

The promoted replica is now accessible as a normal volume.

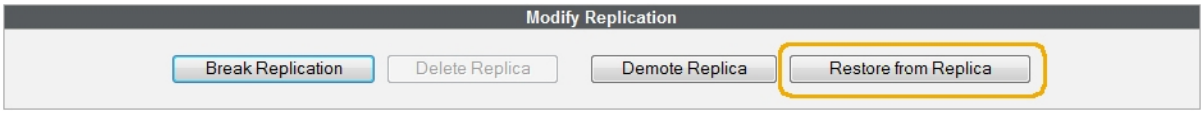
Restore from the replica and reestablish replication link

Note This process overwrites any snapshots made of the source volume since the replica was promoted. If you wish to preserve the source volume’s snapshots, use the procedure under Demote a replica and reestablish replication link on page 64.

To restore the source volume from the promoted replica, demote the replica, and reestablish the replication link:

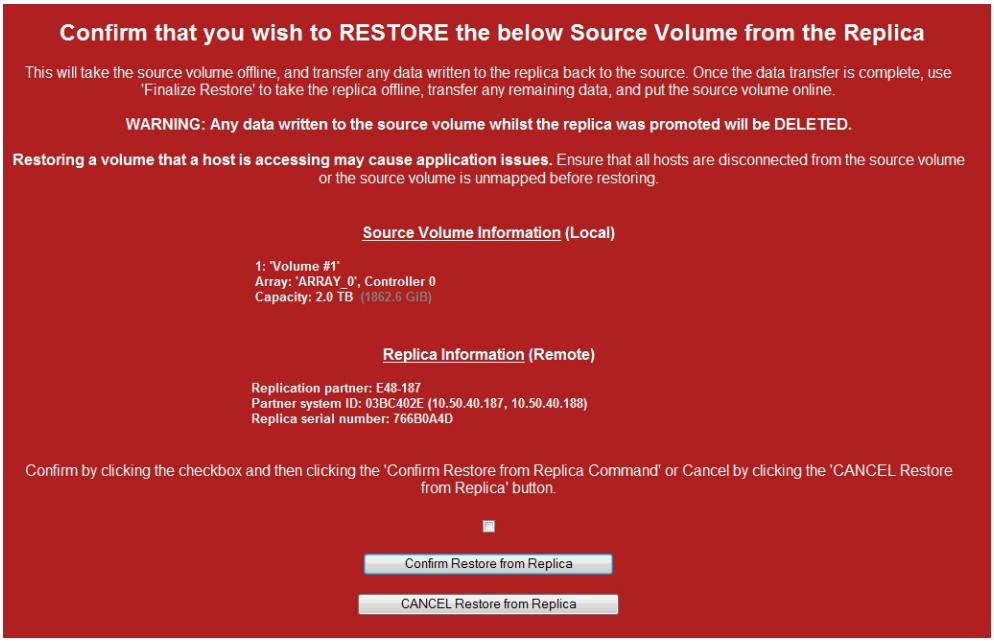
1. Click **Restore from Replica** in the *Modify Replication* section.

Figure 4-13: *Modify Replicaton* section, showing **Restore from Replica** button



A confirmation message appears:

Figure 4-14: Restore from replica warning and confirmation screen



2. To confirm that you wish to restore from the promoted replica, click the confirmation check box and then click **Confirm Restore from Replica**.

   A message appears, indicating that new information from the replica is being copied to the source volume.

3. Click the **Back** button to return to the *Configure Replication* page.

   The *Current Status* is now *Restoring*, and a message displays in the *Outbound Replication* section:

   - *The source volume is currently restoring data from the replica. Once the data transfer is complete, use 'Finalize Restore' to take the replica offline, transfer any remaining data, and put the source volume online. To restore additional data from the replica without finalizing the restore, use 'Restore from Replica'.*

   When the restoration is complete, the *Current Status* becomes *Restored (attention required)*, and the *Outbound Replicatio*n section message is:

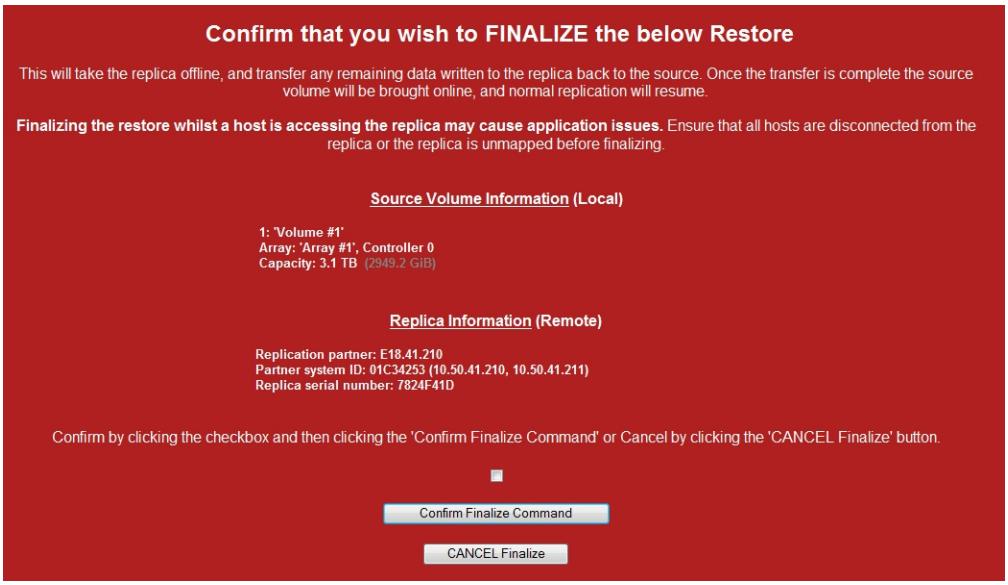
   - *The source volume has been restored from the replica. Use 'Finalize Restore' to take the replica offline, transfer any remaining data, and put the source volume online. To restore additional data from the replica without finalizing the restore, use 'Restore from Replica'.*

4. When the source volume has been restored, click **Finalize Restore** in the *Modify Replication* section.

Figure 4-15: **Modify Replication** section, showing the *Finalize Restore* button

A confirmation message appears:

Figure 4-16: Finalize restoration warning and confirmation screen



5. To confirm that you wish to finalize the restoration and reestablish the replication link, click the confirmation check box and then click **Confirm Finalize Command**.

A message appears, indicating that the replication has been reestablished and that new information from the replica is being copied to the source volume. Click the **Back** button to return to the *Configure Replication* page.

Demote a replica and reestablish replication link

Note This process overwrites any snapshots made of the replica since it was promoted. If you wish to preserve the promoted replica's snapshots, use the procedure under Restore from the replica and reestablish replication link on page 61.

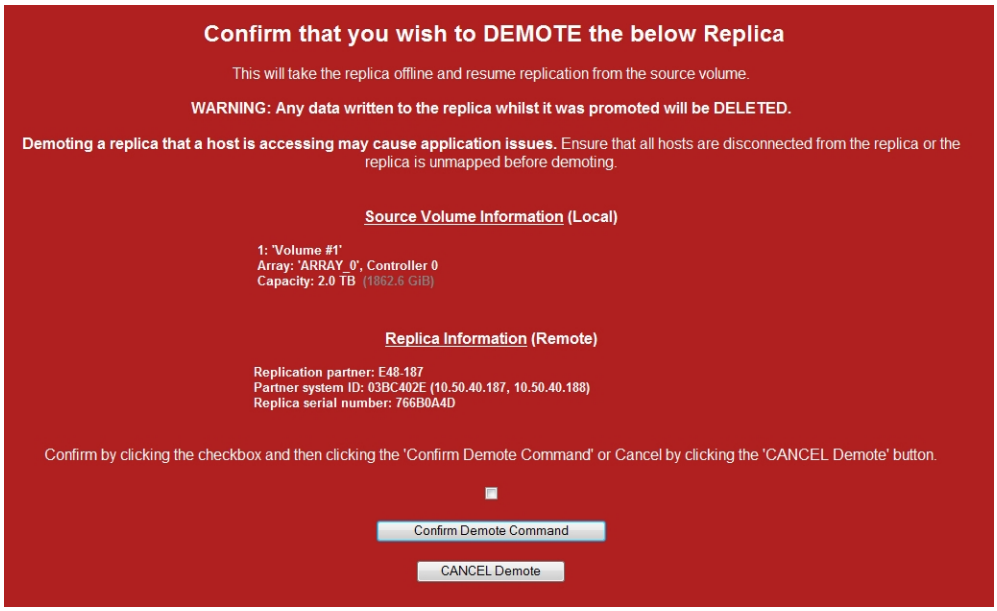
► **To demote the promoted replica, update it with new data from the source volume, and overwrite its snapshots with source volume snapshots:**

1. Click **Demote Replica** in the *Modify Replication* section.

Figure 4-17: *Modify Replication* section, with **Demote Replica** button highlighted

A confirmation message appears:

Figure 4-18: Replica demotion warning and confirmation screen



2. To confirm that you wish to demote the promoted replica and restore replication, click the confirmation check box and then click **Confirm Demote Command**.

A message appears, indicating that the replication has been reestablished and that new information from the source volume is being replicated to the destination volume. Click the **Back** button to return to the *Configure Replication* page.

Delete replication

The Delete Replication action both severs the link between the source volume and replica and deletes the replica from the destination partner.

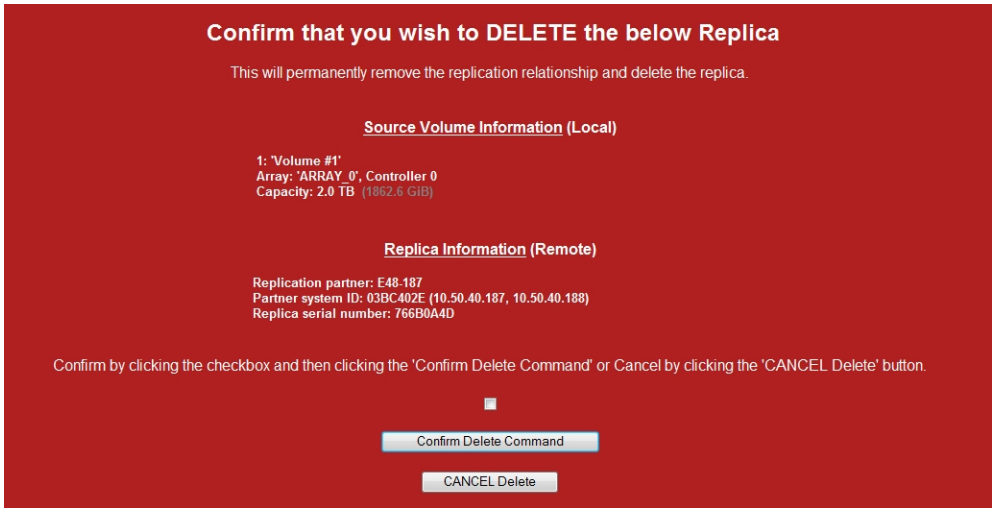
▶ **To remove the replication partner association and delete the replica on the replication partner:**

1. Click the **Delete Replica** button in the *Modify Replication* section.

Figure 4-19: *Modify Replication* section, with **Delete Replica** button highlighted

A confirmation message appears:

Figure 4-20: Replica deletion warning and confirmation screen



2. To confirm that you wish to remove the association and delete the replica, click the confirmation check box and then click **Confirm Delete Command**.

A message appears, indicating that the deletion has been performed. Click the **Back** button to return to the *Replicate Logical Volumes* page.

Reverse replication

Reversing replication swaps the roles of the source volume and the replica: the replica is promoted and becomes the source volume, while the former source volume becomes the new replica.

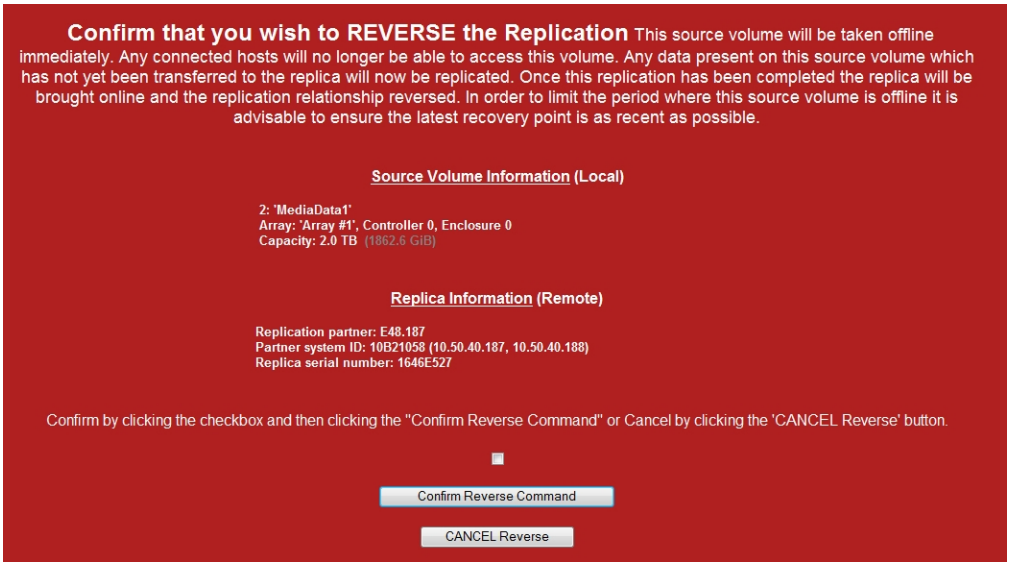
▶ **To reverse replication:**

1. Click **Reverse Replication** in the *Modify Replication* section.

Figure 4-21: *Modify Replication* section, with **Reverse Replication** button highlighted

A confirmation message appears:

Figure 4-22: Replication reversal warning and confirmation screen



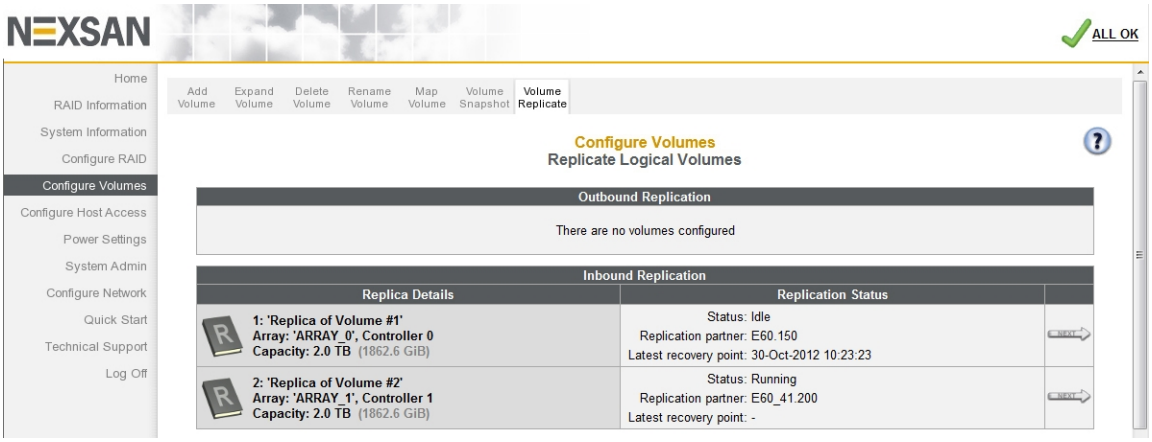
2. To confirm that you wish to restore from the promoted replica and reestablish replication, click the confirmation check box and then click **Confirm Reverse Command**.

A message appears, indicating that the replication has been reversed. Click the **Back** button to return to the *Configure Replication* page.

Manage inbound replications

On destination partners, the *Replicate Logical Volumes* page looks like this:

Figure 4-23: Replicate Logical Volumes page, with inbound replications

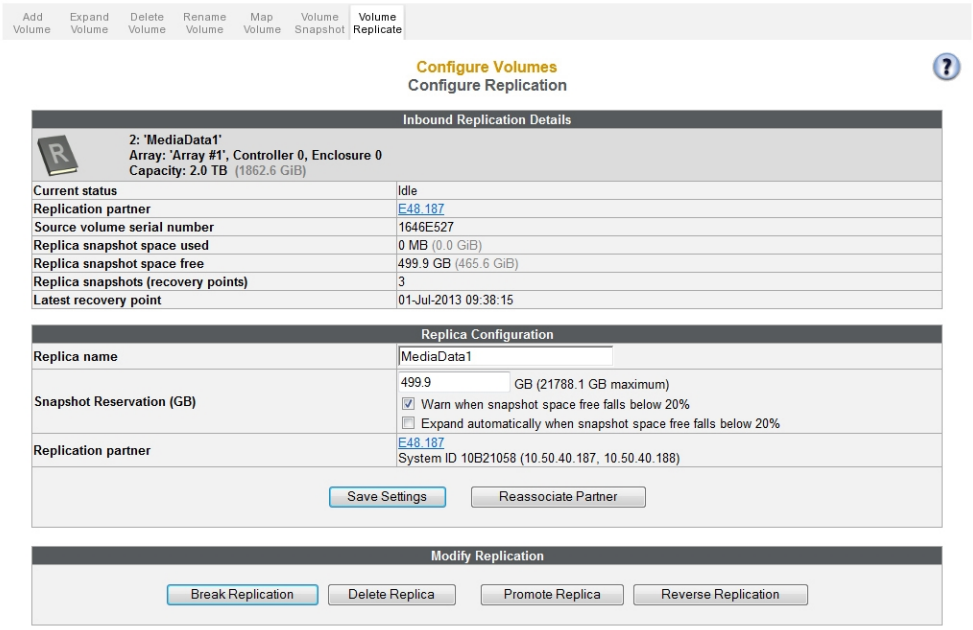


The *Inbound Replication* section contains the following information:

- The *Replica Details* column displays the replica number, replica name, the *Array* to which it is assigned, the number of the *Controller* to which the RAID set is assigned, and the total *Capacity* of the replica.
- The *Replication Status* section displays the replication *Status*, the *Replication partner*, and the time and date of the *Latest recovery point*.

Clicking a replica's **Next** button takes you to the *Configure Replication* page.

Figure 4-24: Configure Replication page, inbound replication



The *Inbound Replication Details* section displays the following information:

Table 4-25: Inbound Replication Details

Item	Contents
Replica name	The user-defined name of the replica.
Array	The user-defined name of the array that the replica is on, the controller which controls that array, and the enclosure where the replica resides.
Capacity	Displays the total data storage space of the replica, in terabytes (TB) and binary gigabytes (GiB).
Current status	Displays the current replication status. Possible values are *Created*, *Idle*, *Running*, *Aborted*, and *Reference Snapshot is Missing*.
Replication partner	Displays a link to the Nexsan Storage System that houses the source volume.
Source volume serial number	Displays the unique serial number of the source volume.
Replica snapshot space used	The amount of the replica's snapshot reservation that is being used by existing snapshots, in megabytes (MB) and binary gigabytes (GiB).

Item	Contents
Replica snapshot space free	The amount of the replica's snapshot reservation that is empty, in gigabytes (GB) and binary gigabytes (GiB)
Replica snapshots (recovery points)	The number of snapshots in the replica's snapshot reservation.
Latest recovery point	Displays the date and time of the latest recovery point, formatted as "Day of Week DD-Mon-YYYY HH:MM". If no replications have yet been made, this field displays a single dash (-).

Rename a replica

▶ **To rename a replica:**

1. In the *Replica Configuration* section, enter the new name of the replica into the **Replica name** field.
2. Click **Save Settings**.

A message appears at the top of the page, indicating that the name has been changed.

Set the replica snapshot reservation size

▶ **To set the snapshot reservation size for the replica volume:**

1. In the *Replica Configuration* section, enter the size of the snapshot reservation in the **Snapshot Reservation** field. See Snapshot reservation size on page 22 for more information.
2. If you want the snapshot reservation to be automatically expanded (enlarged) when its remaining space drops below 20%, check the box next to **Expand automatically when snapshot space free falls below 20%**.

   It is STRONGLY RECOMMENDED that you leave the **Warn when snapshot space free is below 20%** check box checked. This setting causes a warning to be displayed when the reservation space is more than 80% full, allowing you to delete snapshots or expand the reservation size before the reservation is completely full.
3. Click **Save Settings**.

A message appears at the top of the page confirming the new setting.

Other replica management options

The procedures for modifying replication partner information, breaking replication, deleting/promoting/demoting the replica, restoring from the replica, and reversing replication are the same as on the source partner. See the appropriate section of Manage outbound replications for details:

- Modify partner information on page 58
- Break replication on page 59
- Promote a replica on page 61
- Restore from the replica and reestablish replication link on page 61
- Demote a replica and reestablish replication link on page 64

- Delete replication on page 64
- Reverse replication on page 65

Replication failover and failback

Replication of volumes can assist in maintaining access to data during planned outages (such as scheduled maintenance) or unplanned outages (such as loss of power). In either case, one must properly prepare both the source partner's environment and the destination partner's environment in advance in order to take full advantage of replication features.

Preparing for a Planned Outage

Routine maintenance can disrupt access to critical systems. Replication can help mitigate this disruption by providing a path to the volume replicas and allowing them to act as the primary volumes during the planned outage.

To prepare for a planned outage at the source partner's site:

Note Steps 1 through 5 should be performed well in advance of the planned maintenance window.

1. Identify the servers at the destination site that will be taking over host duties from the servers at the source site.
2. Identify any application-specific requirements for the roles that the destination site's server will be taking on.
3. Ensure that the destination server has all necessary applications, tools, and updates installed, including Nexsan Storage Tools (where appropriate).
4. Estimate the amount of time required for the failover from source to destination server based upon typical replication times and any additional overhead required to migrate the application roles.
5. Choose an appropriate maintenance window based on the estimated failover time and the amount of time needed to perform the maintenance.

Note The rest of these steps should be performed immediately before the planned outage, or as close to the planned outage as possible.

6. Make certain that replication is functioning normally and that the latest recovery point is as up-to-date as possible (see Manage outbound replications on page 55).
7. Ensure that the destination servers are connected to the storage area network (SAN) and that they have access to the destination storage system.
8. Cleanly shut down the applications and host servers that are accessing the source partners.
9. Check to make sure that the servers have logged off from the SAN. There should be no link indicators in the Nexsan graphical user interface (GUI).
10. Unmap the source volumes on the source systems to prevent any further modifications to the volumes.
11. Create manual snapshots of each source volume (see Create a volume snapshot on page 23) and note the time/date stamp of each snapshot.
12. Start replication on each volume, if necessary (see Manually start replication on page 57).

    Note If the replication schedule is set to **When a new snapshot is taken** (see Set replication schedule on page 57), this step occurs automatically.

13. Wait until each replication's *Current status* is *Idle*, then check that the time/date stamps of each volume's *Latest recovery point* equals that of the source volumes' snapshots.
14. Promote each volume's replica (see Promote a replica on page 61). Be sure to map the promoted replicas using **Configure Volumes > Map Volume**.
15. On the destination server, use Disk Management's **Rescan Disks** function to detect the mapped replicas.
16. According to application-specific requirements, assign drive letters to the mapped replicas and attach them to the applications.

You may now perform source site maintenance as required.

Restoring access after a planned outage

When maintenance is complete, you must reestablish the original replication relationship and restart the source partner site's servers.

▶ **To restore access to source volumes after a planned outage:**

1. Cleanly shut down the applications and host units that are accessing the promoted replicas.
2. Check to make sure that the servers have logged off from the SAN. There should be no link indicators in the Nexsan graphical user interface (GUI).
3. Unmap the replicas to prevent any further modifications to them.
4. Create manual snapshots of each replica (see Create a volume snapshot on page 23).
5. Perform a **Restore from Replica** operation to copy the changed contents of the replicas back to the source volumes, then perform a **Finalize Restore** operation to demote the replica and reestablish the replication link (see Restore from the replica and reestablish replication link on page 61).
6. When the **Finalize Restore** operation is complete, remap the source volumes using **Configure Volumes > Map Volume**.
7. According to application-specific requirements, assign drive letters to the remapped source volumes and attach them to the applications.

Preparing for an unplanned outage

Many of the same steps necessary for a planned outage can be used to prepare for unplanned outages as well. Making certain that you have the necessary items and plans in place can help to smooth the transition from source to replica and back again.

Note This procedure should be performed when replication is first established.

▶ **To prepare for an unplanned outage:**

1. Identify the servers at the destination site that will be taking over host duties from the servers at the source site.
2. Identify any application-specific requirements for the roles that the destination site's server will be taking on.
3. Ensure that the destination server has all necessary applications, tools, and updates installed, including Nexsan Storage Tools (where appropriate).
4. Estimate the amount of time required for the failover from source to destination server based upon typical replication times and any additional overhead required to migrate the application roles.

Managing an unplanned outage

When the source system goes offline unexpectedly, there are several steps that need to be performed to ensure access to the data on the replica.

To manage an unplanned outage

1. Promote each volume's replica (see Promote a replica on page 61).
2. Map the promoted replicas using **Configure Volumes > Map Volume**.
3. On the destination server, use Disk Management's **Rescan Disks** function to detect the mapped replicas.
4. According to application-specific requirements, assign drive letters to the mapped replicas and attach them to the applications.

Recovering from an unplanned outage

When the source system is brought back online, the source volumes must be brought up to date, the original replication relationship reestablished, and the host links migrated back to the source system.

To recover from an unplanned outage:

1. Cleanly shut down the applications and host units that are accessing the promoted replicas.
2. Check to make sure that the servers have logged off from the SAN. There should be no link indicators in the Nexsan graphical user interface (GUI).
3. Unmap the replicas to prevent any further modifications to them.
4. Create manual snapshots of each replica (see Create a volume snapshot on page 23).
5. Perform a **Restore from Replica** operation to copy the changed contents of the replicas back to the source volumes, then perform a **Finalize Restore** operation to demote the replica and reestablish the replication link (see Restore from the replica and reestablish replication link on page 61).
6. When the **Finalize Restore** operation is complete, remap the source volumes using **Configure Volumes > Map Volume**.
7. According to application-specific requirements, assign drive letters to the remapped source volumes and attach them to the applications.

Chapter 5

Troubleshooting and FAQ

This chapter contains the following sections:

Snapshot issues

Why can't I take a snapshot?

If you are unable to take a snapshot of a volume, check the following:

- Make sure that the array has advanced feature support enabled. This must be established when the array is first created. See Configure arrays during creation on page 17.
- Make sure that the volume you wish to take a snapshot of is enabled for snapshots. This can be performed at volume setup or later, as long as the volume is on an array that is enabled for snapshots. See Configure volumes on page 18.

If both of the above are set up correctly, but you are still unable to take a snapshot, contact Technical Support (see Service and support on page vii).

Where did my snapshot go?

Snapshots are retained for as long as the snapshot retention policy is configured for (see Set snapshot retention policy on page 33) or until the snapshot reservation pool is filled. When the reserve pool is filled, then the oldest snapshots are deleted. (Unmounted snapshots will be deleted before mounted snapshots, however.) It is therefore strongly advised that you do not let your snapshot reserve pool reach full capacity.

Can I map a LUN directly to the snapshot reservation pool?

No. Although the snapshot reservation pool is technically a volume, you cannot access it normally, and so it is not possible to map a LUN to it.

Replication issues

Why can't I establish replication?

If you are unable to establish a replication pairing, check the following:

- Make sure that the arrays on both the source and destination partners are set up for snapshots and replication. This must be established when the arrays are first created. See Configure arrays during creation on page 17.
- Make sure that the volume you wish to replicate is set up for snapshots and replication. This can be performed at volume setup or later, as long as the volume is on an array that is set up for snapshots and replication. See Configure volumes on page 18.
- Check network connectivity between the source and destination partners. The management ports and at least two iSCSI ports must be connected on different networks for replication to work.
- Make certain that the destination array has enough free space to hold not only the source volume, but the source volume's snapshot reservation space.

If all of the above are set up correctly and otherwise functioning properly, but you are still unable to establish a replication pairing, contact Technical Support (see Service and support on page vii).

Why isn't my data replicating?

Replication requires network connectivity between the source and destination partners. Make sure that all network connections and devices (management ports, iSCSI ports, switches, routers, etc.) are operational and properly connected/configured. If all network connections and devices seem to be working and you are still unable to replicate your data, contact Technical Support (see Service and support on page vii).

What do I do if my switch/port/network connection fails during replication?

Nothing. As soon as network connectivity is reestablished, replication will begin again from where it left off. If for some reason this does not happen, contact Technical Support (see Service and support on page vii).

Can I access the replica volume directly?

No. The only ways to view the contents of the replica volume are to either:

- mount a snapshot of the replica, or
- promote the replica to a full volume.

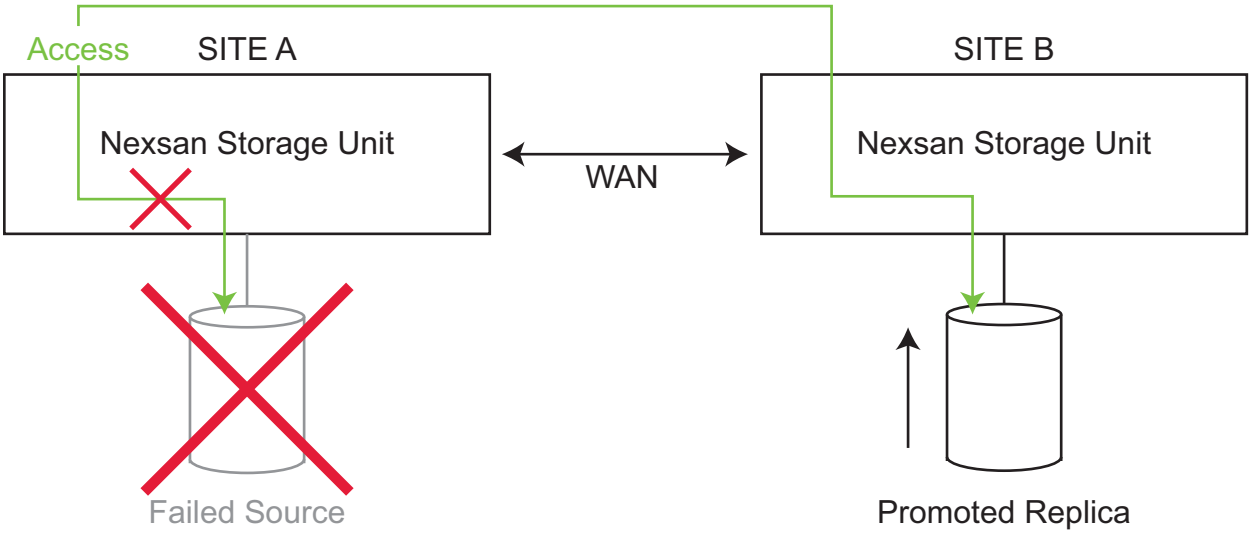
Can I mount a snapshot of the replica while replication is taking place?

Yes. After initial sync has been completed, you can mount replica snapshots at any time without interfering with replication in any way.

How do I continue to access my data if my source volume fails?

If the source volume of a replication pair fails, the replica can be promoted and used like a normal volume. You can promote a replica from the graphical user interface (GUI) (see Promote a replica on page 61).

Figure 5-1: Accessing a promoted replica



Note Depending on how recently the latest replication took place, some data may not be on the replica.

How do I reestablish the original replication pairing after a failure?

There are three components of a replication that can fail: the source volume, the replica, or the connection between the two. The steps to take to reestablish the replication after a failure depend on where the failure has occurred.

If the source volume fails

If the failure occurs with source volume, perform the steps under Managing an unplanned outage on page 71. When the source volume is back online, perform the steps under Recovering from an unplanned outage on page 71. This procedure copies the data from the replica and reestablishes the original replication relationship between the two volumes.

If the replica fails

If the failure occurs with the replica, but you have been continuing to use the source volume, there are two options for reestablishing replication, depending on whether the replica is recoverable or not:

- If the replica is recoverable, perform the procedure under Demote a replica and reestablish replication link on page 64. This procedure reestablishes the replication relationship and copies all data on the source that was changed since the replication pairing was initially broken.
- If the replica is not recoverable, perform the procedure under Software setup on page 52 to create a new replica on the destination partner.

If the replication connection fails

If the failure is in the communication between the source volume and the replica, or if the replication pairing is deliberately broken (see Breaking Replication on page 45), the replica is automatically promoted and can be used as a regular volume. In order to reestablish the original replication relationship, one must decide

which of the two volumes contains the more important data—the original source volume or the promoted replica:

- If the original source volume contains the more important data (i.e., the data that you wish to keep), perform the procedure under Demote a replica and reestablish replication link on page 64. This procedure reestablishes the replication relationship, undoes any changes made to the replica since its promotion, and copies all data on the source that was changed since the replication pairing was broken.
- If the promoted replica contains the more important data, perform the procedure under Restore from the replica and reestablish replication link on page 61. This procedure reestablishes the replication relationship, undoes any changes made to the source volume since the replication pairing was broken, and copies all changes made to the promoted replica to the source volume.

Glossary

A

array
: A linked group of one or more physical, independent hard disk drives. See also “RAID”.

B

bit
: The smallest unit of digital data, representing a 0 or a 1. Abbreviated “b”.

byte
: A unit of data that is 8 bits long. Often used for alphanumeric characters. Abbreviated “B”.

C

copy-on-write
: A system of storing data in snapshots. When the snapshot is first created, only the metadata about where original data is stored is copied; no physical copy of the data is done at the time the snapshot is created. The snapshot then tracks the changing blocks on the original volume as writes to the original volume are performed. The original data that is being written to is copied into the snapshot before original data is overwritten

D

DAT
: The file format of text-based event logs downloaded from Nexsan Storage Systems and of snapshot and replication license files uploaded to Nexsan Storage Systems.

E

Ethernet
: A system for connecting a number of computer systems to form a local area network (LAN), with protocols to control the passing of information and to avoid simultaneous transmission by two or more systems. Supports data transfer rates of 10, 100, 1,000, and 10,000 megabits per second (Mb/s). 10, 100, and 1,000Mb/s networks are often referred to as 10BASE-T, 100BASE-T, and 1000BASE-T, respectively. 10,000Mb/s networks are usually referred to as 10Gb Ethernet or 10GbE.

F

failback
: The capability of a system, after a failover, to return to its primary configuration upon the restoration or restart of the primary system. In replication, the ability to seamlessly switch host

access from a replica to its source volume so as to avoid interruption of data access.

failover
: The capability of a system to switch over automatically to a redundant or standby system upon the failure or abnormal termination of the previously active system. In replication, the ability to seamlessly switch host access from a source volume to its replica so as to avoid interruption of data access.

firewall
: A device or set of devices, either hardware- or software-based, designed to permit or deny network transmissions based upon a set of rules. Used to protect networks from unauthorized access while permitting legitimate communications to pass. Many personal computer operating systems include software-based firewalls to protect against threats from the public Internet.

frame
: A data packet on an Ethernet or Fibre Channel link. Each frame encapsulates a piece of data with sender and destination information, along with a data integrity check routine. Normal frames can contain data up to 1,500 bytes in length. Jumbo frames can contain larger data payloads (up to 9,000 bytes on Nexsan Storage Systems) and are supported on 1Gb/s and 10Gb/s Ethernet (10GbE) networks. Jumbo frames are typically used to boost performance of iSCSI traffic.

G

Gb
: Gigabit. Approximately one billion (1,000,000,000) bits.

GB
: Gigabyte. Approximately one billion (1,000,000,000) bytes. Used to describe the storage capacity of hard disk drives. A gigabyte is usually computed as 10^9 (1,000,000,000) bytes, but can also be computed as 2^30 (1,073,741,824) bytes (often called a “binary gigabyte” and abbreviated GiB).

Gb/s
: Gigabits (Gb) per second. Used to describe the speed of network data transmission.

GB/s
: Gigabytes (GB) per second. Used to describe the speed of network data transmission. 1 GB/s is eight times faster than 1Gb/s.

graphical user interface
: A type of user interface that enables users to interact with electronic devices using images rather than text commands. Nexsan Storage Systems use a graphical user interface for system configuration.

GUI
: See “graphical user interface”.

H

host
: A computer, server, or other device which accesses the volumes in a Nexsan Storage System. The host can be connected to the Nexsan Storage System with a Fibre Channel connection, an iSCSI connection, or a SAS connection.

I

I/O
: Input/Output. The communication between an information processing system (such as a computer or a Nexsan Storage System’s RAID controller), and the outside world (either an operator or another information processing system). Inputs are the signals or data received by the system, and outputs are the signals or data sent from it.

IP address
Internet Protocol address. A numerical label assigned to each device (such as a computer, printer, or Nexsan Storage System) on a computer network that uses TCP/IP for communication.

iSCSI
Internet Small Computer System Interface. A transport protocol that provides for the SCSI protocol to be carried over a TCP/IP network.

J

jumbo frame
See “frame”.

L

LAN
See “local area network”.

local area network
A computer network that links devices within a small geographic area, such as a building or group of adjacent buildings.

logical unit
See “volume”.

LUN
Logical Unit Number. An identification scheme for storage disks that supports a small number of logical units. On Nexsan Storage Systems, LUNs are assigned to volumes and are addressed as LUN 0 through 254.

M

Mb
Megabit. Approximately one million (1,000,000) bits.

MB
Megabyte. Approximately one million (1,000,000) bytes. Used to describe the storage capacity of hard disk drives. A megabyte is usually computed as 10^6 (1,000,000) bytes, but can also be computed as 2^20 (1,048,576) bytes (often called a “binary megabyte” and abbreviated MiB).

Mb/s
Megabits (Mb) per second. Used to describe the speed of network data transmission.

MB/s
Megabytes (MByte) per second. Used to describe the speed of network data transmission. 1 MB/s is eight times faster than 1Mb/s.

N

Nexsan Storage Tools
A suite of tools that, in addition to the graphical user interface, provide ways to manage Nexsan Storage Systems.

P

pairing
The process of associating two units for the purpose of establishing replication between them.

R

RAID
Redundant Array of Independent Disks. A system using multiple hard drives organized into a single logical unit for the sharing or replication of data in order to increase data integrity, fault-tolerance, and throughput. Also referred to as a RAID set. RAIDs are organized into RAID levels, which describe their architecture and configuration.

RAID level
A numeric indicator of the architecture used by a RAID. RAIDs can be built using any combination of striping, mirroring, and parity. The

levels are numbered from 0 through 6. Some RAID levels can also be combined, and these configurations are usually referred to with a two-digit number. For example, RAID 10 = RAID 1 + RAID 0.

RAID set
See “RAID”.

replica
A duplicate of a volume on a Nexsan E-Series Storage System copied onto another Nexsan E-Series Storage System. At the time of replication, replicas contain all of the data on the original volume. Replicas can be promoted to full volumes, after which replication between the two volumes is no longer possible.

replication
A function of Nexsan E-Series Storage Systems that enables the user to make replicas of a volume onto another Nexsan E-Series Storage System to protect data in the event of a disaster or as part of a backup and restore architecture.

retention policy
See "snapshot retention policy".

S

SAN
See “storage area network”.

sandbox
A testing environment that isolates untested code changes and outright experimentation from the production environment or repository. Sandboxing protects "live" servers and their data, vetted source code distributions, and other collections of code, data and/or content, proprietary or public, from changes that could be damaging to a mission-critical system or which could simply be difficult to revert.

SCSI
Small Computer System Interface. A collection of standards and proposed standards for input/output (I/O) communication, primarily intended for connecting storage subsystems or devices to hosts.

Shell Extensions
One of six Nexsan Storage Tools. Shell Extensions adds an extension to the Windows shell to provide information about the Nexsan Storage System associated with a particular disk drive.

snapshot
A “picture” of the data and state of a volume at a particular point in time using a copy-on-write function to capture only data that has changed since the last snapshot. Snapshots can be used for many purposes, including backups, restores, and “sandboxing”.

snapshot reservation
A hidden volume that is used to store snapshot data.

snapshot retention policy
A set of rules for retaining snapshots after they have been created. The rules may be based on maximum snapshot count or snapshot lifetime.

source volume
In replication, the volume that contains the data that is being copied to the replica.

storage area network
An architecture that provides for attachment of remote computer storage devices to servers in such a way that the devices appear as locally attached to the operating system.

Storage Manager
One of the Nexsan Storage Tools. Storage Manager provides a common management point for all Nexsan Storage Systems, either in a standalone window or directly integrated into Windows’ Computer Management.

T

TB
: Terabyte. Approximately one trillion (1,000,000,000,000) bytes. Used to describe the storage capacity of hard disk drives. A terabyte is usually computed as 10^12 (1,000,000,000,000) bytes, but can also be computed as 2^40 (1,099,511,627,776) bytes (often called a “binary terabyte” and abbreviated TiB).

TCP/IP
: Transmission Control Protocol/Internet Protocol. The set of communications protocols used for the Internet and other similar networks. TCP provides reliable delivery of messages between networked computers. IP uses numeric IP addresses to join network segments.

V

volume
: An area of usable storage that is addressed as a single unit as if it were a separate, physical disk drive. Volumes can exist on a single disk drive or on a RAID that spans multiple disk drives.

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