Hewlett Packard
Enterprise

HPE StoreOpen Standalone for Microsoft Windows User Guide

Abstract

This guide provides information about HPE StoreOpen Standalone for Microsoft Windows, which is an implementation of the Linear Tape file system (LTFS) to present an LTO-5, LTO-6, and LTO-7 tape drive and media as a disk volume, accessed via a drive letter.

Acknowledgements

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Contents

1 Introduction

This guide provides information about HPE StoreOpen Standalone software, which is an implementation to aid the use of the Linear Tape File System (LTFS). LTFS makes tape self-describing, file-based, easy-to-use, and allow users to use standard file operations on tape media to access, manage, and share files with an interface that behaves like a hard disk. You can also share data across platforms by using LTFS, as you would with a USB drive or memory stick.

NOTE: A firmware update may be required. LTFS checks and prompt you for any update for tape drive.

Features

The following are some of the main features supported by the HPE LTFS:

- Allows you to use LTO media as a disk.

- Based on Open Source LTFS software with Graphical User Interface (GUI) components added for usability.

- Precompiled application versions provided for supported platforms.

- Source code available for the open source LTFS software.

- Supported on Microsoft Windows.

- Supports mounting two tape drives concurrently.

- 'LTFS smart copy' utility for efficient data transfer from tape to disk.

Benefits

To the wide range of benefits that HPE StoreEver LTO tape drives have to offer, HPE StoreEver LTO-5, LTO-6, and LTO-7 with Linear Tape File System (LTFS) functionality also deliver:

- *Faster access to data:* When a tape is mounted, the files and directories stored on it appear on your desktop in the same way as a disk directory listing.

- *Simple drag and drop:* HPE StoreOpen Standalone increases ease of use; simply drag and drop files to and from the tape.

- *Compatibility across your environment:* Tape media written using LTFS is self-describing so that data retrieval from tape is independent of any hardware or software platforms.

- *Increased data mobility:* Easily share content to increase data mobility. Tapes written with HPE StoreOpen Standalone can be exchanged more easily between users working in different operating systems, using different platforms and in different locations.

- *A single storage media standard:* Unify organization wide file sharing with HPE StoreEver LTO-5, LTO-6, and LTO-7. Tapes can be shared across libraries and vendors. Files on tape can be accessed using straightforward drag-and-drop.

Intended usage

HPE StoreOpen Standalone presents the contents of the tape as a disk volume. However it is important to bear in mind that it is not a true disk, and so there are some best practices to follow to ensure satisfactory performance and a good user experience:

- HPE StoreOpen Standalone is designed to work best in a single-user environment, where only one user is copying files to or from the tape. Multiple users or processes trying to write

or read at the same time will result in poor performance because of the sequential access nature of tape.

- For the same reasons, do not share the tape drive between different systems. A single tape drive must be connected to a single host bus adapter (HBA).

- The expected usage model is to transfer large files between systems, by mounting the tape on one system, writing the files, unmounting, mounting on the second system, and reading the files. Treating the tape volume as a true random access device (for example frequently reading and updating individual files) will not perform as well as streaming large files to and from tape.

Architecture

The various components in the HPE StoreOpen Standalone application are shown in the following diagram.
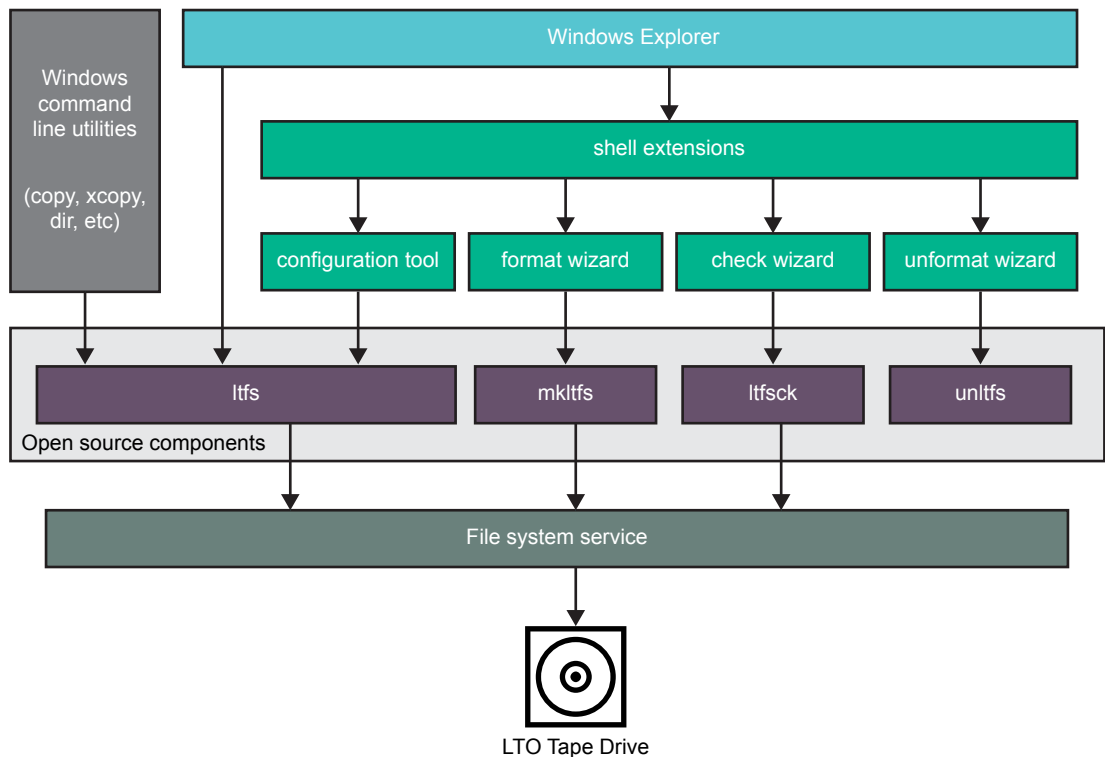
Supported configurations

HPE StoreOpen Standalone supports:

- LTO-7 Ultrium 16000 tape drives with SAS interface

- LTO-5 Ultrium 3000 and 3280 tape drives with SAS interfaces

- LTO-6 Ultrium 6650 and 6250 tape drives with SAS interfaces

- Microsoft Windows 7 (x86 and x64)

- Microsoft Windows Server 2008 SP2 and 2008 R2 SP2 (x86 and x64)

- Microsoft Windows 8 and 8.1 (x86 and x64)

- Microsoft Windows Server 2012 and 2012 R2 (x64)

- Microsoft Windows 10 x64

NOTE: Only the binaries supplied by Hewlett Packard Enterprise are supported. See the Compatibility Matrix on **www.hpe.com/storage/StoreOpen** for the latest details on supported operating system configurations and supported HBA and hardware configurations.

2 Installation and configuration

When using HPE StoreOpen Standalone with HPE StoreEver LTO tape drives, you need the following components:

- An HPE StoreEver LTO-5, LTO-6, or LTO-7 tape drive connected to a supported SAS HBA
- A drive firmware revision that supports dual partitioning. HPE L&TT must be used if a firmware update is required.
- The latest tape driver (`hplto.sys`) installed
- The software package Installer executable. Download the Installer from:

  www.hpe.com/storage/StoreOpen

> **NOTE:** You can download HPE L&TT from **http://www.hpe.com/storage/tapetools**.

Downloading and installing HPE StoreOpen Standalone

To use the precompiled binaries:

- Download the Installer appropriate to your operating system.
- When the download has completed, run the Installer. Administrator privileges may be required depending on your system configuration.
- Follow the Installer steps until the installation is complete.

The executables will be installed into a new menu group under HPE StoreOpen Standalone. For the next steps, see "Using HPE StoreOpen Standalone" (page 8).

Uninstalling HPE StoreOpen Standalone

If you want to remove the software from your system, follow these steps:

Procedure 1

1. Unmount any LTFS file system you currently have mounted (see "Removing the LTFS volume" (page 16))
2. Open the Windows Control Panel and select **Uninstall a program**.
3. From the list of installed software, select **HPE StoreOpen Standalone** and then click the **Uninstall** button.

3 Using HPE StoreOpen Standalone

Mapping a tape drive to a drive letter

Before you can access the tape cartridge as a volume, you must first establish a mapping between the tape drive and a Windows drive letter. Run the LTFS Configuration Tool located in the HPE StoreOpen Standalone program group for mapping tape drive to Windows.

NOTE: The tool may request administrative privileges, depending on your system security policies.

The configuration window will appear on your system:
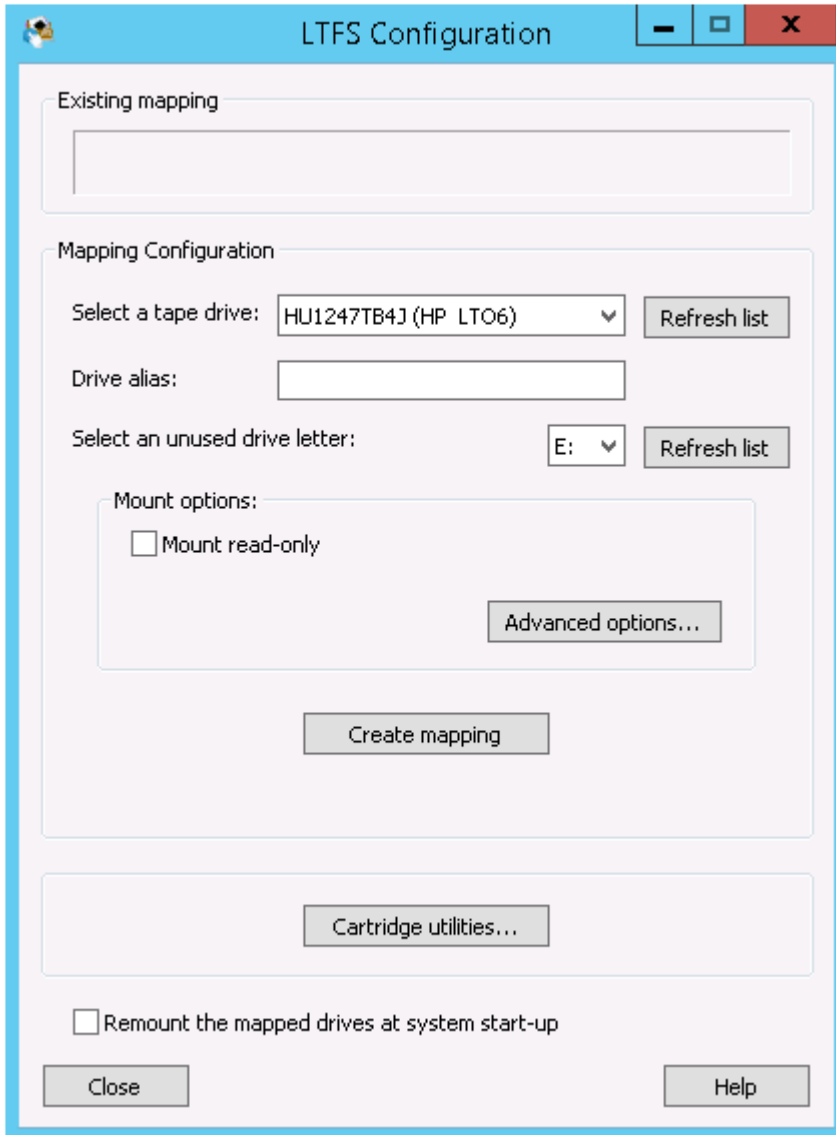
By default the first usable tape drive found on your system is selected, along with the first unused drive letter. Change the selections as desired, then to mount with all the default options, click **Create mapping**. The following actions are performed:

1. The configuration tool checks that the drive is accessible and usable.
2. The tool attempts to verify that your system has suitable HBA driver support for LTFS operation.

3. The tool looks for a currently loaded tape cartridge. If a cartridge is found, it is checked to see if it is formatted as an LTFS volume. If not, you are offered the option of formatting the cartridge before proceeding. It is recommended that you must accept this option.

4. Once a formatted cartridge is detected, or if no cartridge is present, the file system service is started and the window is updated to reflect the new configuration. The following screen illustrates a typical view after a mapping has been established:
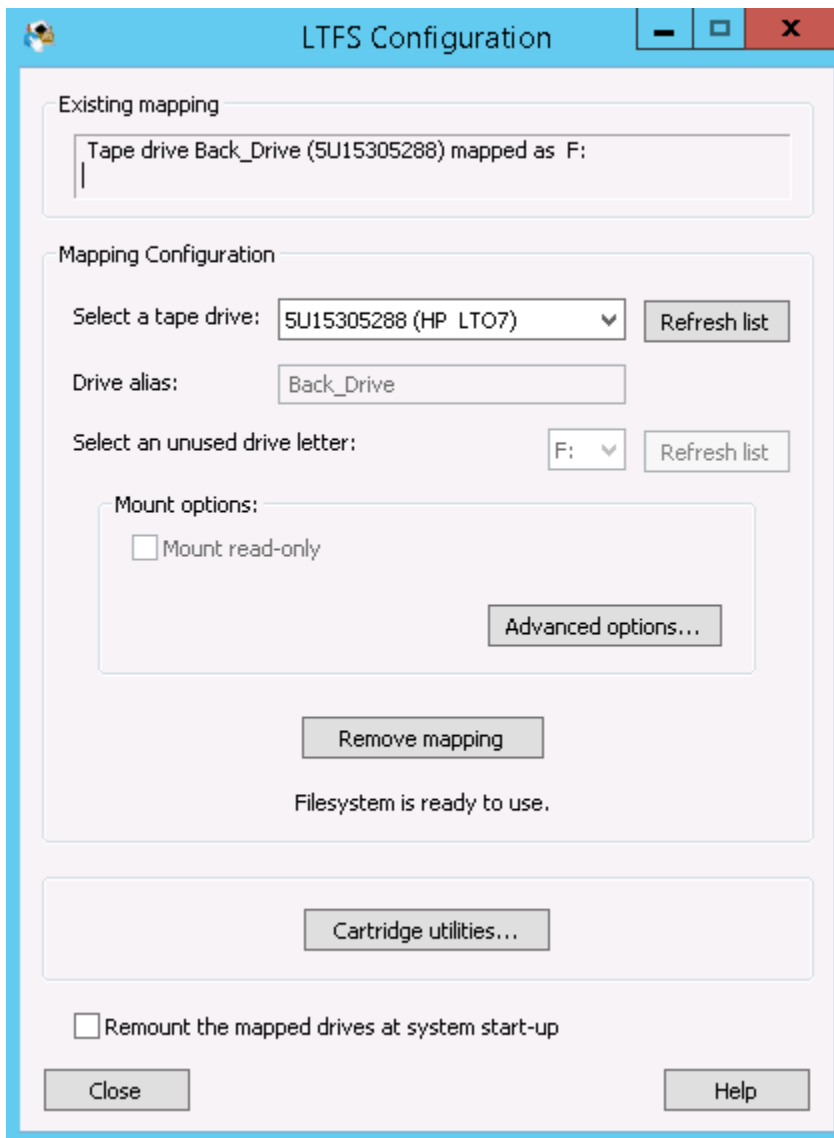
5. When the mapping has been established, you can close or minimize the configuration tool, or choose to map another tape drive.

NOTE: SOS supports mapping of two tape drives at a time.

A Windows Explorer window will now include an LTFS volume. The first time you access this drive volume there will be a slight delay while the index is loaded and checked, but from then on the drive volume may be accessed as normal.

△ CAUTION: If you insert a cleaning cartridge while a drive letter is assigned to the tape drive, HPE StoreOpen will attempt to use the cartridge. This action can degrade the life of the cleaning cartridge. To preserve the cleaning cartridge, remove the drive letter mapping for the tape drive by using the LTFS configurator before inserting the cleaning cartridge in to the tape drive.

Mount options

The default mount options are preferable, but can modify these options according to your need. The options are as follows:

- **Mount read-only** – If you select this option, the cartridge contents are readable but cannot be modified. This option provides a "software" write-protect mechanism; the same effect can be achieved using the "hardware" write protect tab on the tape cartridge.

- **Remount the mapped drives at system startup** – The normal behavior is to configure the service so that it automatically restarts when the system boots up. Clear this option to avoid restarting (for example, if it is a temporary setup where the tape drive is removed after the system closes).

- **Advanced options** – This option opens a further window where you can modify advance options.

  NOTE: Some of these options might have a noticeable impact on performance and in general must not be changed.

  - **Support ticket folder**: Is the location where drive logs are stored. These logs are generated on each unmount and whenever an error is detected. The application will keep the 10 most recent logs and automatically delete any older logs. These logs may be useful to Hewlett Packard Enterprise support personnel but otherwise can be ignored.

  - **Enable verbose logging**: This option is not required in normal operation and you must only use it when requested by Hewlett Packard Enterprise support personnel, as it will have an adverse effect on performance.

  - **Enable extended verbose logging**: This options adds a further level of detail to logfile entries.

  - **Thumbnails**: When Windows encounters a folder full of files, it attempts to build thumbnails to represent the content of each file. This option is not desirable in an LTFS volume, because it may take many minutes or even hours to generate the thumbnails. So by default HPE StoreOpen Standalone tells the operating system that the volume is in the "offline" state, which prevents automatic thumbnail creation. You can turn this option off if desired, but can effect the time, to open and access folders.

  - **Index capture**: This option allows you to keep a copy of the latest index from tape on the local disk. Enable the check box and enter the path to the folder where you would like to keep the index file after the tape is unmounted.

  - **Index updates**: This option allows you to control when indexes are written to tape; see for more details.

  - **Index partition usage**: The LTFS format allows to write data files in the index partition, which improves access times for frequently used files. However, in general you must leave this setting in its default state.

Index updates

Accessing data stored on tape relies on an up-to-date index being available. HPE StoreOpen Standalone offers three different mechanisms for updating the copy of the index stored on tape. The default setting is to write a copy of the index to tape periodically while writing data; the index is written every five minutes. You can change the time interval to every minute. This method of index update reduces the window of exposure to power-loss events, since there will be an index on tape no more than five minutes old (if using the default interval).

The second option is to write the index to tape only when a volume is removed. In normal operation this option is sufficient, since the LTFS usage model requires the volume to be unmounted after use, so there is always a valid index. In case of, power is removed from the drive without unmounting, for example, through an unplanned power outage or accidental unplugging, the volume in an inconsistent state, and all files added since the last dismount operation will be inaccessible. The CheckWizard utility recovers the file data to the `_ltfs_lostandfound` directory, but the metadata (filename, access dates, and so on) will be lost.

In most cases, the default behavior offers the best solution, but the options allow you to modify the behavior for a particular situation. The following table summarizes the options available for choosing when the index is updated:

Index is flushed to tape...	Potential benefits	Potential drawbacks
When the volume is unmounted	Minimal capacity overhead	Exposure to the risk of power failure during writing
Every n minute during writing (default: n=5).	Exposure to the risk of power failure, limited to the last n minutes. Negligible impact on performance.	Some capacity overhead since the index is written more frequently.

Cartridge utilities

The cartridge utilities button opens a further window where you can access the utilities for formatting the tape, and so on.
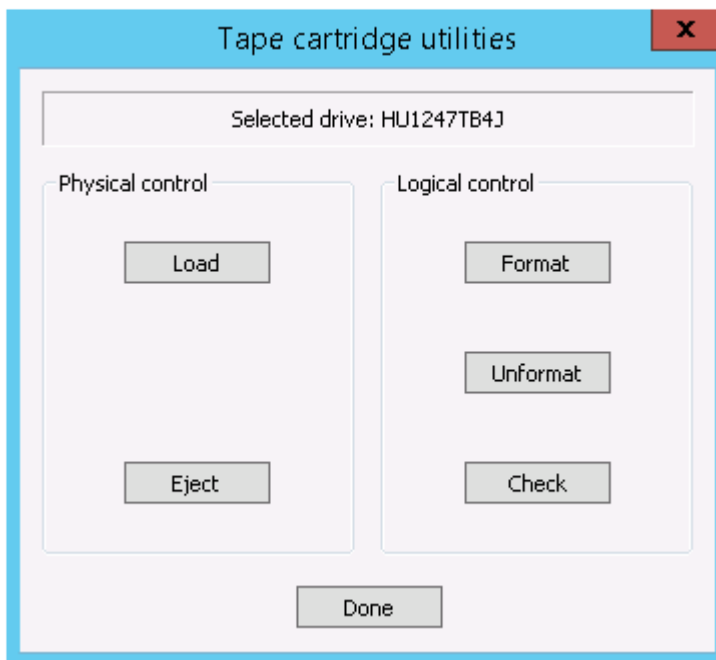
- **Load**: Physically loads the tape which is already presented to the drive.

- **Unload**: Physically ejects the LTFS volume from the tape drive. The file system will continue to run, but attempting to access the volume while no cartridge is present will result in the error message "The device is not ready". When a formatted LTFS cartridge is loaded into the drive, the index will be read and checked, and then the volume may again be accessed.

- **Format**: Starts the FormatWizard to guide you through the steps and options of creating a fresh volume on the current cartridge; more information is given in "Using the FormatWizard" (page 16).

- **Unformat**: Runs the UnformatWizard to guide you through the steps and options of removing the LTFS format from the tape.
- **Check**: Runs the Error-checking tool which scans the volume for consistency and can correct certain problems with the format; see "Using the CheckWizard" (page 19) for more details.

File permissions

The HPE StoreOpen Standalone application manages a common set of file permissions for all files and users; file and directory ownership is not recorded to tape media. The only permission that is tracked is write-protect information.

File names

To maintain compatibility when copying files between multiple platforms, it is recommended not use the following characters LTFS filenames, directory names, or extended attributes:

*? < >: " | / \

Limitations

- When the tape cartridge is almost full, further write operations will be prevented. The free space on the tape (for example, as reported by Explorer) will indicate that there is still some capacity available, but that is reserved for updating the index when the tape is unmounted.

- Future mounts of a cartridge that is almost full (that is, it has passed the point at which "early warning" is reported) will mount as Read Only, to prevent further modifications that may not fit on the tape. This status is cleared when the cartridge is reformatted (using `mkltfs`) or when the volume is rolled back, erasing the history.

- MAM and LTFS attributes cannot be listed using the ltfsattr command. The ltfs and MAM attributes are case-sensitive.

- LTFS volume name cannot be modified on an LTFS tape which is full.

- Disconnecting or powering off a tape drive while it is mounted can make the LTFS volume inconsistent. Always unmount the LTFS volume before disconnecting or powering down the tape drive.

- If the tape runs out of space while writing, the tape might become inconsistent and fail to mount next time. You can run the `LTFSCheckWizard` command to fix this issue. This command fixes the issue by rolling back the tape to a previous good index.

Working with Windows Explorer

Once the mapping has been established and an LTFS-formatted cartridge loaded, you can access the contents of the cartridge either at a command prompt or through Windows Explorer. The following screen shot shows an LTFS volume viewed in an Explorer window:
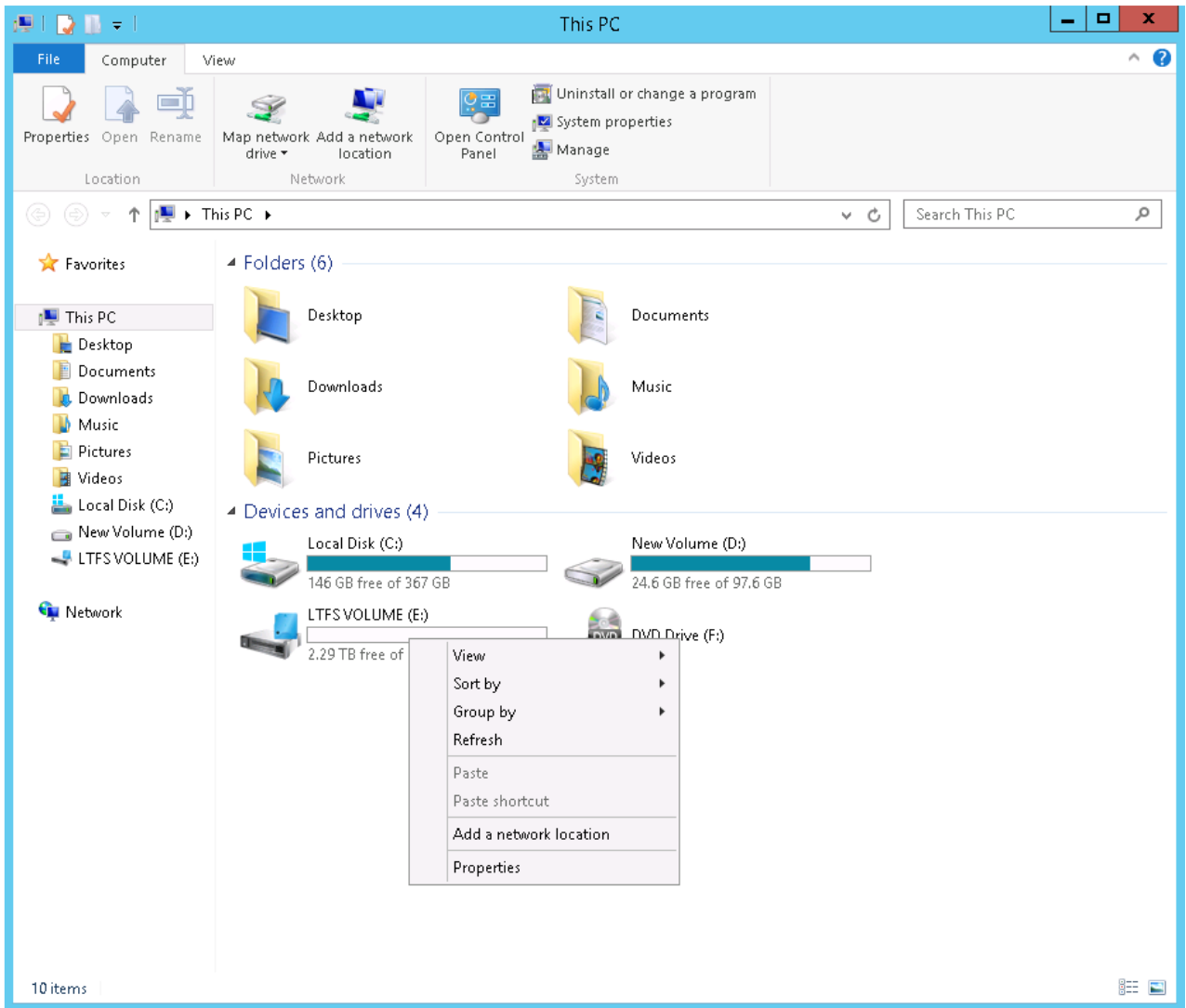
There are several points to note here:

- The volume category is shown as a "RAM Disk". It displays the way an LTFS volume is linked into the operating system, and has no impact on operation.

- The "Total size" and "Space free" figures appear slightly lower than expected. This is due to the way that Windows calculates and report capacities in binary GB (2^{30} bytes) and TB (2^{40} bytes) instead of decimal GB (10^9 bytes) and TB (10^{12}) bytes. These readings indicates worst-case scenarios ; if the volume is having hardware data compression, then the actual capacity available is greater than that shown.

To display a menu with two LTFS-specific operations, right-click on the drive icon :

- **Format LTFS volume** — run the FormatWizard utility option, for creating a fresh volume on the current cartridge. More information, see"Using the FormatWizard" (page 16).

- **Eject LTFS volume** — physically eject the LTFS volume from the tape drive. The file system will continue to run, but attempts to access the volume while no cartridge is present and results in the error message "The device is not ready". To access the volume, load the formatted LTFS cartridge into the drive.

Number of LTFS-specific options available by clicking **Properties** of the volume, as illustrated in the following screenshots:
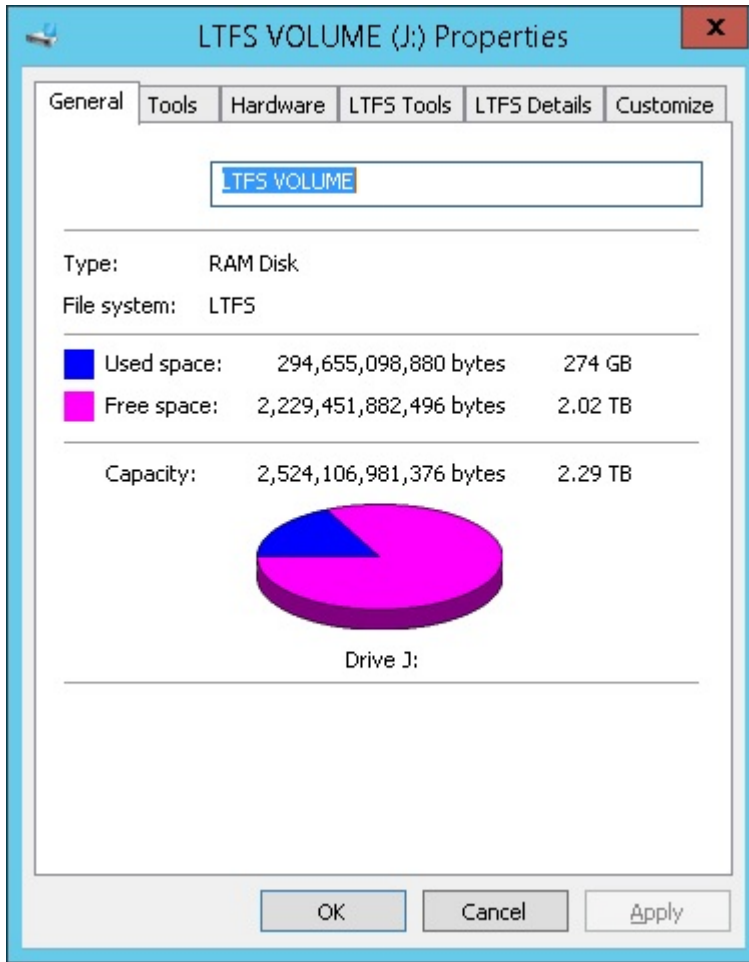
The comments given earlier about the Explorer view (file system category, capacity figures) also apply to the information shown on the General tab.
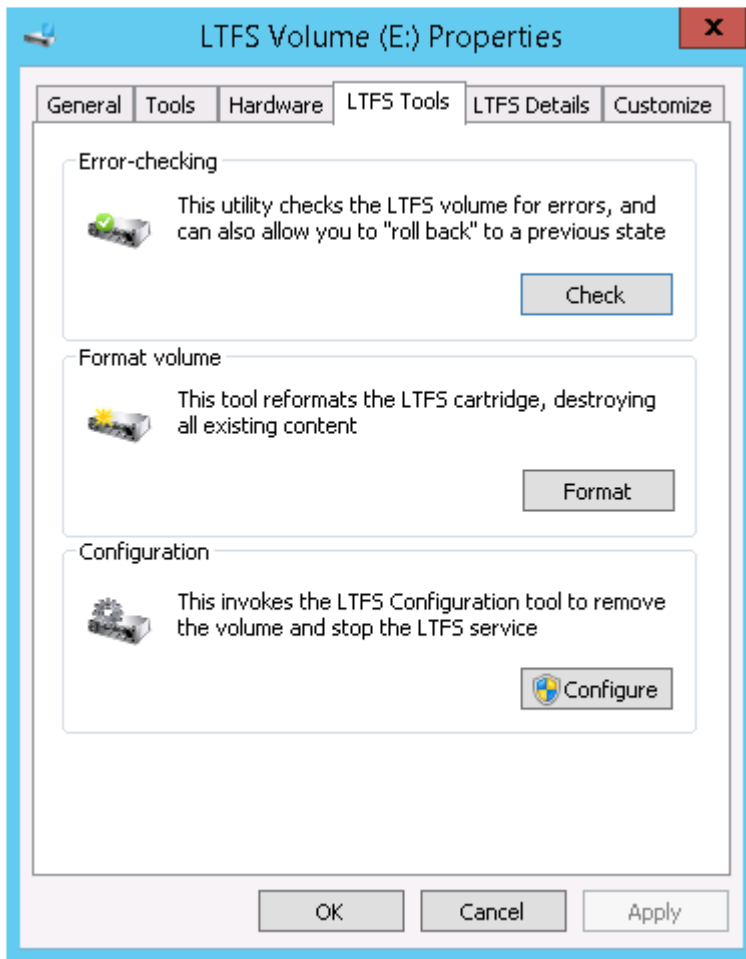
The **LTFS Tools** tab gives access to several utilities for interacting with the volume:

- The **Error-checking** tool scans the volume for consistency and can correct certain problems with the format; see "Using the CheckWizard" (page 19) for more details.

- The **Format volume** tool starts the FormatWizard to guide you through the steps and options of creating a fresh volume on the current cartridge; more information is given in "Using the FormatWizard" (page 16).

- The **Configuration** tool brings up the same window used when the volume was mapped, and is a convenient way to remove the volume.

  NOTE: This action might require administrative privileges depending on your system policies and settings.
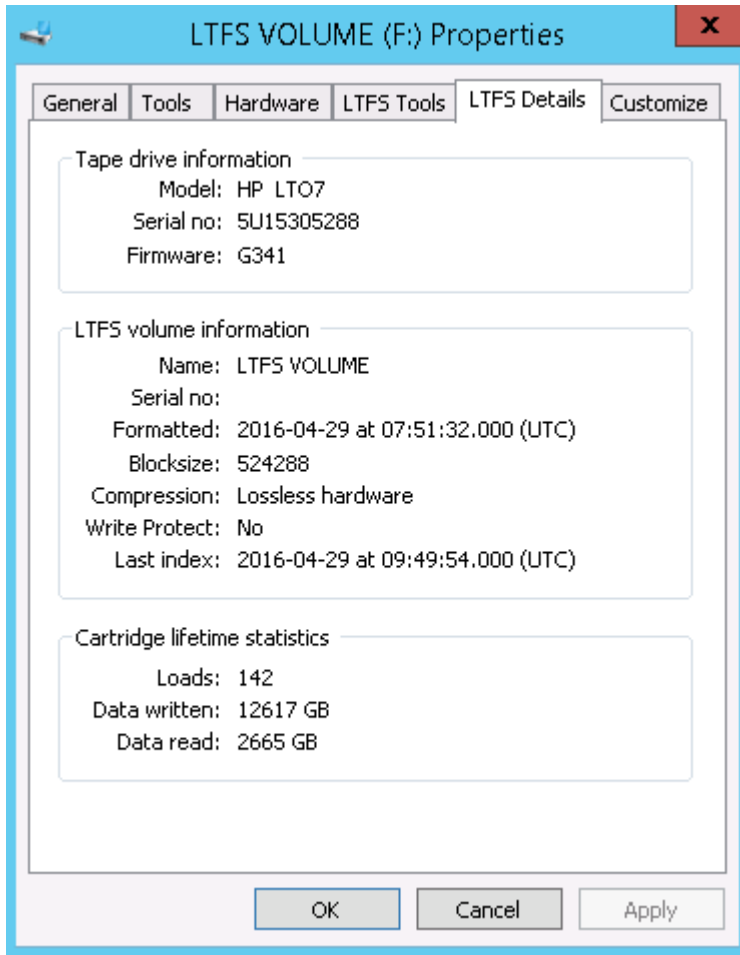
The **LTFS Details** tab provides information about the tape drive, the LTFS volume, and also the cartridge lifetime usage.

Removing the LTFS volume

There are two different ways of removing the LTFS volume:

- You can physically eject the cartridge from the drive by right-clicking on the drive and selecting the option to **Eject LTFS volume**. In this case, the drive letter will remain reserved, although it cannot be accessed until another LTFS cartridge is loaded into the drive.

- You can run the configuration tool again, select the drive from the list, and click **Remove Mapping**. This action unmounts the volume (but leave the cartridge in the tape drive) and then stop the service. This action results in unmapping of the drive letter and is not accessible. Follow the steps described in "Mapping a tape drive to a drive letter" (page 8)for setting-up a new LTFS volume.

Using the FormatWizard

Before start using the LTO-5, LTO-6, or LTO-7 cartridge, format these cartridges to LTFS specifications. The LTFSFormatWizard application helps to select appropriate options and settings and then formats the tape. You can run it from the context menu, from the LTFS Tools tab in the drive properties, or from the HPE StoreOpen Standalone program group.

△ **CAUTION:** Read all the text on the wizard dialog windows carefully. Completing this wizard will irretrievably destroy all tape contents.

NOTE: If you execute the FormatWizard while no LTFS volume is mapped to a drive letter, the wizard might require administrative privileges, depending on system security policies and settings. Right-click on the executable and select **Run as administrator** for administrative privileges.

1. The initial screen presents information about the operation that has been started.
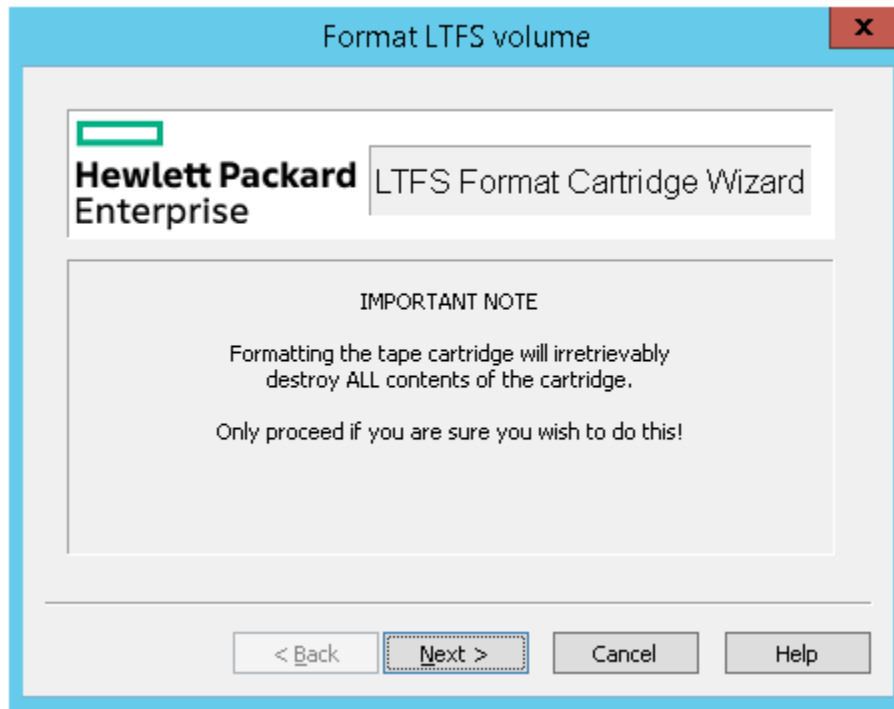
2. The next window allows you to select a tape drive and related options.
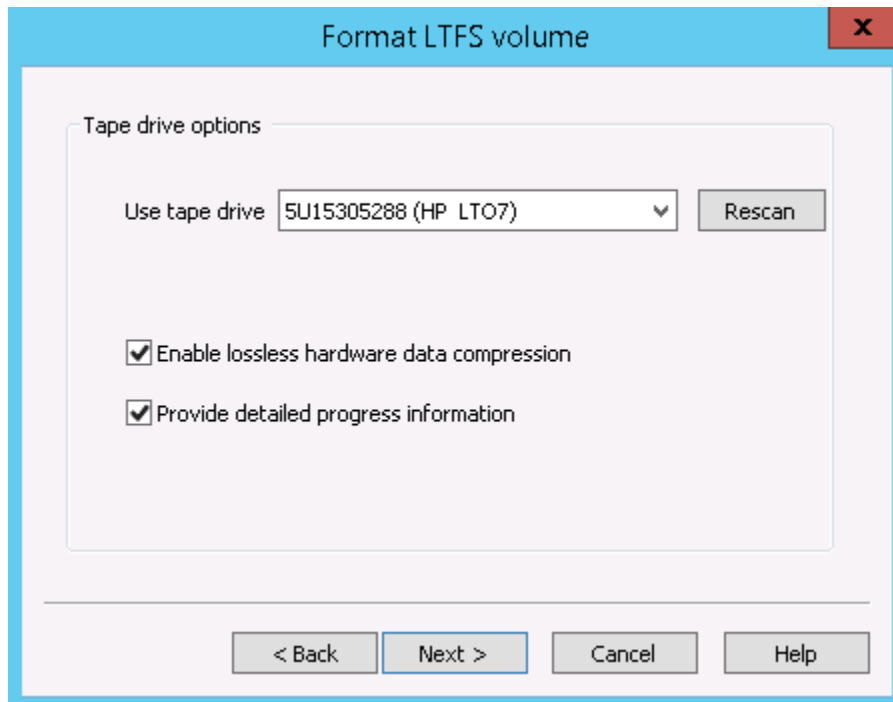
The first drive on the system (or the one being used by the mounted file system, if any) will be selected by default; change the selection to use a different tape drive.

NOTE: Only drives suitable for use with LTFS are shown in the list.

By default, the drive data compression engine will be enabled. To bypass the compression engine, turn off this option.

The other option on this screen allows you to request that more detail is shown during the format operation.

3. The next window contains options related to the cartridge format.

Both of these fields are optional, and are intended to provide a method of identifying the cartridge. **Tape serial number** must be less than six alphanumeric characters (A–Z, 0–9). **Volume name** is a free-format text string.

The **Advanced** button leads to a further set of options; however it is recommended that you leave these options to default settings.

4. The final window summarizes the format operation that you have defined using the wizard.
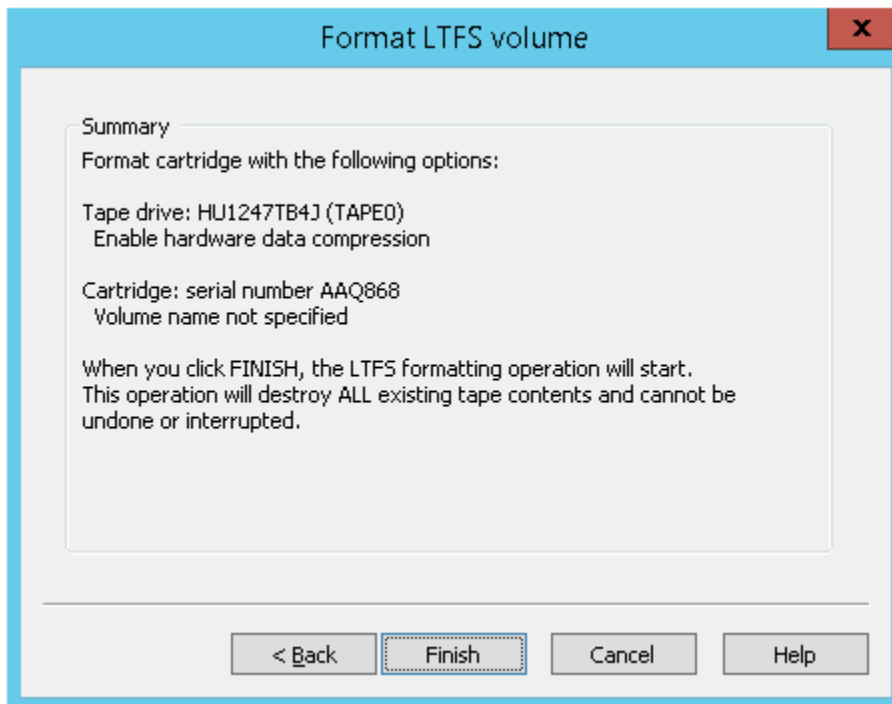
When you click **Finish**, the following operations take place:

a. If the cartridge is mounted, it is unmounted.
b. A "Progress" dialog window is created.
c. The format operation starts.
d. All tape contents are removed and a fresh (empty) index is written to the cartridge.
e. If the cartridge was mounted, the new cartridge is mounted.
f. When the Progress dialog shows that the format is complete, you can close the window.

Using the CheckWizard

The LTFSCheckWizard application has two purposes:

*   To check for problems with the format as written on the cartridge, and usually recover from them. may be required for example if the drive was powered off without cleanly unmounting the volume.

*   To facilitate the rolling back of the cartridge contents to an earlier state.

△ **CAUTION:**   Read all the text on the wizard dialog windows carefully. Completing this wizard can irretrievably modify the tape contents.

NOTE: If you execute the CheckWizard while no LTFS volume is mapped to a drive letter, the wizard may require administrative privileges, depending on system security policies and settings. Right-click on the executable and select **Run as administrator** for administrative privileges.

1. The initial screen presents information about the operation that has been started.
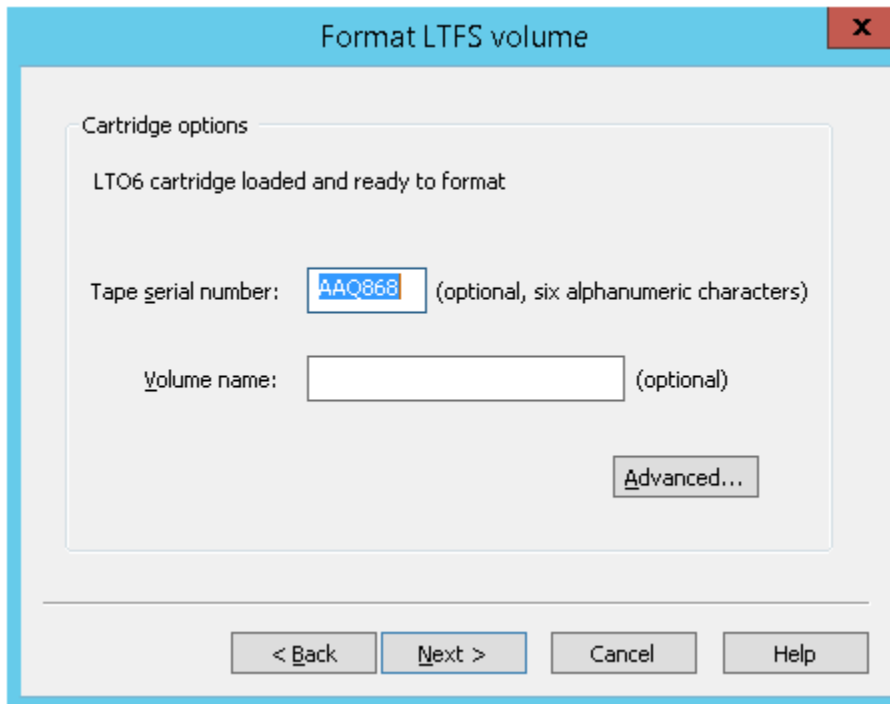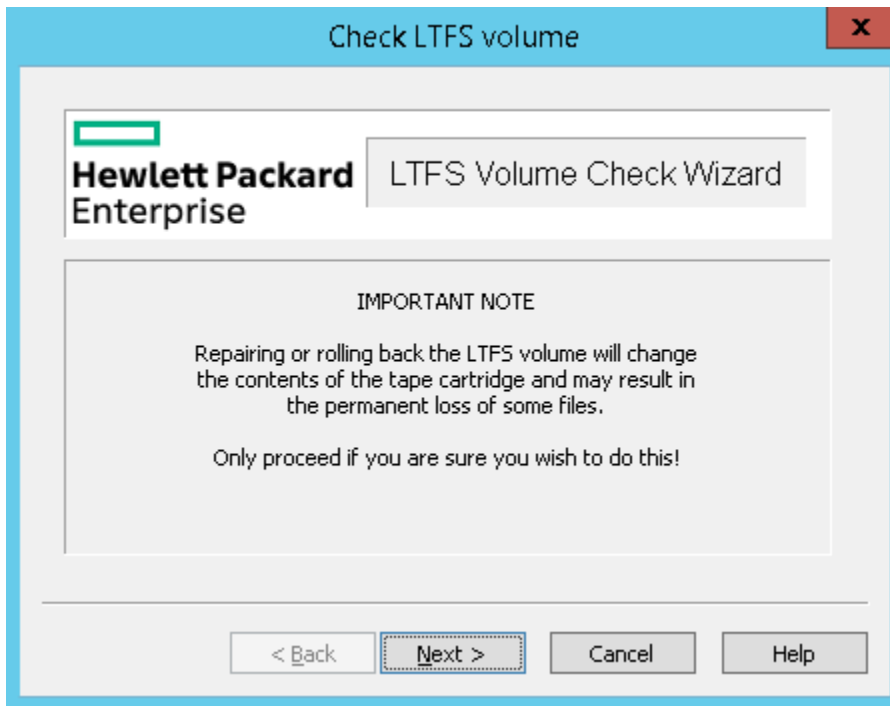
2. The next window allows you to select a tape drive.
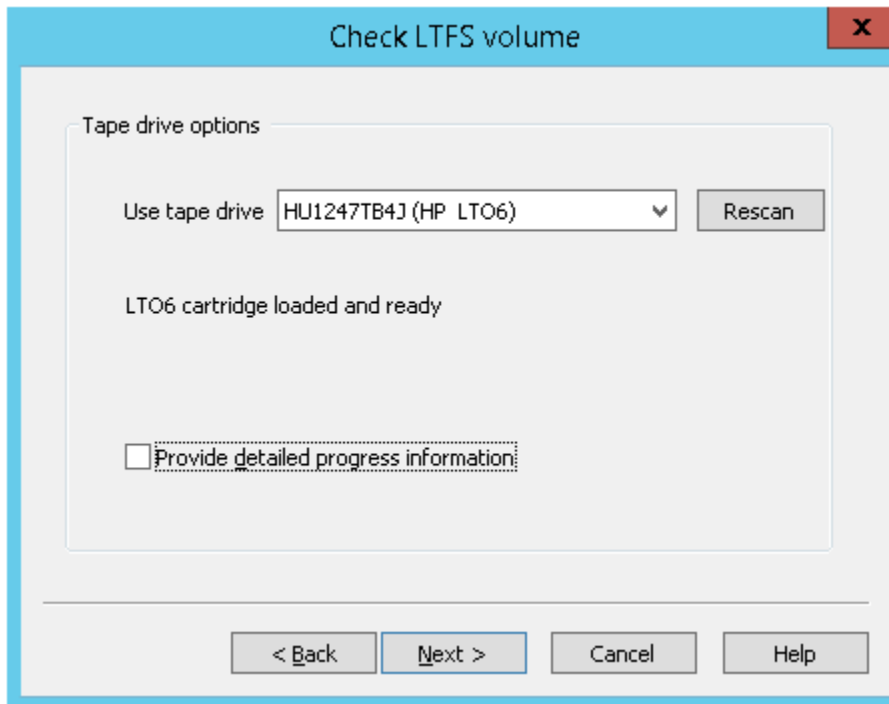
The first drive on the system (or the one being used by the mounted file system, if any) is selected by default; change the selection to use a different tape drive.

NOTE: Only drives suitable for use with LTFS are shown in the list.

Select **Provide detailed progress information** to display more detail during the checking operation.

3. The next window is where you select the desired mode of operation.
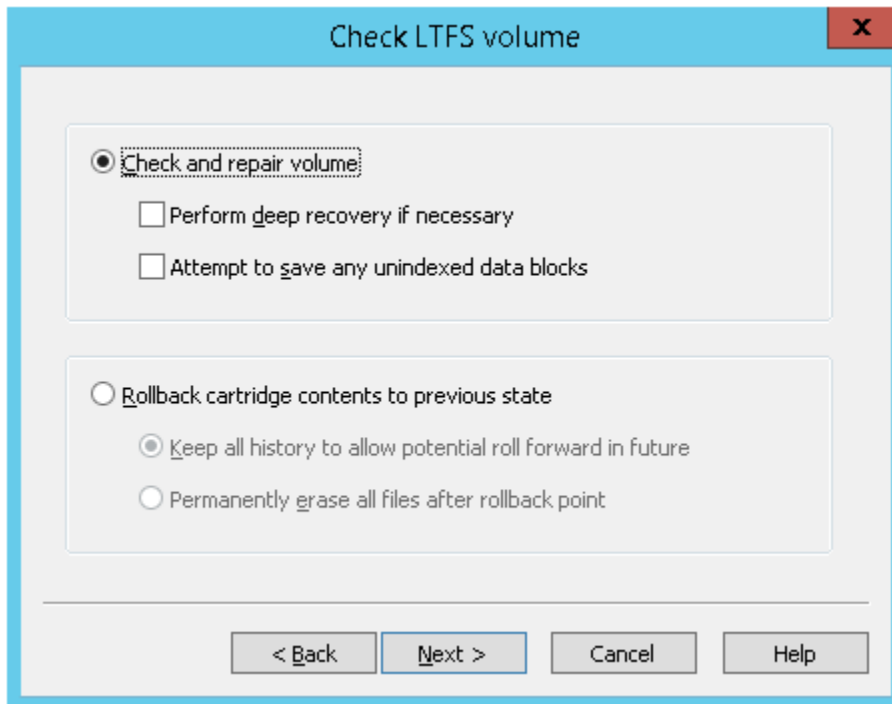
- **Check and repair volume**: To check the volume for consistency, select this option .

  - If you suspect the volume was not updated properly due to a power outage, select the **Perform deep recovery if necessary** option, which will attempt to verify and, if necessary, recover from a missing End Of data (EOD) marker. This option takes a long time and results in the loss of unindexed data blocks written since the last good index.

  - If it is important to try to recover those unindexed data blocks, select the option **Attempt to save any unindexed data blocks**. The utility will try to save the blocks to a new folder `_ltfs_lostandfound`.

    NOTE: Identify and manage recovered blocks manually, as there are no identifying details (because they were not in any index).

- **Rollback cartridge contents to previous state**: Select this option if you want to change the view of the cartridge contents to a previous point in time. There are two choices:

  - **Keep all history to allow potential roll forward in the future**: The default is to roll back the contents as viewed in the index, but not erase any data — on other words, the view of the contents is changed, but the actual contents are unchanged. This option allows for a future operation to "roll forward" the contents again, recovering changes that occurred since the rollback point. this option does not free the storage space.

  - **Permanently erase all files after rollback point**: Roll back and erase the history. In this case, any changes since the rollback point is lost. This option will free up the storage space used by those changes.

  Rollback cartridge contents: displays another window, where you can select a rollback point on the cartridge. Click **Start scan** for starting a scan of the entire volume, looking for previous index points stored on tape. This operation takes several minutes or hours. After completion, the window is refreshed to show the available rollback points. For example:
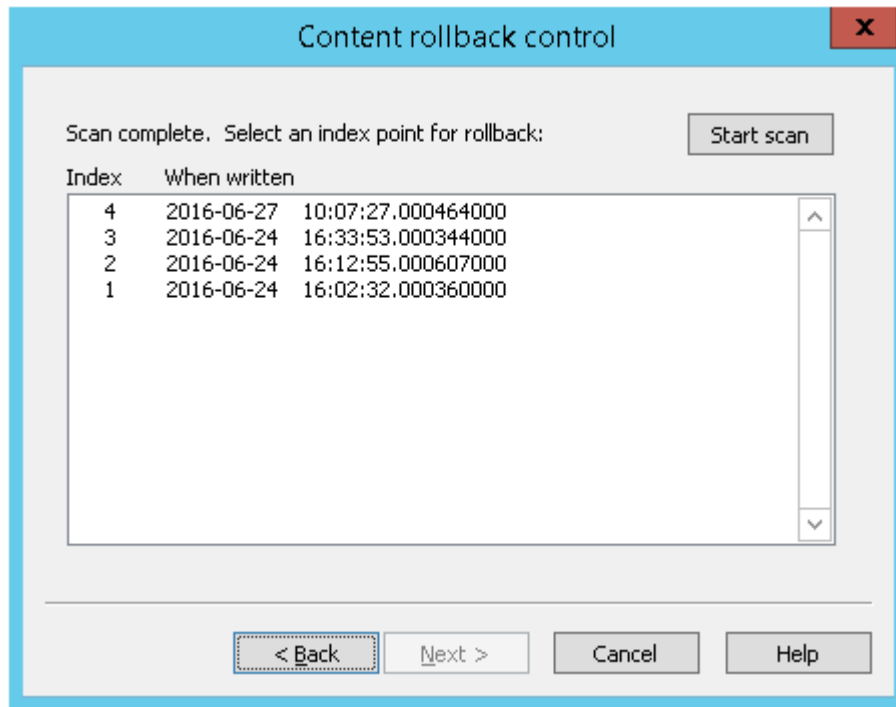
Select a rollback point and click **Next**.

4. A summary of the operation to be carried out is displayed. For example:
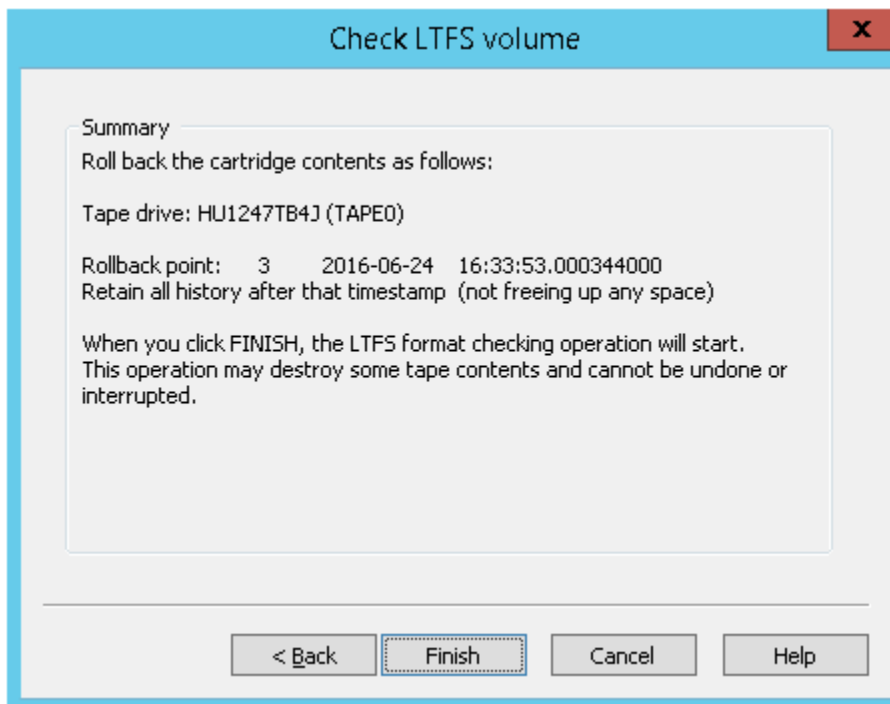
When you click **Finish**, the following operations take place:

a. If the cartridge is mounted, it is unmounted.

b. A Progress dialog window is created.

c. The check or rollback operation starts.

d. The Progress dialog is updated as the operation proceeds to completion.

e. If the cartridge was mounted, the checked or updated volume will be remounted.

5. When the Progress dialog shows that the operation is complete, you can close the window.

Using the UnformatWizard

> △ **CAUTION:** This operation will permanently remove all data present on the cartridge.

UnformatWizard option removes the LTFS format from a cartridge and return it to a single partition, so that the cartridge can be used with a different software application. This utility is similar to the FormatWizard, but is much simpler, since there is only one option affecting operation (to eject the cartridge from the drive once the format has been removed).

> **NOTE:** The UnformatWizard may request administrative privileges to execute (depending on system security policies and settings).

Using the ltfsattr utility

HPE StoreOpen Standalone version 2.2.0 onwards includes the LTFSATTR utility which can be used to access the attributes from the LTFS volume. It is a Windows command-line utility which provides similar functionality to the "attr" command in Linux and the "xattr" command in Mac OS X.

Running the ltfsattr utility with no parameters gives the usage information.

Usage:	`ltfsattr -h`
	`ltfsattr -p attrname [-v] filename`
	`ltfsattr -w attrname attrvalue [-v] filename`
	`ltfsattr -l [-v] filename`
	`ltfsattr -x attrname [-v] filename`

ltfsattr options:

`-h`	prints the usage information
`-p`	reads and displays the value of attrname for filename with -v, also displays the filename and the attribute name
`-w`	writes attribute attrname with value attrvalue for filename with -v, provides confirmation (otherwise silent on success)
`-l`	lists the user attributes for filename with -v, also lists the values (otherwise just the names)
`-x`	deletes attribute attrname for filename with -v, provides confirmation (otherwise silent on success)

> **NOTE:** Filename may also refer to a directory or folder name.

> **NOTE:** This utility manipulates extended attributes in conjunction with HPE StoreOpen Standalone software and is used in that context with a mounted LTFS volume.

HPE StoreOpen Cartridge Browser

HPE StoreOpen Standalone version 2.2.0 onwards includes a Windows GUI utility to view the contents of LTFS index files. Users can select a folder which contains LTFS index files and the utility will list all the index files in that folder. You can open a detailed view, displaying the contents of any index file.

NOTE: This utility does not interact with the tape drive or the StoreOpen software. Instead, it is an independent tool for viewing the stored LTFS index files which are generated when an LTFS volume is mounted and unmounted.
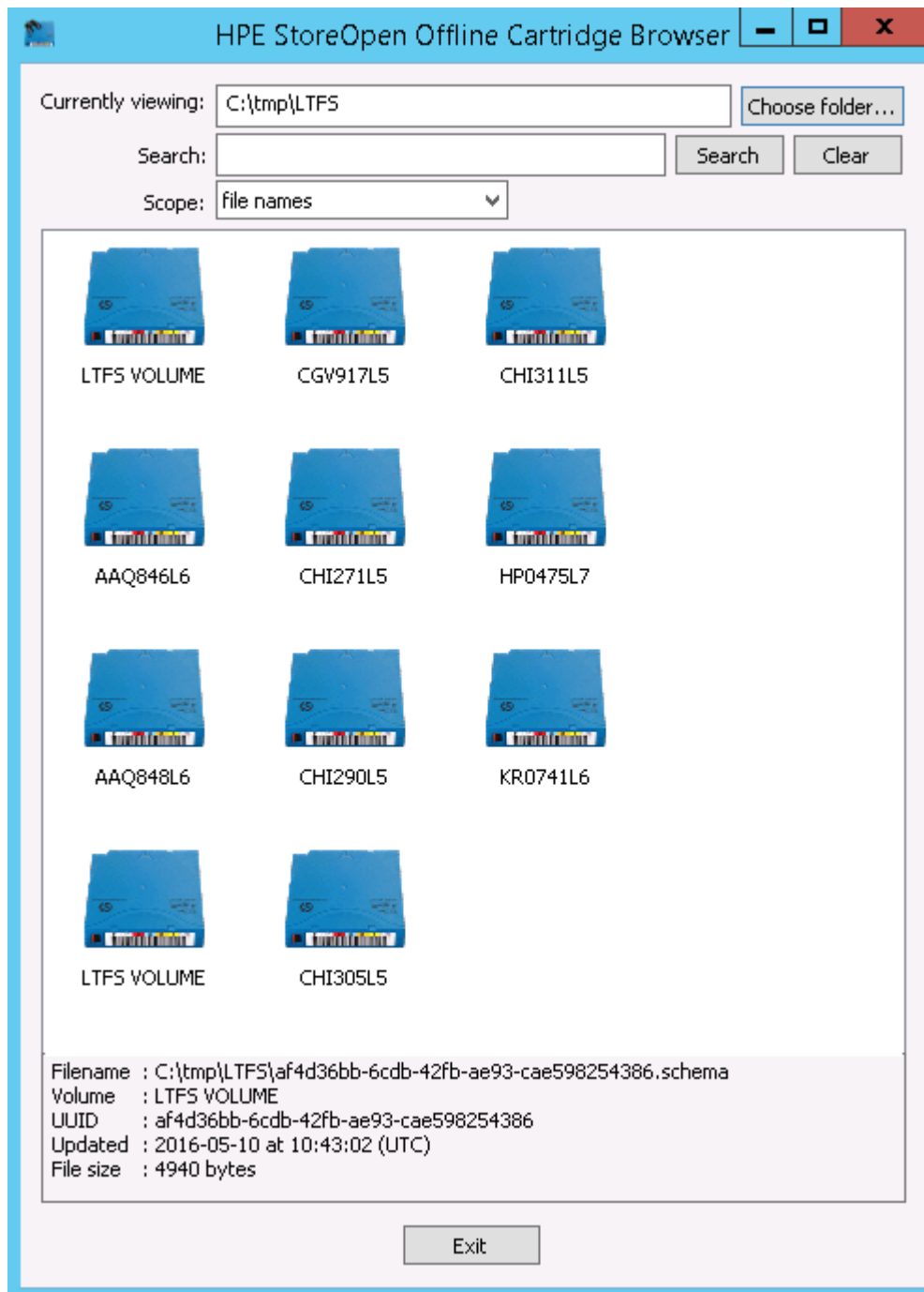
Users can select a folder where the index files are kept (in most setups this option is the directory path selected for the 'index capture' setting in the advanced options of the HPE LTFS configuration

GUI). The Cartridge Browser utility then displays all the index files in the folder. Move the mouse over a particular index file to see the details about the index.

If you double click any of the index files, the utility will open another window which shows a detailed view of the selected index as a nested expandable tree. Selecting a particular file shows the information regarding that file.
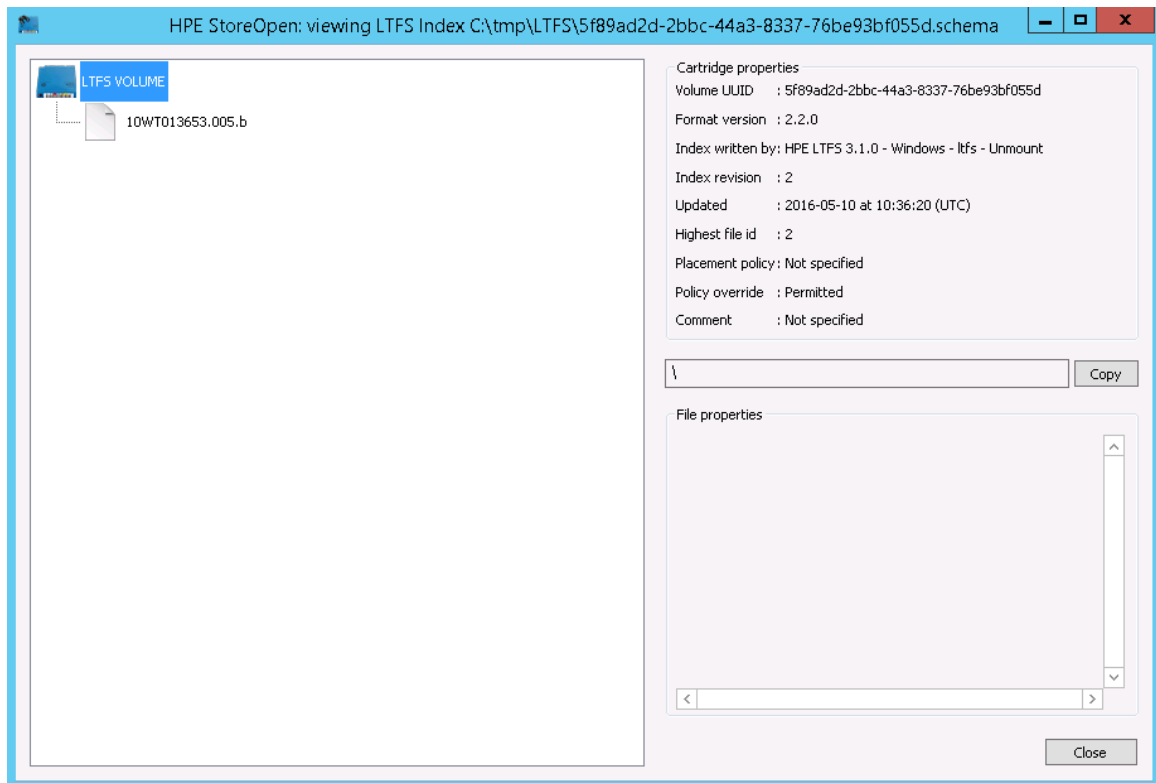
4 LTFS smart copy

The LTFS smart copy utility provides the binary `ltfscopy` command that provides the following benefits to the LTFS users:

- Faster data transfer from tape to disk and tape to tape.

- File verification using hash values.

LTFS smart copy for fast data transfer from tape

As tape is a sequential access medium, retrieving large number of files from the tape requires the tape head to seek the location of the file sequentially, until it reads all the files for copying, causing delays when using the normal copy commands provided by the operating system because those commands do not care about the location of the files on tape. When these commands are used to copy multiple files from tape to disk or another tape it will result in poor data transfer rates. The LTFS smart copy tool overcomes this limitation by rearranging the files to copy in such a way that all files can be copied in just one pass of the head. This significantly reduces the total seek time thus improving the overall performance for multi-file copy operations.

NOTE: This utility does not offer any performance improvement when transferring data from disk to tape.

LTFS smart copy for verifying files

LTFS smart copy provides the facility to verify the files on tape using a hash generated from the original source on the disk or any other storage medium. Users can use this feature in two ways:

- Verify each file after copying to tape — When copying many files from disk to tape or from tape to tape, enabling this feature will make sure that each file is verified using the hash immediately after copying the file to the target tape. After successfully verifying each file, smart copy will set the hash value as an extended attribute to the file. The tool aborts the copy operation after a file fails verification.

- Verify the files on a previously created LTFS volume — In this mode, the user provides a source path and the existing destination path on the LTFS volume. Smart copy verifies each file on the tape against the files on the source by generating hash for the file on source and the corresponding file on tape and comparing it. After the verify operation, smart copy will provide a summary indicating how many files passed the verification and how many failed. If there were failures, it provides the list of files that failed the verification.

LTFS smart copy modes of operation

LTFS smart copy has three available modes of operation. You will use the command-line options described below with the `ltfscopy` command to define the mode of smart copy operations.

- Copy Only — In this mode the user provides a source path and path to the target LTFS Volume. Smart copy does not verify the file in this mode of operation. In this mode, smart copy only copies the source files to the target LTFS volume. If the source is on an LTFS tape, smart copy improves the performance by copying files based on their location on tape.

- Copy and Verify — In this mode the user provides a source path and the path to the LTFS Volume with `--copy` and `--verify` options. Smart copy copies each file on the source to the LTFS Volume and verifies the files immediately. It will abort the copy operation after a file fails verification.

- Verify Only — In this mode the user provides a source path and a destination path on tape and gives a `--verify` option. Smart copy generates hash values for each source file, and compares it with the hash generated for the file on tape.

LTFS smart copy command-line options

The command-line options for the `ltfscopy` command are as follows:

`--help`	Displays the help for `ltfscopy` .
`--version`	Displays the version of the `ltfscopy` tool.
`-s, --source[=path]`	Path to source directory. Only the files in the source directory will be copied by default. The subdirectories and its contents will not be copied. If you would like to copy the entire source tree, use the --recursive option also.
`-d, --destination[=path]`	Path to destination directory. If the destination path does not exist, it will be created.
`-r, --recursive`	Use this option if you want to copy the entire source tree to the destination. In verify only mode, this option can be used if you want to verify all files and folders recursively.
`-v, --verify`	Verify the files at the destination by comparing the hash generated from the source file to the hash generated from the destination file. This option can be used along with `--copy` option or can be used independently. When used along with the `--copy` option, each destination file is verified immediately after copying the file. If the destination is tape, then the generated hash value will be saved as an extended attribute to the file. **CAUTION:** Using the `--verify` option with `--copy` will slow down the copy operation because of the time taken to generate hash values for the source and the destination files.
`-c, --copy`	Use this option along with the `--verify` option for copying and verifying the files. For copying the contents from source to destination, this option is not required.
`-i, --interactive`	Run in interactive mode. By default, `ltfscopy` will overwrite the existing files at the destination. Use this option if you want `ltfscopy` to prompt before overwriting existing files.
`-p, --pattern[" "]`	A search expression that describes the set of files to be copied or verified. The expression can include wildcards * and? .
`--verbose`	Displays detailed messages on what is being done by `ltfscopy`.

Running ltfscopy on Windows

The `ltfscopy` tool is installed by default when you install HPE StoreOpen Standalone. The executable name is `ltfscopy.exe` and it will be available in the installation folder where you installed the HPE StoreOpen Standalone software. The default location is `C:\Program Files\ HPE\HPE StoreOpen Standalone\`.

Command examples:

NOTE: In this example, assume that `E:\` is where the tape drive is mapped.

To copy the files from the tape cartridge to C:\photos:

`ltfscopy.exe -s E:\photos\ -d C:\Photos`

To copy files and all subfolders and files recursively:

`ltfscopy.exe -s E:\photos\ -d C:\Photos --recursive`

To copy files and all subfolders and files recursively and verify:

```
ltfscopy.exe –s E:\photos\ -d C:\Photos --copy --verify --recursive
```

To verify previously copied data by comparing it with source:

```
ltfscopy.exe -s E:\photos\ -d C:\Photos --verify –recursive
```

5 HPE StoreEver TapeAssure drive monitoring

A drive monitoring service is available as a separate download offering access to:

- Drive Health — write/read quality levels, key drive life indicators, and any service actions

- Drive Performance — host and media transfer rates and compression ratios

- Drive Utilization – the time the drive is in use as a percentage

- Tape Health – effective capacity, key tape life indicators, and any service actions

- Tape Utilization – write and read data volumes and capacity used

The download has two parts:

- The TapeAssure service that runs on the LTFS server

- CommandView TL which is used to store and view the TapeAssure data

CommandView TL is a web-based management application for Hewlett Packard Enterprise enterprise tape libraries that runs on Windows systems, and must have network connectivity with the TapeAssure service. It is used with the HPE LTFS TapeAssure service in this configuration for access to the TapeAssure data only and references to library functionality must be ignored.

See **http://www.hpe.com/info/TapeAssure** for further details, downloads, and user guides.

6 Troubleshooting

General

If problems occur during the operation of HPE StoreOpen Standalone or the underlying LTFS utilities, entries may be made in the system log (either Application or System, depending on the nature of the problem). The Source may be shown as `LTFS` or as `FUSE4WinSvc`, again depending on exactly what the problem was.

If there is a problem with tape drive interaction, HPE StoreOpen Standalone will attempt to create a snapshot of the drive internal state at the time of failure. A snapshot may also be taken at unmount time. This will be stored in the log directory specified by the Configuration tool (the default locations is `\ProgramData\HPE\LTFS\`). If these files are not useful for troubleshooting , you can remove them from the system. The software only keep the 10 most recent snapshots, deleting older logfiles as necessary.

HPE StoreOpen Standalone requires the LTO tape drive to be powered up and connected to the system. This connection can be verified using the Windows Device Manager. If the tape drive is not shown, then check cabling, power, and so on. HPE StoreOpen Standalone will not be able to operate until the drive is detected.

Similarly, the Windows driver `(hplto.sys)` must be installed and associated with the tape drive before HPE StoreOpen Standalone can communicate with it. You can install the driver from the CD-ROM that shipped with the drive, or download it from hpe.com.

Errors during configuration

Ensure that no other application is using the tape drive. If another application has control of the tape drive when the configuration tool attempts to create a mapping, you may see one or more of the following error messages:

- `An error occurred while checking the drive status. Please try again.`

- `Operation failed, failed to get exclusive access. Device may be busy.`

- `Drive is inaccessible, The parameter is incorrect.`

In each case, a typical resolution is to find and close the other application that is accessing the tape drive. Other questions to consider are:

- Is the drive is connected and visible in Device Manager?

- Has the user the administrative privileges required to perform the operation?

If the configuration utility determines that the current cartridge is not formatted for use with LTFS, a question is displayed, asking you if you wish to format before proceeding. If you answer **NO** (do not format), the mapping will be created but the cartridge will not be formatted, and so will not be accessible. At this point, you must either format the cartridge (starting the FormatWizard manually) or else eject the cartridge and replace it with one that is already formatted for LTFS.

Explorer windows not refreshing

Any open Explorer window closes automatically after alteration of the contents of the cartridge by one of the Wizard utilities(for example if the format is removed from a cartridge). However, in some cases the Explorer window may not be updated, even though a refresh was requested by the software. In this case you need to refresh the window manually (**F5** or **View→Refresh**).

7 Frequently asked questions

Q: How do I get HPE StoreOpen Standalone?

A: All application downloads and documentation are available from the website at:**www.hpe.com/storage/StoreOpen**.

Q: What are the minimum system requirements?

A: Any server that fulfills the needs of the supported configurations detailed in "Supported configurations" (page 5).

Q: Does HPE StoreOpen Standalone support DDS/DAT devices?

A: No. Only LTO-5, LTO-6, and LTO-7 drives are supported with HPE StoreOpen Standalone.

Q: Does HPE StoreOpen Standalone support non-HPE devices?

A: Although the application may recognize and work with LTO drives from other manufacturers, Hewlett Packard Enterprise is only able to support use with HPE StoreEver LTO-5, LTO-6, and LTO-7 drives.

Q: Why does not LTFS work with my LTO-4 or earlier drives?

A: LTFS relies on a drive feature called partitioning, which was added to the LTO-5 format onwards. It is not part of the LTO-4 or earlier tape formats and they cannot be used.

Q: Can I use LTO-4 media in my LTO-5 or LTO-6 drive?

A:LTO-5 drives can load, read and write LTO-4 media, and LTO-6 drives can load and read (but not write) LTO-4 media. However, the LTO-4 format does not support partitioning, so LTO-4 media cannot be used with LTFS.

Q: Can I use WORM media with LTFS?

A: No, WORM media cannot be partitioned and so cannot be used with LTFS.

Q: Can I uninstall HPE StoreOpen Standalone?

A: Yes. You can remove HPE StoreOpen Standalone software using the normal Windows Control Panel procedures.

Q: Where do I go when I have a problem?

A: For most common issues, see Troubleshooting (page 30). If this option does not address the issue, send an email to **storeopen.cpe@hpe.com**.

Q: Does HPE StoreOpen Standalone replace my existing backup software?

A: In most cases, it is recommended that you continue to use your existing backup application. HPE StoreOpen Standalone provides a good method of storing and transporting large files but is not generally a direct replacement for a backup application.

Q: Is source code available for LTFS?

A: Yes, full source code for the LTFS components is released under the terms of the LGPLv2.1 and can be downloaded from **www.hpe.com/storage/StoreOpen**. However, customers who choose to download and build their own versions of the LTFS application are not supported.

Q: Why are all my files on my LTFS volume shown with a gray cross in Windows Explorer?

A: This issue is because they are being reported in the Offline state to prevent Windows from trying to build thumbnails. See "Thumbnails" in "Mount options" (page 10).

8 Support and other resources

Accessing Hewlett Packard Enterprise Support

- For live assistance, go to the Contact Hewlett Packard Enterprise Worldwide website:

  www.hpe.com/assistance

- To access documentation and support services, go to the Hewlett Packard Enterprise Support Center website:

  www.hpe.com/support/hpesc

Information to collect

- Technical support registration number (if applicable)

- Product name, model or version, and serial number

- Operating system name and version

- Firmware version

- Error messages

- Product-specific reports and logs

- Add-on products or components

- Third-party products or components

Accessing updates

- Some software products provide a mechanism for accessing software updates through the product interface. Review your product documentation to identify the recommended software update method.

- To download product updates, go to either of the following:

  ○ Hewlett Packard Enterprise Support Center **Get connected with updates** page:

    www.hpe.com/support/e-updates

  ○ Software Depot website:

    www.hpe.com/support/softwaredepot

- To view and update your entitlements, and to link your contracts and warranties with your profile, go to the Hewlett Packard Enterprise Support Center **More Information on Access to Support Materials** page:

  www.hpe.com/support/AccessToSupportMaterials

- ⓘ **IMPORTANT:** Access to some updates might require product entitlement when accessed through the Hewlett Packard Enterprise Support Center. You must have an HP Passport set up with relevant entitlements.

Related indormation

For diagnosing Library and Tape drive related issues, you can use "HPE Library and Tape Tools". For more information about using L&TT, refer to the L&TT user guide available at **http://www.hpe.com/support/**.

Websites

For additional information, see the following Hewlett Packard Enterprise websites:

- **http://www.hpe.com**
- **http://www.hpe.com/info/storage**
- **http://www.hpe.com/support/manuals**
- **http://www.hpe.com/support/downloads**

Documentation feedback

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