

EMC[®] NetWorker[®] Snapshot Management for NAS Devices

Version 8.2

Integration Guide

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EMC²

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Preface

As part of an effort to improve its product lines, EMC periodically releases revisions of its software and hardware. Therefore, some functions described in this document might not be supported by all versions of the software or hardware currently in use. The product release notes provide the most up-to-date information on product features.

Contact your EMC technical support professional if a product does not function properly or does not function as described in this document.

Note

This document was accurate at publication time. Go to EMC Online Support (<https://support.emc.com>) to ensure that you are using the latest version of this document.

Purpose

This document provides planning, practices, and configuration information for the use of the EMC NetWorker Snapshot Management for NAS devices features within an EMC NetWorker backup and storage management environment.

Audience

This document is intended for system administrators. Readers of this document must be familiar with the following tasks:

- Identifying the different hardware and software components that make up the NetWorker datazone.
- Following procedures to configure storage management operations.
- Following guidelines to locate problems and implement solutions.

Revision history

The following table presents the revision history of this document.

Table 1 Revision history

Revision	Date	Description
03	November 3, 2014	Restriction against Client Name for NAS backups specified by Isilon SmartConnect or that use aggregated connections.
02	October 17, 2014	Clarified requirement of File Server Credentials (wizard method) or NAS File Access User (manual method) for snapshot data access and recovery on Microsoft Windows hosts.
01	June 18, 2014	First release of this document for EMC NetWorker 8.2 SP1, covers new support for NetApp SnapMirror and SnapVault, and Cluster Mode snapshots.

Related documentation

The following EMC publications provide additional information:

- *EMC NetWorker Online Software Compatibility Guide*
Provides a list of client, server, and storage node operating systems supported by NetWorker and other EMC information protection software versions. You can access the Online Software Compatibility Guide on the EMC Online Support site at

support.emc.com. From the Support by Product pages, search for NetWorker using "Find a Product", and then select the **Install, License, and Configure** link.

- *EMC NetWorker Hardware Compatibility Guide*
This guide provides a matrix of third-party hardware and operating system combinations that are certified with NetWorker.
- *EMC NetWorker Administration Guide*
Describes how to configure and maintain the NetWorker software.
- *EMC NetWorker Cluster Integration Guide*
Contains information related to configuring NetWorker software on cluster servers and clients.
- *EMC NetWorker Installation Guide*
Provides information on how to install, uninstall and update the NetWorker software for clients, storage nodes, and servers on all supported operating systems.
- *EMC NetWorker Updating from a Previous Release Guide*
Describes how to update the NetWorker software from a previously installed release.
- *EMC NetWorker Release Notes*
Contains information on new features and changes, fixed problems, known limitations, and environment and system requirements for the latest NetWorker software release.
- *EMC NetWorker Avamar Devices Integration Guide*
Provides planning and configuration information on the use of Avamar devices in a NetWorker environment.
- *EMC NetWorker Command Reference Guide*
Provides reference information for NetWorker commands and options.
- *EMC NetWorker Data Domain Deduplication Devices Integration Guide*
Provides planning and configuration information on the use of Data Domain devices for data deduplication backup and storage in a NetWorker environment.
- *EMC NetWorker Error Message Guide*
Provides information on common NetWorker error messages.
- *EMC NetWorker Licensing Guide*
Provides information about licensing NetWorker products and features.
- *EMC NetWorker Management Console Online Help*
Describes the day-to-day administration tasks performed in the NetWorker Management Console and the NetWorker Administration window. To view Help, click Help in the main menu.
- **EMC NetWorker User Online Help**
The NetWorker User program is the Windows client interface. Describes how to use the NetWorker User program which is the Windows client interface connect to a NetWorker server to back up, recover, archive, and retrieve files over a network.
- **Technical Notes/White Papers**
Technical Notes and White Papers provide an in-depth technical perspective of a product or products as applied to critical business issues or requirements. Technical Notes and White paper types include technology and business considerations, applied technologies, detailed reviews, and best practices planning.

Special notice conventions used in this document

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NOTICE

Addresses practices not related to personal injury.

Note

Presents information that is important, but not hazard-related.

Typographical conventions

EMC uses the following type style conventions in this document:

Bold	Use for names of interface elements, such as names of windows, dialog boxes, buttons, fields, tab names, key names, and menu paths (what the user specifically selects or clicks)
<i>Italic</i>	Use for full titles of publications referenced in text
Monospace	Use for: <ul style="list-style-type: none"> • System code • System output, such as an error message or script • Pathnames, file names, prompts, and syntax • Commands and options
<i>Monospace italic</i>	Use for variables
Monospace bold	Use for user input
[]	Square brackets enclose optional values
	Vertical bar indicates alternate selections - the bar means “or”
{ }	Braces enclose content that the user must specify, such as x or y or z
...	Ellipses indicate non-essential information omitted from the example

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CHAPTER 1

Overview of NAS Snapshot Features

This chapter includes the following topics:

- [NetWorker snapshot management for NAS feature description](#) 14
- [Components of the NAS snapshot network](#)..... 17
- [Licensing requirements](#)..... 19
- [Example NSM snapshot environments](#)..... 19

NetWorker snapshot management for NAS feature description

The EMC® NetWorker® 8.2 server software includes optional features to enable NetWorker snapshot management for network-attached storage (NAS) also called NSM for NAS. Supported NAS devices are EMC Isilon®, EMC VNX®, EMC VNX2®, EMC VNXe® and NetApp.

NAS devices are configured as clients of the NetWorker server, for example, by using the Client Configuration Wizard, but you do not install NetWorker client software on a NAS device. NAS snapshot and replication features are covered by NDMP licenses.

Before you plan, configure, and administer the snapshot environment, become familiar with the concepts in this chapter. You will need an advanced working knowledge of the NAS devices that you will use with NetWorker snapshot management.

The *EMC NetWorker Hardware Compatibility Guide* provides details on NAS versions that NetWorker supports.

The *EMC NetWorker Release Notes* provides the latest details on NetWorker features, support, fixed problems, and known problems with workarounds.

NAS snapshot operations

A NAS device is a dedicated file server that provides primary data storage for application servers in a heterogeneous network environment. A NAS device may also be called a NAS filer, NDMP data server, NDMP client, or a data mover. The NAS device organizes and presents stored data as file systems. Data backup and data recovery operations can also use NDMP over a TCP/IP network. NDMP enables the required device drivers between the primary NAS device storage and secondary storage on tape or VTL devices.

The amount of data stored on NAS devices can often be large and the backup times for tape and VTL devices can exceed the available backup window. By scheduling local point-in-time snapshot copies of the NAS data, NetWorker can replicate the snapshot data and use whatever time is required to rollover the data to the backup media independently of the normal backup windows.

NetWorker works with NAS devices to perform the following snapshot and replication operations:

- Create a local snapshot save sets of specified data on the NAS device.
- Replicate specified snapshot data on a source NAS device to a different location on the device or to a location on a different NAS device.
- Perform immediate or delayed rollover of specified snapshot save sets to secondary storage by using NDMP.
- Apply retention policies to manage the lifecycles of snapshot, replication, and rollover save sets.
- Recover specified data from snapshots and rollovers.

NetWorker applies retention policies to manage the lifecycles of snapshot and rollover save sets.

Discovery of non-NetWorker snapshots

NetWorker can discover snapshots on the NAS device that NetWorker did not create. NetWorker can manage these snapshots as follows:

- NetWorker catalogs all discovered snapshots as snapshot save sets

- NetWorker can roll over, recover, and report details of discovered snapshots but cannot delete them
- You can schedule discovery once per day or perform discovery manually

Types of NAS snapshot-based backups

The type of NAS snapshot-based backup that you configure depends on where you intend to create and store the snapshots, as follows:

- Local snapshot only
 - NetWorker creates a snapshot of specified files on the NAS device and retains the snapshot on the device. The NetWorker server catalogs the snapshot as a backup in the media database and can perform a recovery from the snapshot.
- Local snapshot with rollover
 - Local snapshot and rollover backup—NetWorker creates a snapshot of specified files on the NAS device and immediately rolls over the snapshot to conventional storage on tape or VTL media. The NAS device retains the snapshot. The NetWorker media database catalogs both the snapshot and the rollover as backups. The NetWorker client file index catalogs the rollover. The NetWorker server can perform a recovery from either the snapshot or the rollover.
 - Rollover-only backup—NetWorker creates a snapshot of specified files on the NAS device and immediately rolls over the snapshot to conventional tape or VTL media. When the rollover completes, NetWorker deletes the snapshot. The NetWorker server can recover only from the rollover.
- Snapshot with replication snapshot (Isilon only)
 - NetWorker creates a snapshot of specified files on a NAS device that you configured with replication policies, and the device-specific features replicate the files to either the same device or to a remote NAS device. When this operation completes, NetWorker creates a snapshot of the replicated data. The NetWorker server catalogs the remote snapshot as a backup in the media database. The NetWorker server can perform rollover and recovery operations from that snapshot.

Types of NAS snapshot recoveries

The types of recovery that you can perform for snapshot-based save sets depends on the location of the snapshot backup and where you want to recover the data:

- Snapshot recovery—NetWorker mounts the snapshot volume where you can browse the save sets and select the directories or the individual files to recover.
 - In-place—Recovers files and directories to their original locations on the NAS device.
 - Out-of-place—Recovers files and directories to a new location you specify on the NAS device.
 - Directed recovery—Recovers files and directories to the NetWorker host that runs the recovery. You can configure the recovery directory as an NFS or CIFS file share, which enables you to recover to a remote location, such as another client or a NAS device.
- Recovery from rollover—Essentially the same as recovery from a backup. You perform a conventional NetWorker recovery from the backup storage media.

NetWorker clone support

NetWorker cannot create clones directly from snapshot save sets. Once NetWorker rolls over a snapshot to conventional tape or VTL storage media, the NetWorker server can create clone copies of the backed-up save sets. The NetWorker server catalogs the clones in the media database. Clones retain the same retention policies as the snapshots, but you can modify the policies.

The *EMC NetWorker Administration Guide* provides details.

Snapshot lifecycle policies

NetWorker software provides lifecycle policies for snapshot save sets. Snapshot policies specify the following information:

- The time interval between the snapshots
- The maximum number of snapshots stored on a NAS device, after which NetWorker automatically deletes the oldest snapshots
- Which snapshots NetWorker backs up to conventional storage media

Backup configuration methods

You can configure snapshot backups by using either the client wizard or the property windows in the NetWorker Management Console (NMC) interface, although each has limitations:

- NMC Client Configuration Wizard
 - Recommended method to create and modify NAS snapshot configurations.
 - Provides the correct sequence of steps and verifications.
 - Cannot configure some special use directives and variables.
- NMC Client Property windows
 - Non-wizard, manual method can modify most configurations for an NAS NDMP client.
 - Cannot configure replication policies used for locally replicated and remotely replicated snapshots, which you must set in the wizard.
 - Can configure uncommon directives or any special functions not supported by the wizard, such as the variables listed in [Application Information Variables on page 41](#).

Recovery interfaces

You can use the following interfaces to recover snapshot-based data:

- The NetWorker Recovery Wizard is the recommended interface to use to recover data from the snapshots and conventional storage media.
- The `nsrsnapadmin` command utility provides an interactive Command Line Interface (CLI) session for various snapshot-related operations, including recovery from a snapshot and recovery from conventional storage media.
- The `nsrnassnap_recover` command provides another CLI method to recover data from a snapshot or conventional storage media.

The *EMC NetWorker Command Reference Guide* provides details of the NetWorker commands.

Monitoring and reporting NAS snapshot operations

NetWorker reporting features enable you to monitor NAS snapshot operations for each NetWorker client or NAS device, including snapshots that you did not create with NetWorker. NetWorker catalogs all snapshots as backup save sets. You can monitor the progress of the snapshot creation, mounting, deletion, and rollover operations.

The NetWorker `nwnassnap.raw` log provides details of snapshot operations.

Internationalization support

NetWorker provides NAS snapshot operations with the standard NetWorker client support for non-ASCII international character sets.

Components of the NAS snapshot network

You can deploy various required and optional devices, hosts, and connectivity for NAS snapshot operations in a NetWorker datazone.

NAS devices

A NAS device is a dedicated file server that provides primary data storage that you can use for NDMP data operations. A NAS device may also be called an NDMP data server, datamover, NDMP client, or NAS filer. You must configure a NAS device as a client of the NetWorker server, but you do not install NetWorker client software on a NAS device.

All the supported NAS devices support directed recovery to the host that runs the recovery. You can recover to an NFS file share directory on that host, which enables recovery to a remote host or remote device.

Table 2 NAS device support and limitations

NAS device	Characteristics
EMC Isilon	<ul style="list-style-type: none"> Supports snapshots with SnapshotIQ™ and requires OneFS® 7.02 or later. Supports replications with SyncIQ® and requires OneFS 7.1 or later. Supports snapshots and replication at the directory level. Supports in-place and out-of-place recovery of snapshot directories. Supports directed recovery. Does not support in-place or out-of-place recovery from a remotely replicated snapshot.
EMC VNX/VNX2	<ul style="list-style-type: none"> Supports snapshots at the file system level. The Client resource must specify the Control Station name. Supports directed recovery. Does not support in-place or out-of-place snapshot recovery. Does not support replication.
EMC VNXe	<ul style="list-style-type: none"> Requires Unisphere Management client (uemcli) on the NetWorker server.

Table 2 NAS device support and limitations (continued)

NAS device	Characteristics
	<ul style="list-style-type: none"> • Supports snapshots at the file system level. • The Client resource must specify the Control Station name. • Supports directed recovery. • Does not support in-place or out-of-place snapshot recovery. • Does not support replication.
NetApp	<ul style="list-style-type: none"> • Requires operating system libraries from the NetApp Manageability SDK, available from NetApp. On Microsoft Windows, install in a directory in the system-level PATH variable. On Linux, install in the /usr/lib64 directory. • Supports snapshots at the volume-level only. No support for cluster-mode systems or for replication (SnapMirror and SnapVault). • Supports OnTAP 8.0 or later (7-mode only). • Supports in-place and out-of-place recovery of snapshot files but not directories or save sets (except if the save set is a single file), and only to the same volume as the source. • Supports directed recovery. • Does not support a temporary mount point for snapshot browse and recover (NetApp on Linux limitation). Must use an existing NFS mount point.

NDMP environment

NetWorker software uses NDMP functionality to enable access to storage in a heterogeneous network environment. NDMP uses TCP/IP to control the movement of the data, and specifies various device drivers to store the data on devices.

NetWorker server

The NetWorker server manages the NAS devices and the configuration settings required to create the snapshots and perform the rollover and the recovery operations. It is the Data Management Agent (DMA).

NetWorker client

NAS devices do not run NetWorker client software. However, to support local or remote replication, you must create a NetWorker Client resource for the device. The Client resource specifies the snapshot replication target and provides credentials to the NetWorker server for replication, rollover, and recovery operations. This Client resource requirement applies only to the following NAS devices:

- EMC Isilon
- NetApp

NetWorker storage node

The NetWorker storage node hosts and manages the devices for rollovers to secondary storage media, such as tape or VTL devices. The storage node is the NDMP tape server.

If you plan to use NAS devices only to create and recover snapshots without rollover to secondary storage, then the use of a storage node is optional.

Backup storage media

NetWorker uses NDMP services to roll over NAS snapshot save sets to tape or VTL storage media. During a rollover, NetWorker catalogs the rollover save set files in its client file index.

Licensing requirements

NAS snapshot and replication features are covered by NDMP licenses.

The *EMC NetWorker Licensing Guide* and an EMC sales representative can provide details about licensing for NSM.

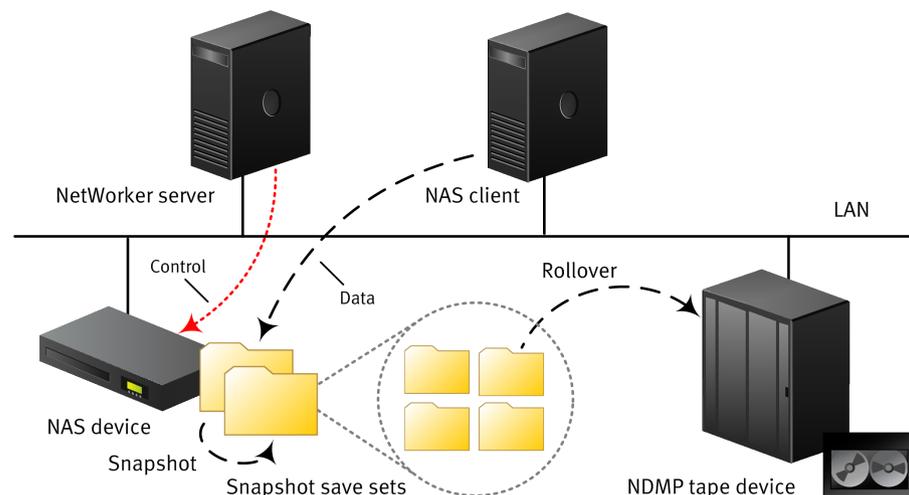
Example NSM snapshot environments

Plan the NSM-NAS environment to manage data efficiently as illustrated by the following examples.

Example of a snapshot and rollover to storage media

The following figure and description illustrates the data flow in a typical environment for a snapshot of NAS client data with rollover to tape storage. A device-specific operation on the NAS device creates separately addressable copies of the production data. These copies are the snapshot save sets. A rollover copies a snapshot save set to an NDMP tape or VTL device where NetWorker stores it as a backup save set.

Figure 1 NAS snapshot with rollover to storage media.



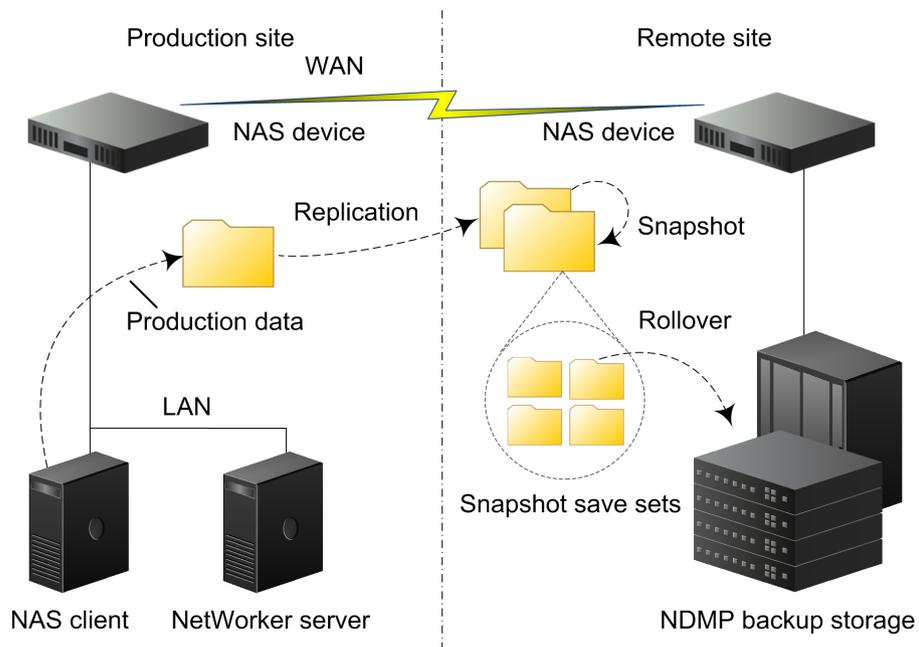
1. A NAS client writes its production data to primary storage on a NAS device.

2. At a specified time, the NetWorker server instructs the NAS device to create a snapshot of production data.
The NetWorker Client resource settings for the NAS device identify which file systems on the device require a snapshot.
3. The NAS device performs a proprietary operation to create a local snapshot.
4. The NetWorker client settings may instruct the NAS device to roll over the snapshot save set to secondary storage on an NDMP tape or VTL device:
 - If NetWorker rolls over the snapshot, the NAS device copies the snapshot save set to the specified tape backup media or VTL on the secondary storage device. By default setting, the snapshot retention policies carry over to the backup copy.
 - If NetWorker does not roll over the save set but retains the snapshot on the NAS device only, NetWorker can recover the save set data from the snapshot only.
5. The NetWorker server manages the snapshot save set and any secondary backup save set according to the options configured in the Client resource and Snapshot Policy resource.
6. The NAS device retains the snapshot until it expires or until the NetWorker server must delete it to create more snapshots, as specified by the snapshot policy.

Example of a snapshot from replication

The following figure and description illustrates the data flow for a snapshot of remotely replicated NAS client data with optional rollover to NDMP storage media.

Figure 2 Remote replication with snapshot and rollover to storage



1. A NAS client writes its production data to primary storage on a NAS device.
2. At a specified time, the NetWorker server instructs the NAS device to create a remote replication/snapshot of production file systems. The NAS device uses its proprietary operations to create the replication on the remote NAS device.
 - For EMC Isilon devices, the production file systems to replicate are specified by the NetWorker Client resource for the device.

- For NetApp devices, the device creates a local full PiT snapshot/replication of the production data on the same device and then updates the remote NetApp mirror device with any new, changed, or deleted data.
3. At a time specified in the NetWorker Client resource for the remote NAS device, the NetWorker server instructs the device to use its proprietary operations to create a snapshot/replication of the replicated file systems. The NetWorker server catalogs the remote snapshot as a backup save set from which recoveries can be made.
 4. The NetWorker Client resource settings may also instruct the remote NAS device to roll over the snapshot save set to secondary storage on an NDMP tape or VTL device.
 5. The NetWorker server manages both the remote snapshot save set and any secondary backup save set according to the retention options and other options configured in the Client resource and Snapshot Policy resource.
 6. The NAS device retains the snapshot until it expires or until the NetWorker server must delete it to create more snapshots, as specified by the Snapshot Policy resource.

Examples of snapshot recovery

The following description of process and figures illustrate the data flow for recovery of directories or files from a snapshot save set:

1. You select the snapshot volume that contains the data that you want to recover. NetWorker mounts the snapshot volume.
2. You browse for the files, file systems, or volumes that you want to recover.
3. You specify where to recover the data on the NAS device host or on a NetWorker host.
 - In-place recovery—Recover to the original location on the NAS device.
 - Out-of-place recovery—Recover to a different location on the NAS device.
 - Directed recovery—Recover to a directory on the NetWorker client host that is running the recovery. The recovery directory may be a local directory or a locally mounted CIFS or NFS remote file system.
4. NetWorker copies the data from the snapshot volume to the specified location.

Figure 3 In-place recovery restores data to the original location on the source device.

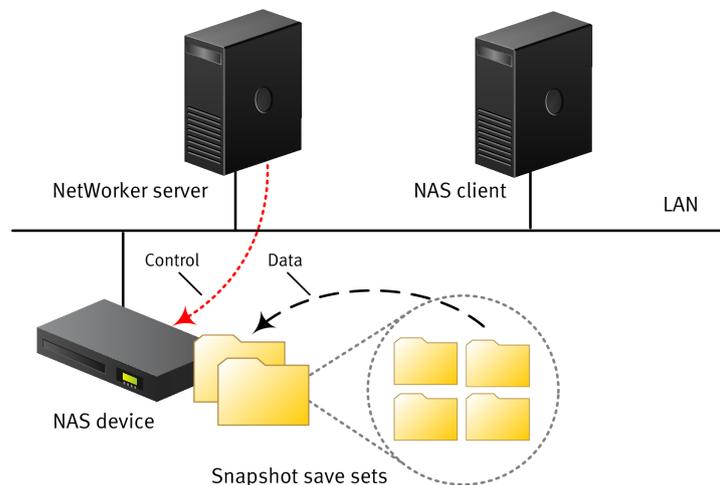


Figure 4 Out-of-place recovery restores data to a different location on the source device.

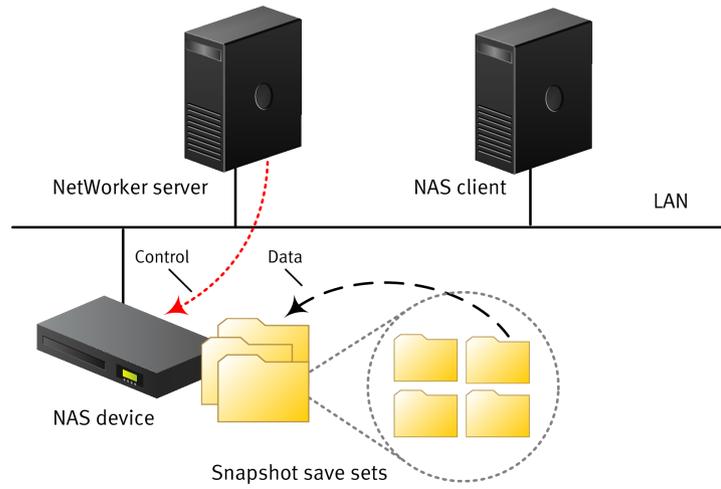
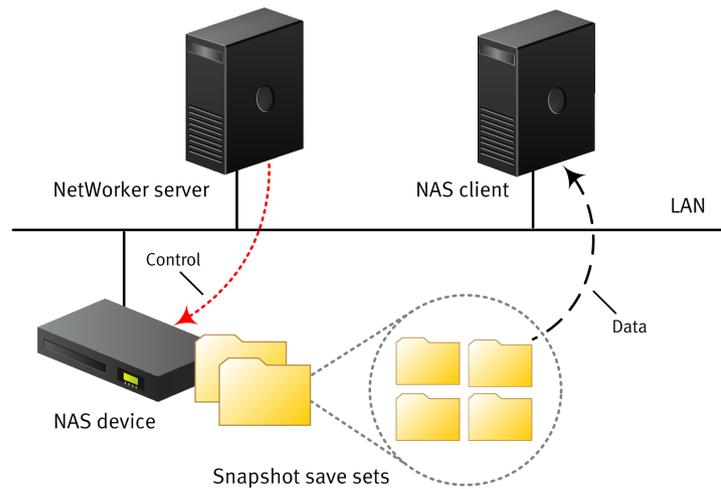


Figure 5 Directed recovery restores data to the NetWorker client that runs the recovery.



CHAPTER 2

Software Configuration

This chapter includes the following topics:

- [Road map for NAS snapshot configuration](#) 24
- [NetWorker with NAS configuration prerequisites](#) 24
- [Configuring a snapshot and rollover with the wizard](#) 25
- [Configuring snapshots and rollovers manually](#) 29
- [Configuring the Application Information variables](#) 31
- [Configuring preprocessing and postprocessing scripts](#) 31

Road map for NAS snapshot configuration

Plan the NAS snapshot configuration by using a high-level road map that outlines the sequence of configuration tasks that you need to perform.

1. Ensure that you meet the configuration prerequisites.
[NetWorker with NAS configuration prerequisites on page 24](#) provides details.
2. Configure the snapshot and the rollover operations by using either the Client Configuration Wizard or the manual method. The following topics provide details:
 - [Configuring NAS device snapshots and rollovers with the wizard on page 25](#)
 - [Configuring snapshots and rollovers manually on page 29](#)
3. Configure any necessary Application Information variables.
[Configuring the Application Information variables on page 31](#) provides details.
4. Configure any necessary preprocessing or postprocessing scripts.
[Configuring preprocessing and postprocessing scripts on page 31](#) provides details.
5. Test the configuration.

NetWorker with NAS configuration prerequisites

Verify the basic compatibility of all systems used for NetWorker operations. [Components of the NAS snapshot network on page 17](#) provides details.

The following sections describe the prerequisites for the hosts involved in NetWorker operations.

NAS device prerequisites

Ensure that the NAS device is installed with the prerequisite software for snapshot and rollover operations:

- EMC Isilon: None required.
- EMC VNX or VNX2: None required.
- EMC VNXe: VNXe Unisphere CLI, available on support.emc.com.
- NetApp: NetApp Manageability SDK, available from NetApp.
 - Ensure `options.httpd.admin.enable` is set to ON.
 - Optionally, `options httpd.admin.ssl.enable` may be set to ON for HTTPS access.

Ensure that the NAS device and NetWorker server have the same system time. Snapshot and replication operations can cause problems or fail if you do not synchronize them within 10 seconds. The recommended method is to use a common Network Time Protocol (NTP) server to obtain system time. This will prevent time drift.

The support matrix for the NAS device that you use, available from EMC Online Support, provides requirement details on systems and software.

Replication configuration

Ensure the following prerequisites for replication operations:

- Ensure you have correctly configured the replication policy on the NAS device before you create the Client resource for the NAS device.

- Ensure you have configured the replication policy to create a snapshot when the replication operation completes.
- Ensure you have synchronized the system times on the NAS devices and the NetWorker server.

The NAS device documentation provides details.

Storage node prerequisites

If you plan to roll over the snapshot save sets to conventional storage media, then a NetWorker storage node is required for recovery operations.

Ensure the following prerequisites:

- NetWorker storage node 8.1 or later software is installed.
- NDMP backup storage devices are configured on the storage node for the rollover operations.

Configuring a snapshot and rollover with the wizard

NMC configures NAS devices as NetWorker clients. NDMP enables NAS devices to mimic NetWorker clients for configuration purposes without NetWorker client software installed. The wizard is the recommended configuration method.

Procedure

1. Ensure the necessary prerequisites.
[NetWorker with NAS configuration prerequisites on page 24](#) provides details.
2. Run NMC, and in the **Enterprise** view, browse tree, right-click the NetWorker server that will manage the snapshots and select **Launch Application**.
3. In the NetWorker server's **Configuration** view, launch the client wizard (NMC configures NAS devices as NetWorker clients):
 - To create a NAS device backup configuration, right-click **Client** in the navigation tree and select **New Client Wizard**.
 - To modify a configuration, right-click an existing NAS device in the Client table and select **Modify Client Wizard**.
4. In the wizard, complete the **Specify the Client Name and Type** page:
 - a. In the **Client Name** field, type a hostname associated with a non-aggregated (non-teamed) network connection to one of the Isilon cluster nodes that has a fixed IP address. Do not use the SmartConnect hostname.
 - b. In the **Client Type** field, select **NAS Device**.
 - c. Click **Next**.
5. Complete the **Specify Credentials for the NAS device** page:
 - a. In the **Management Credentials** fields, type a **User Name** and **Password** for the user authorized to access data on this client instance of the NAS device, for example, to create, delete, or share snapshots. Each instance can have a different user. You may need to provide a management name or address, for example, for a VNX Control Station name if it differs from the NAS device name.
 - b. In the **NDMP Credentials** fields, type a **User Name** and **Password** for the user authorized to perform NDMP operations on the NAS device, such as browsing the file system during configuration.

- c. If a Microsoft Windows client will access the snapshot data, complete the **File Server Credentials**. These fields are ignored by other operating system types. Type a **User Name** and **Password** for the user authorized to mount and access the snapshot data on a Windows recovery host for this instance of the NAS device. Each instance can have a different user.
- d. Click **Next**.
- 6. Complete the **Verify the NAS Device Information** page:
 - a. Review the NAS device information details.
 - b. Click **Next**.
- 7. Complete the **Select the File System Objects** page for NAS devices that do not support file browsing:
 - a. Type a list of pathnames of file systems, directories, and individual files to include in the snapshot save set. List each item on a separate line.
 - b. Click **Next**.
- 8. Complete the **Specify Snapshot Location** page.
 - a. Specify a local or remote location for the snapshot. The available snapshot locations depend on the replication policies that the storage administrator has configured on the NAS device. The available locations for replication are those capable of replicating all the save set paths specified earlier in the wizard.
 - **Local snapshot**—The device will not replicate the selected data and NetWorker will create a snapshot of the original data.
 - **Locally replicated snapshot**—The device will replicate the selected data to a different location on the same device and NetWorker will create a snapshot from the replicated data.
 - **Remotely replicated snapshot**—The device will replicate the selected data to a location on a different NAS device and NetWorker will create a snapshot from the replicated data.

For example, if you have defined the following replication policies on the NAS device.

NAS policy name	Local system	Local path	Remote system	Replicated path
Local1	System_A	/ifs/home/folders	n/a	/ifs/localrep
Remote1	System_A	/ifs/home/folders	System_B	/ifs/remoterep/1
Remote2	System_A	/ifs/home	System_B	/ifs/remoterep/2

Then the following snapshot location paths will use the corresponding NAS replication policies.

Snapshot save set location	NAS policies
/ifs	none
/ifs/foo	none
/ifs/home	Remote2

Snapshot save set location	NAS policies
/ifs/home/folders	Local1, Remote1, Remote2
/ifs/home/folders/bar	Local1, Remote1, Remote2

Note

For NetApp devices, if the snapshot destination volume is written to, the destination becomes the new source volume and the relationship switches.

- b. Click **Next**.
9. Complete the **Select the NetWorker Client Properties** page:
 - a. Select or define a **Browse policy** to specify the period during which snapshot save sets or snapshot rollovers are maintained in the online file index, with easy availability.
 - b. Select or define a **Retention policy** to specify the period during which snapshot save sets or snapshot rollovers are maintained in the save set index, before they expire and begin to be deleted.
 - c. Select a **Backup schedule** to specify the level of snapshot rollover to be performed each day. For example, "full" on Fridays, "incremental" on each other day. Although snapshots always create a complete copy of the data, NetWorker can roll over a full or an incremental level backup from the snapshot.
 - d. The attribute for **Remote Access** does not apply to snapshots.
 - e. Click **Next**.
10. Complete the **Specify the NetWorker Backup Group** page:
 - a. Select or create the NetWorker Group resource that will run the snapshots and rollovers for this client:
 - To add the NAS device client to an existing NetWorker group, select **Add to an existing group** and select one or more groups from the list. The wizard lists only groups that are empty or enabled for snapshots.
 - To create a group, select **Create a new group** and specify the attributes.
 - b. Click **Next**.
11. If you created a new Group resource in the previous step, complete the **Specify the NetWorker Snapshot Policy** page:

Note

Snapshot policies apply to groups only and do not affect manual backups that you perform with the `nsrnassnap_save` command.

- To apply an existing snapshot policy to the new group, select **Select an existing snapshot policy** and select a policy in the table.
- To create a new snapshot policy, select **Create a new snapshot policy** and specify the following attributes:
 - a. In the **Name** field, type a unique name for the policy. You cannot rename an existing policy. You must delete all references to the policy, delete the policy name, then create the new policy name.
 - b. In the **Number of Snapshots** field, specify the number of snapshots to be created in a day from the starting time of the snapshot savegroup.

Note

Ensure there will be enough time between NetWorker backups of the same save sets for the operations to complete. A time interval that is too short will cause NetWorker to skip some snapshot backups.

- c. In the **Retain Snapshots** field, specify the number of snapshots that will be actively maintained for each save set of the savegroup. After this number is reached, the oldest snapshot is deleted before the next snapshot is created.

For example, if you set **Number of Snapshots** to 8 and **Retain Snapshots** to 4, then NetWorker performs a snapshot backup eight times per day but retains only the four most recent snapshots.

If you want a rollover-only snapshot policy, then set **Retain Snapshots** to 0 and select **All** for the **Backup Snapshot Options** setting. NetWorker will automatically delete the snapshot when its rollover completes.

- d. In the **Snapshot Expiration Policy** field, select the period after which snapshots will be marked for automatic deletion. To create a new expiration policy, click the plus sign (+) to the right of the field and in the Create Policy window, specify the Policy Name and Period.
- e. In the **Backup Snapshot Options** field, specify which snapshots of the day will be rolled over to storage media.

Number of Snapshots	Description
All snapshots	Rolls over all snapshots.
First snapshot	Rolls over the first snapshot.
Last snapshot	Rolls over the last snapshot, based on the expected maximum Number of Snapshots value.
Every ___ snapshots	Rolls over specific snapshots in the sequence. Separate the numbers by commas. For example, 3 (every third snapshot), or 3,6,9 (every third, sixth, and ninth snapshot).
Do not back up snapshots	Does not roll over any snapshots.

- f. Click **Next**.

12.If you are configuring snapshot rollovers to NDMP devices, complete the **Specify NDMP Properties for Rollover** page. Available values are those supported by the client's NDMP configuration. The *EMC NetWorker Administration Guide* provides details:

- a. Specify the **NDMP backup type**.

NAS device	Supported backup types
EMC VNX	<ul style="list-style-type: none"> • tar • dump — the optimal backup type for this device; it traverses a file tree in mixed width first and depth-first order • vbb — use the volume-based backup type to back up the entire volume at the block level, more efficient than traditional file-based backups. Used to back up the entire volume at the block

NAS device	Supported backup types
	<p>level rather than at a file level, but does not support DDAR, TBB, and Three Party backups.</p> <ul style="list-style-type: none"> ts — tape silvering
EMC Isilon	<ul style="list-style-type: none"> tar dump
NetApp	<ul style="list-style-type: none"> dump — an inode-based backup that traverses a file tree in directory first and file-based order.

- b. Review the **App Info** options that the wizard has selected for the NAS device. You can disable options, as required.
 - c. In the **Advanced App Info** field, you may specify additional NAS-specific variables supported by the client's NDMP configuration, one per line.
 - d. Click **Next**.
13. Complete the **Backup Configuration Summary** page:
- a. Review the attributes and values listed in the summary.
To modify a setting, click **Back** or click the link in the steps panel.
 - b. To accept and create the configuration, click **Create**.
14. Complete the **Client Configuration Results** page:
- a. Ensure that the backup configuration successfully completes.
 - b. Click **Finish**.
15. If you plan to perform rollovers of snapshots, you must open the NAS device Client resource and select the storage pool you want to use for rollovers.

Configuring snapshots and rollovers manually

In some situations you may need to configure a NAS device manually instead of using the NMC Client Configuration Wizard. For NetWorker purposes NAS devices are configured as NetWorker clients.

For example, you can manually modify a NAS device configuration if you need to specify special directives or any options that the wizard does not support, such as the variables described in [Application Information Variables on page 41](#).

Configuring the Group resource manually

You can manually configure a Group resource for NAS snapshot backups:

Procedure

1. Run NMC, and in the **Enterprise** view, in the browse tree, select the NetWorker server name and then launch the NetWorker application.
2. On the NetWorker server's **Configuration** tab, select **Groups** in the browser tree and select the item you need.
 - To create a Group resource, select the **Groups** icon and from the **File** menu, click **New**.

- To modify a Group resource, select the client name from the list in the right panel and from the **File** menu, select **Properties**.
3. Configure the Group resource attributes as you would for a standard NetWorker backup. On the **Setup** tab, configure the **Snapshots** attributes as follows:
 - a. Select **Snapshot** to enable snapshot backups on NAS devices associated with the group.
 - b. Select a **Snapshot Policy**. The policy specifies how many snapshots NetWorker creates in a particular period and how long NetWorker retains the snapshots.

The *EMC NetWorker Administration Guide* provides additional details on Group, Media Pool, and Snapshot Policy resources.

Configuring a NAS device manually

NAS devices are configured as NetWorker clients. You can manually modify a NAS device for snapshots and rollovers by using the NMC property windows. This method enables you to configure special directives or available options that the wizard interface does not support, such as [Application Information Variables on page 41](#). However, you cannot configure replication policies, required for locally replicated and remotely replicated snapshots, which you must configure with the wizard.

The *EMC NetWorker Administration Guide* provides additional Client resource details that are not specific to NAS device configuration.

Procedure

1. Ensure the necessary prerequisites.

[NetWorker with NAS configuration prerequisites on page 24](#) provides details.
2. Run NMC, and in the NMC **Enterprise** view, browse tree, right-click the NetWorker server that will manage the snapshots and select **Launch Application**.
3. In the NetWorker server's **Configuration** view, right-click the NAS device in the **Clients** table and select **Modify Client Properties**.
4. On the **General** tab, ensure the following settings:
 - a. In the **Save set** field, type or browse and select all the file systems, directories, or individual files that you want to include in the snapshot. List each item on a separate line.
 - b. In the **Pool** field, select the media pool for the rollover.
5. On the **Apps & Modules** tab, ensure the following settings:
 - a. If you plan to roll over the snapshot, provide NDMP credentials in the **Remote User** and **Password** fields.
 - b. Select the **NAS device** checkbox.
 - c. Select the **NDMP** checkbox.
 - d. In the **Application information** field, type any optional NDMP variables you want to use in the rollover.

Variables must be uppercase. NetWorker does not validate the variables. [Application Information Variables on page 41](#) provides details.
6. On the **Snapshot Management** tab, ensure the following settings:
 - a. In the **NAS management user** fields, type the name and password for the user authorized to access data, for example, to create, delete, or share data for this instance of the NAS device. Each instance can have a different user.

- b. In the **NAS device management name** field, type the FQDN required by some devices that use a special address for data management. For example, the VNX or VNXe Control Station address, which is different than the NAS file server address.
 - c. If a Microsoft Windows client will access the snapshot data, complete the **NAS file access user** fields. These fields are ignored by other operating system types. Type a **User Name** and **Password** for the user authorized to mount and access the snapshot data on a Windows recovery host for this instance of the NAS device. Each instance can have a different user.
7. When you have completed the NAS device configuration, click **OK**.
 8. To verify the configurations, in NMC, right-click the NAS device in the **Clients** table and select **Check Snapshot Configuration**. The verification can take some time. A pop-up message will list detected problems. Verification assumes sufficient resources are available for the snapshot and the rollover operations and does not guarantee success.

Configuring the Application Information variables

Special Application Information variables provide specific control of snapshot processes. The Client Configuration Wizard cannot configure these variables. You must manually configure these variables in the NetWorker Client resource for the NAS device by using the NetWorker property windows. [Application Information Variables on page 41](#) provides details.

Configuring preprocessing and postprocessing scripts

You can run user-defined preprocessing and postprocessing scripts from the application client. You can run these scripts only for file system backups.

Use preprocessing scripts and postprocessing scripts for operations such as application quiescing, shutdown, or startup. The scripts can produce output such as log files, but the scripts must return an exit status of 0, which means that the script did not fail and the backup can run. Any other exit code for a preprocessing script will cause the backup to fail.

Note

EMC Technical Support does not support user-defined scripts.

Use the following guidelines for the scripts:

Procedure

1. Provide the script files with the following security:
 - On Microsoft Windows systems, provide the script files with security that grants full control only to the local SYSTEM, local Administrators, or Backup Operators groups. Otherwise, the scripts will not run.
To set this security in Windows Explorer, right-click the script file, select Properties, and click Advanced on the Security tab of the Properties window.
 - On UNIX systems, the root user must own the script files. The scripts can set only owner access permissions, and the scripts must at least have run access. Otherwise, the scripts will not run. Also, the parent directory of the scripts must have at least owner run permissions, and must not have write permissions for the group and world.

2. Place the scripts in a directory where a user must have administrator/root privileges to add, modify, or run the resident scripts. Otherwise, any backups that use the scripts will fail.

On Microsoft Windows systems, NetWorker searches for relative pathnames in the *NetWorker_install_path/bin* directory.

3. Include the pathnames of user-defined scripts in the **Application Information** attribute of the property window of the application Client resource by using the following variables:

```
NSR_PRE_SNAPSHOT_SCRIPT=pre-mirror_split-script_path  
NSR_POST_SNAPSHOT_SCRIPT=post-mirror_split-script_path
```

4. After a backup completes, verify the log files generated in the */nsr/logs* (UNIX) directory on the application client host. The log file name is in the form of *script_name_LOGFILE.txt*. The script output appears in the log file.

CHAPTER 3

Data Management and Recovery

This chapter includes the following topics:

- [Snapshot management](#)..... 34
- [NAS snapshot recovery support and limitations](#)..... 35
- [Recovering data from a snapshot with the Recovery Wizard](#)..... 37

Snapshot management

The chapter describes the management and the recovery operations for NAS device file system data only.

The NMC Recovery Wizard and the NetWorker CLI commands provide features that enable you to browse, delete, change snapshot expiration, and recover snapshot data.

Snapshot reporting

You can use NMC Reports to create individual reports of NAS snapshot, replicate, and rollover activities.

1. In NMC, select the **Reports** view.
2. In the **Snapshot Statistics** folder, select either a summary report or a statement report to view.
The **Configure** tab for the selected report type appears in the right panel.
3. In the **Configure** tab, customize the items that you want to include in the report. Select the item parameters. Click the Remove (◀), Remove All (◀◀), or Add All (▶▶) buttons as required.
If you do not specify **Save Time** values, the report will display all the available data. The **View Report** tab shows the resultant report.

The *EMC NetWorker Administration Guide* provides details.

Discovering NAS save sets

The NetWorker Devices view enables you to review a table of the snapshot save sets on a NAS device, including snapshots that NetWorker did not create.

The table lists all snapshots that NetWorker created as Managed. Snapshots that by NetWorker did not create are listed as Discovered. NetWorker can roll over, recover, and report on discovered snapshots but cannot delete them. Snapshot discovery is not enabled by default.

Manually discover snapshot save sets on a NAS device:

1. In NMC, open the NetWorker application, **Devices** view.
2. In the navigation tree, right-click the NAS device and select **Run Discovery**.
The Save Set table updates.

Schedule the discovery of snapshot save sets on a NAS device:

1. In NMC, open the NetWorker application, **Devices** view.
2. In the navigation tree right-click the NAS device and select **Properties**.
3. In the properties window, on the **Snapshot Management** tab, provide the necessary credentials and the time of day (24 hour clock), when you want the daily discovery to run.

Save set IDs and expiration policies

When NetWorker creates a snapshot, it generates a separate save set ID for each snapshot object specified in the Client resource.

For example, a single physical snapshot can create save sets for /home/folders/user1 and /home/folders/user2 if they both reside on the same NAS device. Each save set will have a separate save set ID, even if both save sets belong to the same client and both reside on the same NAS device.

During rollover to conventional storage media, NetWorker assigns a different save set ID to each rolled-over snapshot object. By having two save set IDs, NetWorker manages the snapshot data separately from the rolled-over data. Each save set has an independent expiration policy, and when one save set expires, you can still use the other save set to perform a recovery.

The snapshot policy of the NetWorker Client resource determines the expiration of a snapshot save set. However, you can change the expiration period of an existing snapshot save set and the change does not affect the browse or expiration periods of an associated rollover.

Browsing snapshot and rollover save sets

The NetWorker client file index records only the save sets that it rolls over to conventional storage media. Because NetWorker indexes rollovers, you can browse the save set files in NMC.

The NetWorker media database contains entries for snapshot save sets. However, unlike rollovers, NetWorker does not catalog the snapshot save sets in the client file index. To browse snapshot save sets, you must use the NMC Recovery Wizard or the `nsrsnapadmin` command utility. NetWorker will mount the snapshot file system on the mount host, which enables you to browse and select files to recover.

Browsing and recovery on Windows hosts

When performing file-by-file browsing, or performing a directed recovery from the NAS device to a Microsoft Windows host, NetWorker connects to the NAS device by using the File Server credentials in the Client resource for the NAS device.

Microsoft Windows cannot connect to the NAS device by using different credentials than a previously established file service connection. NetWorker does not use the credentials that a previously established file service connection has used.

NAS snapshot recovery support and limitations

The following support and limitations apply to NAS snapshot recovery operations:

- A NAS snapshot recovery supports the following user interfaces:
 - NMC Recovery Wizard GUI
 - `nsrsnapadmin` command utility
 - `nsrnassnap_recover` command for NAS devices
- You can use either an existing mount point or a temporary mount point to view the NAS file system contents.
 - Linux systems must use an NFS mount point.
 - Windows systems must use a CIFS share mount point.

Note

On Windows systems, a file share connection cannot exist between the Windows system running the recovery and the NAS device with the stored data.

- You can recover individual files or complete file systems from snapshot save sets.
- You cannot combine individual files from multiple save sets in a single recovery session.

- You can recover data from snapshots that NetWorker has rolled over to conventional storage media as you would for any conventional NetWorker backup.

Device-specific limitations for snapshot recovery

The following two tables list the snapshot recovery limitations and the support specific to each of the supported NAS devices. Restore from rollover copies is supported on all supported platforms.

NAS device	Limitation
Isilon	<ul style="list-style-type: none"> Remote replication does not support in-place recoveries and out-of-place recoveries. Renaming the data is supported only for directed recovery. Directed recoveries overwrite an already existing file.
VNX/VNX2	<ul style="list-style-type: none"> In-place recoveries and out-of-place recoveries are not supported. Renaming the data is supported only for directed recovery. Directed recoveries overwrite an already existing file.
VNXe	<ul style="list-style-type: none"> In-place recoveries and out-of-place recoveries are not supported. Renaming the data is supported only for directed recovery. Recovery of NFS volumes on Windows systems is not supported. Recovery of CIFS volumes on Linux systems is not supported. Directed recoveries overwrite an already existing file.
NetApp	<ul style="list-style-type: none"> In-place recoveries and out-of-place recoveries of directories are not supported. In-place recoveries and out-of-place recoveries of save sets are not supported. In-place recoveries and out-of-place recoveries of one or more files are supported, provided that the set of files does not make up the entire contents of the directory. If a recovered file already exists at the recovery destination then you must specify an overwrite option: <ul style="list-style-type: none"> For CLI recovery, when you issue the recover command, you must specify an overwrite option in the <code>nsrsnapadmin</code> prompt, for example: <pre>-A NSR_PS_FILE_RECOVER_OPTS=Y</pre> For recovery with the NMC Recovery Wizard, you must specify an overwrite option. On Linux systems: <ul style="list-style-type: none"> For CLI recovery, when you issue the recover command, in the <code>nsrsnapadmin</code> prompt, you must specify that you will use the existing mount point: <pre>-A NSRATTR_USE_EXISTING_MOUNTPOINT=Yes</pre> If performing an in-place recovery or an out-of-place recovery with the NMC Recovery Wizard, in the "Browse and recover save set"

NAS device	Limitation
	<p>operation, you must select "Create temporary mount point for access". For these operations, renaming the data is not supported.</p> <ul style="list-style-type: none"> Renaming the data is supported only for directed recovery.

Recovery from snapshot	Isilon	Isilon local replication	Isilon remote replication	NetAPP	VNX	VNX2	VNXe
Directed recovery of save set	Yes	Yes	Yes	N/A	Yes	Yes	Yes
In-place recovery of save set	Yes	Yes	N/A	N/A	N/A	N/A	N/A
Out-of-place recovery of save set	Yes	Yes	N/A	N/A	N/A	N/A	N/A
Directed recovery of individual files	Yes	Yes	Yes	Yes	Yes	Yes	Yes
In-place recovery of individual files	Yes	Yes	N/A	Yes	N/A	N/A	N/A
Out-of-place recovery of individual files	Yes	Yes	N/A	Yes	N/A	N/A	N/A

Recovering data from a snapshot with the Recovery Wizard

You can use the NMC Recovery Wizard to recover file system data from a snapshot stored on a supported NAS device.

Procedure

- Run NMC, and in the **Enterprise** view, select the NetWorker server name and select **Enterprise > Launch Application**.
- In the NetWorker server's **Recover** view, select **Recover > New Recover** to launch the Recovery Wizard.
- Complete the **Select the Recovery Hosts** page:
 - In the **Source Host** field, specify the NAS device that was the original source for the snapshot files or directories you want to recover.
 - In the **Destination Host** field, specify where you want to recover the snapshot files and directories:
 - Recover to the same host**—The wizard will later prompt you to recover to a location on the source NAS device.
 - Select a destination host**—The wizard will later prompt you to direct the recovery to a location on the NetWorker host that is running the recovery.

Note

For recovery on a Microsoft Windows host, the NAS device must be configured with the **File Server Credentials** fields (wizard method) or the **NAS file access user** fields (manual method). [Configuring the NAS device manually on page 30](#) provides details for the manual method.

- c. In the **Available Recover Types** field select either **NAS Snapshots** or **Filesystem (NDMP)**.
 - d. Click **Next**.
4. Complete the **Select a NAS Snapshot** page. You can recover the entire snapshot save set or you can recover individual directories and individual files from the snapshot save set:
 - a. In the **NAS Snapshots** table select the snapshot to recover from, based on the snapshot time and save set volumes.
 - b. In **Select save set**, select a single save set volume to mount and recover from.
-

Note

You can select only one save set for this operation. Each additional save set volume will require a separate pass through the wizard.

- c. In **Recover mode**, select from the following options:
 - **Browse and recover save set.** When you click Next, the wizard will mount the snapshot volume for the save set and open the **Select Data to Recover** page. The mount operation can take some time.
-
- d. Click **Next**. The resultant wizard step depends on the selections.
5. If you selected the **Browse and recover save set** option, complete the **Select Data to Recover** page, otherwise, skip this step:
 - a. Specify the items to recover in the browse tree or type the full path of a location. Mark which directories or files the wizard will recover in the table.
-

Note

The wizard does not list expired save sets. You can recover existing expired save sets manually by using the `nsrsnapadmin` command utility with the `R` command option or the `nsrnassnap_recover` command. [Using nsrsnapadmin for NetWorker operations on page 44](#) and the *EMC NetWorker Command Reference Guide* provide details.

- b. Click **Next**.
6. Complete the **Select the Recovery Options** page:

- a. In the **File Path for Recovery** field, select, browse, or type a location where the wizard will recover the files.
 - **Original path**—Recover to the original (in-place) location on the NAS device.
 - **New destination path**—Specify a different (out-of-place) location on the NAS device, or specify a (directed recovery) location on the NetWorker host that is running the recovery.

A directed recovery may specify a location configured as a CIFS or NFS file share, which directs the recovery to a remote location.

Note

In-place and out-of place recovery on the NAS device is not available for the following devices and conditions:

- VNX, VNX2, and VNXe devices
- Isilon devices for a remotely replicated snapshot
- NetApp devices for a directory or save set; although you may recover one or more files, provided the files do not make up the entire contents of a directory.

[Examples of snapshot recovery on page 21](#) illustrates the recovery options.

- b. In the **Duplicate file options** field, specify how the wizard will resolve conflicts in file names or directory names:
 - **Rename the recovered file**—The wizard will recover the file or directory with a new name that NetWorker automatically generates. This option is available for directed recoveries only.
 - **Do not recover the file**—The wizard will not recover the file or directory, but skip it.
 - **Overwrite the existing file**—The wizard will replace the file content or directory content.
 - **Fail the recover**—The wizard will not recover any further files or directories. This option is not available for directed recoveries.

Note

For NetApp devices, you must select an option, otherwise the recovery fails.

- c. To specify further options, select **Advanced Options** and specify the attributes.
 - d. Click **Next**.
7. Complete the **Perform the Recover** page:
 - a. In the **Recovery Name** field, type a name for the recovery.
 - b. In the **Recovery Start Time** field, specify the following attributes:
 - **Start recovery now** is the only option that snapshot recovery supports.
 - In **Specify a hard stop time**, you can specify a time limit that will stop an uncompleted recovery process.
 - c. In the **Recovery Resource Persistence** field, select the retain or delete option for this recovery resource.
 - **Persist this resource until deleted by user**
 - **Automatically remove this resource based on jobs database retention**

- d. Review the **Summary** of the recovery and make any necessary corrections by going to the previous pages in the wizard.
 - e. Click **Run Recover**. The wizard performs the recovery.
8. The *EMC NetWorker Administration Guide* provides more details on the NMC Recovery Wizard.

APPENDIX A

Application Information Variables

This appendix includes the following topics:

- [Using Application Information variables](#)..... 42
- [Common Application Information variables](#)..... 42

Using Application Information variables

As part of the manual configuration of a NAS device, some NetWorker configurations require the use of special variables that provide specific control of snapshot processes.

To implement these controls, type the variables and their values in the Application Information attribute of the Client resource for the NAS device.

[Configuring the Client resource manually for the NAS device on page 30](#) provides the manual configuration procedure that can include Application Information variables.

Common Application Information variables

The following table lists Application Information variables that are common to the NAS devices that NetWorker supports.

Table 3 Common Application Information variables

Common variable	Definition
<i>NASDeviceType</i>	Specifies the snapshot provider. Usually not required due to device type discovery. Valid values are Isilon, NetApp, VNX, and VNXe. If you do not specify a value, NSM tries each of these values in order.
<i>NSR_DEBUG_LEVEL</i>	Specifies the verbosity of error message logs. Valid values are 0 to 9. The default value is 0.
<i>NSR_MOUNTPOINT_NAME</i>	Specifies the name of the mount point to use when NetWorker needs to mount a snapshot on a client.
<i>NSR_POST_SNAPSHOT_SCRIPT</i>	Specifies the pathname of the postprocessing command script. There is no default value.
<i>NSR_PRE_SNAPSHOT_SCRIPT</i>	Specifies the pathname of the preprocessing command script. There is no default value.
<i>NSR_PS_DEBUG_LEVEL</i>	Specifies the verbosity level of the recovery logs. Valid values are 0 to 9. The default value is 0.
<i>NSR_PS_RECOVER_FILE_OPT=(N/R/Y)</i>	Specifies options to handle duplicate file behavior on recover. Options are: N (skip, do not overwrite), R (rename), and Y (overwrite).
<i>NSR_USE_EXISTING_MOUNTPOINT</i>	Specifies use of an existing mount point instead of creating a temporary mount point. Not available for NetApp on Linux. The default value is No.

APPENDIX B

Command-Line Operations for NAS Recovery

This appendix includes the following topics:

- [Using CLI commands for NetWorker operations](#)..... 44
- [Using nsrsnapadmin operations](#).....44
- [Querying with the mminfo command](#)..... 47
- [Using nsrnassnap_recover operations](#).....47
- [Backing up with the savegrp command](#)..... 48

Using CLI commands for NetWorker operations

This appendix provides a summary of CLI commands and examples for NetWorker operations.

The *EMC NetWorker Command Reference Guide* and NetWorker man pages provide details on the commands.

NAS snapshot commands

You can use the following commands for managing NetWorker NAS snapshots:

- nsrnassnap
- nsrnassnap_discover
- nsrnassnap_recover
- nsrnassnap_save
- nsrnassnapck

The NetWorker man pages and the *NetWorker Command Reference Guide* provide details.

Using nsrsnapadmin operations

You can run the `nsrsnapadmin` command utility in interactive mode to manually query, recover, delete, and expire file system snapshot save sets.

Note

The `nsrsnapadmin` interactive commands support only snapshots of file systems. The commands do not support the snapshots of application data, such as NMDA or NMSAP data.

To start interactive mode, type `nsrsnapadmin` at the CLI prompt. When you receive an input prompt, you can type a specific command and its available options to perform the NetWorker options listed in the following table.

Table 4 Commands and options supported in nsrsnapadmin interactive mode

NSM operation	Command and available options
Back up snapshots to tape	<code>b [-s nsr_server] [-c client] [-M mount_host] -S ssid [or -S "ssid ssid ..."] [-v] [-A attr=val]</code>
Display snapshot save sets	<code>p [-s nsr_server] [-c client] [-v] [path -S ssid]</code>
Delete a snapshot save set	<code>d [-s nsr_server] [-c client] [-v] [-a] [-y] -S ssid [or -S "ssid ssid ..."]</code>

Table 4 Commands and options supported in nsrsnapadmin interactive mode (continued)

NSM operation	Command and available options
Perform a save set recovery	<code>R [-s <i>nsr_server</i>] [-c <i>client</i>] [-M <i>mount_host</i>] [-v] -S <i>ssid</i> [-t <i>destination</i>] [-T <i>recover_host</i>] -m <i>path</i> [-A <i>attr=val</i>]</code>
Perform a file-by-file browsing and recovery	<code>r [-s <i>nsr_server</i>] [-c <i>client</i>] [-M <i>mount_host</i>] [-T <i>recover_host</i>] -S <i>ssid</i> [-A <i>attr=val</i>]</code>
Reset the expiration time for a snapshot save set	<code>e <i>time</i> [-s <i>nsr_server</i>] [-c <i>client</i>] [-v] -S <i>ssid</i> [or -S "<i>ssid ssid ...</i>"]</code>
Exit the program	<code>q</code> or <code>quit</code>

where:

- *nsr_server* is the hostname of the NetWorker server.
- *client* is the name of the NAS device.
- *mount_host* is the hostname of the mount host.
- *-v* is for verbose logging.

The *EMC NetWorker Command Reference Guide* and NetWorker man pages provide details.

Example nsrsnapadmin operations

After you start the `nsrsnapadmin` utility in interactive mode, you can type a specific command and its options at the input prompt to perform an NSM operation. The following sections provide examples of the commands and options used for specific NSM operations.

Querying snapshot save sets

When you type the `p` command and its options at the `nsrsnapadmin` prompt, the program queries the NetWorker server for snapshot save sets for the client. The program lists specific properties of the snapshot save sets, such as the creation time and the date of each snapshot. For example:

```
p -s server -c client [-v] path
```

where:

- *server* is the hostname of the NetWorker server.
- *client* is the hostname of the NAS device.
- *path* is the pathname of a particular snapshot save set. Type the pathname to query a single save set only; otherwise, the output message lists all the save sets.

A message similar to the following appears:

```
nsrsnapadmin> p -c isilon-1.myorg.com
  ssid = 643255862  savetime="4/16/2014 11:05:02 AM"
```

```
(1397660702)    expiretime="4/17/2015 9:41:59 AM"
(1429278119)    ssname=/ifs/data
```

File-by-file browsing and recovery

When you type the `r` command and its options at the `nsrsnapadmin` prompt, the program lists the file system as it existed at the time of the snapshot backup. Options enable you to browse, select, and recover the elements of the file system. For example:

```
r -s server -c client -M mount_host -T recover_host -S ssid
```

where *client* is the name of the NAS device.

Deleting a snapshot save set

Deleting an snapshot save set is similar to deleting a standard NetWorker save set. The `nsrsnapadmin` command deletes the physical snapshot from the NAS device and deletes all save sets that refer to that physical snapshot from the media database.

For example:

```
nsrsnapadmin -d -s server -c client -S ssid
```

where:

- *server* is the hostname of the NetWorker server.
- *client* is the name of the NAS device.
- *ssid* is the snapshot save set ID.

You can also use the `nsrnassnapck` command to delete a snapshot.

Modifying the browse and retention periods of a snapshot save set

To modify the expiration date of a snapshot, type the `e` command at the `nsrsnapadmin` prompt. For example:

```
e time -s server -c client -S ssid
```

where:

- *time* is the date and time when the snapshot save set will expire. Acceptable date and time formats are as follows:
 - mm/dd[/yy]
 - month_name dd[/yy]
 - hh[:mm[:ss]] [meridian] [zone]
 - hhmm [meridian] [zone]
- *server* is the hostname of the NetWorker server.
- *client* is the hostname of the NAS device.
- *ssid* is the ID of the snapshot save set you want to modify.

A message similar to the following appears:

```
Resetting expire time for ssid : 4090300235
```

The message indicates that you have successfully changed the expiration time.

Notes:

- If you omit the year, the year defaults to the current year.
- If you omit the meridian, NetWorker uses a 24-hour clock.
- If you omit the time zone (for example, GMT), NetWorker uses the current time zone.
- If you specify a date mm/dd/yy as in -e 09/04/13, the time defaults to 00:00:00. NetWorker changes the snapshot save set's browse and retention times to 09/04/13 00:00:00.
If you specify a time hh:mm:ss as in -e 20:00:00, the date defaults to the system time, for example, 09/03/13. NetWorker changes the snapshot save set's browse and retention times to 09/03/13 20:00:00.

Querying with the mminfo command

Another way to query a client's snapshot save sets is with the `mminfo` command. The `-q snap` option lists all snapshot save sets for a particular client.

To list the snapshot save sets for a client, type the following at the command prompt:

```
mminfo -s server -S -a -q "client=clientname,snap"
```

where

- `server` is the hostname of the NetWorker server.
- `clientname` is the hostname of the NAS device.

Example output:

```
mminfo -a -q"client=isilon-1.emc.com,snap" -r "ssid,savetime,name"
ssid      date      name
4259966917 1/29/2014 /ifs
643255862  4/16/2014 /ifs/data
609701430  4/16/2014 /ifs/data/folders
1700220469 1/6/2013  /ifs/data/folders/anne
2736137348 3/4/2014  /ifs/data/linux
576146998  5/7/2012  /ifs/data/amsr_jr
1633111605 2/5/2014  /ifs/localtgt/2
777473590  3/28/2014 /ifs/localtgt/2
```

The *EMC Command Reference Guide* and NetWorker man pages provide details on the `mminfo` command.

Using nsrnassnap_recover operations

You can use the `nsrnassnap_recover` command to manually recover save set files and directories.

When specifying the file or directory to recover, directories must end with a slash character (/).

For example:

Single file:

```
nsrnassnap_recover -S file123 -s nas456.lss.cor.com -c
file789.lss.cor.com -d d:\recover\7777 -A NSR_PS_FILE_RECOVER_OPT=Y -
A NSR_DIRECTED_RECOVER_HOST=file1133 -G9 /vol7/jjr4/test1.xml
```

Entire directory tree:

```
nsrnassnap_recover -S file123 -s nas456.lss.cor.com -c
file789.lss.cor.com -d d:\recover\7777 -A NSR_PS_FILE_RECOVER_OPT=Y -
A NSR_DIRECTED_RECOVER_HOST=file1133 -G9 /vol/jjr4/
```

The recovery options for the `-A NSR_PS_FILE_RECOVER_OPT=(Y/N/R)` command are as follows:

- Y = Overwrite the file or directory
- N = Skip the file or directory
- R = Rename the file or directory

Note

For NetApp devices, a recovery option must be specified, otherwise the recovery fails.

Backing up with the `savegrp` command

You can manually perform an NAS snapshot by using the `savegrp` command. You must configure all resources before you run the command to perform the snapshot.

The `savegrp` command, whether invoked from the CLI or NSM settings, initiates the backup process. The `savegrp` command recognizes the application host as a NetWorker client configured for NSM and runs `nsrnassnap`. The `nsrnassnap` command applies the snapshot retention policies when it runs the `nsrnassnap_save` command.

How to perform a `savegrp` command-line backup

To perform a snapshot, you can use the `savegrp` command from the command line, for example:

```
savegrp group_name
```

where *group_name* is the name of the group configured for snapshot operations.

To add a rollover to conventional storage media, add the `-b` option to the command. You must specify the details of the rollover in the snapshot policy.

The *EMC Command Reference Guide* and man pages provide details on the `savegrp` command.

GLOSSARY

This glossary contains the definitions of terms used in this guide.

B

- backup** 1. Replica or copy of database or application data, or entire computer system, stored separately from the original, which can be used to recover the original if it is lost or damaged.
2. Operation that saves data to a volume for use as a backup.
- backup volume** Volume used to store backup data, distinguished from an archive volume or a clone volume.
- browse policy** NetWorker policy that specifies the period of time during which backup entries are retained in the client file index. Backups listed in the index are browsable and readily accessible for recovery. See [retention policy](#)

C

- client** Host on a network, such as a computer, workstation, NAS device, or application server whose data can be backed up and recovered with the backup server software.
- client file index** Database maintained by the NetWorker server that tracks every database object, file, or file system backed up. The NetWorker server maintains a separate index file for each client.
- client-initiated backup** See [manual backup](#)
- Client resource** NetWorker server resource that identifies the save sets to be backed up on a client. The Client resource also specifies information about the backup, such as the schedule, browse policy, and retention policy for the save sets.
- clone** 1. Duplicate copy of backed-up data, which is indexed and managed by the NetWorker server. Single save sets or entire volumes can be cloned.
2. Type of mirror that is specific to a storage array.
- cluster** Group of linked virtual or physical hosts with shared storage that work together and represent themselves as a single host.
- consistent** State of a data set that fully matches an application's active view of the data at any point in time.
- Console server** See [NetWorker Management Console \(NMC\)](#)

D

datazone Group of clients, storage devices, and storage nodes that are administered by a NetWorker server.

- device**
1. Storage unit that can contain a backup volume. A device can be a disk drive, autochanger, or tape drive that is connected to the server or storage node.
 2. General term that refers to storage hardware.
 3. Access path to the physical drive, when dynamic drive sharing (DDS) is enabled.

F

file index See [client file index](#)

- file system**
1. Software interface used to save, retrieve, and manage files on storage media by providing directory structures, data transfer methods, and file association.
 2. The entire set of all files.
 3. Method of storing files.

G

group One or more client computers that are configured to perform a backup together, according to a single designated schedule or set of conditions.

H

host A computer on a network.

hostname Name or address of a physical or virtual host computer that is connected to a network.

L

live backup See [rollover](#)

logical unit (LUN) Logical storage space on a storage array that is addressed by SCSI or Fibre Channel protocols. Multiple LUNs can be used to represent a storage volume.

logical volume manager (LVM) Software that controls disk resources by mapping data between a logical view of storage space and the actual physical disks.

M

manual backup Backup that a user initiates from the client, also known as an on-demand, unscheduled, or ad hoc backup.

media Physical storage, such as a disk file system, optical disk, or magnetic tape, to which backup data is written. See [volume](#)

media database Database that contains records of backups and media volumes and the lifecycle status of all data and volumes managed by the NetWorker server.

- mirror**
1. Exact duplicate of data or another object, such as a disk.
 2. To write duplicate data to more than one device.

mount To make a volume physically available for use, such as the placement of a removable disk volume or tape into a drive for reading or writing.

N

network attached storage (NAS) Disk array or storage device (NAS filer) that connects directly to the messaging network or LAN interfaces and uses the common communication protocols of either TCP/IP or NDMP.

Network Data Management Protocol (NDMP) Software component that uses TCP/IP standards to specify how heterogeneous network components communicate for the purposes of backup, recovery, and transfer of data between storage systems.

NetWorker administrator Person who normally installs, configures, and maintains NetWorker software on network computers, and who adds users and defines user privileges.

NetWorker Management Console (NMC) NetWorker web interface used to manage NetWorker servers and clients. The NMC server also provides reporting and monitoring capabilities for NetWorker processes.

NetWorker server Computer on a network that runs the NetWorker server software, contains the online indexes, and provides backup and restore services to the clients and storage nodes on the same network.

NetWorker Snapshot Management (NSM) NetWorker software feature that provides snapshot copies of production data. The software allows applications to continue to write production data during storage operations and ensures that open files are not omitted.

P

point-in-time (PIT) copy See [snapshot](#)

policy Set of defined rules for client backups that can be applied to multiple client groups. Groups have specific policies for data set, schedule, browse, and retention.

- pool**
1. NetWorker sorting feature that assigns specific backup data to be stored on selected media volumes.
 2. Collection of NetWorker backup volumes to which specific data has been backed up.

Q

quiesce To produce a state in which all writes to a disk are stopped and the file system cache is flushed. Quiescing the database prior to creating the snapshot provides a transactionally consistent image that can be remounted.

R

recover	To restore data files from backup storage to a client and apply transaction (redo) logs to the data to make it consistent with a given point-in-time. See restore
resource	Software component whose configurable attributes define the operational properties of the NetWorker server or its clients. Clients, devices, schedules, groups, and policies are all NetWorker resources.
restore	<ol style="list-style-type: none"> 1. Recover. 2. To retrieve individual data files from a backup and copy the files to a client without applying transaction logs. See recover
retention policy	NetWorker setting that determines the minimum period of time that backup data is retained on a storage volume and available for recovery. After this time is exceeded, the data is eligible to be overwritten. See browse policy
rollover	Backup of a snapshot to conventional storage media, such as disk or tape.
rollover-only backup	Rollover whereupon the snapshot copy is deleted. Previously known as a serverless backup, live backup, or nonpersistent backup.

S

save set	<ol style="list-style-type: none"> 1. Group of files, file system, or volumes on a single client computer that is copied as a snapshot on a storage array or backed up to storage media. 2. NetWorker media database record that describes a specific snapshot or backup.
save set ID (ssid)	Internal identification number assigned to a save set.
scheduled backup	Type of backup that is configured to start automatically at a specified time for a group of one or more NetWorker clients. A scheduled backup generates a bootstrap save set.
snapshot	Point-in-time (PIT) copy of specific data files, volumes, or file systems on a application host that is created on an external disk subsystem, such as a storage array or NAS device.
snapshot backup	Snapshot created on a storage array as a backup.
snapshot policy	Sets of rules that control the lifecycle of snapshots. These rule specify the frequency of snapshot creation, how long snapshots are retained, and which snapshots will be backed up to conventional storage media.
snapshot restore	Restore from a snapshot backup. Previously called instant restore.
snapshot save set	Group of files or other data included in a single snapshot. Previously called snapset
source LUN	LUN on the application host, whose production data can be copied by snapshot.

- storage node**
1. Computer that manages physically attached storage devices or libraries, whose backup operations are administered from the controlling NetWorker server.
 2. Typically a "remote" storage node that resides on a host other than the NetWorker server.

T

- target client** NetWorker client on which data is to be restored.

V

- volume**
1. Unit of physical storage medium, such as a disk or magnetic tape, to which backup data is written.
 2. Identifiable unit of data storage that may reside on one or more computer disks.

