Data Protector NDMP Integration Quickstart Guide

How to set up HP Data Protector NDMP integration and HP StoreOnce Backup Systems to protect data stored in HP X9000 and NetApp FAS3070 NAS filers

Technical white paper

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Executive summary

This white paper provides quick start information for integrating Data Protector with an HP X9000 Network Storage System or NetApp FAS3070 Universal Storage System, for NDMP (Network Data Management Protocol) based backup tasks where the backup target is an HP StoreOnce Backup System.

Key take-away points:

- When using HP Data Protector for direct NDMP backups of HP X9000 and NetApp filers, the HP StoreOnce Backup System can be used as a deduplicating disk backup target.
- Additional Data Protector licenses are needed to enable NDMP backups.
- The StoreOnce Backup System must be configured to emulate tape devices (Virtual Tape) for the backup targets.
- Backing up to the HP StoreOnce Backup System delivers backup storage capacity savings of 90%+ with deduplication in the range 12:1 to 16:1 after around 30 backups. These deduplication ratios are similar to the best deduplication ratios achieved using regular file system backup, that is file system backups using the largest Data Protector configurable block size.
- StoreOnce Backup System replication can be used to create DR copies of virtual tapes at a remote location.

Audience

This document is intended for solution architects, project managers, engineers, and support personnel involved in planning, designing and configuring NDMP backup/recovery solutions using Data Protector with HP X9000 NAS technology, NetApp FAS filer technology, and HP StorageWorks Backup to Disk technology using HP StoreOnce deduplication for backup data reduction.

Familiarity with the following topics is recommended:

- HP X9000 architecture
- HP Data Protector
- HP StoreOnce Backup System (formerly: HP StorageWorks D2D) architecture
- NetApp FAS3070 architecture
- NDMP (Network Data Management Protocol)

Disclaimer

The configurations in this document are HP-recommended configurations. They are provided as a reference only, as configurations vary with specific customer needs. Where memory, processor count and speed, and I/O storage recommendations are given, these should be considered as minimum recommendations.

NAS concept

Network-attached storage (NAS) is file-level computer data storage connected to a computer network providing data access to heterogeneous network clients.

Although it may technically be possible to run other software on a NAS unit, it is not designed to be a general purpose server. For example, NAS units usually do not have a keyboard or display, and are controlled and configured over the network, often using a browser.

A fully-featured operating system is not needed on a NAS device, so often a stripped-down or customized standard operating system is used, such as Linux.

NAS systems contain one or more hard disks, often arranged into logical, redundant storage containers or RAID arrays (redundant arrays of inexpensive/independent disks) often referred to *primary storage*.

NAS removes the responsibility of file serving from other servers on the network.

NAS uses file-based protocols such as NFS (popular on UNIX systems), SMB/CIFS (Server Message Block/Common Internet File System) (used with MS Windows systems), AFP (used with Apple Macintosh computers), WebDAV, HTTP/HTTPS and FTP/FTPS to serve data to applications or users.

NAS units rarely limit clients to a single protocol.

You can now back up data residing on a filer to what is often called *secondary storage* in two different ways:

- On the Application Server
- Direct from the filer to tape using NDMP

The first method would be a "normal" backup, using the Data Protector Disk Agent, which is installed on each Application Server. During backup, data is transferred via the LAN to the system to which a tape device is connected.

The second way uses the NDMP integration of Data Protector and performs the backup locally on the NDMP server. This has two major advantages:

- The backup data does not need to be transferred over the LAN.
- There is no performance degradation on the Application Server.

NAS NDMP 2-way or local backup concept

The NDMP architecture uses a client-server model in which Data Protector is the NDMP client (DMA-Data Management Application) to the NDMP-Host Data Mover (NDMP server or DSP-Data Service Provider).

During an NDMP backup, backup data flows from the primary storage system to the Data Mover, and then on to the secondary storage system, such as an attached tape library backup device, without traversing the Ethernet network. Only the backup software's control data, catalog data, and tape library commands are send over the network, using NDMP protocol.

In a 2-way or local backup scenario (Figure 1) both primary and secondary storage are directly attached to the filer using either SCSI or Fiber Channel connections.

The Data Mover maintains a state machine for each NDMP client connection that executes and maintains backup and restore processes.

Note: Please refer to the filer vendor documentation to find the supported NDMP session concurrency scheme. Up to version 6.2, Data Protector only supports the 2-way or local backup concept.





NDMP backup

Preparation and prerequisites

StoreOnce Backup System (secondary storage)

- 1. Set up the StoreOnce system and create at least one virtual tape library with the appropriate number of tape drives. Select the desired tape emulation and number of tape slots. Make sure the library is mapped to an available Fibre Channel port.
- 2. Connect the configured library to your SAN segment.

SAN router

- 1. Create an Alias for each WWN (secondary storage: StoreOnce backup device, primary storage: NAS appliance).
- 2. Create a zone and include the Aliases.
- 3. Enable the zone.

NAS appliance (primary storage)

- 1. Set up the HP X9000/NetApp FAS3070 system and create at least one file system. Apply LTU were applicable.
- 2. Connect the NAS appliance to your SAN segment (via FC).
- 3. Detect the newly attached tape library/device.
- 4. Configure DSP (NDMP) on the NAS appliance.

Data Management Application (DMA) and NDMP client

- 1. Set up a Data Protector 6.2 Cell Manager.
- 2. Install an NDMP Media Agent, which promotes the Cell Manager to an NDMP client.

Note: The NDMP media agent can be installed on any client within the cell with a supported operating system. Always consult the latest support matrix for the components used to find any potential incompatibilities.

- 3. Ensure that you have correct Data Protector licensing for NDMP backups:
 - NDMP LTU for all platforms: 1xTB B7022BA, 10xTB B7022DA, 100xTB TD186AA
 - Appropriate number of library slots LTU: 1x 61-250/unlimited slots B6957BA/B6958BA, upgrade to unlimited slots B6958CA
 - Appropriate number of tape drive LTU for SAN, UNIX, NAS: B6953AA
 - Alternatively, licensing to tape drive LTU
 - Advanced Backup to Disk LTU for all platforms: 1xTB B7038AA, 10xTB B7038BA, 100xTB B7038CA
- 4. Configure the NDMP client.
- 5. Configure the backup library on the Data Protector Cell Manager.

Figure 2: NDMP 2-way backup topology



Note: Data Protector supports library sharing in a SAN environment.

Configuration steps

The following sections describe the steps necessary for properly configuring the backup target (StoreOnce), the DSP (NAS appliance), and the DMA (NDMP client and Library configuration on the Cell Manager). They do not cover SAN and LAN configuration aspects. All DMA (NDMP client) settings are non-modified standard settings.

StoreOnce Backup System (secondary storage)

The StoreOnce backup system requires five steps to create and configure a new virtual tape library (VTL). These are shown in Figure 3, which depicts the StoreOnce management GUI:

Figure 3: StoreOnce Backup System Administration GUI

Transition of the state of t	mepage.php# 1			🗾 😵 Certificate	Error 🔄 🗙 🔎 Bing	
vorites 🛛 👍 🥫 d2d4323 - HP Stor	ageWork 🅢 X9000 I	4anagement Console				
4222 HD StorageWorks D2D Backur	Sustan Do					
H323 - HF Storageworks D2D backup	b bystein - be					
D2D Backup Svet	am				L0	gout
DZD Dackup Oysi				A CARGE CONTRACTOR		<u>p</u>
e Virtual Tape Devices	NAS Configuratio	n Status Replication	ı Administrat	tion		
23 : 172.16.43.87						🚫 Sta
Devices Cartridges						
vices	_	_	_	_		
Show Details Box						
me	Cartridges	Role	Status	Connection	Device Туре	Port
Demo	96	Replication Source	Online	Connected	EML E Series / LTO5	iSCSI Port
rary 6	24	Non Replicating	Online	Not Connected	MSL G3 Series (2x24) / LTO3	iSCSI Port
SL_D2D4324_target_rep_1	21	Replication Target	Online	Not Connected	MSL G3 Series (8x96) / LTO5	ISCSI Port
C_NDMP_BG	48	Non Replicating	Online	Connected	MSL G3 Series (4x48) / LTO4	FC Port 1
v library	_	_	_	_		
Device Details Interface Info	ormation					
nulation Type	MSL G3 S	eries (4x48) 💌	Drive en	nulation	LTO4 💌	
tal No Of Cartridge Slots	48 🗘	(Range: 8 - 48, Default: 48)	Number	of Drives	4 💌	
ntridge Size	800 Gb	•	Deduplic	cation	Deduplication Enabled	
ort	FC Port 1	•				
of Barcode Characters	six 🗖	Eight 🔽				
arcode Justifcation	Left 🗖	Right 🔽				
						Cancel Create
						Cieate

- 1. Log on to the StoreOnce web administration GUI. Enter the administrator user credentials and password.
- 2. Select Virtual Tape Devices from the menu list.
- 3. Select Create Library.

This alters the lower part of the screen, allowing you to make changes to the library characteristics.

- 4. Change the library characteristics according to your needs. This includes:
 - Library name
 - Robotics emulation type
 - Tape drive emulation
 - Total number of cartridge slots
 - Number of tape drives
 - Cartridge size
 - FC port through which this library will be made accessible
 - Tape media labeling (barcode) details

Note: Make sure the robotic emulation type and the drive emulation is supported by the DSP as well as the DMA. Always consult the latest support matrix for the components used to find any potential incompatibilities.

- 5. Click **Create** in order to create the virtual tape library according to your specification. The creation of the virtual library will make the new library appear on the StoreOnce management GUI.
- 6. To verify the interface information, select the **Interface Information** tab in the lower part of the screen:

Figure 4: Interface Information

Device Details	Interface Information 6				
evice Name	Port	Device Serial Number	FC Address	World Wide Node Name	World Wide Port Name
edia Changer	FC Port 1	CZJ1030J0R	0×0A0405	50014380119CCAB4	50014380119CCAB5
rive 1	FC Port 1	CZJ1030HXK	0×0A0401	50014380119CC9EE	50014380119CC9EF
rive 2	FC Port 1	CZJ1030HXL	0×0A0402	50014380119CC9F0	50014380119CC9F1
rive 3	FC Port 1	CZJ1030HXM	0×0A0403	50014380119CC9F2	50014380119CC9F3
ive 4	FC Port 1	CZJ1030HXN	0×0A0404	50014380119CC9F4	50014380119CC9F5

Note: "Device Serial Number" and "World Wide Node Name" are configuration details that are used in further configuration tasks such as setting up FC SAN zones on the SAN router or identifying tape devices attached to the DSP (NAS appliance).

DSP on NAS appliance (primary storage)

HP X9000 models

The HP X9000 Network Storage System requires the following steps to configure the cluster for NDMP backup. The steps are shown on Figure 5, which depicts a management GUI of an X9000 Network Storage Gateway consisting of two nodes:

Figure 5: HP X9000 Network Storage Gateway Administration GUI

🖉 172.16.43.160 X9000 Management Con	sole - Windows Internet Explorer		_ 🗆 🗙
COO - 10 https://172.16.43.160/fusion	n/resources/window.html	🕐 😵 Certificate Error	<u> ۹</u>
🖕 Favorites 🛛 👍 🙋 d2d4323 - HP Storage	Work 🙋 X9000 Management Console		
[6] 172.16.43.160 X9000 Management Console			
Management Console		User: ibr	ix Role: admin <u>Logout</u> <u>Help</u>
System Status	Summary		
Updated May. 25, 2011, 3:08:17 PM 01C	Hame	Value	
Event Status (24 hours): 0 1 5063	Cluster Name	poc-x9300-1	
	Fusion Manager Primary IP Address	172.16.43.150	
Navigator			
Dashboard			
Cluster Configuration			4 5
Email	NDMP Configuration Summary		Modify Synchronize
🖃 🌼 Email	Name	Value	
	DMA IP Addresses	172.16.45.77	
Sector Events	Minimum Port Number	1025	
E the Sharing Authentication	Maximum Port Number	65535	
Local Groups	Listener Port Number	10000	
DMP Backup	Username	Administrator	
Active Sessions	Password	Admin	
Tape Devices	Enable NDMP Sessions	1	
Support Tickets	Log Level	0	
License License	TCP Window Size	163840	
	Number of Concurrent Sessions	128	

- 1. Log on to the HP X9000 web management GUI. Enter the administrator user credentials and password.
- 2. Select Cluster Configuration in the navigator list.
- 3. Select NDMP Backup in the Cluster Configuration.
- 4. Click **Modify** and make the necessary changes in the web form that appears. This includes the following details:
 - NDMP Sessions = Yes
 - Listener Port Number (typically the port is 10000)
 - Username and Password (must be a user with appropriate backup user rights)
 - DMA (NDMP client) IP Addresses
 - Enable NDMP Sessions = 1

Note: The remaining configuration items can be left unmodified.

- 5. Click Synchronize to distribute the configuration changes to all nodes of the cluster.
- 6. When the configuration changes are distributed, make sure all backup libraries that have been configured in the previous step are discovered and visible on the HP X9000 Network Storage System.

Select **Tape Devices** to verify which backup components are discovered. Refer to Figure 6 for details.

Figure 6: Discover Tape Devices

	Tape and Media Cha	nger Devices		7 🗔	escan Devices
	Hostname	Device Type	Device ID	Device Node	
ntication	poc-x9300-1	MediaChanger	HP_MSL_G3_Series_CZJ1030J0R	/dev/sg32	<u> </u>
	poc-x9300-1	TapeDrive	HP_Ultrium_4-SCSI_CZJ1030HXK	/dev/nst0	
	poc-x9300-1	TapeDrive	HP_Ultrium_4-SCSI_CZJ1030HXK	/dev/sg28	
	poc-x9300-1	TapeDrive	HP_Ultrium_4-SCSI_CZJ1030HXL	/dev/nst1	
	poc-x9300-1	TapeDrive	HP_Ultrium_4-SCSI_CZJ1030HXL	/dev/sg29	
-	poc-x9300-1	TapeDrive	HP_Ultrium_4-SCSI_CZJ1030HXM	/dev/nst2	
	poc-x9300-1	TapeDrive	HP_Ultrium_4-SCSI_CZJ1030HXM	/dev/sg30	
	poc-x9300-1	TapeDrive	HP_Ultrium_4-SCSI_CZJ1030HXN	/dev/nst3	
	poc-x9300-1	TapeDrive	HP_Ultrium_4-SCSI_CZJ1030HXN	/dev/sg31	
	poc-x9300-2	MediaChanger	HP_MSL_G3_Series_CZJ1030J0R	/dev/sg32	
	poc-x9300-2	TapeDrive	HP_Ultrium_4-SCSI_CZJ1030HXK	/dev/nst0	
	noc-y9300-2	TaneDrive	HP Littrium 4-SCSL C7.11030HXK	(dev/sn28	

7. Select Rescan Devices if the newly attached devices do not appear.

Note: "Hostname" and "Device ID" are configuration details that are used in further configuration tasks within the DMA (NDMP client) configuration. Each segment server (Hostname) of the X9000 cluster may discover the attached backup devices (Device ID).

NetApp FAS3070

The NetApp FAS3070 platform has very limited access to NDMP configuration items through either the web GUI or the NetApp System Manager plug-in.

Note: Interaction to NDMP commands through the web GUI is limited to the following:

- Enable/Disable NDMP: the Enable/Disable NDMP Services page enables you to enable or disable the NDMP service on the storage system.
- Terminate NDMP sessions: the Terminate an NDMP Session page enables you to terminate a current active NDMP session.

There is no NDMP management functionality available through the NetApp System Manager plug-in.

It is recommended to use a FTP/SSH client such as PUTTY in order to manage the NDMP functionality using the CLI of the FAS3070 controller.

Verifying the newly-attached library components

To verify newly attached tape library components such as tape libraries (medium changers) or tape devices that are recognized and configured on the FAS3070 controller proceed as follows:

- 1. Log on to the FAS3070 controller using the telnet/ssh client. Provide administrator credentials and password to get the system prompt.
- 2. To verify the supported tape device types enter:

```
tpc008> storage show tape supported [-v]
```

If no options are given, the list of supported tape drives is displayed. The -v option is supported, which displays all the information about the supported tape drives, including their supported density and compression settings.

Note: Make sure you only select backup tape device types in your StoreOnce backup system configuration that appear on the list of supported drives (such as LTO4).

Displaying information about attached tape drives and libraries

To display information about attached tape drives and tape libraries (medium changers), and their associated serial numbers, enter the following command:

tpc008> storage show {tape | mc} [{alias | PPN | WWN}]

- alias is the logical name of the tape drive or medium changer.
- PPN is the physical path name.
- WWN is the worldwide name.

The following shows the result of a medium changer (mc) query:

Medium Changer:	fcs009:0.129
Description:	HP MSL G3 Series
Serial Number:	CZJ04002H3
WWNN:	5:001:438007:5a2878
WWPN:	5:001:438007:5a2879
Alias Name(s):	mc4
Device State:	available

- Serial Number must match the device serial number of the configured library on the StoreOnce backup system.
- Alias Name is the device file to be used in the DMA (NDMP client) configuration.

The following shows the result of a tape device (tape) query:

fcs009:0.124
HP Ultrium 4-SCSI
CZJ04002D1
5:001:438007:5a27ba
5:001:438007:5a27bb
st41
available

 Serial Number must match the device serial number of the configured tape device on the StoreOnce backup system.

The Alias Name is the device file to be used in the DMA (NDMP client) configuration and can be verified by issuing the following command:

```
tpc008> sysconfig -t
```

The sysconfig -t command displays device and configuration information for each tape drive.

If you have a tape device that Network Appliance has not qualified, the sysconfig -t command output for that device is different from that for qualified devices. If the filer has never accessed this device, the output indicates that this device is a non-qualified tape drive, even though there is an entry for this device in the /etc/clone_tape file. Otherwise, the output provides information about the qualified tape drive that is being emulated by this device.

The following shows the result of a sysconfig -t device query:

```
Tape drive (fcs009:0.124) HP Ultrium 4-SCSI

rst411 - rewind device, format is: LTO-2(ro)/3 2/400GB

urst411 - unload/reload device, format is: LTO-2(ro)/3 2/400GB

rst41m - rewind device, format is: LTO-2(ro)/3 2/400GB

format is: LTO-2(ro)/3 4/800GB cmp

nrst41m - no rewind device, format is: LTO-2(ro)/3 4/800GB cmp
```

urst41m	-	unload/reload device,	format	is:	LTO-2	(ro)/3	4/800GB	cmp
rst41h	-	rewind device,	format	is:	LTO-4	800GB		
nrst41h	-	no rewind device,	format	is:	LTO-4	800GB		
urst41h	-	unload/reload device,	format	is:	LTO-4	800GB		
rst41a	-	rewind device,	format	is:	LTO-4	1600GB	cmp	
nrst41a	-	no rewind device,	format	is:	LTO-4	1600GB	cmp	
urst41a	-	unload/reload device,	format	is:	LTO-4	1600GB	cmp	

You can now verify the device file for the DMA (NDMP client) configuration. It is advisable to choose a no rewind device such as nrst41a or nrst41h.

Enabling NDMP services on the NDMP host/server

To enable NDMP services on the NDMP host/server issue the following command:

tcp008> ndmpd on

Note: The NDMP listener is on port 10000

Creating an NDMP password

To create a NDMP user password to be used in the DMA (NDMP client) configuration, issue the following command:

tcp008> ndmpd password username

This will create a NDMP user password similar to the following:

```
tpc008> ndmpd password Administrator
password ZVC5D0JU0JUw0BhV
```

Cut and paste the generated password into your "Import Client" task used on the DMA.

NDMP Client and DMA

The following is an overview of the steps required to set up the NDMP backup environment from a Data Protector perspective:

- 1. Push the NDMP Media Agent component to the designated NDMP client.
- 2. Import the NDMP host/server.
- 3. Create a dedicated NDMP media pool.
- 4. Create a backup library configuration.
- 5. Scan the library slots.
- 6. Format the media in the NDMP media pool.

The following describes these steps in detail:

1. Push the NDMP Media Agent component to the NDMP client.

You can install and upgrade Data Protector clients remotely by distributing the software using the Installation Server.

Note: The NDMP client can be any client in the cell as long as the NDMP Media Agent is supported on the OP/Sys platform this client runs on. Even though the installation process reports that the standard media agent has been removed, it will still be listed on the client's component list because the NDMP media agent provides the same functionality plus NDMP backup/restore functionality. Hence the NDMP media agent fulfills the legacy role of that client too.

Figure 7: Push the NDMP Media Agent component to the NDMP client

properties for File Edit Viev	nearline4.esc.bbn.hp.com - HP Da w Actions Help	ta Protector Manager		
Clients	💽 🛛 🖳 😒 📾	∎ ≠¤ ⊡ @ ? ≝ &	0	
🖃 👘 Data Prote	ector Cell	eneral Security Advanced Certific	ates Connection	
Cliente Barriero Cliente Cliente Add	earline4.esc.bbn.hp.com	Cell Manager		
	grade	Name: nearline4	.esc.bbn.hp.com	Patches
E Che	eck Installation	Platform: microsoft	amd64 wNT-6.1-S	
Add	Impersonation			
Moo	dify Impersonation	nstalled components:		
Dele	ete Impersonation	Component	Version	
<u>S</u> ec	ure	Disk Agent	A.06.20	
U <u>n</u> s	ecure	Media Agent	A 06 20	
Ena	ble encrypted communication	NDMP Media Agent	A.06.20	
Dela	eteKOMMA (ZEHNERTASTATUR)	User Interrace	A.06.20	
Call	last dabug filos	Automatic Disaster Becovery Module	A 06 20	
	sulate debug files space	English Documentation (Guides, Help)	A.06.20	
Dele	ete debug files			
	ato dobag filos			
Prop	perties Alt+EINGABE		0	man l Annia l
				Apply
📲 Objects	И	4 ▷ ▷ Properties for nearline4.esc.t	bbn.hp.com	

2. Import the NDMP host/server.

Figure 8: Import the NDMP host/server

Properties for poc-x9300-1.esc.bbn.hp.com	- HP Data Protector Manager	
Clients	● 📾 🖛 📾 😭 🕴 🕙	
Data Protector Cell Clients Data Protector Cell Clients Data Protector Cell Data Protector Ce	General Storage Appliance	<u>*</u>
	Port 10000 User name Administrator Pagsword ••••• NDMP Server Type HP×9000	Y
Dijects	Id <	- Andre

Note: Importing a client means manually adding a computer to a Data Protector cell. On NDMP hosts/servers, no Data Protector component will be installed. When added to a Data Protector

cell, the system becomes a Data Protector client. Once the system is a client of the cell, information about the new client is written to the IDB, which is located on the Cell Manager.

3. Specify information about the NDMP Server.

NDMP Server Type

Select one of the available NDMP host types that matches your setup: NetApp, Celerra, BlueArc, Hitachi, or HPX9000.

Port

Specify the TCP/IP port number of the NDMP Server. The default is 10000.

User Name

Type the user name that Data Protector will use to establish the connection to the NDMP Server. Default might be "ndmp". Check the vendor documentation for a valid "ndmp" user name and password.

Password

Type the password for the user. For NetApp FAS3070, use the password generated in one of the previous steps.

4. Create the NDMP media pool.

Figure 9: Create the NDMP media pool

🔂 Environment - HP Data Protector Manager 📃 🖸
File Edit View Actions Help
Devices & Media 🔄 🖳 🖳 🖛 🗐 😭 🚅 🛎 🖼 🍰 🍰 🥵 🖑
Environment Devices Policies Devices by host Devices by host Extended Copy Media Media Default DLT Add Media Pool Default DLT Default DLT Add Media Pool Default TO-Ultrium Default TO-Ultrium Default SuperDLT

Note: Although Data Protector provides default media pools, you should create your own media pool to suit your needs. Select the **Media Type** that matches the tape drive technology on your StoreOnce backup device. For example, select LTO-Ultrium if you have selected LTO4 on the backup device.

5. Create a Backup Library configuration.

Figure	10:	Create a	Backup	Library	configuration
--------	-----	----------	--------	---------	---------------

💼 Properties for x9k_Lib - HP Data Protector	Manager		
File Edit View Actions Help			
Devices & Media 💽 📔 🛃) 🛅 🛥 🖻 🛅 🤔	a 💣 🖼 🎽 2 <i>5</i> 9	
Environment	General Control Repository S	ettings	
Automated Operations Device Policies Devices	Library		^
Robotics	lame	x9k_Lib	
x9k_Lib_D1	Description		
	Device <u>T</u> ype	SCSI Library	<u>_</u>
	Interface Type	NDMP - HP-X9000	•
	Client	nearline4.esc.bbn.hp.com	•
	NDMP Server	poc-x9300-1.esc.bbn.hp.com	•
	Management Console URL	https://172.16.43.160/fusion/resources/wind	ow.html#
Extended Copy ⊕ ∰ Media	MultiPath device		
	Virtual tape library - TB based	licensing (Advanced backup to disk)	
	Estimated library capacity o	onsumption (TB)	-
]	Cancel	Apply
🟭 Objects	Properties for x9k_Lib	J	

Once the device has been connected and configured on the NDMP host, the device can be configured with Data Protector. The library robotics and tape drives require the following common configuration items:

- In the **Device Name** text box, enter the unique name of the device.
- In the **Description** text box, enter a description (optional).
- In the **Device Type** list, select the SCSI Library device type.
- In the **Interface Type** list, if the device is to be shared with non-NDMP Data Protector media agent clients within the cell, select the SCSI interface type. If the device is to be used exclusively for NDMP backup, select the NDMP interface type specific to the NDMP host being configured (such as HP X9000, NetApp, Celerra, BlueArc, Hitachi).
- In the **Client** list, select the client that handles the NDMP communication (NDMP client).
- In the NDMP Server list, select the NDMP Server. If the SCSI Interface type has been selected this
 will be grayed out as the device robotic will be configured through SCSI on the selected Client.
- Enter a valid URL of the library management console in the **Management Console URL** text box. (Optional for the robotics configuration.)

6. Enter the SCSI and media handling details.





SCSI library devices are large backup devices, also called autoloaders. They consist of a number of media cartridges in the device's repository and can have multiple drives handling multiple media at a time.

A typical library device has a SCSI ID (Windows) or a device file (UNIX) for each drive in the device and one for the library's robotics, which moves media from slots to drives and back again. For example, a library with four drives has five SCSI IDs, four for the drives and one for the robotics.

A medium is stored in a slot in the device's repository. Data Protector assigns a number to each slot, starting from one. When managing a library, you refer to the slots using their numbers.

Continue with the following steps:

7. Enter the SCSI address of the library robotics.

Note: This is dependent on which Interface Type has been selected. If NDMP Interface has been selected, use the SCSI address as it appears on the NDMP host. For example, on the X9000 GUI (Device ID, such as P_MSL_G3_Series_CZJ1030J0R), or as device file as it appears on the NetApp CLI (such as mc4). If the SCSI Interface Type has been selected, enter the SCSI address for the device robotic that is attached to the Client system.

- 8. In the Busy Drive Handling list, select the action Data Protector should take if the drive is busy.
- 9. Select SCSI Reserve/Release (robotics control).
- 10. Specify the slots for the device. Use a dash to enter slot ranges and then click **Add**. For example, enter 1–3 and click **Add** to add slot 1, 2, and 3 all at once. Do not use letters or leading zeros.
- 11.In the **Media Type** drop-down list, select a media type for the device that you are configuring.

12.Click **Finish** to exit the wizard. You are prompted to configure a library drive. Click **Yes** and the drive configuration wizard appears.

Note: Creating a tape drive configuration requires the same steps as for the library robotics except that you have to perform the following actions:

- Enter the correct drive index.
- Assign the previously created NDMP media pool to every drive configuration you create.
- Verify the correct tape block size.
- Use "Lock Names" when appropriate.

The SCSI address follows the same convention as described for the library robotics.

When the device configuration is finished you must scan the library slots and format the tape media to prepare the media pool for NDMP backups.

Creating an NDMP backup specification

Creating an NDMP backup specification in the Data Protector GUI follows a similar approach as for regular file system backups using the "normal" Disk agent (DA), except for a few details.

1. In the backup context, expand "Backup Specifications" and right-click on **Filesystem** to start the backup specification wizard by selecting **Add Backup** (see Figure 12).

Figure 12: Adding a backup specification using the GUI wizard

reate New Backup		×
Select a template to appl settings.	to the new backup. Use the Blank template to create a specification with no default	
Filesystem		
Name Blank Filesystem Backup Daily_Intensive End_User_Archive Monthly_Full NT_NNM_template Unix_NNM_template Weekly_Full Weekly_Full_Catalog Weekly_Full_Log_Dire Weekly_Full_Over_WAN	Group Default Schedule	
Backup options	Data mover backup	
F (<u>T</u> F -	✓ Load balanced	
S <u>u</u> b type	NDMP · HP-X9000	
OK	Cancel Help	

- 2. Select Data mover backup as the Backup type and your NDMP interface type in the Sub type field.
- 3. Continue in the wizard and start adding the backup source to the new backup specification (see Figure 13).

Figure	13:	Adding	the	backup	source	for	an	ΗP	X9000
--------	-----	--------	-----	--------	--------	-----	----	----	-------

le Edit View Actions Help	r Manager	×
ackup	22 ◇ ta = m ? M (R) (0 <i>⊆ ∞</i>	
Backup - (B) Backup Specifications 	Select the items that you want to back up.	
I ×9k_fs1_dump_1 	Show: All NDMP-HP-X90	
	poc-x9300-1.esc.bbn.hp.com	Map Network Share
Add/R	emove Dick Mount Points	Disconnect Share
		Add/Remove
	nount point //sd Ad nt point Bern [/fs1]	ld ove
	nount point //s2 Ad nt point //s2 Ad /fs1] OK Cancel He	ld ove Finish Cancel

4. As there is no Data Protector Disk Agent installed on any of the NDMP server platforms, you must manually specify the mount point to be included in the backup specification. You cannot browse existing file systems and have them added to the backup specification.

Each filer vendor has a specific syntax on how to add mount points to the backup specification:

- For an HP X9000, you must enter the file system name immediately after the root slash. For example: /fs2
- For NetApp FAS3070, the syntax is: /vol/fs2 (see Figure 14).

Figure 14: Add disk mount point syntax for NetApp FAS3070

Add/Remove Disk Mount Points		×
Add or remove disk mount points.		
New mount point	/vol/fs2	Add
Mount point [/vol/fs1]		<u>H</u> emove
<u>O</u> K <u>C</u> ancel		<u>H</u> elp

 Continue in the wizard and make your selection for the backup destination, global file system options and backup schedule. On the Backup Object Summary tab of the wizard you may configure each backup object individually (see Figure 15).



Backup - NetApp_vol1_dump_1 - HP Data Protector Manager						_ 🗆 ×
Eile Edit View Actions Help						
Backup 🗾 🔡 🐼 📷 🖛 🗃	? 🖪 🐼 🕀 💭 🖉		_			
	Source Destination Options Schedul	Backup Object Summar	e last-minute change:	s.		
BlueArc4_2	Client Source	Type D	escription De	evice	Man <u>u</u> al add	
Object Properties	tpc008.deu.hp.com /vol/tic_bbn_v	l1 Filesystem [Unix] A	/ol/tic_bbn_vol1 [L	oad Balance	<u>D</u> elete	1
General Options Other Trees/Filters NDMP					Change device	5
Modify NDMP specific options.					Change <u>M</u> irror.	
NDMP User Override					Properties	
Username	Advanced				X	
Password	_ NDMP e	nvironment variables				
NetApp Options	Variable	name	DIRECT	.	Add	
	Value	ľ	М		<u>S</u> et	
Advanced	Variat HIST EXCL UPDA	le name Vi Y JDE *,i TE Y	alue mp3		emove	
dump						
			Cancel		Help	
						Apply
	Bai Medium 🔫 Bai	kup∙NetApp_FC_lun1 *	Backup - NetAp	p_vol1_dump_1 ⊣	<u>-</u>)	

6. On Advanced NDMP Object Properties you can now specify your backup specific environment variable, such as EXCLUDE to exclude specific file types or directories.

Note: Consult the NAS filer administrator handbook for supported environment variables and their usage.

Performance and implementation considerations

As described earlier in this paper, there are two methods of backing up the data on NAS filers. The first method uses the regular file system backup of the application server. The NAS share is backed up using the same process as the backup of a file system on a local disk. This method is well understood and simple, but not optimized for NAS filer protection.

The second method uses NDMP to enable a direct backup from the filer to the HP StoreOnce Backup System. This requires additional setup and licensing, as covered in detail in this paper, but is optimized for NAS filer protection. The performance and implementation considerations for both methods are summarized in Table 1.

	Regular file system backup	NDMP-controlled backup
Impact on production servers	Higher; the Data Protector Disk Agent runs on each protected machine. Requires a backup window.	None, all processing is done on the filer. No impact on the data network.
Impact on data network	Higher, all backup data is transmitted over the data network contending for bandwidth with the production data. Additional impact if the	None, the backup data is written over the storage network to the StoreOnce Backup

Table 1: Summary of performance and implementation differences between the methods of protecting NAS filer data

	StoreOnce Backup System is connected using the data network.	System.
Backup flexibility	It is a simple process to include and exclude files and directories for backup through the Data Protector GUI.	Standard dump format enables control over what is backed up via file and directory exclusion policies implemented using vendor- specific environment variables.
Backup throughput	Depends upon the 'front end' performance of the filer to the clients: the protocol used and filer connections to the data network (10 GbE), and the design of the backup infrastructure. Protection can be configured using multiple backup objects to enable multiple parallel backup streams to be written to the StoreOnce Backup System for best performance.	Depends on the 'back end' performance of the filer to the StoreOnce Backup System (8 Gb Fibre Channel), and the performance of the backup format (dump). Multiple virtual tape drives (one per backup object) can be used to enable multiple parallel backup streams during backup to be written to the StoreOnce Backup System for best performance. Data Protector supports load balancing for NDMP backups for optimal virtual drive usage.
Backup data deduplication (for a given data set and change rate)	The key variable is the block size set in Data Protector – larger block sizes have higher deduplication ratios.	Test results show that the block size set in Data Protector and the NDMP BLOCKING_FACTOR have no significant effect on the deduplication ratio.
StoreOnce Backup System backup targets supported	All; virtual tape drives via FC or iSCSI, and the Data Protector File Library on the NAS Share.	Requires a virtual tape target. Connectivity is over FC because there is no iSCSI support on filers.
Restore flexibility	All or selected files and directories are restored to their original or an alternate location.	All or selected files and directories are restored to the same or alternate locations on the same filer or the same model of the filer if the HISTORY environmental variable is set to "YES".
Data Protostor liconsina	For backup and recovery menogements	
(assuming this is a new	Cell Manager	Cell Manager
installation)	Disk Agents (no cost)	NDMP Media Agent (no cost)
	• Media Agent (no cost)	• Direct Backup Using NDMP license for the
	For the StoreOnce Backup System:	capacity of protected data on the filer
	 Advanced Backup To Disk license for the usable capacity of the appliance or 	For the StoreOnce Backup System:Advanced Backup To Disk license for the usable capacity of the appliance
	 Drive and Slot licenses for virtual tape libraries used 	 or or Drive and Slot licenses for virtual tape libraries used

Configuring Data Protector block size and the NDMP blocking factor

Within the limits of the backup device, the Data Protector block size determines the size of the blacks (data units) processed. The backup device processes data in the specified block sizes. The block size is specified as backup device parameter as shown in Figure 16.

The default block size value for all devices is 64 kB. Increasing the block size can improve backup performance and the deduplication ratio for regular file system backup. For NDMP backup, changing the block size has no significant effect on deduplication ratios.

Figure 16: Specifying the Data Protector block size used to write the backup to a virtual tape drive.

Advanced Options		×
Settings Sizes Ot	her	
Specify b ↔	lock, segment sizes and the num	ber of buffers.
Block size (kB)	256	(8 - 1024)
	ОК	Cancel Help

For an NDMP-controlled backup, the data stream is not in a Data Protector format. The default format is *dump* (others are possible), which can use different blocking factors. The blocking factor determines the size of the units of backup data moved and processed by the NDMP Server.

In Data Protector, the blocking factor is specified as an NDMP environment variable in the backup object properties, as shown in Figure 17. The syntax and default values for the blocking factor parameter are different for an HP X9000 and a NetApp FAS3070 as shown in Table 2.

Figure 17: Specifying the blocking factor environment variable in the backup object properties.

Object Properties	×
General Options Other Trees/Filters NDMP	
Comment Modify NDMP expecting actions	Advanced X
NDMP User Override	Variable name BLOCKING_FACTOR Add
Usemame /	Value 65536 Set
Password	Variable name Value Remove
	DIRECT Y
HP-X9000 Options	EXCLUDE *.mp
	HIST Y
Advanced	BLOCKING_FACTOR 65536
NDMP backup type	
	1
dump I I	OK Cancel Help
OK Cancel	Help

Table 2: HP X9000 and NetApp FAS3070 vendor-specific variables and values for the NDMP blocking factor.

NAS filer	Blocking factor parameter	Default value	Other available settings
HP X9000	BLOCKING_FACTOR	128 kB	64–256 kB
NetApp FAS3070	MOVER_RECORD_SIZE	63 kB	4–256 kB

Deduplication performance test results

As part of the validation of Data Protector managed protection of HP and NetApp NAS filers using a HP StoreOnce Backup System as the backup storage, the backup data deduplication rates were measured. The test data set was made up of unstructured file data from a production environment. A backup scheme that simulated daily full backups was used. Between each backup, a random selection of 5% of the data was changed.

The tests were run multiple times from an HP X9000 and a NetApp FAS3070 to investigate the effects of varying the Data Protector block size and the NDMP blocking factor. The results are shown in Figure 18.

Figure 18: Comparison of deduplication ratios using different tape block sizes and different NDMP blocking factors versus a regular file system backup of the same data to an HP StoreOnce Backup System. The backup configuration was for full backups with a random 5% of the data changed between each backup.



Licensing considerations

As shown in Table 1, the file system and NDMP-controlled methods of protecting the NAS filer require different Data Protector licenses. Both require a Data Protector Cell Manager and either Advanced Backup To Disk, or Drive and Slot licenses for the StoreOnce Backup System.

The difference is that an NDMP-controlled backup requires a Direct Backup Using NDMP license. The licensing for this is calculated based on the configured capacity of the NAS filer. The result is that the NDMP-based method will have higher Data Protector licensing costs.

Conclusions

- The main benefits of NDMP direct backups are delivered when:
 - There is a need to minimize the backup load on the data network, application servers and backup media servers.
 - The filer is required to be backed up as a complete entity, although you can exclude files using exclude commands in the NDMP environmental variables set in the NDMP backup job.
- The benefits of NDMP direct backups should be traded off against the fact that NDMP backup s can be more expensive to implement (require additional licensing, such as an HP Data Protector Direct NDMP backup license), and more complex to manage and configure compared to regular file system backups.
- Backing up to an HP StoreOnce Backup System enables a deduplication ratio of between 12:1 and 16:1 over a period of 20+ backups with a simulated typical daily change rate of 5%. This provides an approximately 90% + increase in backup storage use compared with backing up the same data to a physical tape device or non-deduplicating disk.
- NDMP direct backups achieve similar deduplication ratios to file system backups using the largest Data Protector block size. (NDMP backups achieve higher deduplication ratios than file system backups using smaller Data Protector block sizes).
- The NDMP direct backup testing was conducted with various Data Protector tape block sizes along with HP X9000 NDMP BLOCKING_FACTORs and NetApp FAS3070 NDMP MOVER_RECORD _SIZEs. The results show that changing the tape block size and NDMP blocking factor had no appreciable effect on the backup data deduplication ratio. The recommendation is to use the default values in both Data Protector and the NAS filer.
- Testing showed that the HP X9000 implementation of NDMP backup delivers an approximately 10% + better backup data deduplication ratio compared with the NetApp FAS3070.

For more information

To read more about:

- HP Data Protector software, go to www.hp.com/go/dataprotector
- HP X9000 Network Storage System, go to <u>www.hp.com/go/x9000</u>
- HP StoreOnce Backup System, go to www.hp.com/go/d2d
- HP Data Deduplication, go to www.hp.com/go/storeonce



Get connected www.hp.com/go/getconnected Current HP driver, support, and security alerts

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