Hewlett Packard Enterprise

Data protection for HPE 3PAR StoreServ with HPE StoreEver Tape Libraries

Using EMC NetWorker

Contents

Introduction

In today's business environment, enterprise customers rely on the most efficient, high performing, and reliable data protection and archiving systems. Customers need to protect increasing levels of data while keeping costs under control. In particular, businesses today are concerned about the costs of backing up and archiving important data from mission-critical servers.

Tape storage is a critical component of a comprehensive, tiered, and converged data protection and archiving solution that balances cost and performance. The ideal approach to data protection and archiving is to match the access, retention, and cost requirements for a business with the right storage technology. Most often, the result is a multi-tier strategy that blends the access speeds of disk with the low cost, offline, and long shelf life benefits of the tape.

When paired with HPE 3PAR StoreServ Storage and HPE StoreAll Storage—which incorporate Hewlett Packard Enterprise innovations such as storage federation, scale-out architecture, and adaptive optimization—HPE StoreEver Tape lowers costs while increasing data security and reliability. HPE Storage enables businesses to efficiently respond to new and ever changing demands.

Technology overview

HPE StoreEver Tape—key features and benefits
HPE StoreEver Tape products protect your data longer, for less.
As the worldwide leader[1] in tape drives and automation, HPE StoreEver Tape provides tape storage that is critical to comprehensive data protection and archiving. HPE StoreEver also addresses all of your long-term retention needs. With the broadest and most advanced portfolio in the industry, HPE StoreEver features support for linear tape–open 7 (LTO-7). HPE StoreEver includes tape media, standalone tape drives, and tape libraries that accommodate more than 180 PB[2] in a single system.

HPE StoreEver Tape automation libraries include HPE StoreEver ESL G3 and MSL Tape library families.

HPE StoreEver:

- Reduces TCO and management burden—efficiently protect and retain rapidly growing data

  With support for LTO-7, HPE StoreEver offers significant cost, energy, and footprint advantages. Lowest cost per gigabyte for longer-term storage with limited power or energy requirements as the less frequently accessed data is stored or as media become full.

  The HPE MSL6480 Tape Library offers up to 195 TB/s (equivalent to 13 LTO-7 tape cartridges) per 1U of rack space using LTO-7 drives, while providing the highest tape drive density per module of any mid-range tape library, providing flexible options to consider for your business.

  HP Command View for Tape Libraries software is a single pane of glass management software which eases data protection with remote management, diagnostics, and configuration of all your ESL G3 and MSL tape libraries through a single console.

- Is reliable—protect and retain data over the long term

  New HP Data Verification software increases the verification of a successful restore of critical business data from infrequently accessed LTO tape cartridges by periodically scanning tapes to validate the quality of data on each tape.

  With enhanced reliability, extreme durability, and proactive monitoring by HP TapeAssure Advanced technology, you can store essential but less frequently accessed data with confidence.

---

[1] According to the IDC Branded Tape Tracker CQ2 2013, Hewlett Packard Enterprise is the worldwide market share leader in total branded tape drive units.
[2] Using 2.5:1 compression and a fully populated 16-frame ESL G3 tape library.

TapeAssure Advanced makes managing, fine-tuning, and archiving faster and easier with comprehensive reports on status, performance, utilization, and health of all tape drives and media. The advanced analytics feature of TapeAssure Advanced makes use of predictive analytics to predict the likelihood of failures, bottlenecks, and load balancing issues in the tape infrastructure. This data can be exported on demand or at scheduled times through HP Command View Tape Library software.

HPE StoreEver Tape is ideal for archiving cold or active data with a media shelf life of up to 30 years in normal ambient conditions.

- Is secure—enable a vital "last line of defense"

Hardware-based data encryption, write once, read many (WORM) protection, and removable storage that are offline to threats make HPE StoreEver a highly reliable safety net and an optimal platform for long-term digital archive.

- Delivers enormous scalability and high availability—answer data growth challenges

The HPE StoreEver ESL G3 Tape Library can scale from 100 to up to 12,006 tape cartridges—from 1 to 192 LTO-5 and newer Ultrium tape drives—and 1 to 16 library frames, with each frame in a standard 19-inch rack form factor which is the smallest enterprise library footprint available.

Support ongoing host and SAN connectivity under varying conditions with library logical unit number (LUN) control failover. Achieve near-continuous data access with new dual-robotic capabilities available with the HPE StoreEver ESL G3 Tape Library.

The HPE StoreEver MSL6480 Tape Library has scale-out architecture which allows you to pay as you grow—simply add in new modules to boost capacity and performance without investing in a whole new library.

An HPE StoreEver MSL6480 Tape Library can scale vertically from 80 to 560 cartridge slots to store up to 8.4 PB in a single 19-inch rack; add in between 1 and 42 LTO-5 and newer half-height SAS or Fibre Channel (FC) drives for speed of up to 113.4 TB/hr (assumes LTO-7 with 2.5:1 data compression) which can save you a lot of time.

HPE 3PAR StoreServ Storage—key features and benefits

HPE 3PAR StoreServ Storage products enhance your storage on the fly to help maximize capacity utilization while delivering high service levels.

HPE 3PAR StoreServ Storage are storage systems which range from tier 1, mission-critical solutions with the highest performance and scalability that support cloud and IT as a service (ITaaS) environments, to storage solutions with enterprise class features at a midrange price, designed for the virtualized data center.

HPE 3PAR StoreServ is:

- **Efficient**

Reduce capacity requirements by 50 percent—guaranteed.[3]

- **Autonomic**

Simplify, automate, and expedite storage management by handling storage provisioning, tiering, and change management autonomically—intelligently, at a sub-system level, and without administrator intervention—reducing administration time by up to 90 percent.

- **Federated**

Meet the needs of today's data center with the ability to move data and workloads between arrays without impact to applications, users, or services. Simply and non-disruptively shift data between HPE 3PAR StoreServ systems without additional management layers or appliances.

---

[3] Requires the use of HPE 3PAR Thin Conversion software and HPE 3PAR Thin Provisioning software. For details, refer to the Get Thin Guarantee Terms and Conditions. More information is available at: hp.com/storage/getthin.

HPE StoreAll Storage—key features and benefits

HPE StoreAll Storage products let you hyperscale your storage to tame and mine business value from your large amounts of unstructured data.

HPE StoreAll Storage reduces the cost, complexity, and time to store, protect, and extract business value from massive amounts of unstructured data. HPE StoreAll Storage instantaneously pinpoints data and turns it into actionable intelligence. Bring structure to unstructured data with custom metadata attributes, data retention policies, and autonomic protection for data durability.

HPE StoreAll is:

- Hyperscale—massive scalability without complexity

  Scale to over 1,000 nodes, 16 PB, and billions of objects and files in a single namespace.

- Harnessed—structure for unstructured data

  Custom meta tagging, rapid deployment tools, and autonomic protection for data durability.

- Instant—ultra-fast search and value extraction at petabyte scale

  Express Query from HPE Labs lets you access billions of files in minutes. Run scans and queries you could never execute before due to time constraints.

Integrating HPE StoreEver Tape with EMC NetWorker

EMC NetWorker is an enterprise class data protection application. NetWorker backup and recovery software centralizes, automates, and accelerates data backup and recovery across your IT environment. NetWorker delivers a wide range of data protection options to safeguard your critical business data. For more information, visit emc.com/backup-and-recovery/networker.

Installation and configuration

Hewlett Packard Enterprise has partnered with leading software companies to develop a comprehensive approach to help ensure that all hardware, firmware, driver, and software components are properly fitted into certified and supported data protection and archiving solutions. Before configuring and implementing a data protection and archiving solution, refer to the following:

- The HPE StoreEver information held within the HPE Backup, Recovery and Archive (BURA) Solutions Design Guide—hp.com/go/buracompatibility.

  Extensive documentation to design, configure, and implement a broad selection of data protection and archiving solutions that are fully supported and certified with HPE StoreEver Storage in homogeneous and heterogeneous environments.

- The StoreEver section of the most recent version of the HPE Data Agile BURA Compatibility Matrix—hp.com/go/buracompatibility.

  It is a single point of reference for the latest HPE StoreEver interoperability and device compatibility details. It contains tape device connectivity details including supported servers, operating systems, controllers and infrastructure components, as well as Backup and Archival ISV partner compatibility.

- HPE SAN Design Reference Guide explains how HPE Storage systems, storage management tools, and FC products can be used in open heterogeneous SANs.

Installation checklist

If the answer to each of the following questions is "yes," then all components on the SAN are logged in and configured properly:

- Are all of the following hardware components at the minimum supported firmware revisions specified in the current Data Agile BURA Compatibility Matrix: servers, host bus adapters (HBAs), FC switches, Command View Tape Library, tape drives, and library robots?

- Is the minimum patch level support for each OS installed?

- Is the minimum supported drivers specified in the Data Agile BURA Compatibility Matrix installed (HBAs, tape drives, etc.)?

- Is the HPE StoreEver tape library or partition(s) online?

- Are all of the host HBAs correctly logged into the FC switch?

- If the FC switches are cascaded or meshed, are all Inter-Switch Link (ISL) ports correctly logged in?

- Was congestion control enabled on the FC to avoid oversubscription of ISLs?

- Are all tape and robotic devices zoned, configured, and presented to each host from the FC switch?

- Are the host(s) HBAs, tape, and robotic devices in the same switch zone(s)? See the below note.

- Are there separate zones for tape devices? Do not mix disk and tape devices in the same zones.

- Did you limit the zoning of tape devices to only systems that actively use them? Doing so limits external interferences and enables quicker diagnostics when issues are encountered.

- Is single initiator zoning being used? Each zone should contain only one HBA, but can contain multiple targets (tape devices).

- Are one-gigabyte interfaces or multi-vendor switches in a single SAN cloud being used? One-gigabyte interfaces are not tape-safe and using multi-vendor switches causes equipment to run in a compatibility mode that does not include FCP-2 tape-safe extensions.

- Do the hosts detect all of the tape and robotic devices intended to be used?

  Are all HPE StoreEver Storage devices seen by HP Command View Tape Library?

- Has connectivity been verified using HP Library and Tape Tools or OS specific tools (for example, the sg3_utils package for Linux®)?

Note
Hewlett Packard Enterprise strongly recommends creating zones by HBA port. For more detailed information on creating zones by HBA port, refer to the BURA Solutions Design Guide: hp.com/go/buracompatibility.

Installing EMC NetWorker
After all components on the SAN are logged in and configured, the hosts are ready for installation of EMC NetWorker.

Before installing NetWorker, it is recommended that you complete the following tasks particularly when using tape libraries and drives:

- Go to the EMC online support (registration required) to gain access to documentation, release notes, software updates, or information about EMC products, licensing, and service. The following documents should be downloaded for reference:

1. NetWorker Hardware Compatibility Guide—provides the most up-to-date list of supported devices.

2. NetWorker Installation Guide—describes how to install NetWorker on Windows®, Linux, Mac OS-X, HP-UX, Solaris, and AIX.

3. NetWorker Administration Guide—describes how to configure and maintain the NetWorker software.

4. Configuring Tape Devices for EMC NetWorker technical note—describes best practices for configuring tape devices for use by NetWorker servers and storage nodes.

5. NetWorker Performance Optimization Planning Guide—provides basic performance information to size, plan, and optimize the NetWorker environment.

6. NetWorker Licensing Guide—describes how to license the NetWorker products and features.

- Verify that the TCP/IP requirements have been met:

  1. The **/etc/hosts** file on all Linux NetWorker hosts contains an entry for the Internet Protocol version 4 (IPv4) loopback address:

     a.   127.0.0.1   localhost.localdomain   localhost

  2. The NetWorker server, when configured as a Dynamic Host Configuration Protocol (DHCP) client, uses a reserved address that is synchronized with DNS.

  3. The name of the host that the **hostname** command returns on the system must match the name that the IP address resolves to when using the command **nslookup**.

  4. The hostname does not contain an underscore character (_).

  5. The IPv6 loopback interface is configured on each host as NetWorker does not support temporary or link-local IPv6 addresses. The host's file on each NetWorker host has an entry that associates the IPv6 loopback interface (::1) with the localhost. Add the IPv6 interface entry before the IPv4 loopback entry (127.0.0.1 localhost):

     a.   ::1 localhost

     b.   127.0.0.1   localhost.localdomain   localhost

  6. The IPv6 loopback entry must remain in the hosts file when the host is operating in a pure IPv4, pure IPv6, or dual stack configuration.

- If the NetWorker software is installed on a file allocation table (FAT) partition, do not disable long name support.

- Enable Windows Error Reporting (WER). WER replaces the Dr. Watson user dumps used in earlier releases of Windows and provides the ability to collect full User-Mode Dumps after an application crash. MSDN describes how to configure WER to collect User-Mode Dumps.

- Enable Data Execution Prevention to protect essential Windows programs and services:

  1. Navigate to **Start** -> **Control Panel** -> **System and Security** -> **System** -> **Advanced system settings**

  2. Select **Advanced** -> **Performance** -> **Settings** -> **Data Execution Prevention**

  3. Select **Turn on DEP for essential Windows programs and services only**

  4. Click **OK** (reboot required)

- Follow the recommendations in the section **Adjusting antivirus software settings** in the **Installation Guide**.

- Configure persistent bindings and naming at the OS level then verify for the FC HBA. This will prevent device-ordering issues. For the Windows 2008 R2 hosts, Emulex FC HBAs were used (latest Hewlett Packard Enterprise drivers are installed) and auto mapping was enabled by default (binding by World Wide Port Name). Detailed recommendations regarding LTO device configuration for different OSs (AIX, Solaris, Windows, Linux, and HP-UX) can be found in the section **Device configuration best practices** of the **Configuring Tape Devices for EMC NetWorker technical note**.

  For Windows 2008:

  – For Windows 2008 R2, only step 3 had to be completed as test unit ready requests were already disabled and Window Removable Storage Manager (RSM) was not selected for installation during the OS install.

  1. Disable all Test Unit Ready (TUR) requests for a tape device using Windows knowledgebase article 842411: support.microsoft.com/kb/842411.

  2. If Window RSM is installed, start RSM and remove all tape drives from the RSM configuration so that it does not attempt to check device status at regular intervals which causes unwanted SCSI resets. RSM is no longer installed by default on Windows 2008 (or newer).

3. Configuration of persistent naming is recommended at the OS layer to stop the OS from changing device file order on reboots. A reboot is required after completing the configuration.

    a. For Microsoft® and other vendor-provided device drivers, set the registry key (The Microsoft knowledge base article 873337 provides details.): **HKLM\System\CurrentControlSet\Control\Tape\Persistence: DWORD=1** support.microsoft.com/kb/873337.

    b. After a reboot, run **regedit** again. Under **HKLM\System\CurrentControlSet\Control\Tape** you should see folders for each tape device with names such as Tape2147483646. The folders can be renamed, **Tape100** for example, if the preference is for simple device names. Right-click on each folder and choose **rename**. Provide a unique name for each folder then reboot the system. Once the system boots up, open device manager and right-click on any of the tape drives. Under the tab **Tape Symbolic Name**, you will find the custom name provided.

For Linux:

– The minimum recommended version of Red Hat® Enterprise Linux (RHEL) for use with Common Device Interface (CDI) is RHEL 4 Update 4, with kernel version 2.6.9-39.

– The minimum recommended version of Novell SUSE Linux Enterprise Server (SLES) for use with CDI is SLES9 SP3, with kernel version 2.6.5-7.267.

1. Linux provides a built-in HBA driver for both QLogic and Emulex but with limited capabilities only, without monitoring or full plug and play functionalities. It is recommended to use vendor-provided drivers for HBAs.

2. Configuration of persistent naming is recommended at the OS layer to stop the OS from changing device file order on reboots. Persistent naming is achieved by using udev rules that are controlled by **/etc/udev/udev.conf** and included folders or files.

3. Newer versions of the udev subsystem already contain rules for tape devices, so no additional OS configuration is needed.

4. Check if the device file is already created under **/dev/tape/***. In that case, simply enable "**Use Persistent Names**" from NetWorker Management Console (NMC) after all of the pre-installation recommendations have been completed, and you are scanning for devices or configuring all libraries.

5. If the appropriate udev rule for tape devices is present on the system but device filenames are not being created, refer to the Linux section of the **Device configuration best practices technical note** for more detailed information.

- Before you install NetWorker on Linux systems, create a backup of the OS configuration file and configure the target host to support NetWorker. Create a backup copy of the OS configuration files:

1. cp /etc/rpc /etc/rpc.orig

2. cp /etc/ld.so.conf /etc/ld.so.conf.orig

3. Ensure that the PATH variable for the root and user accounts contains the **/usr/sbin directory**

4. If you have enabled Security-Enhanced Linux (SELinux) on your system, add the file contexts and the security contexts that the NetWorker software requires

5. To add file contexts, type:

    a. semanage fcontext -a -t textrel_shlib_t "/usr/lib/nsr/lib.*\.so"

    b. To update the security contexts, type:

    c. restorecon -R "/usr/lib/nsr"

- Enable the CDI tool by making sure to set it to "**SCSI commands**" for each tape device. Refer to step 7 in the section **Configure backup devices** under **Initial Setup**.

- Hewlett Packard Enterprise recommends that you remove any other backup software currently configured on your computer before installing NetWorker. Other backup software, tape device applications that are part of the OS, and SAN or system management software can negatively affect how NetWorker installs and functions.

- Proper NetWorker licensing is required to run the application beyond the trial period of 30 days. For detailed instructions, login to the EMC online support (registration required) and search for the NetWorker Licensing Guide which contains the section **How to permanently license the NetWorker software**: support.emc.com.

Installing EMC NetWorker software
NetWorker components

- NetWorker datazone is a single NetWorker server and its client and storage node hosts.

- NetWorker server provides services to back up and recover the data of any NetWorker host in a datazone. The NetWorker server can also act as a storage node and control multiple remote storage nodes. The NetWorker server schedules and queues all backup operations, tracks real-time backup and restore related activities, and all Console server communication.

- NetWorker storage node controls storage devices such as tape drives, disk devices, auto-changers, and silos. The NetWorker server is a local storage node. Data is backed up directly to devices local to a NetWorker server or remotely to a NetWorker storage node.

- NetWorker client software communicates with the NetWorker server and provides client initiated backup and recovery functionality. The NetWorker client software is installed on all machines that are backed up to the NetWorker server.

- NMC server or Console server is a Java-based Web application and database server that provides centralized management, monitoring, and backup reporting of multiple NetWorker servers across multiple datazones.

Note

You can install the Console server software on the NetWorker server but EMC does not recommend this configuration when the NetWorker server manages 50 or more clients and when the Console server will monitor multiple datazones. The Installation Guide lists minimum system requirements for a Console server host when monitoring 50, 100, or 200 servers.

For this guide, a NetWorker server and multiple NetWorker clients were installed following instructions in the **EMC NetWorker 8.1 Installation Guide. Figure 1** shows one example of the EMC NetWorker architecture.
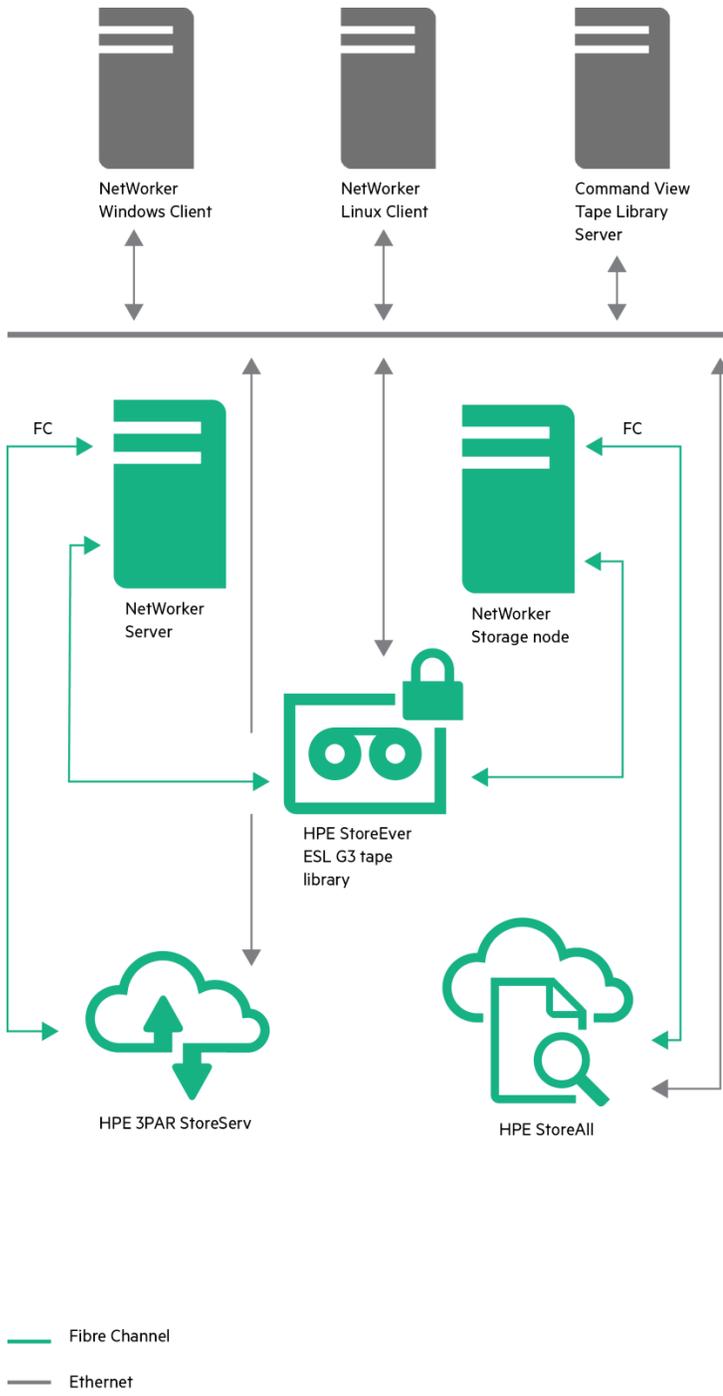
Figure 1. NetWorker architecture with an HPE StoreEver ESL G3 Tape Library, an HPE 3PAR StoreServ system, and an HPE StoreAll system

Initial setup

Connecting to the NMC

The Console server is a Java-based Web application that manages NetWorker server operations. Refer to the **NetWorker Installation Guide** for more detailed information about connecting to the Console server including troubleshooting issues.

1. From a supported Web-browser session, type the URL of the Console server:

    a. http://server_name:http_service_port

        I. server_name is the name of the Console server, and http_service_port is the port for the embedded HTTP server. The default HTTP port is 9000. For example: **http://lugo:9000**.

2. In the **Welcome** window, click **Start**.

3. In the **Security Warning window**, click **Start** to install and run **NetWorker Console**.

4. In the **Licensing Agreement** window, select **Accept**.

5. If you did not install the appropriate Java Runtime Environment (JRE) version on the system, a prompt to install JRE appears. **Follow the onscreen instructions to install JRE**.

6. In the **Welcome to the Console Configuration Wizard** window, click **Next**.

7. In the **Set Administrator password** window, type the preferred NMC password, then click **Next**.

8. In the **Set Database Backup Server** window, specify the name of the NetWorker server that will back up the Console server database, and then click **Next**.

9. In the **Add NetWorker servers** window, specify the name of the NetWorker server that the Console server will manage. Leave the default options (**Capture Events** and **Gather Reporting Data**) enabled. The **NetWorker Administration Guide** on the EMC online support site describes how to run reports and the reports that are available.

10. Click **Finish**. The **NetWorker Management Console** window and the **Preface/Getting Started** window should appear.

11. The Management Console will open with the **Enterprise** button selected. Right-click the NetWorker server listed and select **Launch Application**. The **NetWorker Administration** interface should open. If no NetWorker server is listed, right-click on **Enterprise**, select **New**, and then choose **Host**. Specify the NetWorker server.

Configure backup devices

The NetWorker software provides the ability to scan, detect, and configure library and tape devices that will be used for backups and recoveries directly from the NMC GUI. This is the recommended way to configure libraries. Autodetection is a scanning process that applies only to physical tape libraries and virtual tape libraries (VTLs).

The maximum number of configured devices for any NetWorker server and storage node combination is 512. The maximum number, including non-configured devices, can vary depending on the specific server that is being administered.

• Scanning of devices should not be performed while devices are in use.

• NetWorker recommends using only one device driver for all of the tape devices which should be the native OS device drivers when possible or auto-detect operations might not function correctly.

• Multipathing can be configured for tape devices but is not directly utilized. The OS will maintain device files for the same device visible over different paths and for when there is a path failure, the device must be reconfigured in NetWorker. Automatic path failover is not possible for sequential input/output used by tape drives so any backup or restore in progress is aborted regardless of the multipathing solution in place.

Note

If you run **Scan for Devices** or **Configure All Libraries** from the server folder instead of the storage node folder, then all storage nodes on the NetWorker server are automatically selected for configuration in the wizard, or for scanning, respectively.

To verify that all of your tape libraries and drives are seen by NetWorker:

1. In the server's **NetWorker Administration** interface, click on the **Device**s button.

2. Right-click on the **server name** at the top of the navigation tree, and select **Scan for Devices** to detect available devices. The **Scan for Devices** window appears.

3. Select the storage node to be scanned. If the appropriate storage node is not listed, click on **Create a New Storage Node**.

4. When creating a new storage node, replace the default value in the **Name** field with the name of the new storage node.

5. Fill in any required information such as scan for SCSI devices and whether to search all LUNs.

6. Click on **Start Scan**. Check the scan status by clicking the **Monitoring** button at the top of the interface then selecting the **Log** tab. When the operation completes, you can return to the **Devices** navigation tree.

7. Select either the **Devices** folder or the **Storage Nodes** folder in the navigation tree. All detected tape libraries and drives are listed. Any devices that are not configured are preceded by a circular icon that displays a wrench.

8. To display SCSI or Network Data Management Protocol (NDMP) libraries available to the NetWorker server, select the Libraries folder in the navigation tree. Any available library or silo appears in the **Libraries** detail table.

After verifying that all of the expected devices are seen by NetWorker, you can automatically configure all of the detected devices:

1. In the server's **NetWorker Administration** interface, click on the **Devices** button.

2. Expand the **Storage Nodes** folder in the navigation tree.

3. Right-click on the preferred storage node and choose **Configure All Libraries**. This opens a wizard that can configure all detected libraries.

4. In the **Configure All Libraries** wizard, step through the configuration providing:

   a. **Library type** (SCSI was selected).

   b. Adjust the **Enable new device** option if necessary (The default of Yes was used).

   c. **Current server sharing** policy (The default of maximal sharing was used).

   d. Click on **Next** then select the **Storage node** to which libraries can be configured (The NetWorker server Lugo was selected by default).

   e. **Update the storage node properties**, if necessary (**Yes** was selected for **Search all LUNs** and **Use Persistent Names**; **Library Configuration Type** was SCSI).

5. Click on **Start Configuration**. The configuration window displays a message that the **Configure All Libraries** process has started. Check the configuration status by clicking the **Monitoring** button then selecting the **Log** tab. When the operation completes, you can return to the **Devices** navigation tree.

6. When the configuration is complete, click **Finish** to close the configuration wizard. If problems occur during the configuration, you can click on the **Back** button in the configuration window to repeat the process (steps 4 and 5) and adjust any of the settings.

7. Once all libraries have been successfully configured, verify that the CDI tool is enabled:

   a. Expand the **Libraries** folder in the navigation tree then click on one of the tape libraries listed.

   b. The library details will be displayed to the right. Right-click on one of the listed tape drives and select **Properties**.

   c. The **Device Properties** window will open. Click on the **Advanced** tab.

    d. Under **Device Configuration** -> **CDI: SCSI commands** should be selected by default. CDI is enabled if and when SCSI commands are selected.

    e. Repeat for all tape drives in each tape library.

    f. A reconfiguration of the library to scan for device serial numbers must be performed after changing the device's **CDI attribute** from **Not Used** to **SCSI Commands**.

CDI allows for functionality in NetWorker to check the serial number of a device before issuing any mount requests, and enables the use of the TapeAlert feature and on-demand auto-cleaning of tape drives. CDI is required for:

– Many of the newer features added to recent versions of NetWorker

– WORM and future encryption support

– Support for Persistent SCSI Reserve/Release

8. To rename a tape library with user-friendly naming:

    a. Expand the **Libraries** folder in the navigation tree then right-click on a library and choose **Properties**.

    b. The **Library Properties** window will open showing the **General** tab. Under **Identity**, provide a user-friendly **Name** for the library. For an ESL G3 Tape Library with LTO-6 tape drives, a user-friendly name could be **ESLG3-LTO6**.

    c. Click on **OK** to save the changes.

    d. Repeat for all tape libraries.

Note

To reconfigure a library in case a device path has been added to, or removed from, the library, refer to the section Library Reconfiguration in the NetWorker Administration Guide.

Create backup groups

Backup groups specify the starting time for a client's scheduled backup. A default backup group is already created for you. For this guide, new backup groups were created so that each client type had specific backup schedules. The newly created backup groups will be selected when creating media pools and backups.

1. In the server's **NetWorker Administration** interface, click on the **Configuration** button.

2. From the navigation tree, right-click on **Groups** and choose **New**.

3. Under the **Setup** tab, provide the following:

    a. **Name** and optionally, a **comment**. All new groups were named for the client being backed up.

    b. **Start time** and if **Autostart** should be set to **Enabled**.

    c. The default settings were used for **Clones**, **Output**, and **Snapshots**.

4. Under the **Advanced** tab, you can specify:

    a. **Schedule** and **Interval** (how often backups would run) were modified. **Autorestart** was enabled. The defaults were used for all other settings.

5. Click on **OK** to save the new group.

Note

For additional details on any of the fields that can be modified when viewing properties for an object or device, click on the ? symbol inside of the circle at the bottom left-hand corner of the window. The **Field Help** is available for the majority of the sections in this guide.

Create media pools

While NetWorker contains pre-configured media pool types to keep different types of data separate, it is useful to create media pools by library or drive type to make managing media easier.

1. In the server's **NetWorker Administration** interface, click on the **Media** button.

2. From the navigation tree, right-click on **Media Pools** and choose **New**.

3. The **Create Media Pool** window opens. Provide the following:

    a. Under the **Basic** tab, a useful **name**. An example would be to name the media pool **ESL-LTO6** if the pool is for an ESL G3 library with LTO-6 tape drives.

    b. Optionally, add a **comment** for the media pool.

    c. Verify that the **Configuration** is **enabled**, the **Pool type** is **Backup**, and the **Label template** is specified (**Full** was selected).

    d. Select one of the previously created **Backup Groups** (in the previous section **Create backup groups** under **Initial Setup**) for the **Data Source**.

    e. Under the **Selection Criteria** tab, the ESL G3 LTO-6 tape drives were selected as **Target Devices**.

    f. **Media type preferred** was specified as LTO Ultrium-6.

    g. Under the Configuration tab, **Month** was selected for the **Retention Policy**.

4. You can create media pools for each of your tape libraries.

Inventory library volumes

1. In the **NetWorker Administration** interface, click **Devices**.

2. Expand the **Libraries** folder in the navigation tree. The **Libraries** detailed table appears.

3. Select a library in the navigation tree, then right-click, and select **Inventory**. The **Inventory Library** window appears.

4. Type the numbers of the first and last slots to be inventoried in the **Slot Range** area.

5. The defaults were used for the remaining settings.

6. Click **OK**. If the media does not have barcode labels, the NetWorker software must mount each media, read its label, and then unmount it. In this case, the inventory process can take some time to complete.

Format the media

Note

Prior to formatting the media, any user defined media pools should already be created.

---

1. In the **NetWorker Administration** interface, click **Devices**.

2. Expand the **Libraries** folder in the navigation tree. The **Libraries** detailed table appears.

3. Select a library in the navigation tree. You have two options for formatting the media:

    a. Right-click on one of the tape drives listed and choose **Label**. This requires that you know all of the slots containing the media to be formatted. This method automatically specifies which tape drive will be used to format the media.

    b. From the list of media to the far right of the pane, highlight all of the media to be formatted then right-click and choose **Label**. This can be time consuming if you have hundreds of media to format, and the tape drive used for formatting the media is automatically selected by the application.

4. The **Label Library Media** will open.

5. If you choose option **A** for **Step 3**, under **Slot Range**, the radio button for **Slot List** will be selected by default. Type the numbers of the first and last slots to be inventoried. If you choose option **B** for **Step 3**, under **Slot Range** the radio button for **Selected Slots** will be selected by default. The media that you previously highlighted will already be selected/listed.

6. **Target Media Pool** should be modified to one of the user defined media pools that were previously created.

7. The defaults were used for the remaining settings.

8. Click **OK**. If the volumes do not have barcode labels, the NetWorker software must mount each volume, read its label, and unmount it. In this case, the inventory process can take some time to complete.

Note
If multiple tapes require formatting and multiple tape drives are available to format the media, divide the number tapes by the number of tape drives to efficiently format the media. To do so, repeat steps 3–8 above selecting or specifying different slots and a different tape drive each time.

Backup and restore jobs
Create a backup job
You can create a scheduled backup for NetWorker servers or clients quickly by using the **Client Backup Configuration** wizard.

1. In the server's **NetWorker Administration** interface, click on the **Configuration** button.

2. From the navigation tree, right-click on **Clients** and choose **New Client Wizard**.

3. For **Specify the Client Name and Type**, the fully qualified client **name** was provided and **Traditional NetWorker client** was selected. Click **Next** to continue.

4. When selecting the **Backup Application Type**, verify the following (and modify if necessary):

    a. Client OS version (Windows Server® 2008 R2 6.1 for example).

    b. NetWorker version (8.1 build 162 for example).

    c. Application type (Filesystem for example).

5. Click on **Next** to continue.

6. Now you will specify the **Client Backup Options**. The defaults were accepted for all settings except:

    a. **Target Pool** which was modified to be one of the user defined media pools that were previously created (**ESLG3-LTO6**).

7. Click on **Next** to continue.

8. When you select the **Filesystem Objects** that will be backed up, the entire contents of the client will be backed up by default. For this guide, only the contents of the local **E:** drive was selected to be backed up. Click on **Next** to continue.

9. Select the **NetWorker Client Properties**. The defaults were accepted for all settings. Click on **Next** to continue.

10. Specify the **NetWorker Backup Group**. The user defined backup group **Sly**, which was created following the section **Create backup groups** under **Initial Setup**, was selected. You could also create a new group now if you skipped creating a backup group earlier.

11. Specify the **Storage Node Options**. For this guide, **Backup to NetWorker server only** was selected since there were no additional NetWorker servers or storage nodes configured.

12. Lastly, verify the **Backup Configuration Summary**. If any changes are necessary, click on **Back**, otherwise click on **Create**, to configure the client backup.

13. You should then see a message indicating that the new client is successfully added.

14. In the server's **NetWorker Administration** interface, click on the **Monitoring** button.

15. You should see all of the backup groups that have been created listed under **Groups and Policies**. You can also view when the groups were last run and when the next run will be.

Create a restore job

You can recover NetWorker data by using the **NMC Recovery** wizard on the NMC server:

1. In the server's **NetWorker Administration** interface, click on the **Configuration** button.

2. From the navigation tree, click on Clients to view a list of the **clients** in the right pane.

3. Right-click on the desired client and choose **Recover**. The **Recovery** wizard will open.

4. First, verify the **source host**, the **destination host**, and the **recovery type**. Make changes if necessary otherwise, click on **Next** to continue.

5. Now select the data to recover. You can:

   a. Browse for files from a specific date and time

   b. Search for file system objects from a specific date and time or

   c. Perform a **Save Set Recover** from a specific date and time

   For this guide, the **Save Set Recover** option was used as the preference is to restore data from a backup completed on an earlier date and time. Click on **Next** to continue.

6. When specifying the **Recovery Options**, you can choose to restore the data to the original path or to a new destination path as well as how to handle duplicate files. Click on **Next** to continue.

7. For **Obtain the Volume Information**, you can either allow the **Recovery** wizard to select the required media or you can manually select the required media. Click on **Next** to continue.

8. The final step is to **Perform the Recovery**. The recovery can be started now or scheduled for later after you have provided a name for the recover. Click on **Run Recovery** to start the restore.

9. **Check the Recovery Results** will automatically be displayed allowing you to monitor the progress of the restore operation.

Performance and tuning

To analyze speed and performance, it is necessary to examine the entire backup and archive process as a system. Although many factors contribute to the overall performance of the system, there are five main factors that must be thoroughly understood to determine the maximum performance in any specific situation. These factors are:

- Storage connection—For BURA Solutions with HPE StoreEver Tape Libraries, this is the FC connection.

- Block size—BURA Solutions with NetWorker supports configurable sizes. See "Block size" in the next section for specific details.

- File (data) compression ratio—The amount of compression has a direct impact on the rate at which a tape drive can read or write data.

- Source disk and file systems—Data source, local disk, RAID array storage, file system type, and volume type.

- Tape drive—In BURA Solutions, these are the various types of tape drives in HPE StoreEver Storage.

Block size

Block size indicates the size of the data on a single transfer to the physical tape. This is dependent on the tape device, SCSI controller, and SCSI controller driver. Different devices have different block sizes, which can be used, but may not be optimal. By adjusting the block size, you can enhance the performance of the tape drive. Default block size varies on different platforms, and as a result, data actually written on tape might be in a different format that cannot be easily interpreted by another host. The actual block size is assigned to a tape during the labeling process and marked in the header of the tape. The label operation uses the value defined in the **Device block size** attribute for the device. The block size for both read and write operations uses the block size defined in the media header during the label operation rather than the device block size.

The NetWorker software has the ability to control block sizes, but only if it is allowed to do so by the OS. In cases where the OS assigns a specific value for block size, the NetWorker settings no longer have any impact.

EMC strongly recommends that the OS configuration is set to use a variable block size, thus allowing application control over it, otherwise recoveries can fail resulting in data loss. Configuring a variable block size is achieved by setting it to a value of 0. For specific information about configuring a variable block size, consult the OS documentation.

Warning

Different SCSI hardware limitations exist between UNIX® and Microsoft Windows OSs. This can lead to data block size compatibility problems (although they are less likely to occur now than in the past, given larger FC capacities). For example, with a device defined in UNIX that is physically attached to a Windows HBA, it is possible to define a block size greater than that is allowed by the Windows hardware. This could lead to I/O errors in both write and read states on the device. In order to use both OSs, it is necessary to determine a block size that is acceptable to both.

To determine the allowable block size, check the **Properties** window of a mounted volume while in **Diagnostics Mode**:

1. In the **NetWorker Administration** interface, click **Devices**.

2. Next click on **View** and select **Diagnostic Mode**.

3. Now expand the **Libraries** folder in the navigation tree and select the drive that contains the mounted volume with the block size being verified.

4. Right-click on the device in the devices details table and select **Properties**.

5. In the properties window, select the Volume tab. In the Loaded Volume area, one of the displayed volume attributes is the **Volume Block Size**.

6. Click **OK** to close the properties window.

You can set the block size of a backup device by:

1. In the **NetWorker Administration** interface, click **Devices**.

2. Next click on **View** and select **Diagnostic Mode**.

3. Now select **Devices** in the navigation tree. The devices details table will be displayed.

4. Double-click on the device in the devices details table and select the **Advanced** tab within the **Device Properties** window.

5. In the **Device block size** attribute, select a value. In NetWorker 8.0.1 and later, the default block size for an LTO device is 256 KB.

6. Click **OK** to save the changes.

7. Re-label all media that the device or devices use for the new setting to take effect. Refer to the section **Format the media** under **Initial Setup** for more detailed information.

Note

Forcing larger block sizes has a positive performance impact on high-speed tape drives, but it can also waste space on the media.

File (data) compression ratio

Hewlett Packard Enterprise tests show that not all data can be compressed equally. The compression ratio affects the amount of data that can be stored on each tape cartridge, as well as the speed at which the tape drives can read or write the data. Table 1 shows typical compression ratios of various applications.

Table 1. Typical file compression ratios

DATA TYPE	TYPICAL COMPRESSION
Computer-aided (or -assisted) design (CAD)	3.8:1
Spreadsheet/Word processing	2.5:1
Typical file/print server	2.0:1
Lotus Notes databases	1.6:1
Microsoft Exchange/SQL Server databases	1.4:1
Oracle/SAP® databases	1.2:1

Source disk and file systems

In the past, tape performance was typically identified as a bottleneck. However, tape performance has now surpassed many of the source systems available today. Items to consider when calculating desired throughput and performance metrics include:

• Source hardware (disk subsystems)

• Source file system status

• Server configuration

The following factors critically affect the speed of backup from disk to tape:

• Data file size

  The larger the number of smaller files, the larger the overhead associated with backing them up. The worst-case scenario for backup is large numbers of small files due to system overhead of file accession.

• Data compressibility

  Incompressible data will back up slower than higher compressible data. For example, JPEG files are not very compressible, but database files can be highly compressible. The accepted standard for quoting tape backup specifications revolves around an arbitrary figure of 2:1 compressible data.

- Disk array performance

  It is often overlooked that data cannot be put onto tape any faster than it can be read from disk. Backup is more sequential in nature than random (from a disk array access perspective). Disk array performance depends on the number of disks, RAID configuration, the number of FC ports accessing the array and queue depth available, for example.

- Fragmentation

  The more fragmented the files are on disk, the more random will be the disk access method; hence the backup will take longer. If the system has a defragmentation utility, it is advisable to run it before full backups or on a regular scheduled basis to help ensure that files are contiguously arranged on the disk.

Tape drive

The tape drives are the remaining factor in determining backup and restore performance. HPE StoreEver Tape Drives have varying levels of performance. Factors such as file size (larger is better), directory depth, and data compressibility all affects system performance. Data interleaving during backup also affects restore performance. Table 2 shows performance information for various HPE StoreEver Tape Drives.

Table 2. Tape drive throughput speed (native)

TAPE DRIVE	NATIVE THROUGHPUT MB/s
Ultrium 15750 (LTO-7 FH)	300
Ultrium 15000 (LTO-7 HH)	300
Ultrium 6650 (LTO-6 FH)	160
Ultrium 6250 (LTO-6 HH)	160
Ultrium 3280 (LTO-5 FH)	140
Ultrium 3000 (LTO-5 HH)	140
Ultrium 1760 (LTO-4 HH)	80
Ultrium 920 (LTO-3 HH)	60

Conclusion

Enterprise business customers demand an efficient, reliable, data growth management backup and archiving solution while managing costs. Hewlett Packard Enterprise Storage provides a comprehensive range of reliable data protection storage solutions which allow enterprise business customers to help maximize the value from their data over its entire lifecycle while help minimizing total cost of ownership (TCO). HPE StoreEver Storage with EMC NetWorker can provide a complete solution in itself or be used as a major constituent of a disk-to-disk-to tape implementation. HPE StoreEver Tape systems offer significant cost, energy, and footprint advantages, while addressing data growth by adding drives and capacity on-demand as needed. In all, HPE StoreEver Storage systems integrate easily with EMC NetWorker and are a critical component for comprehensive data protection and archiving of mission-critical applications.

Resources

HPE Backup, Recovery and Archive Solutions and Compatibility Matrices

HPE StoreEver MSL6480 Tape Library manuals

HPE 3PAR StoreServ 10000 Storage manuals

HPE 3PAR StoreServ 7000 Storage manuals

HPE StoreAll Storage manuals

EMC NetWorker

Learn more at
hp.com/go/StoreEver

f 𝕐 in ✉

Sign up for updates

★ Rate this document

**Hewlett Packard
Enterprise**