



Hewlett Packard
Enterprise

HPE StoreEver Tape Libraries with HP Data Protector

Implementation guide

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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 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 leader¹ 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 now features support for LTO-7. HPE StoreEver includes tape media, standalone tape drives, and tape libraries that accommodate more than 180 PB² 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 (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**

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

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.

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.

- **Is secure—enable a vital “last line of defense”**

Hardware-based data encryption, 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 can scale from 100 to up to 12,006 tape cartridges—from 1 to 192 LTO-5 or 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 LUN control failover. Achieve near-continuous data access with new dual-robotic capabilities available with the HPE StoreEver ESL G3.

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 MSL6480 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 or newer half-height SAS or FC drives for speeds of up to 113.4 TB/hour (assumes LTO-7 with 2.5:1 data compression) which can save you lots of time.

HPE 3PAR StoreServ Storage key features and benefits

HPE 3PAR StoreServ Storage products optimize your storage on-the-fly to 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 Service 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.

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.

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 is:

- **Hyperscale—Massive scalability without complexity**

Scale to over 1000 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 HP Data Protector

HP Data Protector is an enterprise class data protection application. Its architecture is designed to protect your data from edge to data center and across physical, virtual, and cloud environments by offering comprehensive backup and restore functionality. HP Data Protector features extensive HPE Storage system and third-party device support, broad application support, native VMware® vCloud Director integration, granular application specific single file recovery and integrated secondary backup to the cloud (via HP LiveVault). For more information visit hp.com/go/dataprotector.

Installation and configuration

Hewlett Packard Enterprise has joined with leading software companies to develop a comprehensive approach to ensuring 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 HPE Data Agile BURA Compatibility Matrices—hp.com/go/buracompatibility.

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 Fibre Channel 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, HBAs, Fibre Channel switches, Command View Tape Library, tape drives, and library robots?
- Is the minimum patch level support for each operating system installed?
- Is the minimum supported drivers specified in the Data Agile BURA Compatibility Matrix installed (HBA, tape drives)?
- Is the HPE StoreEver tape library or partition(s) online?

- Are all of the host HBAs correctly logged into the Fibre Channel switch?
- If the Fibre Channel switches are cascaded or meshed, are all Inter-Switch Link (ISL) ports correctly logged in?
- Are all tape and robotic devices zoned, configured, and presented to each host from the Fibre Channel switch?
- Are the host(s) HBAs, tape and robotic devices in the same switch zone(s)? See the below note.
- 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 operating system specific tools (for example, the sg utility in 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 HP Data Protector

After all components on the SAN are logged in and configured, the hosts are ready for installation of HP Data Protector. Before installing Data Protector, you should complete the following tasks:

- Hewlett Packard Enterprise recommends that you remove any other backup software currently configured on your computer before installing Data Protector. Other backup software, tape device applications that are part of the OS, and SAN or system management software can negatively affect how Data Protector installs and functions.
- Check your Windows® security settings to make sure that they work properly with Data Protector.
- Proper Data Protector licensing is required to run the application beyond the trial period. Licensing information can be obtained by contacting your HPE support contact or from the online HPE licensing site at webware.hp.com.

Installing HP Data Protector Software

Figure 1 shows the HP Data Protector architecture. For this guide, the following components were manually installed using the HP Data Protector installation DVD-ROM in the order listed.

1. **Cell Manager:** The computer that is the central point for managing the backup environment.
2. **Client systems:** Client systems can be computers that are backed up (the Disk Agent component must be installed), computers with backup devices (the Media Agent component must be installed) or both (the Disk Agent and Media Agent components must both installed).

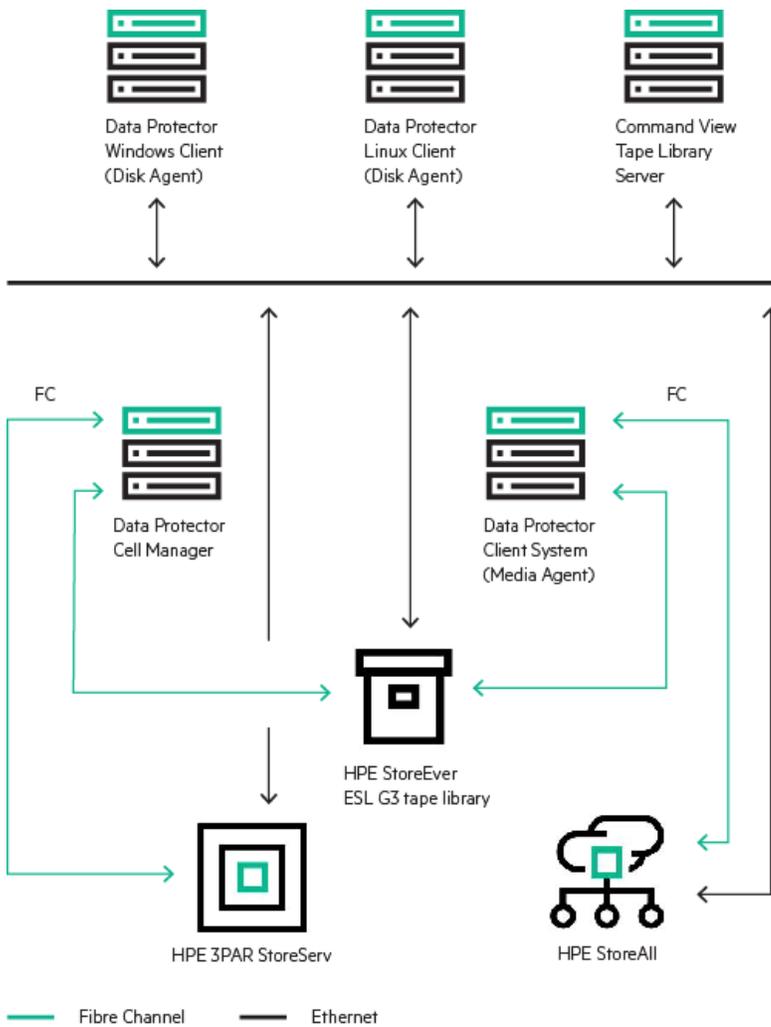


Figure 1. Data Protector architecture with an HPE StoreEver ESL G3 tape library, an HPE 3PAR StoreServ system, and an HPE StoreAll system

Initial setup

Launch the Data Protector Manager (Start>All Programs>HP Data Protector>Data Protector Manager) from the Data Protector Cell Manager computer.

The Next Step Wizard will be displayed. This dialog box provides shortcuts to particular Data Protector wizards that you can use to perform most common operations in a Data Protector Cell, such as adding clients, users, devices, and backup specifications, as well as running backups and restores. For this guide, the Next Step Wizard was not used.

Note

For content-sensitive help during any of steps throughout this guide, the following options are available:

- Press the **F1** key while using the Data Protector Manager.
- Click on **Help** in the Data Protector Manager menu bar. You can then select Help Topics, Context-Sensitive Help, Guides, **Data Protector on the Web** and/or **Online Support**.

Data Protector guides are available in the electronic PDF format. Install the PDF files during the Data Protector setup procedure by selecting the installation component **English Documentation** (Guides, Help on Windows systems) or **OB2-DOCS** (on UNIX® systems). Once installed, the guides reside in the following directory:

Windows systems: Data_Protector_home\docs (for this guide, the directory was C:\Program Files\OmniBack\Docs)

UNIX systems: /opt/omni/doc/C

Add clients to the cell

Data Protector client systems can be installed locally (using the installation DVD-ROM) or remotely (using an Installation Server). For this guide, all of the client systems were installed using the installation DVD-ROM.

During the installation of the software on each client system, the name of the Data Protector Cell Manager computer will be requested. Once the installation of the Data Protector software on all client systems has completed, the clients can be imported to the Data Protector Cell Manager as follows:

1. In the Context List, click **Clients**.
2. In the scoping pane, right-click **Clients** and click **Import Client**.
3. Type the name of the client or browse the network to select the client (on Windows GUI only) you want to import.
4. Click **Finish** to import the client.

Configure backup devices for all clients

After all of the client systems have been added to the cell, you can configure backup devices for use with Data Protector.

It is recommended that you let Data Protector configure backup devices automatically. Data Protector can automatically configure most common backup devices, including libraries, on multiple client systems in a SAN environment. You still need to prepare the media for a backup session, but Data Protector determines the name, policy, media type, media policy, and the device file or SCSI address of each device, and also configures the drive and slots. You can modify the properties of each device that was automatically configured afterwards to adapt it to your specific needs. Each client system you want to autoconfigure must have a Media Agent installed.

Autoconfiguration is possible on the following operating systems:

- **Windows**
- **Linux**
- **HP-UX**
- **Solaris**

Note

When you introduce a new host into a SAN environment, the configured libraries and devices will not be updated automatically.

- If you want to use an existing library on a new host, delete this library and autoconfigure a new library with the same name on the new host.
 - If you want to add devices to an existing library, you can delete the library, and autoconfigure a library with the same name and new drives on a new host or you can manually add the drives to the library.
-

Autoconfiguration cannot be used to configure the following devices in a SAN environment:

- Mixed media libraries
- DAS or ACCLS libraries
- NDMP devices

1. From the context drop down list, select **Devices & Media**.
2. In the scoping pane, right-click on **Devices** and select **Autoconfigure Devices**. This will launch the **Device Autoconfiguration Wizard**.
3. Select the client systems that are connected to the tape libraries and for whom automatic configuration is preferred. Click on **Next**. The selected clients will then be scanned to identify the connected devices.
4. A list of grouped devices will then be displayed. Choose what devices each client will see/use.

Note

By default, **Automatically configure multipath devices** is selected. If this option is selected, you can assign multiple paths, that is client names and SCSI addresses (device files on UNIX systems) to a single physical device.

With previous versions of Data Protector, a device could be accessed from only one client. To overcome this problem, several logical devices had to be configured for a physical device using a lock name. Thus, if you were using lock names for configuring access from different systems to a single physical device, you had to configure all devices on every system. For example, if there were 10 clients who were connected to a single device, you had to configure 10 devices with the same lock name. With this version of Data Protector, you can simplify the configuration by configuring a single multipath device for all paths.

Multipath devices increase system resilience. Data Protector will try to use the first defined path. If all paths on a client are inaccessible, Data Protector will try to use paths on the next client. Only when none of the listed paths is available, the session aborts.

5. Click **Next** to continue.
6. The final autoconfiguration wizard page, options, allows the user to choose whether Data Protector should **Automatically discover changed SCSI address** or not. By default this option is not selected. In SAN environments it is recommended to use this option. If this option is not selected and the SCSI address of a device changes, the backup session will fail. Do not use this option for devices without serial numbers.
7. Click **Finish**. The list of configured devices is displayed.

Run a barcode scan

1. Select **Devices & Media** from the context drop down list.
2. In the scoping pane, click on **Devices** then right-click on the desired library listed in the results area and choose **Barcode Scan**. The scan will start immediately.
3. Once the barcode scan operation completes, verify that the listed media have the expected barcode labels. If the expected barcode labels were discovered, move on to the next step. If the expected barcode labels were not discovered, verify the library has **Barcode reader support** enabled by right-clicking on the library and choosing **Properties**; then selecting the **Control** tab.

Create media pools

1. Select **Devices & Media** from the context drop down list.
2. In the scoping pane, click on **Media** then right-click on **Pools** in the results area (to the right) and choose **Add Media Pool**.
3. Provide a useful pool name and select the media type. An example would be to name the media pool ESL-LTO6 if the pool was for an ESL G3 library with LTO-6 tape drives. Optionally, add a description for the media pool.

Note

If uncertain what type of media is used by the physical device, expand Devices then expand one of the listed libraries. Click on Drives and in the results area, under the column Media/Interface Type, the media type is listed. HP Data Protector version 8.00 supports various media types, such as tapes and magneto-optical, File, and LTO media. For this guide, LTO-Ultrium is the media type.

4. Specify the Media Allocation Policies (optional). For this guide, the defaults were used. Click **Next** to continue.
5. If desired, you can change the settings in the Media Condition Factors dialog. For this guide, the defaults were used. Click **Finish** to create your media pool and exit the wizard.

Modify the settings for each drive to use the new media pool

1. From the context drop down list, select **Devices & Media**.
2. Under **Devices** in the scoping pane, expand the library with the drives that will use the new media pool.
3. Under **Drives**, expand the drives and click on a drive.
4. In the results area, choose the **Settings** tab and under **Default Media Pool**, select the new media pool that was manually created for use with the selected drive.
5. Repeat for all drives configured for the chosen library.
6. Repeat these steps for any additional libraries that new media pools were created for.

Format the media

Note

Prior to formatting the media, any user defined media pools should be created and the **Default Media Pool** setting for all drives that will use the new media pools should be modified.

1. From the context drop down list, select **Devices & Media**.
2. In the scoping pane, expand **Devices** then expand the desired library. Click on **Slots**.
3. In the results area, highlight all slots containing media to be formatted and right-click. Select Format.
4. Specify the library drive to be used to format the media. Click **Next** to continue.
5. Specify the media pool the formatted media should be added to. Click **Next** to continue.
6. The media description can be **Automatically generated, Specify** or can **Use barcode** during the formatting. For this guide, the media barcode was used. Click **Next** to continue.
7. Under the additional options, select the box **Force operation** if the media was previously used and/or does not contain data that needs to be retained. Click on **Finish** to initiate the media format and exit the wizard.

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 2–7 above selecting different slots and a different tape drive each time.

Backup and restore jobs

Create a backup job

1. Select **Backup** from the context drop down list.
2. In the scoping pane, expand **Backup Specifications** then right-click on **Filesystem** and choose **Add Backup**.
3. The **Create New Backup** popup will be displayed. For this guide, the **Blank Filesystem Backup** template was used including the default backup options. Click **OK** to continue.
4. Next you will select what you want backed up. A list of available clients is displayed. Expand a client to view what objects can be selected for backup. If multiple OS platforms are configured, you can modify either of the drop down menus for **Show**: to simplify the view. After selecting the items for backup, click on **Next**.
5. Select the devices or drives to be used for the backup. All configured devices will be displayed. Select the desired device or devices to be used to back up the previously defined client. Click **Next** when the backup device has been selected.

Note

The properties for any selected drive can be verified and/or modified by clicking on a drive and selecting the **Properties** tab to the right.

6. Next you can select the backup options for all objects in the backup specification. For this guide, all of the defaults were used. Click **Next** to continue.
7. Specify the date and times that you want backups performed. Predefined schedules can be used or you can manually add backup schedules. Click **Next** to continue.
8. You can review summaries of the backup specifications and make any changes if necessary. Click **Next** to continue.
9. Perform finishing steps for your backup. For this guide, **Save as** was selected so that the backup would be permanently saved. When using the **Save as** option, provide a useful Name. For this example, the host name + the library + the drive type was used: SLY-ESLG3-LTO6. Click **OK** to save the backup.
10. With **Backup** still selected from the drop down list, expand **Backup Specifications** then **Filesystem**. The recently created backup, SLY-ESLG3-LTO6 in this example, will be displayed. Click on that backup to verify or modify any settings if necessary now or later.
11. To start the backup, right-click on the newly created backup and choose **Start Backup** which will launch the Start Backup dialog box.
12. You can then select the backup type (**Full** or **Incremental**) and network load (**High**, **Medium**, or **Low**). Click **OK** to start the backup operation.
13. The **Backup Monitor** will automatically launch and show the progress of the backup operation. Alternatively, you can select **Monitor** from the context drop down list to view all active sessions. Click on any individual session for detailed information for that session.

Note

You can right-click on a backup and select **Copy As** which creates a copy of that backup. This allows you to quickly modify the copy of the backup—changing the source device, destination device, or backup schedule—to create additional backup jobs for other clients, devices, or schedules rather than walking through the entire **Create New Backup** popup again.

Create a restore job

You can browse for data to restore in two possible ways: either from the list of the backed up objects or from the list of sessions. The difference is in the scope of directories and files presented for restore:

- **Restore Objects** with a list of backed up objects classified by client systems in the cell and by different data types (such as Filesystem, Disk Image, Internal Database, and so on). You can browse all the directories, files, and versions, which were backed up and are still available for restore.
- **Restore Sessions** with a list of filesystem sessions with all objects backed up in these sessions. You can choose to view only sessions from the last year, last month, or last week. You can browse all objects that were backed up in this session (like any drives from all clients named in the backup specification), and all versions of this restore chain. By default, the entire restore chain of the selected directories or files is restored, but you can also restore data from a single session only. You cannot perform restore of the online database integrations from a specific backup session.

For this guide, **Restore Sessions** was used.

1. Select **Restore** from the context drop down list.
2. In the scoping pane, click on **Restore Sessions** to display a list of all of the backup sessions in the results area. You can click on the various column headings, such as Status, Backup Specification, Backup Type, Start Time, etc., to sort the backup sessions accordingly. By default, the backup sessions are listed from most recent to oldest.
3. Double-click on the desired backup session then the client system and finally the object listed to view the files and directories that can be selected to be restored.
4. In the **Source** page, select directories and files to be restored.
5. By default, the entire restore chain is restored (**Show full chain** is selected). To restore only data from this session, select **Show this session only**. Select the files and/or directories to be restored.
6. In the **Destination** page, specify the restore destination. Options include restoring the files to the original location, how file conflict should be handled (whether to overwrite files or not) or restore the files to a new location.
7. Verify the settings for the **Options, Devices, Media, Copies** pages. Default settings for all of these pages were used for this guide.
8. The final page, **Restore Summary**, allows you to verify the selected backup session.
9. Click on the **Restore** tab which will allow you to verify the client, name (object containing the data being restored), and the filesystem type. You can also click on **Needed media** to view the tape(s) to be used for the restore operation (toggle from **Non-resident media** to **All media**).
10. Click **Next** if you want to set the **network load** or **report level** for the restore session. **Enable resumable restore** is selected by default. This option creates checkpoint files during the restore session. The checkpoint files are needed if the restore session fails and you want to resume the failed session using the Data Protector resume session functionality.
11. Click **Finish** to start the restore session.
12. The Restore Monitor will launch automatically and shows 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 Backup, Recovery and Archive (BURA) Solutions with HPE StoreEver tape libraries, this is the Fibre Channel connection.
- **Block size, segment size, and disk agent buffers**—BURA Solutions with Data Protector support configurable sizes. See “Block size, segment size, and disk agent buffers” 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/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.

Note

To achieve the best results, first optimize your environment by installing the latest drivers and firmware, optimize your network, and so on. Refer to the [Installation checklist](#) on page 5.

Block size, segment size, and disk agent buffers

You can set the block size, segment size, and/or disk agent buffers of a backup device by:

1. From **Devices & Media** in the drop down list, expand **Devices** in the scoping pane then click on a library.
2. In the results area, double-click on **Drives** then double-click on a specific drive.
3. Click on the **Settings** tab then click on the **Advanced** tab.
4. By selecting the **Sizes** tab, you can then edit the **Block size** (KB), **Segment size** (MB), and/or **Disk agent buffers**.

Note

You can press the F1 key, while performing step 4 above, to launch Data Protector Help to specify the advanced options for a device. For some versions of Internet Explorer (IE), you must click Allow block content (at the bottom of the web browser) in response to the IE popup stating the Internet Explorer has restricted this webpage from running scripts or ActiveX controls.

Block size

When a device receives data, it processes it using a device-type-specific (DDS, LTO) block size. 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 Data Protector sessions.

Data Protector supports block sizes from 8 KB to 1024 KB. Check for supported block sizes of the current host adapter before using a higher block size.

Warning

Data Protector can only append to media with the same block size as was originally written to that media. You should change the block size before formatting tapes. The device block size is written on a medium header so that Data Protector knows the size to be used. If the device block size differs from the medium block size, an error occurs. Before increasing the block size for a device, make sure the desired block size does not exceed the default maximum block size supported by the operating system using the device. If the limitation is exceeded, Data Protector cannot restore data using that device.

For information if and how the maximum supported block size can be adjusted, see the operating system documentation.

Segment size

A medium is divided into data segments, catalog segments, and a header segment. Header information is stored in the header segment, which is the same size as the block size. Data is stored in data blocks of data segments. Information about each data segment is stored in the corresponding catalog segment. This information is first stored in the Media Agent memory and then written to a catalog segment on the medium as well as to the IDB.

Segment size, measured in megabytes, is the maximum size of data segments. If you back up a large number of small files, the actual segment size can be limited by the maximum size of catalog segments. Segment size is user configurable for each device and influences performance during restore and during import of media.

Optimal segment size depends on the media type used in the device and the kind of data to be backed up. The average number of segments per tape is 50. The default segment size depends on the media type. The default segment size can be calculated by dividing the native capacity of a tape by 50. The minimum value you can specify is 10. The maximum catalog size is limited to a fixed number (12 MB) for all media types.

Data Protector finishes a segment when the first limit is reached. When backing up a large number of small files, the media catalog limit is reached faster, which can result in smaller segment sizes.

Note

The segment size affects the speed of the restore and of the import of media. A smaller segment size requires additional space on the media because each segment has a fast-search mark. The additional fast-search marks result in faster restores because the Media Agent can quickly locate the segment containing the restore data. On the other hand, with smaller segments, there are more catalog segments, which makes the importing of media slower.

Disk Agent buffers

The Data Protector Media Agent and Disk Agent use memory buffers to hold data waiting to be transferred. This memory is divided into a number of buffer areas (one for each Disk Agent, depending on device concurrency). The buffer size is the number of Disk Agent blocks that a Media Agent can hold in its buffer. Each buffer area consists of 8 Disk Agent buffers (of the exact same size as the block size configured for the device). Values from 1–32 can be specified. The default number of Disk Agent blocks is 8.

There are two basic reasons to change this setting:

- Shortage of memory: The shared memory required for a Media Agent can be calculated as follows:
 $DA\ Concurrency * Number\ of\ Buffers * Block\ Size$. Reducing the number of buffers from 8 to 4, for instance, results in a 50 percent reduction in memory consumption, but also results in the creation of performance implications.
- Streaming: If the available network bandwidth varies significantly during backup, it is important that a Media Agent has enough data ready for writing to keep the device in the streaming mode. In this case, you should increase the number of buffers.

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
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 Fibre Channel 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 ensure that files are contiguously arranged on the disk.

Tape drive

The tape drives is the fifth 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 1840 (LTO-4 FH)	120
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 maximize the value from their data over its entire lifecycle while minimizing total cost of ownership. HPE StoreEver Storage with HP Data Protector 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 HP Data Protector and are a critical component for comprehensive data protection and archiving of mission-critical applications.

Useful links

[HPE Backup, Recovery and Archive Solutions and Compatibility matrices](#)

[HPE StoreEver MSL6480 Tape manuals](#)

[HPE StoreEver MSL Tape manuals](#)

[HPE 3PAR StoreServ 10000 Storage manuals](#)

[HPE 3PAR StoreServ 7000 Storage manuals](#)

[HPE StoreAll Storage manuals](#)

[HP Data Protector](#)

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