



DXi-Series Configuration and Best Practices Guide for NetWorker from EMC

Quantum#: 6-67849-01 Rev C

BPG00021-V03



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DXi-Series Configuration and Best Practices Guide for NetWorker from EMC

This guide seeks to help Quantum customers who own DXi-Series systems (DXi4000-Series, DXi6000-Series, DXi8000-Series, and DXi V-Series), and who also use NetWorker from EMC, to get the most out of their investment. It is also intended to help Quantum field sales teams by providing guidance to enhance the installation and integration of NetWorker with Quantum DXi-Series systems. This guide includes advice and best practices for using Quantum DXi-Series systems with NetWorker.

How to Use This Guide

This document assumes that the reader has basic expertise with NetWorker, as well as basic networking and SAN experience. It also assumes that the reader has a Quantum DXi installed in a working NetWorker environment.

This document provides key recommendations and useful information for quickly setting up a DXi system with NetWorker. It expands on these recommendations and discusses the features and performance tuning considerations relevant to various storage access methods.

This document is organized according to the various storage target access methods to be employed with NetWorker. Depending on the DXi model, the DXi can appear as a Virtual Tape Library (VTL) storage device over Fibre Channel (FC), or as a NAS device using CIFS or NFS. These access methods are discussed in the following order.

- DXi VTL
- DXi NAS – CIFS/NFS

Shortcuts to Quick Start Activities

To go directly to any of the following sections, click that section's name.

- » [Documentation and References \(p.2\)](#)
- » [Best Practices for NetWorker Installation \(p.4\)](#)
- » [Summary of Tuning Parameters for NetWorker \(p.5\)](#)
- » [Configuring NetWorker with DXi VTL \(p.6\)](#)
- » [Best Practices Guide with DXi VTL \(p.9\)](#)
- » [Configuring NetWorker with DXi NAS \(p.12\)](#)
- » [Best Practices Guide with DXi NAS \(p.15\)](#)
- » [Common Operational Considerations for NetWorker \(p.17\)](#)
- » [Helpful Resources \(p.20\)](#)

Documentation and References

The following is a list of documents, references, and links where you can find additional information regarding specific activities and products. Access to many of the Quantum documents below requires a valid serial number. Please have that available when following the hyperlinks to the documents. Access to the NetWorker documents requires an account on the EMC Enterprise Single Sign-On website.

Online Documentation for your Quantum Product

<http://www.quantum.com/ServiceandSupport/SoftwareandDocumentationDownloads/Index.aspx#>

In the lists below, if multiple versions of a manual for your DXi are listed on the linked page, scroll down and select the version for your hardware/software combination. Please note that on the linked pages, documents are not listed in alphabetical order, so two versions of the same manual will not necessarily be listed in consecutive lines.

DXi-Series Management Console & User's Guides

The DXi-Series Management console helps you configure and use your storage solution. Refer to the following documents for more information on DXi-Series Management:

- [DXi8500 User's Guide](#)
- [DXi6800 Series User Guide](#)
- [DXi6700 Series User's Guide](#)
- [DXi4000 Series User's Guide](#)
- [DXi4700 Series User's Guide](#)
- [DXi-V Series User's Guide](#)

Virtual Tape Library Setup

Refer to the following documents for VTL setup:

- [DXi8500 User's Guide](#)
- [DXi6800 Series User Guide](#)
- [DXi6700 Series User's Guide](#)
- [DXi4700 Series User's Guide](#)

Network Attached Storage

Refer to the following documents for NAS Share setup:

- [DXi8500 User's Guide](#)
- [DXi6800 Series User Guide](#)
- [DXi6700 Series User's Guide](#)
- [DXi4000 Series User's Guide](#)
- [DXi4700 Series User's Guide](#)
- [DXi-V Series User's Guide](#)

DXi Replication

Refer to the following documents for DXi-to-DXi Replication setup:

- [DXi8500 User's Guide](#)
- [DXi6800 Series User Guide](#)
- [DXi6700 Series User's Guide](#)

- [DXi4000 Series User's Guide](#)
- [DXi4700 Series User's Guide](#)
- [DXi-V Series User's Guide](#)

The following NetWorker documentation requires and EMC login:

NetWorker Installation Documentation

- [NetWorker 7.6 installation guide](#)
- [NetWorker 8.0 installation guide](#)
- [NetWorker 8.1 installation guide](#)
- [NetWorker 9.2 installation guide](#)

NetWorker Administration Documentation

- [NetWorker 7.6 administration guide](#)
- [NetWorker 8.0 administration guide](#)
- [NetWorker 8.1 administration guide](#)
- [NetWorker 9.2 administration guide](#)

NetWorker Command Documentation

- [NetWorker 7.6 command reference guide](#)
- [NetWorker 8.0 command reference guide](#)
- [NetWorker 8.1 command reference guide](#)
- [NetWorker 9.2 command reference guide](#)

Best Practices for NetWorker Installation

Best practices include tips and recommendations to help you install or upgrade NetWorker more effectively. See the appropriate Administrator's Guide for your particular Operating System for additional information. The following best practices are for preparing to install or upgrade NetWorker:

- Visit the EMC Support Web site to check for updates to the documentation.
- Review the Readme document and Documentation Addendum for updates to the NetWorker Administrator's Guide.
- Use only standard ANSI characters for the computer name of the computer on which you want to install NetWorker. You may receive errors if you install NetWorker on a computer with a name that uses non-standard characters.
- Ensure that the most recent version of Microsoft .NET framework is installed on the computer on which you want to install NetWorker on Windows platform.
- Document your current configuration and settings before you upgrade NetWorker. You can verify your configuration after the upgrade is complete.
- Back up your server before you install or upgrade any software, including NetWorker.
- Pause or stop all jobs before upgrading NetWorker. If you run NetWorker jobs during an upgrade, the jobs fail.
- Delete any unnecessary job history and alert history before an upgrade, to help expedite the process.
- Disable any monitoring utilities that may restart services.
- Perform database maintenance on your NetWorker Database immediately before an upgrade.

The following best practices are for during the installation process and the upgrade process:

- Use an uninterruptible power supply (UPS) for your NetWorker server during the installation. A UPS helps ensure that you do not have a failed installation due to a power outage.
- Wait until after the installation to make configuration changes. Do not make configuration changes during the installation.
- Run the installation wizard from the local server, from a DVD image on the local server, or by push-installing from the local server.

The following best practices are for after the installation process or the upgrade process:

- Run Microsoft Windows Update. NetWorker uses many Microsoft technologies that may have been updated since NetWorker's release.

Summary of Tuning Parameters for NetWorker

For backup administrators who are well versed on NetWorker and Quantum DXi systems, the following table offers a summary of suggested parameters/values. As with any modifications to a system that impact performance and/or tuning, your results may vary and are not guaranteed.

Parameter or Option	Settings
Compression	Although NetWorker supports compression, to obtain effective deduplication rates, you should NOT compress your backup data before sending it to a DXi appliance. Refer to the NetWorker Administration Documentation for disabling compression.
Encryption	Although NetWorker supports data encryption, to obtain optimal performance, you should NOT encrypt your backup data before sending it to a DXi appliance. Refer to the NetWorker Administration Documentation for disabling encryption.
Deduplication	To obtain effective deduplication rates, you should NOT deduplicate your backup data before sending it to a DXi appliance. By default, NetWorker does not use deduplication.
Multiplexing	By default, NetWorker multiplexes data streams. This will inherently reduce data deduplication rates and performance. To disable multiplexing using the NetWorker Management Console (NMC), right click a VTD and select Properties . On the Configuration tab, set Target Sessions to "1" and click save. This will need to be done on all VTD's within the VTL.
VTL Options	Settings
VTL Sign-On String	Use native DXi Inquiry. This will allow NetWorker to determine if the library is virtual or physical. Using a physical emulation can lead to problematic issues with NetWorker.
Data Path Properties	Quantum recommends using a block size of 128kb. Using any other block size could result in slow backup performance or a poor deduplication ratio. You can adjust the block size from the NetWorker Management Console (NMC) by right clicking a VTD and selecting Properties . On the Advanced tab, the Device Block Size pull-down menu will list all available block sizes. Select 128kb block size and click Save .
VTD Unload Timer	By default, NetWorker sets the Drive Unload Timeout to 0 minutes. This causes media to stay in the drive indefinitely until the device is needed by another operation. This can cause cartridge-based replication not to run until that tape is unloaded from the drive. Quantum recommends that you change the unload times to 1 minute. To change the unload time from the NetWorker Management Console (NMC), right-click the VTL and select Properties . On the Timers tab, set the Idle Device Timeout value to 1 and click Save .
Windows OS Options	Recommendations
Services	Disable the Removable Storage Manager (RSM) service. As shown in this article , Removable Storage Manager is no longer available as of Windows 7 and Windows Server 2008 R2.

Configuring NetWorker with the DXi-Series

Configuring NetWorker with DXi VTL

Creating a backup image on a virtual tape is no different than creating a backup image on a physical tape. The backup functionality is unchanged.

The DXi VTL can appear differently, depending on the interface through which it is viewed. If the DXi is viewed through Fibre Channel interfaces, it appears as a virtual library, with virtual drives and cartridges. When viewed through a TCP/IP interface, it appears as an NDMP (Network Data Management Protocol) host. During backups, NetWorker creates a backup image on the virtual tape cartridges. NetWorker can then use the NDMP host interface to duplicate the image on the virtual tape cartridges to physical tape cartridges.

VTL Device Installation and Configuration Considerations

One of the key ways to ensure that SAN-connected physical and virtual tape libraries are detected properly by backup servers is *serialization*. Serialization provides a unique identifier for each device in a physical or virtual tape library, to automate device association from multiple backup servers. These identifiers, returned by the VTL devices, are separate from the *element addresses* that define the position of devices in the library. The element address is used by the library's robot or medium changer to manage the tape drives.

Serialization allows servers running NetWorker to coordinate tape drive configuration by aligning the device serial number with the device's element address. This enables NetWorker device configuration to align these two addresses, reducing the potential for improper configuration.

If the device configuration does not serialize the devices listed, do not commit the changes, and be sure to check the VTL online state. The DXi VTL partition must be online for this to function properly.

The Quantum recommended device identification for each DXi system is the native mode (in other words, use the DXi4700, DXi6700, DXi6800, or DXi8500 inquiry response string as the identification for each model, respectively). This allows product identification for the service teams at both EMC and Quantum.

When using the native device mode, Windows environments will display the device in the Device Manager as an *unknown media changer*. This is normal and not an error, and does not create a problem for NetWorker. If the customer environment has requirements for a specific changer device for compatibility, the Quantum DXi products support emulation of many popular devices, to meet those requirements.

Always ensure that the latest drivers and firmware have been installed for the tape drive, robotic library, and HBA. For best performance, IHV drivers should be loaded for the tape drive or emulated tape library. The three IHV tape drive manufacturers Quantum emulates are Quantum, IBM, and HP. The tape drivers may be found at the IHV's Web site (login may be required):.

OEM Tape Drivers and NetWorker Hardware Compatibility List

- [Quantum](#)
- [International Business Machines – support/fixcentral](#)
 - Click on the Select product tab in the middle of the page.
 - In the Product Group box, select System Storage.
 - In the Select from System Storage box, select Tape Systems.
 - In the Select from Tape Systems box, select Tape drivers and software.
 - In the Select from Tape drivers and software box, select Tape device drivers.
 - In the Platform box, select your operating system.

- [Hewlett Packard – Enterprise Support Center](#)
- [NetWorker Hardware Compatibility List](#)

Configuring the DXi and NetWorker for VTL operations

EMC NetWorker seamlessly integrates with a DXi-Series disk backup system using the VTL interface. Once installed and configured, NetWorker can manage backups through the DXi and can take advantage of the DXi system's capabilities, such as data deduplication and replication.

Installing and configuring the DXi and NetWorker for VTL operations consists of the following major steps:

- » [Configure the DXi for VTL \(p.7\)](#)
- » [Configure NetWorker with DXi VTL \(p.8\)](#)
- » [Test Backup to the DXi VTL Storage Target Device \(p.8\)](#)

Configure the DXi for VTL

A virtual tape library (VTL) is a data storage virtualization technology used for backup and recovery. A VTL presents itself as a tape library with tape drives for use with existing backup software. Virtualizing disk storage as tape allows integration of VTLs with existing backup software and existing backup and recovery processes and policies. The benefits of such virtualization include storage consolidation and faster data restores.

In the DXi Remote Management Console, under the **Configuration** tab, the **VTL** page allows you to configure a DXi to present its storage capacity as VTL (virtual tape library) partitions that are compatible with standard backup applications. You can add virtual tape drives and storage slots to VTL partitions, and you can create and work with virtual tape cartridges. You can also map partitions to hosts.

Partitioning lets you divide the DXi virtual tape drives and storage elements into separate partitions, usable by separate host computers. The **Partitions** page contains a list of assigned tape drives, as well as listing all user-defined partitions that are currently configured on the system. This page also lets you add, edit, and delete partitions.

The **Summary** page displays the maximum number of partitions, the total number of tape drives, and the number of assigned tape drives. The **Summary** page also provides a list of configured partitions on the system. Click the link in the **Name** column to edit a specific partition.

Note: If you are planning to replicate partitions to another DXi system, you must ensure that every partition name and barcode number on the system is unique. You can **NOT** have duplicate partition names or barcode numbers on a DXi system, or on a system receiving a replicated partition.

The **Create Media** page allows you to create virtual media for a specific partition. Once created, these virtual cartridges are available for backing up data. You can configure the media type, capacity, starting barcode, and initial location on this page.

Note: It is possible to oversubscribe space on the DXi system. The sum total of capacity for all media could be more than the physical capacity of the system. See [Oversubscription of Space on the DXi](#) on p.17 for more information on this subject.

DXi Tape Drive Emulations and Recommend Drivers:

SDLT 600 & DLT-S4:	Use the OEM driver or inbox drivers
HP LTO drives:	Use the OEM driver or inbox drivers
IBM LTO drives:	Use the OEM driver or inbox drivers

Configure NetWorker with DXi VTL

After a VTL has been defined in the Quantum DXi-Series system and the host HBA has been configured, you can begin integration with the NetWorker application.

To configure the newly created library and tape drives within NetWorker, follow these steps:

1. Verify that the operating system can detect the VTL and all VTD(s). If applicable, install the latest [OEM](#) during this step.
2. Verify that NetWorker can detect the VTL and all VTD(s), by issuing the **inquire** command.
3. See the [NetWorker command reference guide](#) for more details on using the **inquire** command.
Note: For HP/UX, you must remove the `/tmp/lgto_scsi_devlist` file prior to issuing the **inquire** command.
4. Open the NetWorker Management Console (NMC). Then:
 - a. Click on **Devices**.
 - b. In the **Storage Nodes** section in the right pane, right-click the SCSI storage node to which the VTL and VTD(s) are attached.
 - c. Select **Scan for Devices**.
 - d. When the **Scan for Devices** window opens, select the following parameters and click **Start Scan**.
 - Search all LUN's = No
 - Use persistent names = No
 - Device scan type = SCSI
5. After the scan has completed, the NMC log will display the message *finished searching for backup devices*. Refresh the NMC display. The VTL and VTD(s) should now be present under the **Storage Node**.
6. After the devices have been recognized by NetWorker:
 - a. Right-click on the VTL and select **Configure Library**.
 - b. When the **Configure Library** window opens, select all the VTD(s) associated with the VTL.
 - c. Click **Start Configuration**.

Note: If NetWorker fails to detect or configure the VTL/VTD's via NMC, run the **jbconfig** command to configure the devices. See the [NetWorker command reference guide](#) for more details on using the **jbconfig** command.

Test Backup to the DXi VTL Storage Target Device

After you have completed the configuration, test the configuration by performing a backup job and monitoring its results.

Best Practices Guide with DXi VTL

Virtual Tape Drive Device Description and Recommendation

Quantum DXi products support multiple tape drive emulations and allow user-definable capacities of tape cartridges to support the drive type. The drive type selection does not internally impose any throttling of the ingest rate. The host system uses tape device drivers to communicate with the virtual tape drives and the NetWorker application.

Quantum follows EMC’s recommendation to use the OEM tape drive drivers for backup. The complete tape drive driver recommendations from EMC can be located in their hardware compatibility list.

Quantum recommends against using the Windows update function to get the latest tape drive drivers, as it is possible that Windows Update can find unexpected driver matches for a tape drive. These unexpected matches often are not the same as the ones supplied by the tape drive manufacturer and may introduce unexpected incompatibilities. This can result in a change to the device in the Windows Device Manager.

Number of Concurrent Tape Drives in Use

Each DXi model has a maximum number of virtual tape drives that can be configured. Each model also has a maximum aggregate throughput rate, which will be divided relatively equally between the virtual tape drives in use. This does not prohibit a single tape drive from using all available bandwidth. The Storage Node typically determines individual tape drive performance.

It is not a good idea to configure the maximum number of virtual tape drives and perform I/O through all of them concurrently. Better performance can be achieved by using a subset of those virtual tape drives at the same time. Quantum expects the customer configuration to distribute those virtual tape drives among multiple Storage Nodes, to simplify initial installation by providing dedicated resources to each Storage Node.

Quantum also recommends that backups be staggered, so that only a subset of drives is in use at one time. During a backup, the data transfer rate is primarily controlled by the Storage Node, because the DXi system does not restrict the ingest data rate. This creates the opportunity for one or more Storage Nodes to burst data at a higher rate, leaving less bandwidth for the remaining virtual tape drives. Conversely, it supports the coexistence of fast data streams with slow streams, for maximum use of the available bandwidth.

Keep in mind that increasing the number of concurrently active virtual tape drives does not increase the aggregate DXi bandwidth. It could also result in a failed backup job due to a timeout from a bandwidth-starved operation.

The recommended maximum number of concurrently active virtual tape drives for various maximum aggregate bandwidths is listed in the table below.

DXi Model	Max VTDs*	Max # of Concurrently Active VTDs	Max Aggregate Bandwidth
DXi470x	64	32	1,650 MB/s (5.9 TB/Hr)
DXi6700	80	80	972 MB/s (3.5 TB/Hr)
DXi6701 / DXi6702	256	80	1,580 MB/s (5.7 TB/Hr)
DXi6802	256	80	3,299 MB/s (11.9 TB/Hr)
DXi690x 256GB	512	256 **	6,277 MB/s (22.6 TB/Hr)
DXi690x-S 256GB	512	512 **	9,722 MB/s (35.0 TB/Hr)
DXi8500***	160	160	1,777MB/s (6.4 TB/Hr)
DXi8500****	512	160	3,047MB/s (11.0 TB/Hr)

- * Virtual Tape Drives; max # defined in the system
- ** Quantum suggests that you contact NetBackup about possible limitations or other considerations related to the maximum number of concurrently active VTDs
- *** DXi8500 w/64GB RAM & 2TB drives
- **** DXi8500 w/128 GB RAM & 3TB drives

Tape Cartridge Capacity Considerations

Space on a given tape cartridge cannot be reused until after all backup data on that cartridge has expired. The greater the capacity of a cartridge, the longer it will typically take for all data on that cartridge to expire. Expired data continues to take up space on the virtual tape cartridge, as well as on the DXi, until that cartridge is overwritten, relabeled, or erased. This means that lower cartridge capacities are more desirable, so that tapes will be returned to the default scratch pool for reuse and overwritten sooner.

There is virtually no relationship between the configured capacity of a virtual tape cartridge and the tape drive emulation that has been configured for the partition:

- Backup/restore operations will span the number of tapes required, ignoring the configured capacity.
- Vaulting/duplicating operations performed by the backup application will ignore the virtual capacity when writing to another cartridge, whether virtual or physical.
- DXi-Series devices limit the maximum capacity permitted by the tape drive emulation; the minimum is 5GB.
- The capacity utilization is tracked in UNCOMPRESSED GB, and the data is stored in compressed form. That is, 100GB of data that is 2:1 compressible will be reported as occupying 50GB of virtual tape cartridge space.
- Quantum's general guidance is to specify a smaller virtual tape cartridge capacity, such as 50GB to 100GB, for the reasons mentioned above.

Tape Drive LUN Mapping

Quantum recommends the following:

- Map the device starting with LUN 0 on each port and **DO NOT** skip any LUNs.
- As a best practice, zone the VTL devices together with the NetWorker Storage Nodes to prevent other servers from taking control of the VTL resources.
- Additionally, Quantum recommends that you configure the HBA driver to use *persistent binding* to fix the devices to specific addresses. This will keep devices in the same order after a reboot.
- Set the **WWNN = WWPN** for DXi systems. This allows for the HBA to use either WWNN or WWPN.

VTL Fibre Channel Performance Tuning

To enhance performance for NetWorker environments, consider using the tuning parameters indicated by the article mentioned below to eliminate interference from the Host System.

According to the Microsoft knowledgebase article "Windows Server 2003 cannot perform backup jobs to tape devices on a storage area network" (<http://support.microsoft.com/kb/842411/en-us>), you may encounter the following problem:

"A conflict in Windows Server 2003 causes a Test Unit Ready (TUR) request issue on SCSI-attached and fiber-attached devices. When this issue occurs, an overflow of TUR requests causes the storage unit not to respond or to respond slowly to SCSI commands. In a SAN environment, any Windows Server 2003-based computer that is zoned to detect the Tape Backup Unit hardware can send TUR requests."

The article referenced above lists the cause of the problem, and a workaround for it.

[Considerations for the Handling of Expired Media within NetWorker](#)

When a tape is expired by NetWorker, the event is not directly communicated to the DXi. The result is that a tape may be displayed as empty or SCRATCH to the NMC, but the same tape will be shown on the DXi GUI as containing data. This indicates that the data on the expired tape is still using space on the DXi.

To reclaim this space, we recommend using NMC to re-label the expired media. This new label is a data block written to the virtual tape cartridge at the beginning of tape, effectively blanking the tape. The DXi VTL will act similarly to how it would with a physical tape, and the data after the label will no longer be accessible. The space reclamation process can be initiated by a scheduled timed event, or started manually from the DXi GUI. Additional information about the reclamation process can be found in the DXi user manual.

[Additional Best Practice Considerations](#)

Several operational considerations are common to all three access methods (VTL, CIFS, and NFS). See the [Common Operational Considerations for NetWorker](#) section on p.17 for more information on Deduplication, Encryption, Compression, Backup Streams, and Replication.

Configuring NetWorker with DXi NAS

A Network Attached Storage (NAS) unit is essentially a self-contained computer connected to an Ethernet network, with the sole purpose of supplying data storage services to other devices on the network. Several DXi models can present themselves as a NAS appliance for backup purposes. Before you can use a DXi system as a NAS appliance you must first configure a NAS share on the DXi.

Important Note: The DXi is **NOT** a Network Attached Storage device to be used to store customer data. The DXi only emulates a NAS device for the sole purpose of being a Backup-to-Disk target for backup applications such as NetWorker. Do **NOT** use the DXi NAS share as “Drag-and-Drop” file storage.

A DXi system can serve as a NAS backup system where the following protocols are supported:

- **CIFS Protocol** -The CIFS (**C**ommon **I**nternet **F**ile **S**ystem) protocol defines a standard for remote file access using many computers at a time. This protocol allows users with different platforms to share files without installing additional software. This protocol is used with Windows networks.
- **NFS Protocol** - The NFS (**N**etwork **F**ile **S**ystem) protocol was originally designed by Sun Microsystems and allows all network users to access shared files stored on computers of different types. NFS provides access to shared files through an interface called the Virtual File System (VFS) that runs on top of TCP/IP. Users can manipulate shared files as if they were stored locally on the user's own hard disk. With NFS, computers connected to a network operate as clients while accessing remote files, and as servers when providing remote users access to local shared files. This protocol is used with UNIX/Linux networks.

NAS Device Path Considerations

Network segmentation is the process of splitting a single network into several sub-networks or segments. The advantages of a segmented network are improved performance and security. Performance is improved because there are fewer hosts on the segmented network, which in turn minimizes local traffic. Security is improved because the data traffic is contained on this segment and is not visible to the outside network.

Note: If you are using network segmentation and Automated Deployment Services (ADS), you must use the data segment IP information for ADS management, **NOT** the management segment. ADS uses the Server Message Block (SMB) data protocol to manage the NAS shares on your system, which requires that the management traffic use the data segment.

DXi systems allow you to configure your network for separate segment types. The three primary segments are defined by the type of network traffic that can be used on that segment. The three types of network traffic are:

- **Replication traffic** - This segment is used exclusively for replication data movement.
- **Management traffic** - This segment is used exclusively for DXi remote management (Web page access).
- **Data traffic** - This segment is used exclusively for NAS data movement.

Each network segment has its own network interface (IP address, network mask, and default gateway). In this way, the segment is separated from other network segment traffic.

Note: Regardless of which type of bonding is used on the DXi (Round Robin or LACP), the ports on the Ethernet switch that the DXi are connected to must be in the same matching group type as the bond on the DXi. If you are using the Round Robin (Mode 0) option, and you have either a Dell or CISCO switch, the ports that connect to the DXi must be bonded.

EMC NetWorker seamlessly integrates with a DXi-Series disk backup system using the NAS (CIFS or NFS) interface. Once installed and configured, NetWorker can manage backups through the DXi and take advantage of the system's capabilities, such as data deduplication and replication.

Installing and configuring the DXi and NetWorker for NAS operation consists of the following major steps, which are discussed below:

- [Configure the DXi for NAS](#)
- [Configure NetWorker with DXi NAS](#)

Configure the DXi for NAS

The DXi system allows you to configure it to present its storage capacity as NAS shares that are compatible with NetWorker. You can create NAS shares for use with Windows or Unix/Linux networks. You can also join the DXi to a Windows domain or workgroup, and manage users.

In the DXi Remote Management Console (the GUI) the **Configuration** page allows you to configure many of the features of the DXi, including storage presentation. A NAS license must be installed on the DXi prior to configuring NAS shares.

Configuring the DXi for NAS lets you choose which network protocol will be used as the transport method to the DXi. CIFS (Windows) and NFS (UNIX/Linux) are available on the **NAS > Summary** tab. After NAS Shares have been configured on the DXi, NetWorker can be configured to use these shares as storage resources.

Configure NetWorker with DXi NAS

To configure NetWorker with NAS follow the appropriate steps for your environment:

- [Windows with CIFS \(p.13\)](#)
- [Unix/Linux with NFS \(p.14\)](#)

Windows with CIFS

Before you can configure NetWorker with NAS/CIFS, you must modify its Windows Services properties to include the DXi's CIFS Share Access List information.

To configure NetWorker's Services properties, complete the following steps:

1. Navigate to a Microsoft Management Console (MMC) and open **Services**.
2. Right click on the **NetWorker Backup and Recovery Server** service and choose **Properties**.
3. In the **Log On** tab, select **This Account** and add the user name and password of the CIFS user account that was created on the DXi.
4. Locate the **NetWorker Remote Exec** service and make the same **Log On** modifications as in the previous step.
5. Restart all NetWorker services for the changes to take effect.
6. Using the NetWorker Management Console (NMC), right click on **Devices** and select **New**.

Then do the following, according to your version of NetWorker:

NetWorker 7.6:

1. In the **Identity** section, add the DXi's IP address and CIFS share in the **Name** field. The format should be as follows: `\\DXi_IP\share_name`.
2. In the **Media Type** pull down list, select **adv_file**.

3. In the **Access** section, add the user name and password that were created on the DXi, then click **OK**.
4. When NetWorker asks you to verify the path, click **yes**.
5. After the device has been created, right click on the new device and select **Label**. Select the intended backup pool, and click **OK**.

NetWorker 8.x / 9.x:

1. In the **Identity** section, give the device an alias name in the **Name** field. This can be any name the user wishes to use. This is a mandatory field.
2. In the **Device Access Information** field, add the DXi's IP address and CIFS share. The format should be as follows: `\\DXi_IP\share_name`.
3. In the **Access** section, add the user name and password that were created on the DXi, then click **OK**.
4. When NetWorker asks you to verify the path, click **yes**.
5. After the device has been created, right click on the new device and select **Label**. Select the intended backup pool, and click **OK**.

Unix/Linux with NFS

Before NetWorker can be configured with NAS/NFS, you must mount the DXi NFS share to a Unix/Linux file system.

Using the NetWorker Management Console (NMC), right click on **Devices** and select **New**.

Then do the following, according to your version of NetWorker:

NetWorker 7.6:

1. In the **Identity** section, add the NFS mount point in the **Name** field. An example would be `/mnt/share_name` if this is the mount point.
2. In the **Media Type** pull down list, select **adv_file**.
3. When NetWorker asks you to verify the path, click **yes**.
4. After the device has been created, right click on the new device and select **Label**. Select the intended backup pool, and click **OK**.

NetWorker 8.x and 9.x:

1. In the **Identity** section, give the device an alias name in the **Name** field. This can be any name the user wishes to use. This is a mandatory field.
2. In the **Device Access Information** field, add the NFS mount point. An example would be `/mnt/share_name` if this is the mount point.
3. When NetWorker asks you to verify the path, click **yes**.
4. After the device has been created, right click on the new device and select **Label**. Select the intended backup pool, and click **OK**.

Best Practices Guide with DXi NAS

Number of Shares Considerations

Quantum DXi systems support both CIFS (Windows-based) and NFS shares. Each system can support multiple NAS shares, with a maximum of 128 shares. Quantum recommends that users create only the required number of shares for each Media Agent. DXi systems can support concurrent NFS and CIFS shares, and can support Fibre Channel VTLs concurrently with those NFS and CIFS shares.

When using NAS shares on DXi systems, Quantum recommends that you create at least one share for each Media Agent to use. Media Agents should not share the NAS shares during normal backup operations. Root access to an NFS share is not allowed, and the access rights will be changed to **nfsnobody** as a security precaution.

With NetWorker 7.6, this does not impact access to the share from the backup application. However, changes were made in NetWorker 8 that now require root access to the NFS share.

- With DXi firmware 2.3.0 and above, there is now a **syscli** command to allow root access to an NFS share. See the DXi command line interface document for further information.
- For DXi firmware below 2.3.0, a field service member will need to gain access to the DXi to modify the NFS share to allow root access for NetWorker 8 users. See [Technical Support Bulletin \(TSB\) 00002498](#) for further explanation.

Network Share Access Control Considerations

In Windows Active Directory environments, the share acts as the target for NetWorker. The share is **NOT** intended as primary storage or drag-and-drop storage. A best practice is to create a new account and workgroup, as opposed to joining the domain, to limit access and prevent accidental file deletion by another user. Quantum recommends that you **DO NOT** reconfigure or delete NAS shares while data is being written. There is no mechanism to detect the I/O and provide a warning to the user.

Network Considerations

Some network considerations include:

- Use a dedicated network for backup data, or use QoS features that guarantee network bandwidth. Another option would be to use virtual networks (VLANs) to segregate backup traffic from production network traffic.
- Configure network interface cards (NICs) in the server and clients, and set routers to full duplex.
- Cabling:
 - Use only CAT5e or CAT6 cables (1Gb/s rated cables).
 - Use only OM3 or OM4 (Aqua) Fibre Optic cables (10Gb/s rated FC). and SFP+ Optical or TwinAx for 10 GbE
- If you are using a DNS server, verify that the DNS server configuration settings are correct by using **nslookup** on the host name, as well as the IP address.
- It is also a good idea to add the HOSTNAME and IP Address to the hosts file on Linux/UNIX systems.
- Use multiple DXi ports when connecting to the network. The more DXi ports used, the better the performance capability will be across the ports.
- Install and configure multiple network ports on the Media Agents. Dedicate multiple ports for the transfer of data to and from the DXi.

- Install and configure multiple network ports on the Media Agents. Dedicate multiple ports for the transfer of data from backup clients to the Media Agents.
- Set up multiple networks, and segregate traffic from the Backup Clients to Media Agent such that the client traffic does not interfere with the Media Agents to DXi traffic.
- Leverage NetWorker's ability to set up Alternate Data Paths. This can help ensure the success of data protection if you are using multiple Ethernet ports between Media Agents and the DXi..
- Leverage the DXi's ability to set up multiple networks. The DXi network configuration allows for integration into nearly any networked environment.
- For redundancy, connect at least two DXi ports to an Ethernet switch.
- Set each switch port used by the DXi to **auto-negotiate/auto-sensing**. The DXi network interface cards are preset to auto/auto and cannot be changed.

Additional Best Practice Considerations

Several operational considerations are common to all access methods (VTL, CIFS, and NFS). See the [Common Operational Considerations for NetWorker](#) section on p.17 for more information on Deduplication, Encryption, Compression, Backup Streams and Replication.

Common Operational Considerations for NetWorker

Data Deduplication Considerations

Deduplication results can be negatively impacted by compression, encryption, software deduplication, and multiplexing. These functions all change the data stream in a way that obscures patterns in the data content. They will reduce the performance and deduplication from any downstream appliance, including DXi systems. To obtain effective deduplication rates, you should **NOT** encrypt, deduplicate, compress, or multiplex your backup data before sending it to a DXi appliance.

The use of multiplexing was intended for slow source data, and for the minimum transfer rate required by physical tape drives. Multiplexing backup streams was intended to provide more efficient use of a limited number of physical tape drives. Since the virtual tape drives in DXi systems are not susceptible to performance losses from slow data transfer rates, the number of virtual tape drives can easily be increased without any time penalty for repositioning. It is not necessary to use multiplexing with the DXi systems. Additionally, multiplexing adds additional header information to the data and reduces the deduplication ratio.

Good Candidates for Data Deduplication

Data deduplication can work well with virtual machines, large databases, and unstructured data such as Microsoft Office documents (PowerPoint presentations, Word documents, and Excel spreadsheets), with SQL, Oracle, and Exchange databases, and with source code.

Not So Good Candidates for Data Deduplication

Data deduplication does **NOT** work well with encrypted data, in-line compressed data, SQL with LiteSpeed (in-line compression), Oracle with multi-channel RMAN (in-line multiplex), Exchange 2010, and compressed video, compressed audio, and compressed JPG images

For long-term archiving, Quantum recommends that you vault the data to a physical tape device.

Replication Considerations

For first-time replication setups, it is important to manually replicate the name space once the target system is configured and is online. This facilitates the first replication following the first backup to that share/partition.

- The replication is only available to NAS shares with deduplication enabled.
- The DXi supports 256-bit AES encryption for replication.
- Data is only encrypted while in transit between the replication source and replication target.
- Data is unencrypted upon arrival at the replication target.
- Encryption may affect replication performance. You should disable encryption if your WAN is already secured.

Oversubscription of Space on the DXi

Deduplication will reduce the amount of space used on the physical system by the virtual tapes. Users are advised to monitor for Low Space conditions on the DXi and free up virtual media before reaching this threshold. A best practice would be to trigger the Space Reclamation process *before* the DXi reaches approximately 80 percent full.

The **Disk Usage** overview on the **Home** page of the DXi Management GUI displays the following information about disk usage on the system (**Note:** Values are displayed as an amount and as a percentage of the total capacity in the system):

- **Disk Capacity** - The total usable disk capacity of the DXi.
- **Available Disk Space** - The disk space available for data storage (free space).
- **I/O Write Low Threshold State (Yellow)** - Free disk space is equal to or less than 500GB + [10GB * (Total system capacity in TB)].
- **Stop Write State (Red)** - Free disk space is equal to or less than 250GB.
- **Stop I/O State (Red)** - Free disk space is equal to or less than 10GB.

Note: For optimal system performance, Quantum recommends keeping the amount of Available Disk Space (free space) at 20% or more.

Note: When disk capacity is low, target replication to the system is paused. In addition, space reclamation is automatically started to free up disk space.

Space Reclamation

When data is deduplicated it is stored in a block pool—a pool of all unique data blocks that were captured during the data deduplication cycle. When subsequent backup jobs occur, the data deduplication engine searches for new data entering the DXi and uses a variable length compression algorithm to compare new data to existing data in the block pool. Unique blocks are added to the block pool and known blocks are indexed.

The space reclamation function searches the blockpool for data blocks that are not referenced by any pointers (that is, the files associated with the block have been expired and removed). Once such a data block is identified, the block is removed to make the space reusable.

For correct system operation, space reclamation must be run at regular intervals (at least once a week). Quantum recommends creating a schedule to automatically run space reclamation (see).

It may be beneficial to schedule space reclamation for a time when other operations are not normally being carried out. Therefore, it is important to know when to schedule the space reclamation process. As best practice, it is recommended that this process commences at least two hours after your backup job has completed on a daily basis. It is far more efficient to process a day's worth of new data than a week's worth.

Refer to the DXi User Guide for configuration details.

DXi Multiprotocol Guidance - NFS/VTL Scenario

The NFS **Synchronous** setting requires all data written to be committed to physical storage. This means that protocol “stable writes” and “commits” require all data to be written to disk before the command is complete. This ensures that when a backup completes, all the data resides on disk. The default setting is **Synchronous**. You can change this setting through the CLI.

Asynchronous mode allows the system to acknowledge receipt of “stable write” or “commit” commands without having the data (and related metadata) fully written to disk. This allows backups to be completed faster (from the NetWorker point of view), but it creates the possibility of having an incomplete backup if the system fails (e.g., power is lost) before all the data gets flushed to disk.

Simultaneous inline deduplication of VTL **and** NFS traffic represents the mixing of a heavy, intensive I/O payload with an out-of-order, bursty, and response-time-sensitive protocol.

In a mixed VTL and NFS environment, you should change the DXi 2.1 configuration for NAS shares settings from the default mode of **synchronous** to run in **asynchronous** mode. You can do this from the Command Line Interface: **syscli --nfscommit async {--share <sharename>} | --all**.

Additional notes:

- All other multi-protocol combinations work well together.
- The recommendation above applies to all operating systems and applications.
- As a general rule of thumb, reduced VTL traffic may lessen the frequency of NFS timeouts.

Helpful Resources

The following is a list of documents, references, and links where you can find additional information regarding specific activities and products.

Quantum Web Site

<http://www.quantum.com>

StorageCare Guardian Web Site

<http://www.quantum.com/ServiceandSupport/Services/GuardianInformation/index.aspx>

Quantum Vision Reporting Software Web Site

<http://www.quantum.com/products/Software/quantumvision/Index.aspx>

Contacting Quantum

More information about Quantum products is available on the Service and Support website at <http://www.quantum.com/serviceandsupport/get-help/index.aspx>. The Service and Support Website contains a collection of information, including answers to frequently asked questions (FAQs). You can also access software, firmware, and drivers through this site.

For further assistance, or if training is desired, contact the Quantum Customer Support Center:

Region	Support Contact
North America	1-800-284-5101 (toll free) +1-720-249-5700
EMEA	+800-7826-8888 (toll free) +49 6131 324 185
Asia Pacific	+800-7826-8887 (toll free) +603-7953-3010

For worldwide support:

<http://www.quantum.com/serviceandsupport/get-help/index.aspx#contact-support>