Hitachi Data Systems

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HNAS Backup with NDMP

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Introduction to NDMP

Network Data Management Protocol

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NDMP manages data transfer between storage media

NDMP Client and Server Model

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NDMP sessions are controlled by a Data Management Application (DMA)

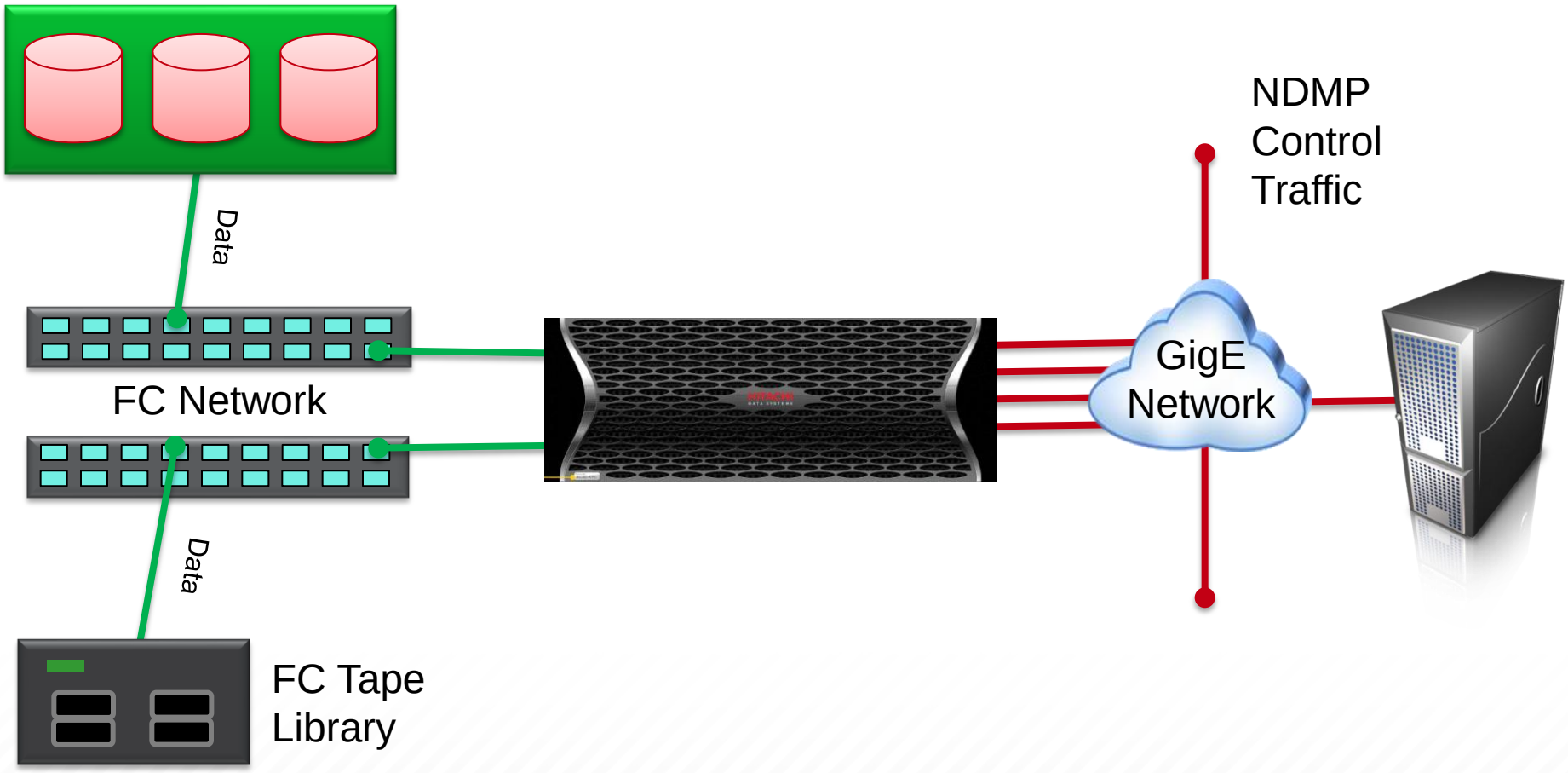
commvault®
solving forward®

IBM Tivoli Storage Manager

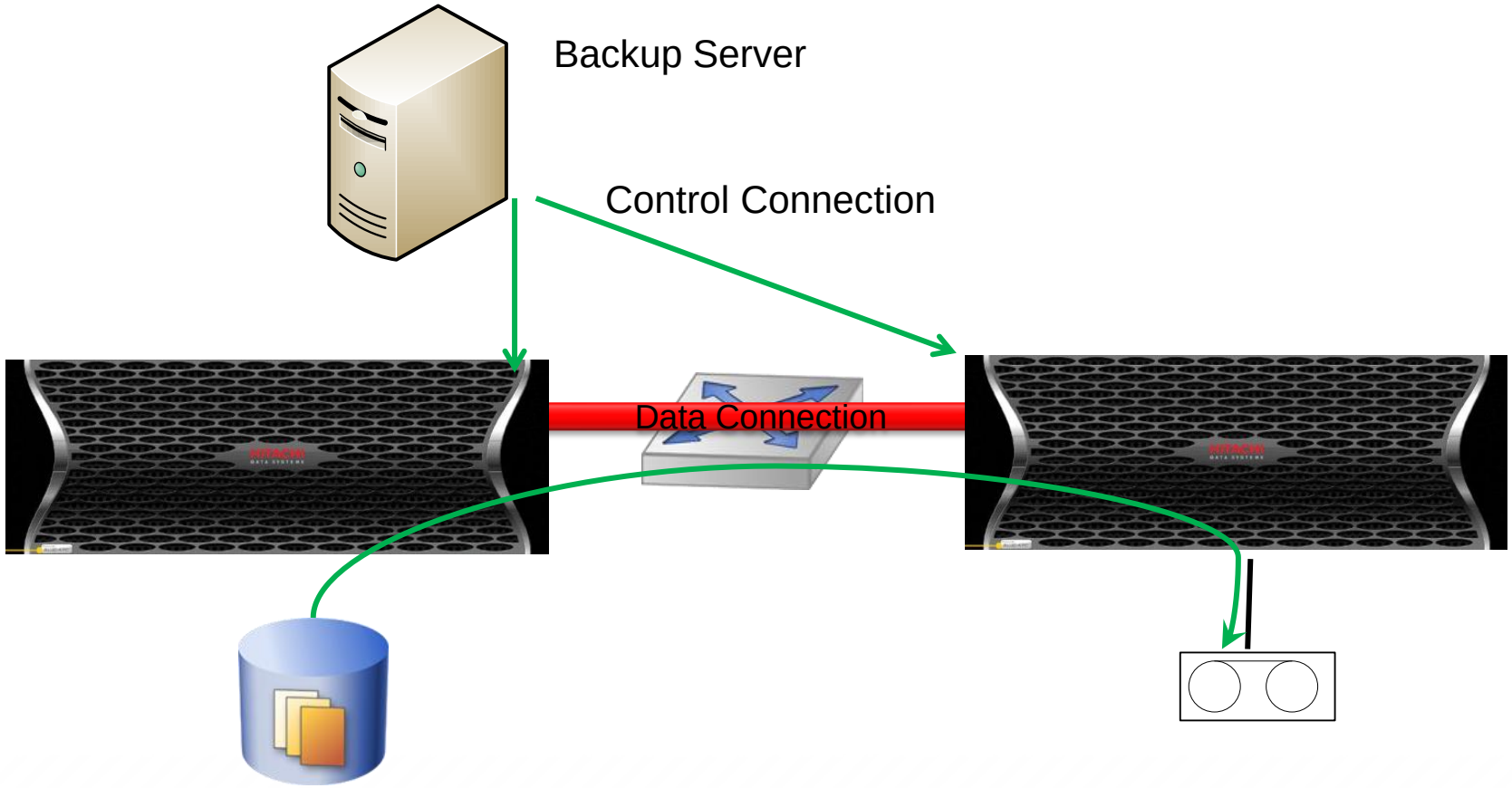
Symantec NetBackup™

ADC

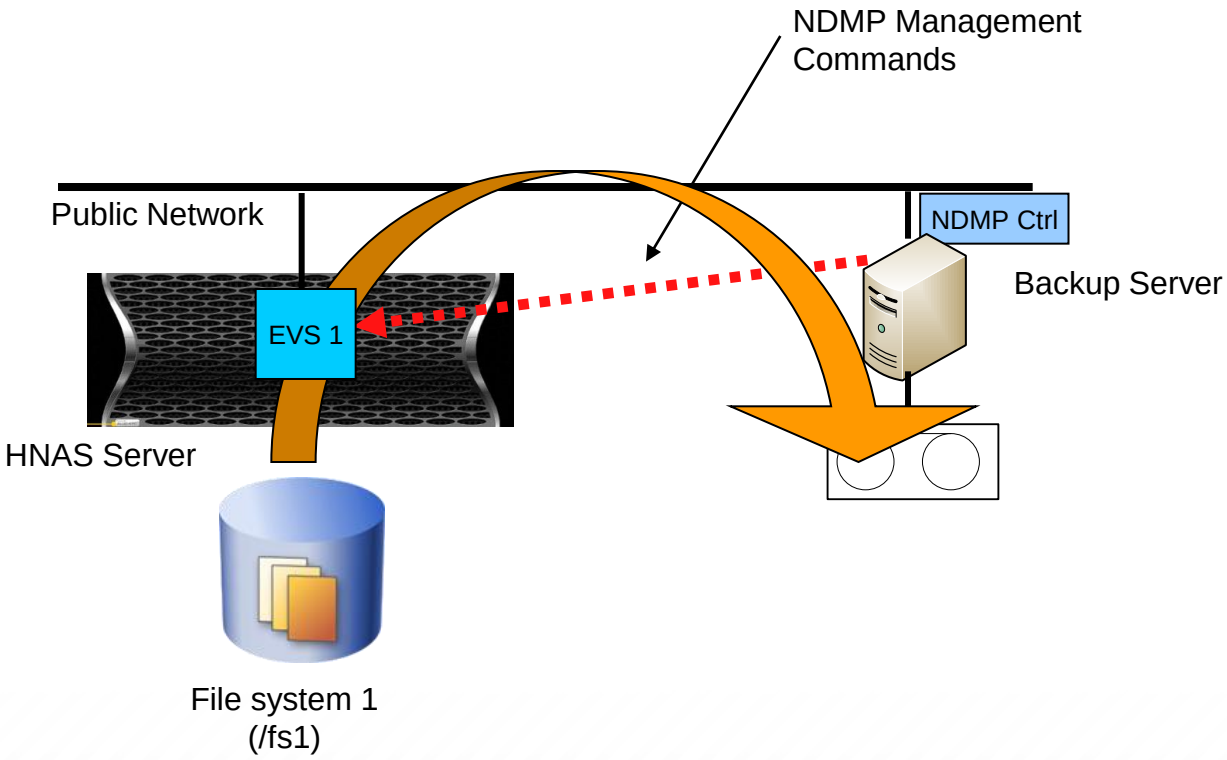
Local NDMP


Data
FC Network
Data
FC Tape
Library
NDMP
Control
Traffic
GigE
Network

3-Way NDMP



Remote NDMP


NDMP Management
Commands
Public Network
NDMP Ctrl
Backup Server
EVS 1
HNAS Server
File system 1
(/fs1)

Master and Servant

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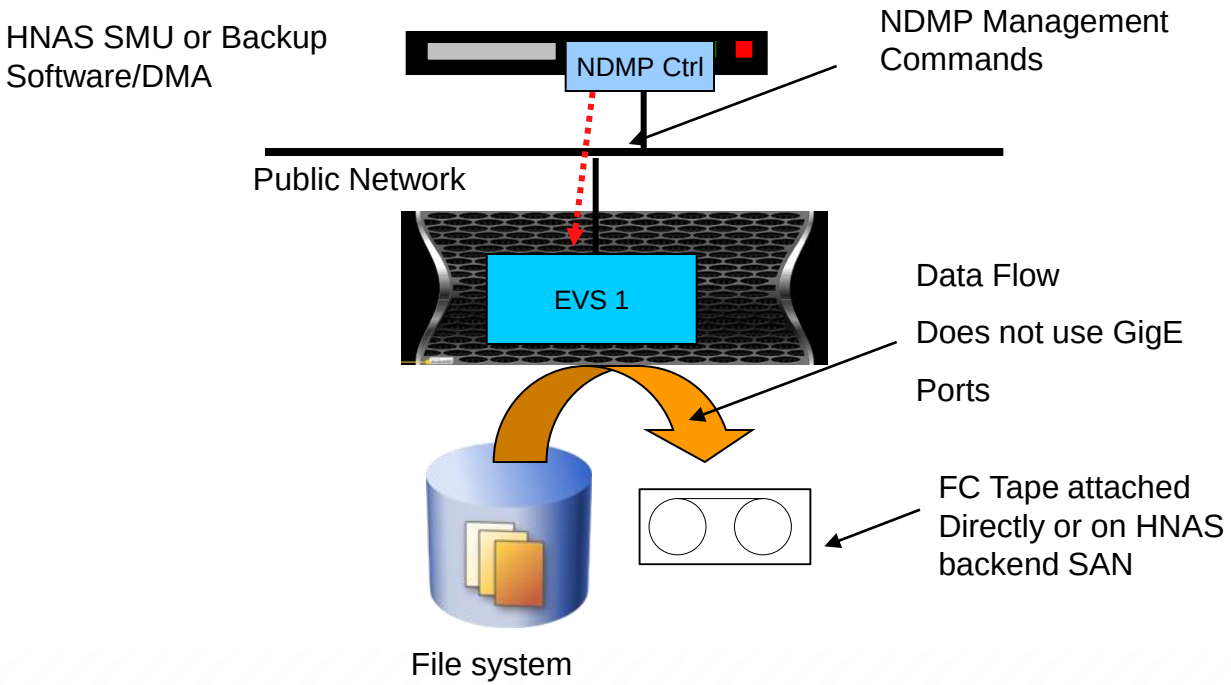
The NDMP server only does what it's told



NDMP Advantages and Disadvantages

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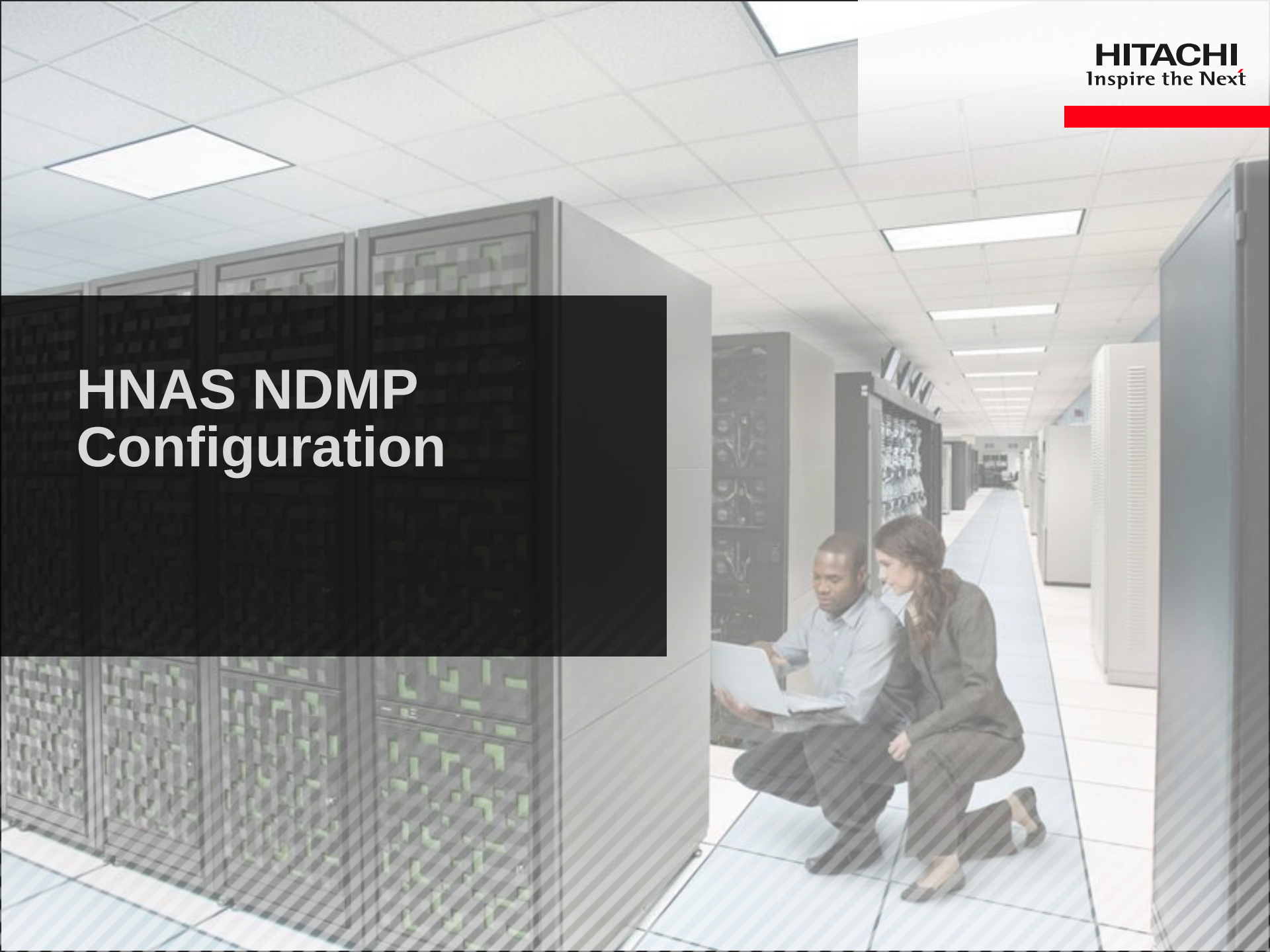
- NDMP backups automate snapshot management to facilitate incremental backups and ensure the data is in a consistent state and will not be affected by on-going file activity
- NDMP backups capture mixed mode security accurately, independent of data access protocols
- The NDMP dump format used by HNAS is proprietary – an NDMP backup from an HNAS cannot be read by a Windows or Linux server, it must be read by an HNAS server
- Backup performance may be better over NFS or even CIFS, although it will put increased burden on the LAN
- Snapshots for NDMP backups do not automatically quiesce applications using iSCSI LUNs or VMDK files
  - Quiescence may be scripted, or it may be better to back up iSCSI LUNs through client software on the hosts (use VSS hardware provider)



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HNAS NDMP Configuration

HNAS NDMP Configuration

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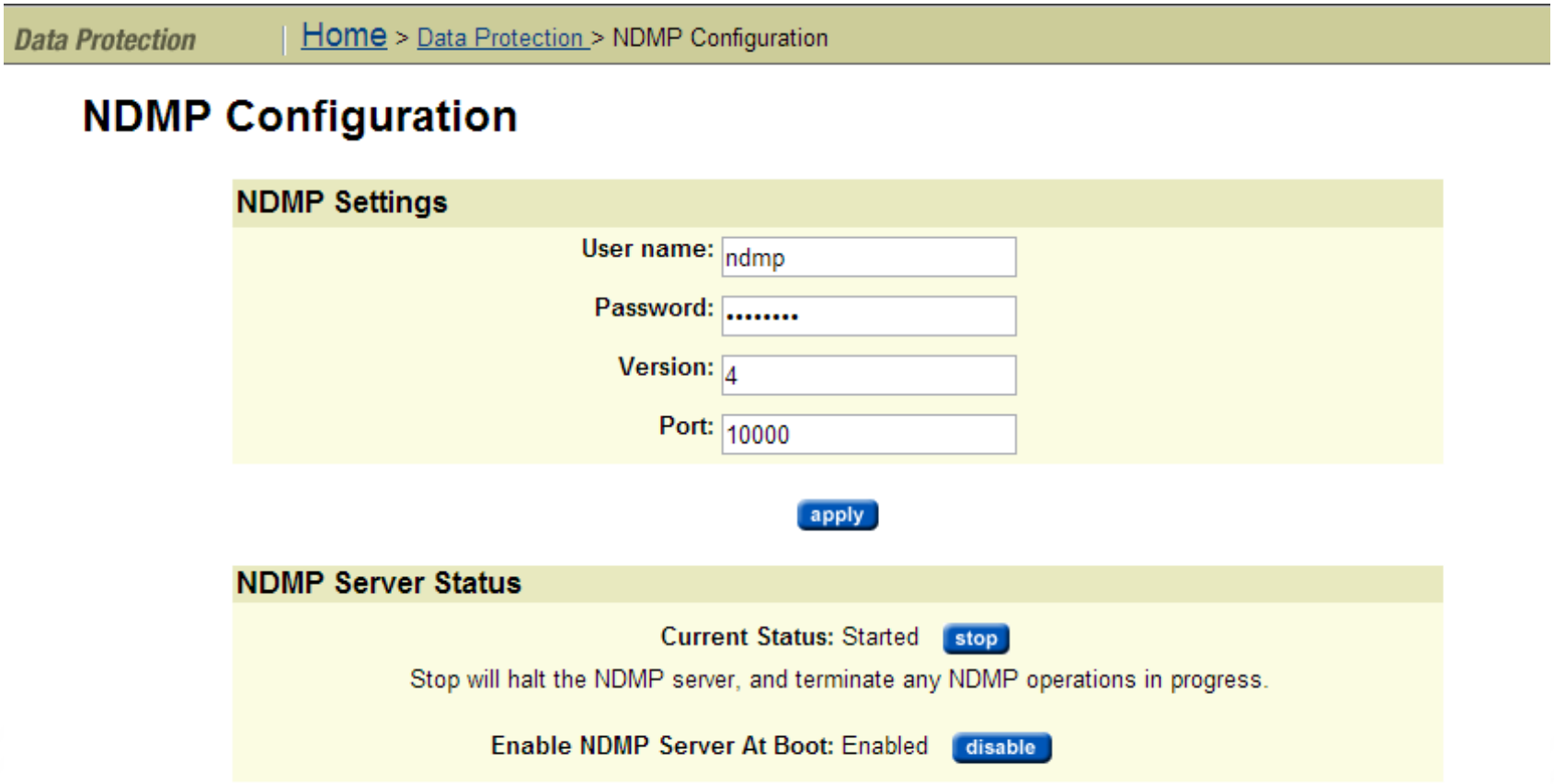
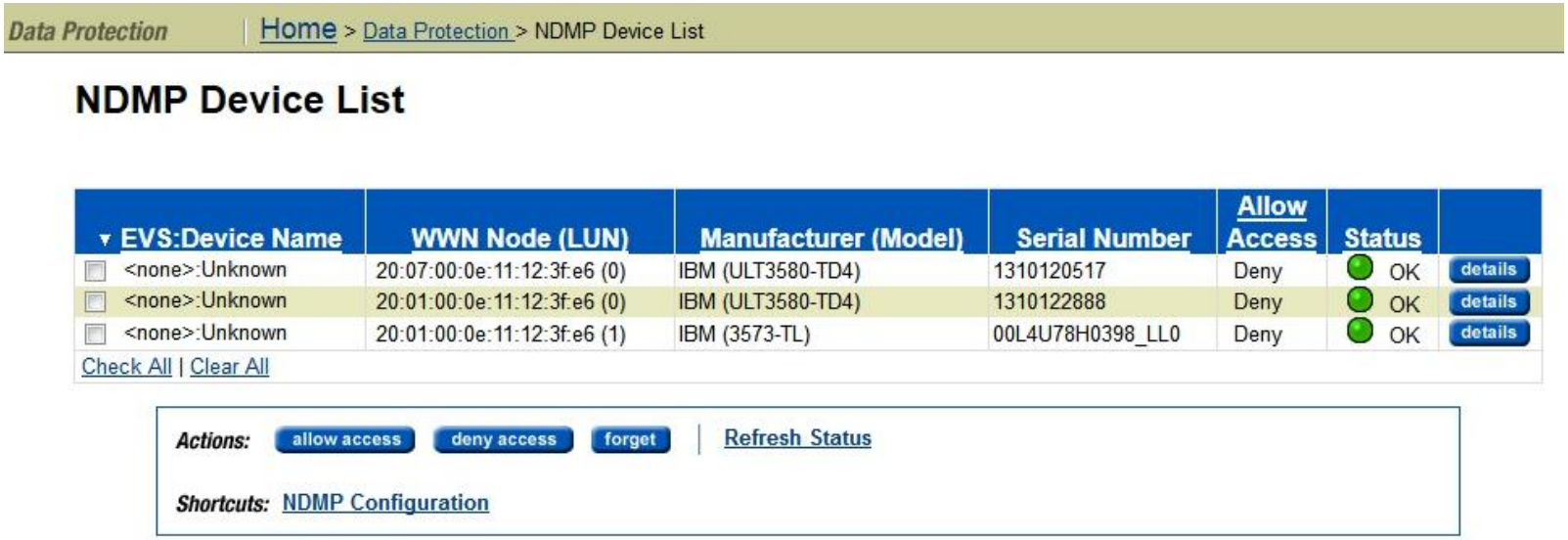
- Configure the HNAS NDMP server
  - Set the NDMP username and password
  - Set NDMP version 4 and TCP port 10000
  - Enable NDMP
- Configure tape devices
  - Direct attach or zone the devices to the HNAS
    - No preference – either is fine
      - 3080 DA, 3090 – Zone (high perf cases) otherwise DA is ok
  - Each has 3080/3090 hport can provide up to 350MB/s of write peformance to tape
    - Only 1 FC port
  - Assign the devices to an EVS
  - Allow the devices
- Configure NDMP snapshot options
- Configure NDMP options

Configure NDMP Server



Configure Tape Devices

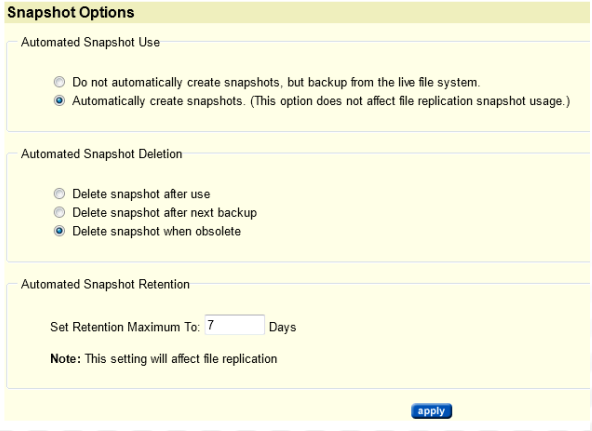
- Attach the tape drives and optionally the media changer to the HNAS or zone them into the SAN



- On the "**details**" page for each device, assign an EVS and allow the device

Configure HNAS NDMP Snapshot Options

- 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 on-going 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.



Configure Advanced NDMP Options

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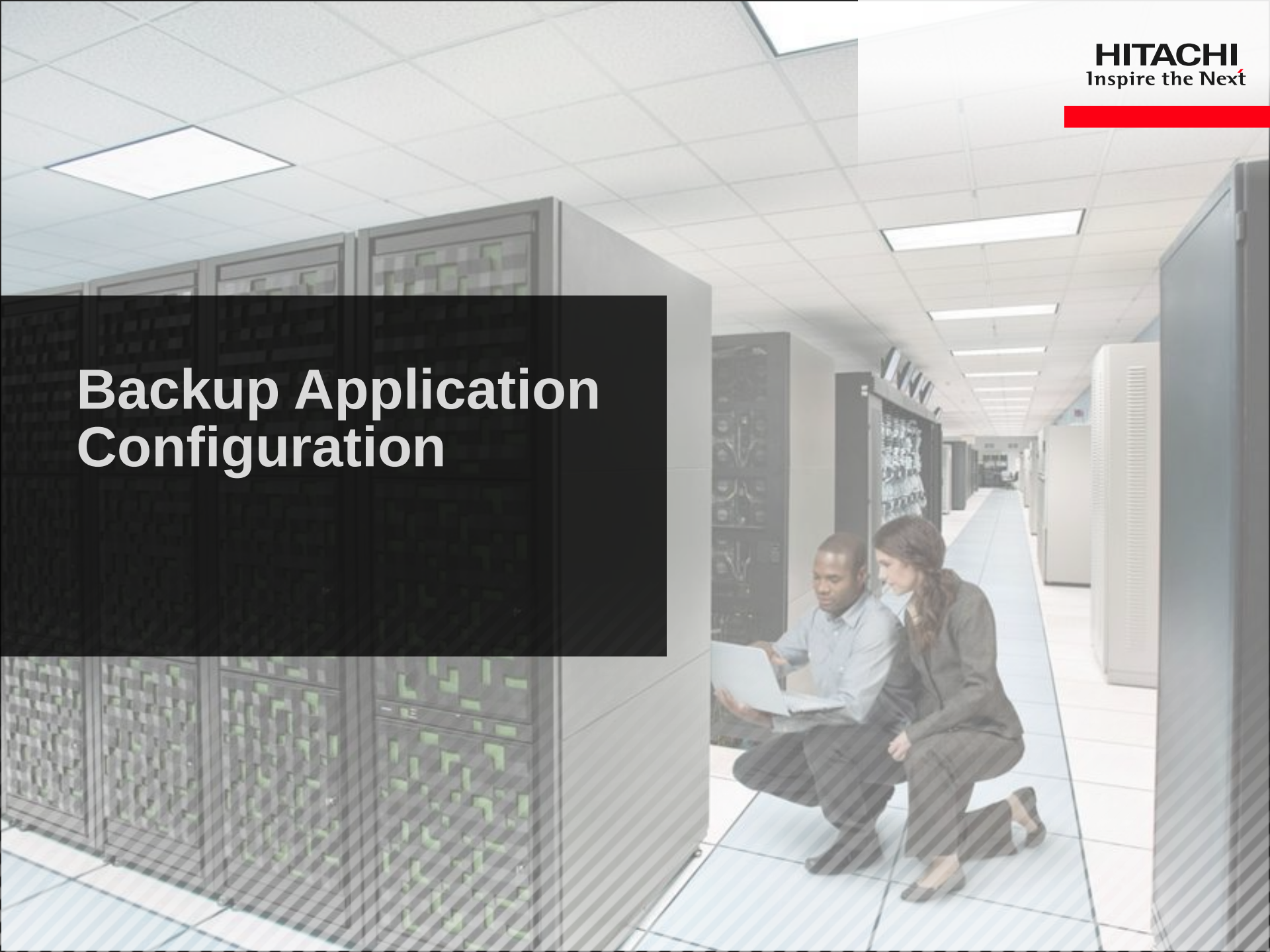
- Use the ndmp-option command to configure advanced options
- NetBackup does best when the reserve-devices option is set to all
- TSM requires the tokens option set to on, the report_as_fs option set to all, and the mover_window_adjust option set to recovery
- Other options, such as setting change_list_incr to on may be appropriate for some datasets



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Backup Application Configuration

Backup Application NDMP Configuration

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- NDMP license requirements
- Configure NDMP tape libraries
- Configure NDMP backup policies
- Configure NDMP environment variables

NDMP License Requirements

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- CommVault/HDPS requires an NDMP license for each NDMP server
  - That means one license for each EVS that will be backed up over NDMP
- NetBackup requires an NDMP license tier for each NDMP server
  - That means one license tier for each EVS that will be backed up over NDMP
- If the HNAS cluster has a CNS license, then any EVS can open an NDMP slave session to any other EVS in the same security context
  - That essentially uses the three-way NDMP model, but appears to HDPS and NetBackup as if it were local NDMP with a single NDMP server
- NDMP support is included in TSM Extended Edition

Configure Tape Libraries

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- Backup applications will need each EVS configured as an NDMP server
  - Requires the NDMP username and password configured on HNAS
- CommVault/HDPS and NetBackup use GUI wizards for discovering tape libraries and the position of each tape drive in a library
- TSM library configuration must be done through the CLI and requires detailed information about the position of each tape drive in the library

Configure Backup Policies

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- Valid data paths may be specified by NFS export name or CIFS share name, optionally followed by a subdirectory path
  - For instance “/export_name/subdir1" or "/share_name“
  - If there is an export with the same name as a share then a prefix "/__EXPORT__" or “/__SHARE__" can be used to distinguish as in "/__EXPORT__/vol1" or "/__SHARE__/vol1/backup_dir“
  - Alternatively, file system names may be specified by using the "/__VOLUME__/" prefix as in "/__VOLUME__/fs2/users"
- Snapshots are always made at the file system level, so each path backed up within a file system will create a snapshot of the whole file system
  - File system deletion impacts performance, so try to keep the number of snapshots per file system to a minimum

Configure NDMP Environment Variables

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- CommVault/HDPS allows tuning of NDMP_BLUEARC_EXCLUDE_MIGRATED, NDMP_BLUEARC_TAKE_SNAPSHOT, NDMP_BLUEARC_QUOTAS, and NDMP_BLUEARC_READAHEAD_PROCESSES variables through advanced backup options
- Other variables may be used in CommVault/HDPS by configuring them in the Windows Registry of Windows media agents or a .properties file on Linux media agents
- Variables are added to the backup selections list in NetBackup policies
- TSM does not support user customized NDMP environment variables

Useful NDMP Environment Variables

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- EXCLUDE
- NDMP_BLUEARC_EMBEDDED_HARDLINKS
- NDMP_BLUEARC_EXCLUDE_MIGRATED
- NDMP_BLUEARC_EXTERNAL_LINKS
- NDMP_BLUEARC_INCLUDE_ONLY_MIGRATED
- NDMP_BLUEARC_OVERWRITE
- NDMP_BLUEARC_READAHEAD_PROCESSES
- NDMP_BLUEARC_REMIGRATE
- NDMP_BLUEARC_USE_CHANGE_LIST
- NDMP_BLUEARC_USE_SNAPSHOT_RULE


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Performance Considerations

Performance Considerations

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- Incremental and differential backups should never be used for performance testing or comparison
  - Since the worst performance bottleneck for HNAS 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
- Use a 256KB block size for LTO whenever possible
  - Most applications default to 64KB block size which usually causes a 20% decrease in performance with LTO
- Tune the number or HNAS readahead processes as depending on the directory structure
- Consider the use of the HNAS changed object list option for datasets that contain changes in a small percentage of directories

Performance factors

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- Changed Directory List (CDL)
  - Indicates if incremental backups or replications will use a changed object list to direct the search for changed files.
  - If the process does not use the changed object list, it will have to search the entire directory tree looking for changed files.
  - When using the changed object list, the search only passes through those directories that contain changed files.
  - CDL can hurt performance if there are too many changes and often provides little value
  - Best used
    - When the directory structure is wide with very small and infrequent changes
    - Full file system backup or replication
    - Time in between replications is only a few hours

Backup Speeds

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- Speeds will vary by dataset, number of files, available disk performance, head utilization
- Most common stream speed: 30MiB\s
- Highest stream seen on customer data: 100MiB\s
- 30x0 Head capability
  - 300-350MiB\s

Backup Table

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For reference

Speed	Amount of Data	Backup Time LTO4	Backup Time LTO5
30MiB/s	1TB	11.5 hours	11.17 hours
45MiB/s	1TB	8 hours	7.44 hours
60MiB/s	1TB	5.7 hours	5.58 hours
80MiB/s	1TB	4.3 hours	4.19 hours
100MiB/s	1TB	3.48 hours	3.35 hours

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CVL OPTIONS

- Internal Data Migrator
- Options
  - Backup
  - Do not backup

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EXTERNAL DATA MIGRATION XVL

- External migration with HCP target
- Options
  - Do not backup
  - Backup

NDMP Limits

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- Limits
  - 60 tape drives
  - 10 media changers
  - 50 sessions per head (25 max recommended)
- Directory hierarchies deeper than 1024 levels will not be backed up beyond that depth
- CDL gives up after 1M changed files


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JetImage

JetImage

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OVERVIEW

- Designed for a specific customer
- Leverages similar technology used in JetMirror object replication
- Works specifically with Quest NetVault only
- Not used by any customer - might have undiscovered bugs
- Initial tests indicate it is not that much faster than NDMP
- From a management perspective, it is treated the same as NDMP

JetImage Restores

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RESTORE PROCESS

- Only difference is on restore
  - HNAS CLI commands: filesystem-prepare-for-ndmp-image-recovery
  - Restore process
    - Un-mount the file system
    - Run filesystem-prepare-for-ndmp-image-recovery
    - Mount file system and begin restore from netvault
    - After restore, unmount file system
    - Run filesystem-revert-after-ndmp-images-recovery
    - Mount file system


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Troubleshooting

Troubleshooting

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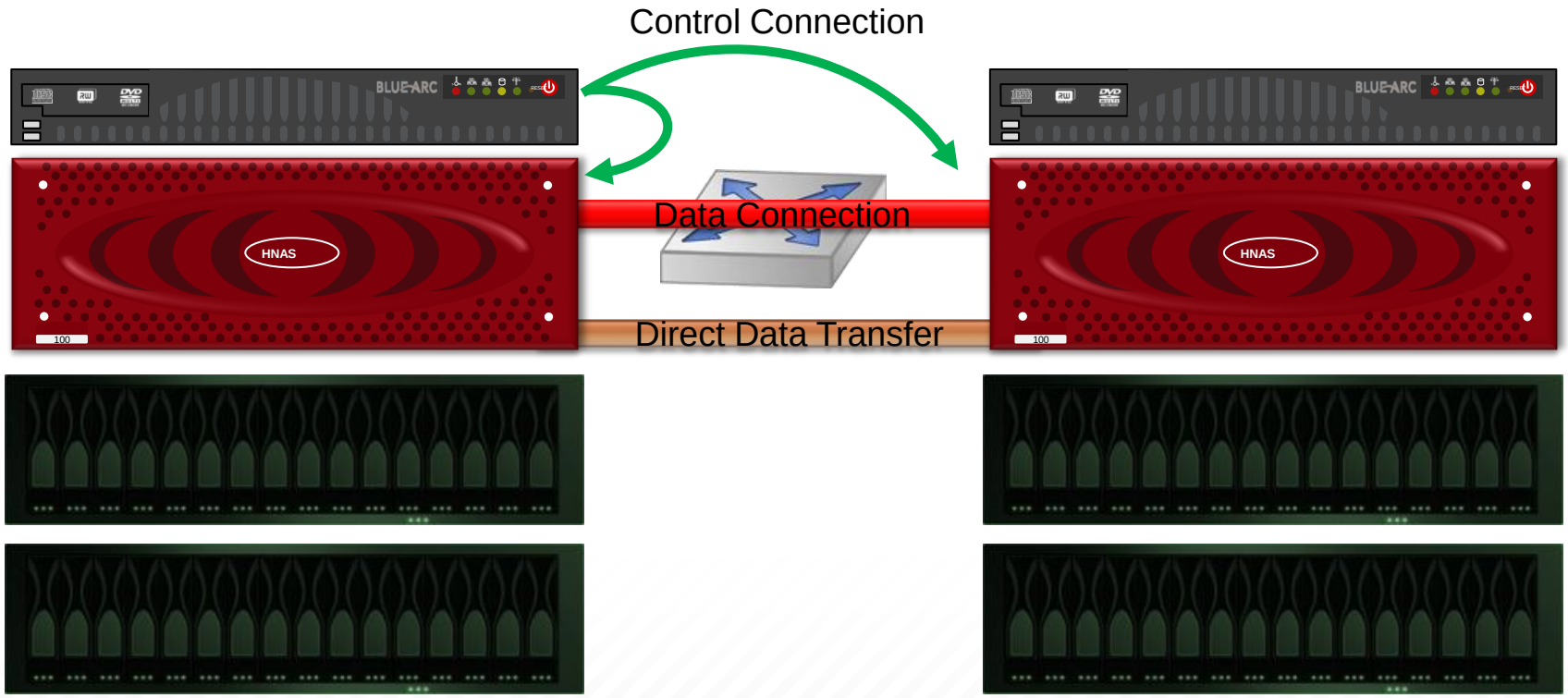
- The HNAS event log will include events for the start and completion of backups and restores, as well as automatic NDMP snapshot creation and deletion
- The dblog will include more details including general failure reasons and performance statistics
- If more details for a specific job are needed, find that job's NDMP session number from the NetBackup logs, or correlate the timestamps from other backup applications, then use the ndmp-session-trace command to capture the details of that session
- Include ndmp-session-trace output and backup application logs for any backup cases that require escalation

Questions and Discussion

NDMP Backup Overview



ABOUT: NDMP Backup Overview

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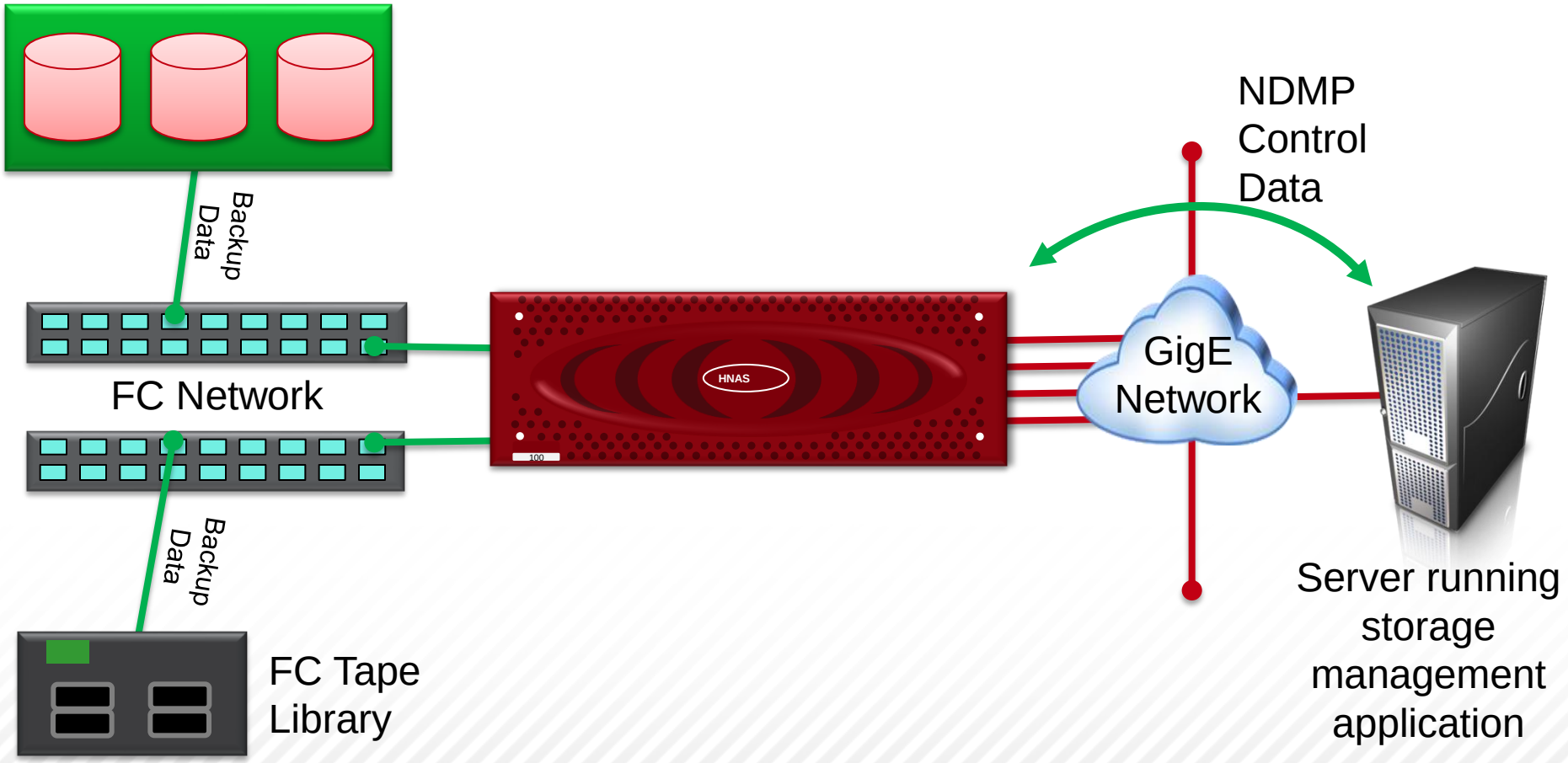
Standard NDMP Configuration



NDMP Backup Overview

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Common Applications of NDMP Backup

- Backing up (or recovering) data on a server to (or from) an Ethernet attached NDMP tape library.
- Backing up (or recovering) data on a server without a tape library to (from) a second HNAS system that has a tape library attached.
- Using Data Replication to copy file systems between HNAS systems.

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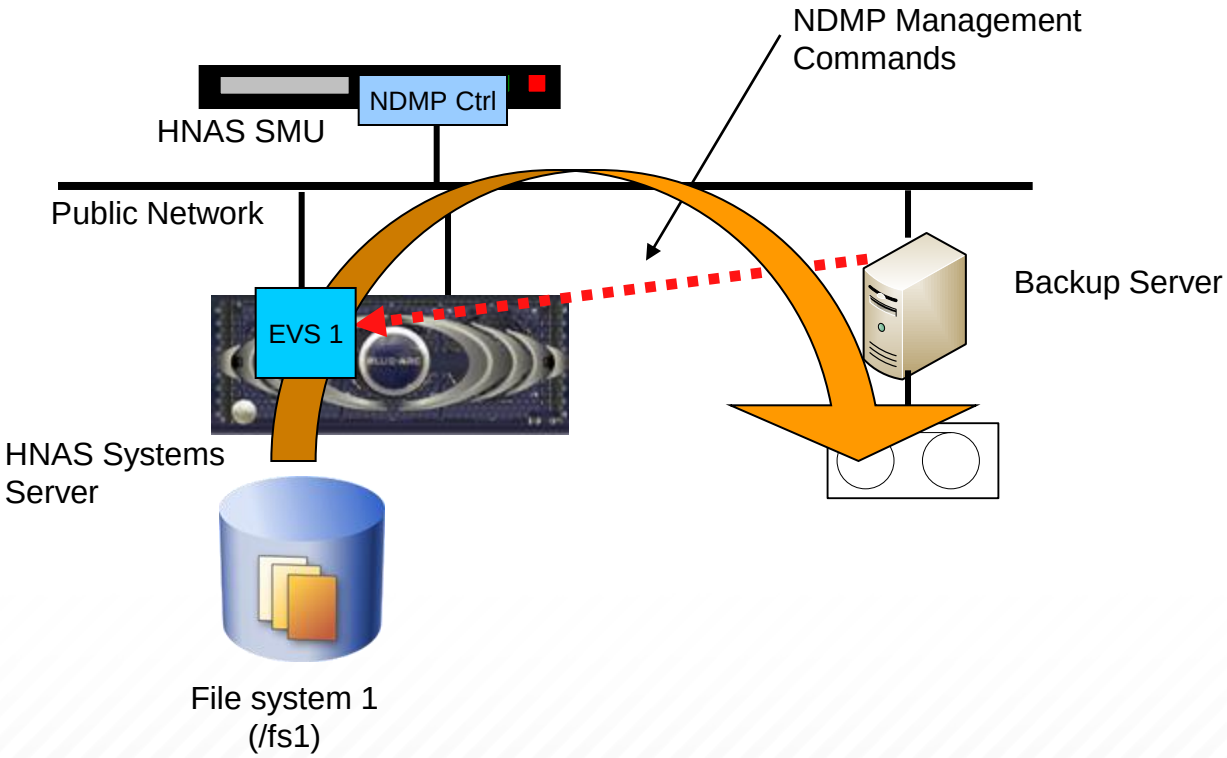
Network Backup



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FC Backup