Hitachi NAS Platform NDMP Backup with IBM® Tivoli® Storage Manager 7.1 for Microsoft® Windows®

Implementation Guide

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Hitachi NAS Platform NDMP Backup with IBM® Tivoli® Storage Manager 7.1 for Microsoft® Windows®

Implementation Guide

This document describes the procedure for protecting data stored on Hitachi NAS Platform (HNAS) using IBM® Tivoli® Storage Manager (TSM). The document was written using HNAS release 12.0 and TSM 7.1 for reference. The procedures described have been largely unchanged since release 6.0 for HNAS and TSM 5.5; being more than likely relevant for future releases as well.

Data on HNAS may be protected in a variety of ways, including file system snapshots, local and remote object-based replication, local and remote file-based replication, and Sync-DR. Often, the best solution includes one or more of those in addition to traditional backup. Traditional backup uses an application, such as TSM, to schedule copies from primary storage to secondary storage.

The secondary storage may be disk attached to a TSM media server, tape attached to a TSM server, or tape attached directly to the HNAS. Regardless, that target is controlled by TSM.

HNAS data may be backed up over NFS or CIFS. Often that is the method that will provide the best performance simply because HNAS is designed to optimize performance for these protocols. The drawbacks to backing up over NFS or CIFS include lack of automated snapshot management, increased load on the LAN, and lack of protection for mixed-mode security descriptors (that is, data backed up over NFS will not capture the data’s CIFS security descriptors, and vice versa).

Backing up over network data management protocol (NDMP) does use automated snapshot management and fully captures all security descriptors. Depending on the type of NDMP backup used, the data may also be diverted directly to Fibre Channel (FC) attached tape drives rather than going over the LAN.

The NDMP protocol uses a server and client model in which the HNAS is the NDMP server and the TSM server is the NDMP client, also called a Data Management Application (DMA). There are three NDMP backup models: local NDMP, remote NDMP, and three-way NDMP.

**Note:** Support for NDMP is only offered in Tivoli® Storage Manager Extended Edition.
Product Features

Hitachi NAS Platform

Hitachi NAS Platform leads the industry in performance and scalability and delivers the most advanced virtualization framework. This NAS solution is ideal for virtualization, file server/NAS consolidation and protection of highly valuable data, reducing management complexity and total cost of ownership (TCO). Hitachi NAS Platform seamlessly integrates with Hitachi SAN storage, including Hitachi Command Suite.

It is also ideal for data intensive, performance driven markets such as Life Sciences, Internet Services, Entertainment, Electronic Document Discovery, Government, Education, Oil and Gas, and Electronic Design, enabling customers to minimize processing cycle times and improve productivity.

IBM Tivoli Storage Manger

IBM Tivoli Storage Manager is a data protection platform that gives enterprises a single point of control and administration for backup and recovery. It is the flagship product in the IBM Tivoli Storage Manager family.

It enables reliable, cost effective backups and fast recovery for virtual, physical and cloud environments of all sizes.

- Reduces backup and recovery infrastructure costs by up to 38 percent
- Delivers greater visualization and administrator productivity
- Simplifies backups by consolidating administration tasks
- Protects up to ten times more user data per day per backup server

Target Audience

The intended audience for this implementation guide is anyone deploying this solution. The reader needs to have a working knowledge of HNAS configuration, as well as a basic administrative knowledge of the target operating system.
Assumptions

- HNAS is installed and configured with at least one EVS defined with share(s) assigned
- Fibre Channel zones have been configured, providing connection between the HNAS/HNAS cluster and the tape library/tape drives
- Target operating system is installed and patched
- Current tape library/tape drive drivers for the target operating system are installed
- TSM Extended Server Edition is installed on the target operating system
Tested Solution Components

Hardware Components

Table 1. Hardware Components

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hitachi NAS Platform 4000 Dual Node Cluster</td>
<td>Server</td>
<td>Hitachi NAS Platform 4060 Hitachi NAS Platform (DM2PEP511F108)</td>
</tr>
<tr>
<td></td>
<td>Firmware</td>
<td>12.0.3528.01</td>
</tr>
<tr>
<td></td>
<td>NDMP</td>
<td>4.0</td>
</tr>
<tr>
<td>Hitachi Unified Storage VM</td>
<td>Configuration</td>
<td>73-03-01-00/00</td>
</tr>
<tr>
<td></td>
<td>2 ×1 TB LUNs RAID-6 (6D+2P)</td>
<td></td>
</tr>
<tr>
<td>Hitachi Compute Rack</td>
<td>Server Platform</td>
<td>CR 220H</td>
</tr>
<tr>
<td></td>
<td>CPU</td>
<td>2 Intel® Xeon® CPU E5-2620 @ 2.00 GHZ</td>
</tr>
<tr>
<td></td>
<td>CPU Socket/Core</td>
<td>2/6</td>
</tr>
<tr>
<td></td>
<td>Memory</td>
<td>16 GB</td>
</tr>
<tr>
<td></td>
<td>HBA</td>
<td>Emulex LPe12002-M8 Firmware 2.01a12</td>
</tr>
<tr>
<td>IBM System Storage T3200 Tape Library Express</td>
<td>Tape library</td>
<td>3573-TL FW C20/3.20e</td>
</tr>
<tr>
<td></td>
<td>Drive 1 Element: 256</td>
<td>ULT3580-TD5 (FC) FW: D8D4</td>
</tr>
<tr>
<td></td>
<td>Drive 2 Element: 257</td>
<td>ULT3580-TD5 (FC) FW: D8D4</td>
</tr>
<tr>
<td>Brocade 5100 Switch</td>
<td>SAN Fibre Channel connection 4 × 8 Gb ports</td>
<td>FabOS v6.4.1b</td>
</tr>
</tbody>
</table>
Software Components

Table 2. Software Components

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM Tivoli® Storage Manager Server</td>
<td>Server software</td>
<td>TSM 7.1 Server Extended Edition for Microsoft® Windows®</td>
</tr>
<tr>
<td></td>
<td>Tivoli Storage Manager Operations Center</td>
<td>7.1.0.000 Build 23121126-1623</td>
</tr>
<tr>
<td></td>
<td>Tivoli Storage Manager Backup-Archive Client</td>
<td>7.1.0.0</td>
</tr>
<tr>
<td></td>
<td>Operating system</td>
<td>Windows Server® 2012 R2 Standard Edition</td>
</tr>
<tr>
<td></td>
<td>Hardware</td>
<td>Hitachi Compute Rack 220H</td>
</tr>
<tr>
<td>IBM Tivoli Storage Manager Client</td>
<td>Client software</td>
<td>Tivoli Storage Manager 7.1 Client for Windows TSM_V6.3_LIN_CLIENTS.tar.gz</td>
</tr>
<tr>
<td></td>
<td>Operating system</td>
<td>Windows Server 2008 R2 Standard Edition</td>
</tr>
</tbody>
</table>

Storage Configuration
Hitachi Unified Storage VM was provisioned with two 1 TB LUNs, from which CIFS shares were created and provisioned by Hitachi NAS Platform 4060. Hitachi Storage Navigator Modular 2 was utilized to create the following storage space:

- Two Storage Pools configured as RAID 6 (6D+2P)
- Two 1 TB LUNs
- One Host Group

SAN Configuration
SAN connectivity utilizing the Fibre Channel protocol provides connectivity between the Hitachi NAS Platform Fibre Channel port(s) and the IBM TS3200. An Hitachi NAS Platform 4060 SAN attached via a Brocade 5100 Fabric switch was used to develop this implementation. There was no SAN connectivity between the TSM server and the tape library's robotic control. Direct Fibre Channel connectivity to a library's robotic control is only supported if the robotics are segregated from the tape drive(s) (i.e. a dedicated path). A single Zone was created such that the Hitachi NAS Platform ports had connectivity to both tape drives within the IBM TS3200 tape library. Robotic control passes through Tape Drive 1.

Note: Tape library configurations and capabilities vary by vendor. Please consult with the appropriate vendor when configuring Fibre Channel zoning.
Network Configuration

- Ethernet connectivity utilizing TCP/IP protocol provides the communication path between the following:
  - IBM Tivoli Storage Manager server and client (1 Gb network)
  - IBM Tivoli Storage Manager server and IBM TS3200 tape library (1Gb network)
  - HUS VM and Hitachi NAS Platform 4060 (10 Gb Network)

Tivoli Storage Manager Server Configuration

The server used for testing was configured with the following hardware and software components:

- Hitachi CR 220H (see table 1 for detailed components)
- Windows Server 2012 R2 Standard Edition (Fully Patched)
- Tivoli Storage Manager Extended Edition Version 7.1
- Tivoli Storage Manager Operations Center Version 7.1.0.000 Build 20131126-1623
- Tivoli Storage Manager Backup-Archive Client for Windows 7.1.0.0
Logical Configuration

TSM 7.1 Client

TSM 7.1 Server

Ethernet Switch

TS3200

Brocade 5100 SAN Switch

HUS VM

File System

HNAS

SAN

1 Gb Ethernet

10 Gb Ethernet

Figure 1
Hitachi NAS Platform NDMP and Backup Device Configuration

Hitachi NAS Platform Configuration

Hitachi NAS Platform and IBM Tivoli Storage Manager use the NDMP protocol to execute requests, provide services, and move data. Each Hitachi NAS Platform has its own NDMP secured device file. Only via NDMP can the device file can be backed up and restored.

Configure Hitachi NAS Platform as described in the following sections.

Hitachi NAS Platform NDMP Communications Setting

The standard Hitachi NAS Platform configuration for NDMP is to use port 10000 for communications. This port value is used when configuring the 'DATAMOVER' within TSM. The user name and password (ndmp) will also be used in the TSM configuration process. Figure 2 shows the Hitachi NAS Platform NDMP settings.

Start the NDMP server if it is stopped, and verify that the option to enable the NDMP server at boot is enabled.

![NDMP Configuration](NDMP_Configuration.png)

**Figure 2**

These options may also be set via the Hitachi NAS Platform CLI via the `ndmp-user` and `ndmp-status` commands.
Hitachi NAS Platform NDMP Options

Set and enable Hitachi NAS Platform NDMP options allowing NDMP to work more efficiently. Failure in setting these options may result in failed backup and restore operations.

Utilizing SSH, connect to Hitachi NAS Platform System Management Unit (SMU), select the desired Hitachi NAS Platform. Via the Hitachi NAS Platform CLI, execute the following commands:

HNAS01:$ ndmp-option tokens on
HNAS01:$ ndmp-option report_as_fs all
HNAS01:$ ndmp-option mover_window_adjust_recovery

Option Description:

- tokens [{ on | off }]
  Enable use of token based incremental backups.

- report_as_fs [{ volume | export | share | all | ...}]
  Some backup applications show lists of File Systems that can be backed up by NDMP servers. The server allows File System (volume) names, export names and share names to be used as the backup file system path. This option may be used to select which of the various File System specifiers will be reported back to the backup application in the list of File Systems. By default the option is set to 'volume;' meaning that only File Systems (volumes) will be reported.

- mover_window_adjust_recovery
  This option changes the way that the server processes the offset field of a MOVER_SET_WINDOW request received from a backup application. This setting may be required to successfully recover backups spanning multiple tapes with TSM.

Hitachi NAS Platform NDMP Snapshot Configuration

It is best practice to back up from snapshots rather than a live file system to ensure the data is in a consistent state and will not be affected by ongoing file activity. Snapshots also facilitate incremental backups.

Navigate to the Home > Data Protection > NDMP History & Snapshots page of the Web Manager GUI and select the options to 'Automatically create snapshots' and 'Delete snapshot when obsolete'. Ensure the automated 'Snapshot Retention' is set to a period long enough to allow any differential backup to complete before the snapshot for the previous full backup expires.
The above options may also be viewed and configured with the `ndmp-snapshot-options` command from the Hitachi NAS Platform CLI.

**Figure 3**

**Hitachi NAS Platform NDMP Device Configuration**

Skip this section when exclusively using remote NDMP, in which case the backup targets are on the TSM server.

The Hitachi NAS Platform Fibre Channel ports must be zoned with the tape drive ports in order for Hitachi NAS Platform to assign pathing to the library's robotics and tape drives. Create zoning such that Hitachi NAS Platform has visibility to the tape drives, optionally the media changer, and to the Hitachi NAS Platform FC initiator ports. Any of the Hitachi NAS Platform FC initiator ports may be used. Hitachi NAS Platform may access disk and tape targets over the same ports.

**Note:** Hitachi NAS Platform servers may share tape devices with other servers. However, always ensure SAN zoning does not allow other servers access to Hitachi NAS Platform initiator ports or array controller ports used by Hitachi NAS Platform servers.

The Tivoli Storage Manager Server executes requests, sending SCSI commands to Hitachi NAS Platform via the NDMP protocol; which in turn passes these commands on to the tape library.
Special device files defined by Hitachi NAS Platform are used when configuring TSM. The file pathing information is used to define the specific paths by which TSM may access the tape library for which Hitachi NAS Platform is proxying. These files define both the tape library's robotic and drives. Without the device files association, successful backup and restore operations would not be possible.

**Hitachi NAS Platform NDMP Device List**

Ensure the targets have been discovered and are presented on the Home > Data Protection > NDMP Device List page of the Web Manager GUI and/or the `ndmp-devices-list` command output of the CLI.

The device pathing used in this guide is as follows:

/dev/mc_d3l1 (TS3200 robotic control)
/dev/mt_d3l0 (Tape Drive 1)
/dev/mt_d2l0 (Tape Drive 2)

The Hitachi NAS Platform NDMP device file information was obtained from the Hitachi NAS Platform NDMP Device List as shown in Figure 4.

![NDMP Device List](image)

**Figure 4**

**Hitachi NAS Platform Device Access Details**

Each device must be granted access to an EVS. Granting access by an EVS to a device may be accomplished in one of two ways. Placing a check mark next to the devices and clicking the 'allow access' button, will grant access to the drives from all EVS(s), which is the Hitachi NAS Platform default; see Figure 5.

The Hitachi NAS Platform server will detect the devices automatically. If the devices are not displayed, click the **Refresh Status** link or run the `ndmp-devices-update` command from the CLI.
Figure 5 shows the **Home>Data Protection>NDMP** Device List.

<table>
<thead>
<tr>
<th>EVS:Device Name</th>
<th>WWN Node (LUN)</th>
<th>Manufacturer (Model)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;any&gt; dev/mc_d011</td>
<td>20:01:00:0e:11:14:03:56 (1)</td>
<td>IBM (3573-TL)</td>
</tr>
<tr>
<td>&lt;any&gt; dev/mt_d010</td>
<td>20:01:00:0e:11:14:03:56 (0)</td>
<td>IBM (ULT3580-TD5)</td>
</tr>
<tr>
<td>&lt;any&gt; dev/mt_d110</td>
<td>20:07:00:0e:11:14:03:56 (0)</td>
<td>IBM (ULT3580-TD5)</td>
</tr>
<tr>
<td>TSM71-1/dev/mc_d311</td>
<td>20:01:00:0e:11:14:05:b3 (1)</td>
<td>IBM (3573-TL)</td>
</tr>
<tr>
<td>TSM71-1/dev/mt_d210</td>
<td>20:01:00:0e:11:14:05:b3 (0)</td>
<td>IBM (ULT3580-TD5)</td>
</tr>
<tr>
<td>TSM71-1/dev/mt_d310</td>
<td>20:01:00:0e:11:14:05:b3 (0)</td>
<td>IBM (ULT3580-TD5)</td>
</tr>
</tbody>
</table>

Check All | Clear All

**Figure 5**

The second approach and best practice, is to restrict access to a single EVS, which is the approach taken for this guide.

**Figure 6**

Click the details link for each device and select the EVS that will use the device. If more than one EVS will use the device, select Any EVS. Then click **reassign**. The CLI `backup-device-set-evs` command may also be used to set this option.

In **Figure 7**, the EVS **TSM71-1** will be granted access to both tape drives and robot. **Figure 7** shows that access has been allowed for the robotic control (`/dev/mc_d311`), for tape drive 1 (`/dev/mt_d310`) and tape drive 2 (`/dev/mt_d210`).
Allow the devices for NDMP use by selecting allow access or running the `backup-device-allow-access` command from the CLI.

**Tip:** TSM must have tape device order configured accurately. The library location of each tape drive must be properly configured to TSM. The TSM configuration requires specificity. Best practice is to maintain consistency in naming. For example if two Hitachi NAS Platform clusters share a tape drive, one cluster may see that tape drive as `/dev/mt_d210`, while the other cluster may call the same drive `/dev/mt_d110`. Administrators may find it helpful in this situation to assign aliases to the tape drives that are easier to remember than the server’s device name or the tape drive’s serial number. Aliases may be assigned via the Hitachi NAS Platform GUI or via the `ndmp-device-assigned-name-set` CLI command.
Hitachi NAS Platform Volumes, File Systems and CIFS Shares

Two CIFS shares have been used for backup and restore testing, as shown in Figure 10. The primary share TSM24 was populated with data which included a directory consisting of over 5 million files of varying sizes. The second share TSM71-Restore was used to restore a backup to an alternate location and verify that backup data matched the restore data.

![CIFS Shares Table]

<table>
<thead>
<tr>
<th>Name</th>
<th>Comment</th>
<th>File System</th>
<th>Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSM24</td>
<td>TSM 7.1</td>
<td>iso9979626</td>
<td></td>
</tr>
<tr>
<td>TSM24_Restore</td>
<td>TSM 7.1</td>
<td>iso9979626_Restore</td>
<td></td>
</tr>
</tbody>
</table>

Figure 10

Tape Library Configuration

Tape drives and robotics within a library must be defined to TSM. Tape drive position within the library must specified as well. Each tape drive location has a corresponding ‘Element Address’, defining its location. Many tape libraries specify the element address for each tape drive in the user interface; which is the case for IBM tape libraries. If element information is not readily available, consult the library manufacturer's user guide.

IBM also provides a Web reference which may be useful:


An IBM TS3200 (3573-TL) was used in the configuration example to follow. The library consisted of the following components:

- Two Fibre Channel attached ULT3580-TD5 (LTO5) Tape Drives
- One Robotic changer accessible via Tape Drive1
The 'Element Address' for each drive will be used to configure TSM. The information below was obtained by accessing the library's management GUI, 'Monitor Library,' 'Drive Identity.'

<table>
<thead>
<tr>
<th>Drive Identity</th>
<th>1 (LUN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vendor ID</td>
<td>IBM</td>
</tr>
<tr>
<td>Product ID</td>
<td>ULT380-TD5</td>
</tr>
<tr>
<td>Serial Number</td>
<td>1068004732</td>
</tr>
<tr>
<td>Firmware Revision</td>
<td>D8D4</td>
</tr>
<tr>
<td>Element Address</td>
<td>256</td>
</tr>
<tr>
<td>Control Path Drive</td>
<td>Yes</td>
</tr>
<tr>
<td>Data Compression</td>
<td>Yes</td>
</tr>
<tr>
<td>Interface Type</td>
<td>Fibre Channel</td>
</tr>
<tr>
<td>Node Name</td>
<td>2001000E111405B3</td>
</tr>
<tr>
<td>Port A</td>
<td>Enabled</td>
</tr>
<tr>
<td>Port Name</td>
<td>2002000E111405B3</td>
</tr>
<tr>
<td>Topology</td>
<td>N-Port</td>
</tr>
<tr>
<td>Speed</td>
<td>Automatic</td>
</tr>
<tr>
<td>Port B</td>
<td>Disabled</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drive Identity</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vendor ID</td>
<td>IBM</td>
</tr>
<tr>
<td>Product ID</td>
<td>ULT380-TD5</td>
</tr>
<tr>
<td>Serial Number</td>
<td>1068004759</td>
</tr>
<tr>
<td>Firmware Revision</td>
<td>D8D4</td>
</tr>
<tr>
<td>Element Address</td>
<td>257</td>
</tr>
<tr>
<td>Control Path Drive</td>
<td>No</td>
</tr>
<tr>
<td>Data Compression</td>
<td>Yes</td>
</tr>
<tr>
<td>Interface Type</td>
<td>Fibre Channel</td>
</tr>
<tr>
<td>Node Name</td>
<td>2007000E111405B3</td>
</tr>
<tr>
<td>Port A</td>
<td>Enabled</td>
</tr>
<tr>
<td>Port Name</td>
<td>2008000E111405B3</td>
</tr>
<tr>
<td>Topology</td>
<td>N-Port</td>
</tr>
<tr>
<td>Speed</td>
<td>Automatic</td>
</tr>
<tr>
<td>Port B</td>
<td>Disabled</td>
</tr>
</tbody>
</table>

Figure 11

Tivoli Storage Manager Server Configuration

This section covers the steps necessary to configure an Hitachi NAS Platform EVS and tape library to TSM in an NDMP environment. Many of the steps in this section may need to be repeated if configuring multiple EVS or tape libraries. Node registration, library configuration, and filesystem mapping will need to be repeated for each EVS being backed up via NDMP.

It is highly recommended that before proceeding, a copy of the 'IBM Tivoli Storage Manager for (OS type) Version 7.1 be available as reference. The Administrator's Reference guide for Windows may be downloaded from the following location:


Note: The command syntax for TSM administration transcends operating systems. You may use the same command syntax for configuring Hitachi NAS Platform and tape libraries in operating environments other than Windows. The same does not hold true for TSM Server or Client installation. The appropriate installation guide(s) should be referenced.
For additional information the following IBM URLs may be used as reference:


http://pic.dhe.ibm.com/infocenter/tsminfo/v7r1/index.jsp

TSM Command Line Interface

The TSM configuration process is completely performed via its own command line interface. The TSM is accessed via the dsmadmc utility. The utility may be run as follows:

Windows: C:\Program Files\Tivoli\TSM\server\tsmdiag\dsmasmc.exe

Linux: /opt/tivoli/tsm/server/bin/tsmdiag/dsmasmc

The default user name and password are admin. However, check with your storage administrator in the event they have been changed. For the purposes of this guide tsmadmin/tsmadmin123 were chosen as the userid/password.

Once started, the TSM CLI will present a command prompt as follows:

```tsm: (tsmnnode name)>
```

Tivoli Storage Manager Configuration Steps

Configure a Policy

1. Define a Domain to be used for the Hitachi NAS Platform backups.

   ```
   define domain DOMAIN_NAME description="description"
   ```

   ```tsm: >define domain HNASDOMAIN description="Policy Domain for HNAS"
   ```

2. Define a Policy Set for the Hitachi NAS Platform domain.

   ```
   define policyset DOMAIN_NAME POLICY_SET_NAME
   ```

   ```tsm: >def policyset HNASDOMAIN HNASPOLICY standard
   ```

3. Define a Management Class for the HNASdomain and policyset.

   ```
   define mgmtclass DOMAIN_NAME POLICY_SET_NAME CLASS_NAME
   ```

   ```tsm: > def mgmtclass HNASDOMAIN HNASPOLICY HNASMGMT standard
   ```

4. Assign the HNASMgmt class as the default.

   ```
   assign defmgmtclass DOMAIN_NAME POLICY_SET_NAME CLASS_NAME
   ```

   ```tsm: > assign defmgmtclass HNASDOMAIN HNASPOLICY HNASMGMT
   ```
Configure Storage Pools, Copy Groups and Policy Sets

1. Create an optional TOC (Table Of Contents) Storage Pool

   `define stgpool STORAGE_POOL_NAME devclass
   (optional) If a TOC is being created, create a stgpool for the TOC.

   `tsm: >define stgpool TOCPOOL DISK`

   **Note:** It is best practice to create a TOC storage pool

2. Define the volume(s) for of the TOC storage pool.

   `define volume TOC_POOL_NAME "TOC_POOL_LOCATION"
   access=type formatsize=SIZE_IN_MB`

   `tsm: >define volume tocpool "c:\tocpool\hnas_toc_vol1.dsm"
   access=readwrite formatsize=10000`

   **Note:** A 10 GB TOC is a recommended size for a typical installation.

3. Configure a management class to use the NDMP storage pool and write the catalog to the TOC storage pool.

   Define a copygroup.

   `define copygroup DOMAIN_NAME POLICY_SET_NAME
   CLASS_NAME type=backup destination=NDMP_POOL_NAME
tocdestination=TOC_POOL_NAME verexists=# _versions`

   `tsm: > define copygroup HNASDOMAIN standard HNASMGMT
destination=NDMPPPOOL tocdestination=TOCPOOL verexists=4`

4. Activate the policyset.

   `activate policyset DOMAIN_NAME POLICY_SET_NAME`

   `tsm: >activate policyset HNASDOMAIN HNASPOLICY`
Register an EVS as a TSM Node and Configure it as a Datamover

In TSM terminology a ‘node’ is a server that hosts the data. For Hitachi NAS Platform this host is the EVS. The TSM node and the EVS are synonymous.

1. Register node with a type of NAS.

   ```
   register node HOST_NAME password userid=user_id
domain=DOMAIN_NAME type=NAS
   
   tsm: > register node EVS71 pwevs71 userid=EVS71
domain=HNASDOMSAIN type=NAS
   ```

2. Define a datamover to the Tivoli Storage Manager Server.

   ```
   define datamover HNAS_EVS type=NAS
   HLAddress=EVS_IPAddress
   
   tsm: >define datamover EVS71 type=NAS
   HLAddress=xxx.xx.xx.xx llAddress=10000
   userid=ndmp password=ndmp dataformat=ndmp
   ```

**Note:** (LLAddress, userid and password are obtained from Hitachi NAS Platform communications settings. See Figure 2).
Defining Tape Library, Tape Drives and Pathing

1. Define the library to the Tivoli Storage Manager.

   
   ```
   define library LIBRARY_NAME libtype=SCSI
   tsm: >define library HNASlib libtype=scsi
   ```

2. Define a path to the library.

   ```
   define path datamover(EVS_NAME) LIBRARY_NAME
   desttype=library device=CHANGER_SPECIAL_FILE_NAME(see Figure 3) online=y/n
   ```

3. Define the drives that are attached to the library.

   ```
   define drive DRIVE_NAME element=ELEMENT_NUMBER online
   tsm: >define drive HNASLIB TAP01 element=256
   tsm: >define drive HNASLIB TAP02 element=257
   Note: See Figure 8 to obtain the Element Number
   ```

4. Define a path to the drives.

   ```
   define path datamover(EVS_NAME) Tape_Drive_Name
   srctype=datamover desttype=drive       library=hnaslib device=/dev/ mc_xxxx (see Figure 3)
   tsm: >define path EVS71 TAP01 srctype=datamover
   desttype=drive library=HNASLIB
   device=/dev/mt_d3l0
   tsm: >define path EVS71 TAP02 srctype=datamover
   desttype=drive library=HNASLIB
   device=/dev/mt_d2l0
   ```

Defining Device Class

1. Define a Device Class for Hitachi NAS Platform.

   ```
   define devclass DEVICE_CLASS_NAME Devtype=NAS
   library=LIBRARY_NAME mountretenion=MOUNT_RETENTION_ PERIOD estcapacity=CARTRIGE_CAPACITY(GB)
   tsm: > define devclass HNASCLASS devtype=NAS
   library=HNASLIB mountretenion=0 estcapacity=1500g
   ```
Label Tape

1. Label and check the tape volumes into the library.

   tsm: > label libvol hnaslib search=yes labelsource=barcode checkin=scratch

   tsm: TSM-NODE1> q libvol

<table>
<thead>
<tr>
<th>Library Name</th>
<th>Volume Name</th>
<th>Status</th>
<th>Owner</th>
<th>Last Use</th>
<th>Home Element</th>
<th>Device Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>HNASLIB</td>
<td>382AABL5</td>
<td>Scratch</td>
<td></td>
<td></td>
<td>4,096</td>
<td></td>
</tr>
<tr>
<td>HNASLIB</td>
<td>383AABL5</td>
<td>Scratch</td>
<td></td>
<td></td>
<td>4,097</td>
<td></td>
</tr>
<tr>
<td>HNASLIB</td>
<td>406AABL5</td>
<td>Scratch</td>
<td></td>
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<td>4,099</td>
<td></td>
</tr>
<tr>
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<td>407AABL5</td>
<td>Scratch</td>
<td></td>
<td></td>
<td>4,100</td>
<td></td>
</tr>
<tr>
<td>HNASLIB</td>
<td>FL0149</td>
<td>Scratch</td>
<td></td>
<td></td>
<td>4,101</td>
<td></td>
</tr>
</tbody>
</table>

Perform a Backup

1. Perform a backup to test the configuration.

   backup node NODE_NAME
   managementclass=management_class_name mode=<full|diff> toc=yes wait=yes

   tsm: TSM-NODE1>backup node evs71 mgmtclass=hnasmgmt toc=yes mode=full type=backupimage toc=yes wait=yes

   ANR1063I Full backup of NAS node EVS71, file system /__SHARE__/ TSM24_Restore, started as process 4 by administrator TSMADMIN.

   ANR1063I Full backup of NAS node EVS71, file system /__SHARE__/ TSM24, started as process 5 by administrator TSMADMIN.

   ANR1063I Full backup of NAS node EVS71, file system /__VOLUME__/isv2977fs24, started as process 6 by administrator TSMADMIN.

   ANR1063I Full backup of NAS node EVS71, file system /__VOLUME__/isv2977fs24_Restore, started as process 7 by administrator TSMADMIN.

   ANS8003I Process number 7 started.
Query the Backup Process

1. `tsm: TSM-NODE1> q proc`

<table>
<thead>
<tr>
<th>Process</th>
<th>Process Description</th>
<th>Process Status</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Backup NAS (full)</td>
<td>NAS Node EVS71, Source /<strong>SHARE</strong>/TSM24_Restore, Bytes Moved 0 KB, Estimated 0% Completed with Data Movement, Estimated 0% Completed with table of contents Creation, Elapsed Time 21 seconds. Waiting for mount of output volume 407AABL5 (21 seconds).</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Backup NAS (full)</td>
<td>NAS Node EVS71, Source /<strong>SHARE</strong>/TSM24, Bytes Moved 0 KB, Estimated 0% Completed with Data Movement, Estimated 0% Completed with table of contents Creation, Elapsed Time 20 seconds. Waiting for mount of output volume FL0149 (20 seconds).</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Backup NAS (full)</td>
<td>NAS Node EVS71, Source /<strong>VOLUME</strong>/isv2977fs24, Bytes Moved 0 KB, Estimated 0% Completed with Data Movement, Estimated 0% Completed with table of contents Creation, Elapsed Time 18 seconds. Waiting for mount point in device class HNASCLASS (18 seconds).</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Backup NAS (full)</td>
<td>NAS Node EVS71, Source /<strong>VOLUME</strong>/isv2977fs24_Restore, Bytes Moved 0 KB, Estimated 0% Completed with Data Movement, Estimated 0% Completed with table of contents Creation, Elapsed Time 17 seconds. Waiting for mount point in device class HNASCLASS (17 seconds).</td>
<td></td>
</tr>
</tbody>
</table>
2. Query all backups for the EVS

```bash
tsm: TSM-NODE1>q nasbackup evs71 *
```

<table>
<thead>
<tr>
<th>Node Name</th>
<th>Filespace Name</th>
<th>Object Type</th>
<th>Object Name</th>
<th>Creation Date</th>
<th>Has Table</th>
<th>Mgmt Class</th>
<th>Image Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVS71</td>
<td>/<strong>SHARE</strong>-</td>
<td>Full Image</td>
<td><strong>SHARE</strong>-</td>
<td>10/24/2014</td>
<td>YES</td>
<td>HNASMGMT</td>
<td>NDMPPOOL</td>
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<tr>
<td></td>
<td>/TSM24</td>
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<td></td>
<td>12:05:11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EVS71</td>
<td>/_<em>VOLUME</em>-</td>
<td>Full Image</td>
<td>_<em>VOLUME</em>-</td>
<td>10/24/2014</td>
<td>YES</td>
<td>HNASMGMT</td>
<td>NDMPPOOL</td>
</tr>
<tr>
<td></td>
<td>_/isv2977-</td>
<td></td>
<td></td>
<td>12:05:12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>fs24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EVS71</td>
<td>/<strong>SHARE</strong>-</td>
<td>Full Image</td>
<td><strong>SHARE</strong>-</td>
<td>10/24/2014</td>
<td>YES</td>
<td>HNASMGMT</td>
<td>NDMPPOOL</td>
</tr>
<tr>
<td></td>
<td>/TSM24_Resto</td>
<td></td>
<td><strong>SHARE</strong>-</td>
<td>12:05:10</td>
<td></td>
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<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td>EVS71</td>
<td>/_<em>VOLUME</em>-</td>
<td>Full Image</td>
<td>_<em>VOLUME</em>-</td>
<td>10/24/2014</td>
<td>YES</td>
<td>HNASMGMT</td>
<td>NDMPPOOL</td>
</tr>
<tr>
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<td>_/isv2977-</td>
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<td></td>
<td>12:05:14</td>
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</tr>
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<td>fs24_Restore</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NDMP Backup Performance Tuning

There are few ways to improve NDMP backup performance, and even fewer ways to improve NDMP restore performance. In general, for local NDMP backups, use LTO-5 or newer tape drives and media, and ensure the FC links are error free. For remote backups, use 10 GbE end-to-end if possible, enable jumbo frames if possible, and make sure the network is as error free as possible.

**Note:** Incremental and differential backups should never be used for performance testing or comparison. Since the worst performance bottleneck for Hitachi NAS Platform backups over NDMP is usually the process of walking the file system to find data to back up, incremental and differential backups frequently take just as long to complete as full backups even though they do not move as much data.
Hitachi NAS Platform Performance Tuning

Modify the number of readahead processes (readahead_procs) and second level readahead requests (ext_readahead). These settings are controlled cluster-wide with the `ndmp-option` command.

The default number of readahead processes is 5, and the default number of second level readahead requests is 1. Possible values where performance of NDMP is very important might be 10 for ext_readahead and 30 for readahead_procs. The impact of these changes is greatly dependent on the directory structure of the dataset to back up. The biggest benefit will be for datasets with very few, small files in each directory.

Increasing these values will use additional Hitachi NAS Platform resources and can adversely affect Hitachi NAS Platform client performance if increased too high and too many backups are run simultaneously.

To improve the performance of incremental backups, consider enabling the use of a changed object list, sometimes referred to as Changed Directory List or CDL. When this option is enabled, Hitachi NAS Platform will scan each of the file system's snapshots taken since the previous backup of the same level and create a list of directories that contain changes since that backup. Then the incremental backup will only search those directories for data to back up. This can drastically improve performance for datasets that contain changes in a small percentage of directories. On the other hand it can make the situation worse. For file systems with many snapshots, directory structures with few files per directory, and datasets with changes in most directories, enabling this option can make incremental backups take up to twice as long.

The use of changed object lists for incremental backups may be enabled cluster-wide with the Hitachi NAS Platform command `ndmp-option change_list_incr on`. 

Troubleshooting

This document does not cover troubleshooting in detail, but the following sections outline where to find the pertinent logs.

Hitachi NAS Platform Diagnostics

The Hitachi NAS Platform event log includes events for the start and completion of backups and restores, as well as automatic NDMP snapshot creation and deletion. The dblog includes more details including general failure reasons and performance statistics. If more details for a specific job are needed, find that job’s NDMP session number from the TSM logs, then use the `ndmp-session-trace` command to capture the details of that session.

TSM Troubleshooting

Please see the TSM Troubleshooting and Support, available from:


Best Practices

- As best as possible, be up to date with the latest drivers and firmware.
- In the case of IBM libraries and tape drives, IBM drivers for both tape drives and robotics (changer) must be installed.
- Insure that the latest TSM Fix Pack is installed. APARs and Fix Pack information may be found at: [http://www-01.ibm.com/support/docview.wss?uid=swg21651645](http://www-01.ibm.com/support/docview.wss?uid=swg21651645)
- Create a TOC storage pool with TSM
- Back up Hitachi NAS Platform from snapshots rather than a live file system to ensure the data is in a consistent state and will not be affected by on-going file activity. Snapshots also facilitate incremental backups.
- Restrict access to the tape library to an individual EVS.
For More Information

Hitachi Data Systems Global Services offers experienced storage consultants, proven methodologies and a comprehensive services portfolio to assist you in implementing Hitachi products and solutions in your environment. For more information, see the Hitachi Data Systems Global Services website.

Live and recorded product demonstrations are available for many Hitachi products. To schedule a live demonstration, contact a sales representative. To view a recorded demonstration, see the Hitachi Data Systems Corporate Resources website. Click the Product Demos tab for a list of available recorded demonstrations.

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