Hewlett Packard Enterprise HPE Support Center

HPE StoreOpen and Linear Tape File System (LTFS) Software - Installation and Configuration

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Installation and configuration for HPE StoreOpen Standalone 3.1.0 (MicrosoftWindows)

When using HPE StoreOpen Standalone with HPE LTO tape drives, user need the followingcomponents:

- HPE LTO-5, LTO-6 or LTO-7 tape drive connected to a supported SAS HBA.
- A drive firmware revision that supports dual partitioning. HPE Library and Tape Tools (L&TT) should be used if a firmwareupdate is required.
- The latest tape driver (**hplto.sys**) installed.
- The software package installer executable.

  Click here to view and install the software package .

NOTE: HPE L&TT can be downloaded from the below link:

Click here to view and download L&TT .

Downloading and installing HPE StoreOpen Standalone

To use the precompiled binaries:

- Download the installer appropriate for the Operating System.
- When the download has completed, run the installer. Note that administrator privileges maybe required depending on the 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.

Uninstalling HPE StoreOpen Standalone

To remove the software from the system, follow these steps:

1. Unmount any LTFS file system which are currently mounted.

   Removing the LTFS volume

   There are two different ways of removing the LTFS volume:

   - User can physically eject the cartridge from the drive by right-clicking on the drive and selectingthe option to **Eject LTFS volume**. In this case the drive letter will remain reserved, althoughit cannot be accessed until another LTFS cartridge is loaded into the drive.
   - User can run the configuration tool again, select the drive from the drop-down list and click**Remove Mapping** button. This will unmount the volume (but leave the cartridge in the tapedrive) and then terminate the service. The drive letter is then released and can no longer beaccessed. Follow the steps described in **Mapping a tape drive to a drive letter** below, to set up a new LTFS volume.

   Mapping a tape drive to a drive letter

   Before user can access the tape cartridge as a volume, user must first establish a mapping betweenthe tape drive and a Windows drive letter. To do this, run the **LTFS Configuration Tool** locatedin the HPE StoreOpen Standalone program group.

NOTE: The tool may request administrative privileges, depending on the system securitypolicies.

The configuration window will appear on the system:

By default the first usable tape drive found on the system is selected, along with the first unuseddrive letter. Change the selections as desired, then to mount with all the default options, click**Create mapping**. This results in the following actions:

a. The configuration tool checks that the drive is accessible and usable.

b. The tool attempts to verify that the system has suitable HBA driver support for LTFSoperation.

c. The tool looks for a currently loaded tape cartridge. If a cartridge is found, it is checked tosee if it is formatted as an LTFS volume. If not, user is offered with the option of formatting thecartridge before proceeding. It is recommended that user should accept this option.

d. Once a formatted cartridge is detected, or if no cartridge is present, the file system serviceis started and the window is updated to reflect the new configuration. The following screenshotillustrates a typical view after a mapping has been established:

e. When the mapping has been established, user 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 user access thisdrive volume, there will be a slight delay whilst the index is loaded and checked, but from thenon the drive volume may be accessed as normal.

CAUTION: If user inserts a cleaning cartridge while a drive letter is assigned to the tape drive,HPE StoreOpen will attempt to use the cartridge. This can degrade the life of the cleaning cartridge.In order to preserve the cleaning cartridge, remove the drive letter mapping for the tape drive byusing the LTFS configurator before inserting the cleaning cartridge in to the tape drive.

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.

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Installation and configuration for HPE LTFS 3.1.0 (Linux)

When using HPE LTFS with LTO-5, LTO-6 or LTO-7 tape drives, the following components arerequired:

- A drive firmware revision that supports dual partitioning. HPE LTFS will check and tell the user ifthe tape drive needs updating. HPE L&TT should be used if a firmware update is required.
- The software package that contains the **run-time** executable.

  Click here to view and install the software package .
- The FUSE kernel module.
- The International Components for Unicode (ICU) libraries.

NOTE: HPE L&TT can be downloaded from the below link:

Click here to view and download L&TT .

Downloading and installing HPE LTFS (precompiled binaries)

1. Before starting to install and use HPE LTFS, make sure that the FUSE kernel moduleis present and loaded.

   To check, execute the following command:

   ```
   $ lsmod | grep fuse
   ```

   - If the module is not listed as currently loaded, user must load it before proceeding with the following command:

     ```
     $ modprobe fuse
     ```
   - If the module is not present on the system, user must first obtain and install it.

     Click here to view more information on this .
2. User must determine whether to use the precompiled binaries or to build their own version of theHPE LTFS application.

   To build own version of the application, download and unpack the tar source file and then follow the instructionsin **ltfs-<version>/doc/BUILDING.linux**.

   NOTE: Only the installations that use HPE supplied binaries are supported.
3. To use precompiled binaries, download the appropriate package file and unpack it.

For example, the installation package for RHEL x64 contains the following files:

- RPM package file for installation on 64–bit systems.
- README file (general usage information).
- **INSTALLING.linux** (prerequisites and installation instructions).
- **COPYING.lib** (LGPL v2.1 required licensing text).

4. Install the appropriate RPM package depending on the architecture:

```
$ rpm -ivh <file_name>
```

NOTE: Upgrading to SOS 3.1.0 is not supported, it is required to uninstall the current versionbefore installing SOS 3.1.0 version. For installation instructions on Linux and Mac operatingsystems, see **INSTALLING.linux** or **INSTALLING.macosx** file respectively.

5. HPE LTFS is now installed.

NOTE:

- The precompiled binaries supplied by HPE require additional shared librarieswhich may not be present on every system, or which may need to be updated in order for thebinaries to execute.
- If the dependencies are installed by compiling the source, **--nodeps** switchwith the **rpm** command for installing the rpm.

To uninstall HPE LTFS

To uninstall HPE LTFS from the system, execute the below command:

```
$ rpm -e hp-sos
```

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Installation and configuration for HPE LTFS 3.1.0 (Mac OS X)

When using HPE LTFS with LTO-5, LTO-6 or LTO-7 tape drives, the following components arerequired:

- A drive firmware revision that supports dual partitioning.
- The software package that contains the **run-time** executable.
- The OSXFUSE kernel module (or, for older systems, the MacFUSE kernel module).
- The ICU libraries (Included in the installer package).

NOTE: HPE LTFS will check and tell if the tape drive needs updating. HPE L&TT shouldbe used if a firmware update is required.

Click here to view and download L&TT .

Downloading and installing HPE LTFS (precompiled binaries)

1. User must determine whether to use the precompiled binaries or to build their own version of theHPE LTFS application.

   To build own version of the application, download and unpack the source tar file and then follow the instructionsin **ltfs-<version>/doc/BUILDING.macosx**. In this case user must also obtainand install the OSXFUSE and ICU packages.

   NOTE: Only the installations that use HPE supplied binaries are supported.

2. To use precompiled binaries, download the install file for Mac Os.

   This contains the three packages that are necessary for operation: **OSXFUSE**, **ICU** and**LTFS**.

3. Install the ICU package first by double-clicking on the file **ICUFramework-<version>.pkg**and following the instructions.
4. Install the OSXFUSE package in a similar way.

   NOTE: While installing OSXFUSE, make sure that **MacFUSE compatibility Layer** isselected for installation. Click here to view the HPE BURA Compatibility Matrix for compatibility of versions of OSXFUSE/MacFUSE with correspondingMac OS X versions .

5. Install the HPE LTFS package by double-clicking on the install file and following the instructions.
6. HPE LTFS is now installed. The installation package also places a **HPE Linear Tape FileSystem** application in the Applications folder which can be used to simplify the tasks ofpreparing, formatting and mounting an LTFS volume.

To uninstall LTFS

- If at a later date user wants to uninstall HPE LTFS from the system, should delete **/usr/local/bin/*ltfs*** and then delete the tree under **/Library/Frameworks/LTFS.framework**.

- The GUI management application can be uninstalled by dragging it to the **Trash**. To cause thePackage Manager subsystem to remove references to LTFS, execute the command:

  ```
  pkgutil --forget com.hp.ltfs
  ```

- To delete the ICU package as well, delete the tree under **/Library/Frameworks/ICU.framework**.

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Installation and configuration for HPE StoreOpen Automation 3.1.0 (MicrosoftWindows)

When using HPE StoreOpen Automation with HPE LTO tape libraries, the following components arerequired:

- HPE tape library with supported tape drives, connected via a supported SAS or FC HBA.
- The Library or partition must not contain more than 4 drives and 48 slots.
- A drive firmware revision that supports dual partitioning. HPE L&TT should be used if a firmwareupdate is required.
- The latest drivers for libraries and tape drive (**hplto.sys**) installed.

  Click here to view the HPE support website for downloading latest drivers .
- Software uses the unique barcode on tapes, mounted with HPE StoreOpen Automation, foridentifying process. Those barcodes currently must consist of 8characters and the last two characters must indicate the media generation (L5, L6 or L7).
- HPE StoreOpen Automation installer executable.

  Click here to view and download the installer for HPE StoreOpen Automation .

NOTE: HPE L&TT can be downloaded from the below link:

Click here to view and download L&TT .

Downloading and installing HPE StoreOpen Automation

To use the precompiled binaries:

1. Download the installer appropriate to the operating system.
2. When the download has completed, launch the installer by double clicking the installerexecutable

   ---

   NOTE: The administrator privileges may be required depending on the systemconfiguration.

   ---

3. Follow the installer steps until the installation is complete.

The executables will be installed into a new menu group under Hewlett-Packard\HPE StoreOpenAutomation in the **Start Menu**, **Programs**.

Uninstalling HPE StoreOpen Automation

To remove the software from the system, follow these steps:

1. Unmount any LTFS file system that are currently mounted
2. Close all LTFS program windows.
3. Open the Windows Control Panel and select **Uninstall a program**.
4. From the list of installed software, select **HPE StoreOpen Automation** and then click **Uninstall**.

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Installation and configuration for HPE StoreOpen Automation 3.1.0 (Linux and Mac OS)

CAUTION:

- **Do not run multiple instances of HPE StoreOpen Automation on a single hostmachine. The software will only allow one instance to be running at any time.**
- **Installing an instance of HPE StoreOpen Automation on a Linux/Mac host machinealready running HPE LTFS (HPE SOS) for standalone LTO drives is not supported. Portions of thestandalone software will be modified and may become unusable.**

NOTE: Do not install HPE Storage TapeAssure LTFS service version 1.0, for SLES and RHEL.This software is for the standalone version of LTFS. The MSL, EML and ESL libraries supportHPE TapeAssure directly and do not require this service to collect TapeAssure data.

Configure the open source software dependencies

- FUSE

Table 1: FUSE site and filename details

Operating System	Site	Compatible Versions
RHEL 6.0 through 6.8 (x86_64)	Click here to view the site .	fuse-2.8.4

Operating System	Site	Compatible Versions
RHEL 7.0 through 7.2 (x86_64)	Click here to view the site.	fuse-2.9.2
Mac OS X 10.7 through 10.11	Provided with the HPE StoreOpen Automation package	Install OSXFUSE 2.8.3

Instructions, comments:

untar the file to a test directory, then follow the instructions.

Before starting to install and use HPE StoreOpen Automation, make sure that the FUSEkernel module is present and loaded. To check, execute the following command:

```
$ lsmod | grep fuse
```

If the module is not currently loaded, user can load it as follows:

```
$ modprobe fuse
```

- libxml2

Table 2: libxml2 site and filename details

Operating System	Site	Compatible Versions
RHEL 6.0 through 6.8 (x86_64)	Click here to view the site	libxml2-2.7
RHEL 7.0 through 7.2 (x86_64)	Click here to view the site	libxml2-2.9
Mac OS X 10.7 through 10.11	Not required	Not required

Instructions, comments:

Installs as a **rpm**, but be prepared for installation issues since other software may havedependencies on other versions of this package.

Be prepared for the **rpm** command to appear to hang for a minute or two before reportingsuccessful status.

- libicu

Table 3: libicu site and filename details

Operating System	Site	Compatible Versions
RHEL 6.0 through 6.8 (x86_64)	Click here to view the site	ICU 50.1.2
RHEL 7.0 through 7.2 (x86_64)	Click here to view the site	ICU 50.1.2
Mac OS X 10.7 through 10.11	Provided with the HPE StoreOpen Automation package	ICU 50.1.2

Instructions, comments:

Find the **readme** file in the download and follow the process.

- libuuid

Table 4: libuuid site and filename details

Operating System	Site	Compatible Versions
RHEL 6.0 through 6.8 (x86_64)	Click here to view the site	e2fsprogs 1.4.1
RHEL 7.0 through 7.2 (x86_64)	Click here to view the site	e2fsprogs 1.42
Mac OS X 10.7 through 10.11	Not required	Not required

Instructions, comments:

Find the **readme** file in the download and follow the process.

- Xcode

Table 4: libuuid site and filename details

Operating System	Site	Compatible Versions
RHEL 6.0 through 6.8 (x86_64)	Not required	Not required
RHEL 7.0 through 7.2 (x86_64)	Not required	Not required
Mac OS X 10.7 through 10.11	Provided with the OS X DVD	Xcode package from the OS X DVD

Instructions, comments:

Find the **readme** file in the download and follow the process.

Installing HPE StoreOpen Automation

Download the installation package for the Operating System (OS) and save it in a temporary directory on the system.

To install HPE StoreOpen Automation on the RHEL system

To install HPE StoreOpen Automation on Linux, follow these steps:

1. Download the installer package appropriate for the OS.
2. Unzip the zip file:

   ```
   gunzip HPE_STOREOPEN_AUTOMATION_3.1.0_RHEL_x64_PKG.tar.gz
   ```
3. Untar the package:

   ```
   tar -xvf HPE_STOREOPEN_AUTOMATION_3.1.0_RHEL_x64_PKG.tar
   ```

   This will extract the contents of the package to the current directory.
4. Install the rpm package by running this command:

   ```
   rpm -ivh hp-soa-x.x.x-xx.x86_64.rpm
   ```

NOTE: Upgrading to SOA 3.1.0 is not supported, it is required to uninstall the current version beforeinstalling SOA 3.1.0 version.

HPE StoreOpen Automation requires the open source software mentioned above. Click here to view the section Configure the open source software dependencies . The rpm installer expectsthese dependencies to be installed from their rpm package.

If any of those dependencies are installed by compiling the source, installation of the rpm packagewill fail because it will not detect that dependency in the RPM database. In that case, the userwould need to run the rpm installer with the **--nodeps** switch:

Sample command:

```
#rpm -ivh hp-soa-x.x.x-xx.x86_64.rpm --nodeps
```

To install HPE StoreOpen Automation on a MacOS X system

Install the HPE StoreOpen Automation package by double-clicking on the **.dmg** file.

Uninstalling HPE StoreOpen Automation

- **To remove HPE StoreOpen Automation from an RHEL**

  To un-install HPE StoreOpen Automation, issue the following command:

  ```
  # rpm -e hp-soa
  ```
- **To remove HPE StoreOpen Automation from a MacOS X system**

  Delete **/usr/local/bin/*ltfs*** and then delete the tree under **/Library/Frameworks/LTFS.framework**.

  The GUI management application and the GUI utilities can be uninstalled by dragging them to the**Trash**. To delete the ICU package, delete the tree at **/Library/Frameworks/ICU.framework**.

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Installation and configuration for HPE StoreOpen Standalone 3.1.0 (MicrosoftWindows)

When using HPE StoreOpen Standalone with HPE StoreEver LTO tape drives, need the followingcomponents:

- 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 isrequired.
- The latest tape driver (hplto.sys) installed
- The software package Installer executable. Click here to download the file .

Downloading and installing HPE StoreOpen Standalone

To use the precompiled binaries:

- Download the Installer appropriate to operating system.
- When the download has completed, run the Installer. Administrator privileges may be required dependingon user's 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 nextsteps, click here to access drivers & software page for HPE StoreOpen Standalone .

Uninstalling HPE StoreOpen Standalone

If user wants to remove the software from system, follow these steps:

Procedure

1. Unmount any LTFS file system user currently have mounted click here to view Removing the LTFS volume .
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 **Uninstall** button.

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Using HPE StoreOpen Standalone - 3.2.0 (MicrosoftWindows)

Mapping a tape drive to a drive letter

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

NOTE: The tool may request administrative privileges, depending on user's system security policies.

The configuration window will appear on system:

By default the first usable tape drive found on 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**. Thefollowing actions are performed:

1. The configuration tool checks that the drive is accessible and usable.
2. The tool attempts to verify that user's 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 isformatted as an LTFS volume. If not, user are offered the option of formatting the cartridge beforeproceeding. It is recommended must to accept this option.
4. Once a formatted cartridge is detected, or if no cartridge is present, the file system service is started andthe window is updated to reflect the new configuration. The following screen illustrates a typical view aftera mapping has been established:

5. When the mapping has been established, user can close or minimize the configuration tool, or choose tomap 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 user access this drive volumethere will be a slight delay while the index is loaded and checked, but from then on the drive volume may beaccessed as normal.

CAUTION: If user insert a cleaning cartridge while a drive letter is assigned to the tape drive, HPE StoreOpen willattempt to use the cartridge. This action can degrade the life of the cleaning cartridge. To preserve thecleaning cartridge, remove the drive letter mapping for the tape drive by using the LTFS configuratorbefore inserting the cleaning cartridge in to the tape drive.

Mount options

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

- **Mount read-only**: If user 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 thatit automatically restarts when the system boots up. Clear this option to avoid restarting (for example, if it isa temporary setup where the tape drive is removed after the system closes).
- **Advanced options** : This option opens a further window where user can modify advance options.

  NOTE: Some of these options might have a noticeable impact on performance and in general mustnot be changed.

  - **Support ticket folder:** Is the location where drive logs are stored. These logs are generated on eachunmount and whenever an error is detected. The application will keep the 10 most recent logs andautomatically delete any older logs. These logs may be useful to Hewlett Packard Enterprise supportpersonnel but otherwise can be ignored.
  - **Enable verbose logging:** This option is not required in normal operation and you must only use it whenrequested by Hewlett Packard Enterprise support personnel, as it will have an adverse effect onperformance.
  - **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 torepresent the content of each file. This option is not desirable in an LTFS volume, because it may takemany minutes or even hours to generate the thumbnails. So by default HPE StoreOpen Standalonetells the operating system that the volume is in the "offline" state, which prevents automatic thumbnailcreation. You can turn this option off if desired, but can effect the time, to open and access folders.
  - **Index capture** : This option allows to keep a copy of the latest index from tape on the local disk.The check box and the folder path to save the index file after the tape is unmounted is selected bydefault.
  - **Index updates** : This option allows to control when indexes are written to tape; see Index updatesbelow.

- **Index partition usage** : The LTFS format allows to write data files in the index partition, whichimproves access times for frequently used files. However, in general user must leave this setting in itsdefault state.

Index updates

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

The second option is to write the index to tape only when a volume is removed. In normal operation thisoption 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, throughan unplanned power outage or accidental unplugging, the volume in an inconsistent state, and all files addedsince 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 behaviorfor a particular situation. The following table summarizes the options available for choosing when the index isupdated:

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

Cartridge utilities

The cartridge utilities button opens a further window where user 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, butattempting to access the volume while no cartridge is present will result in the error message `The deviceis not ready`. When a formatted LTFS cartridge is loaded into the drive, the index will be read andchecked, and then the volume may again be accessed.
- **Format**: Starts the FormatWizard to guide user through the steps and options of creating a fresh volume onthe current cartridge, for more information view in Using the FormatWizard .
- **Unformat**: Runs the UnformatWizard to guide user through the steps and options of removing the LTFSformat from the tape.
- **Check**: Runs the Error-checking tool which scans the volume for consistency and can correct certainproblems with the format, click here to view Using the CheckWizard for more details .

Using volume advisory lock

Volume advisory lock option is an alternate to the latch on the LTFS volume. After formatting the volume is inan unlocked state, by using this option user can lock, unlock, and permanent lock a volume through SOSapplication. If a volume is in permanent lock state, it must be formatted to set to unlock state. User cannot lockor unlock a volume from a permanent lock state. Volume is also set to permanent lock state due to writingerrors.

Syntax

- `ltfsattr.exe -p ltfs.volumeLockState E:/`
- `ltfsattr.exe -w ltfs.volumeLockState 1 E:/`

  Where E:/ is the mount point where tape is mounted.

Inputs

To lock a volume:

```
ltfsattr.exe -w ltfs.volumeLockState 1 E:/
```

To unlock a volume:

```
ltfsattr.exe -w ltfs.volumeLockState 0 E:/
```

To permanently lock a volume:

```
ltfsattr.exe -w ltfs.volumeLockState 2 E:/
```

To view the status of a volume:

```
ltfsattr.exe -p ltfs.volumeLockState E:/
```

Output

0	Volume is in unlocked state. User can lock and againunlock a volume. You can also permanent lock avolume from this state.

1	Volume is in a locked state. User can unlock andagain lock a volume. You can also permanent lock avolume from this state.
2	Volume is in permanent lock state. User can lock andunlock the volume only after formatting the volume.
4	Volume is physically locked.
5	Volume is physically and virtually locked.
6	Volume is permanently and physically locked.
33	Volume is locked due to write error.
37	Volume is physically locked and locked due to writeerror.

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-protectinformation.

File names

To maintain compatibility when copying files between multiple platforms, it is recommended not use thefollowing 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 thetape (for example, as reported by Explorer) will indicate that there is still some capacity available, but thatis 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 isreported) will mount as Read Only, to prevent further modifications that may not fit on the tape. This statusis cleared when the cartridge is reformatted (using mkltfs) or when the volume is rolled back, erasing thehistory.
- MAM and LTFS attributes cannot be listed using the ltfsattr command. The ltfs and MAM attributes arecase-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.User can run the LTFSCheckWizard command to fix this issue. This command fixes the issue by rollingback the tape to a previous good index.

Working with Windows Explorer

Once the mapping has been established and an LTFS-formatted cartridge loaded, user can access thecontents of the cartridge either at a command prompt or through Windows Explorer. The following screen shotshows 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 theoperating 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 thatWindows calculates and report capacities in binary GB (230 bytes) and TB (240 bytes) instead of decimalGB (109 bytes) and TB (1012) bytes. These readings indicates worst-case scenarios, if the volume ishaving 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 currentcartridge. More information, see Using the FormatWizard.
  - Eject LTFS volume - physically eject the LTFS volume from the tape drive. The file system will continueto 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 followingscreenshots:

The comments given earlier about the Explorer view (file system category, capacity figures) also apply to theinformation 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 theformat, for more details for more details click here to see Using the CheckWizard .

- The format volume tool starts the FormatWizard to guide user through the steps and options of creating afresh volume on the current cartridge, for more information click here to view Using the FormatWizard
- The configuration tool brings up the same window used when the volume was mapped, and is aconvenient way to remove the volume.

NOTE: This action might require administrative privileges depending on system policies andsettings.

The LTFS Details tab provides information about the tape drive, the LTFS volume, and also the cartridgelifetime usage.

Removing the LTFS volume

There are two different ways of removing the LTFS volume:

- Physically eject the cartridge from the drive by right-clicking on the drive and selecting the optionto Eject LTFS volume. In this case, the drive letter will remain reserved, although it cannot be accesseduntil another LTFS cartridge is loaded into the drive.
- Run the configuration tool again, select the drive from the list, and click **Remove Mapping** . Thisaction unmounts the volume (but leave the cartridge in the tape drive) and then stop the service. Thisaction results in unmapping of the drive letter and is not accessible. Click here to view Mapping a tape drive to a drive letter 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. TheLTFS Format Wizard application helps to select appropriate options and settings and then formats the tape.User can run it from the context menu, from the LTFS Tools tab in the drive properties, or from the HPEStoreOpen Standalone program group.

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

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

Procedure

1. The initial screen presents information about the operation that has been started.
2. The next window allows user 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 bydefault, 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 offthis option.

   The other option on this screen allows user to request that more detail is shown during the formatoperation.
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. Tapeserial number must be less than six alphanumeric characters (A–Z, 0–9). Volume name is a free-formattext string.

   The **Advanced** button leads to a further set of options, however it is recommended that user leave theseoptions to default settings.
4. The final window summarizes the format operation that have defined using the wizard.

   When 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, user 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 berequired 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.

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

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

1. The initial screen presents information about the operation that has been started

2. The next window allows selecting a tape drive.

   The first drive on the system (or the one being used by the mounted file system, if any) is selected bydefault, 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 user 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 amissing End Of data (EOD) marker. This option takes a long time and results in the loss ofunindexed 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 saveany 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 user want to change the view ofthe 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 thecontents as viewed in the index, but not erase any data - on other words, the view of the contentsis changed, but the actual contents are unchanged. This option allows for a future operation to **rollforward** the contents again, recovering changes that occurred since the rollback point. this optiondoes not free the storage space.
     - Permanently erase all files after rollback point: Roll back and erase the history. In this case, anychanges since the rollback point is lost. This option will free up the storage space used by thosechanges.

       Rollback cartridge contents: displays another window, where user can select a rollback point on thecartridge. Click **Start** scan for starting a scan of the entire volume, looking for previous index pointsstored on tape. This operation takes several minutes or hours. After completion, the window isrefreshed 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 user 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, user 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 thecartridge can be used with a different software application. This utility is similar to the FormatWizard, but ismuch simpler, since there is only one option affecting operation (to eject the cartridge from the drive once theformat has been removed).

NOTE: The UnformatWizard may request administrative privileges to execute (depending on systemsecurity policies and settings).

Using the ltfsattr utility

HPE StoreOpen Standalone version 2.2.0 onwards includes the LTFSATTR utility which can be used toaccess the attributes from the LTFS volume. It is a Windows command-line utility which provides similarfunctionality 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 ofattrname for filename with -v, alsodisplays the filename and the attributename
w	writes attribute attrname with valueattrvalue for filename with -v,provides confirmation (otherwise silenton success)
l	lists the user attributes for filenamewith -v, also lists the values(otherwise just the names)
x	deletes attribute attrname for filenamewith -v, provides confirmation(otherwise silent on success)

NOTE:

- Filename may also refer to a directory or folder name
- This utility manipulates extended attributes in conjunction with HPE StoreOpen Standalonesoftware and is used in that context with a mounted LTFS volume.

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HPE StoreOpen cartridge browser

HPE StoreOpen Standalone version 2.2.0 onwards includes a Windows GUI utility to view the contents ofLTFS index files. Users can select a folder which contains LTFS index files and the utility will list all the indexfiles 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 anindependent tool for viewing the stored LTFS index files which are generated when an LTFS volume ismounted and unmounted.

Users can select a folder where the index files are kept (in most setups this option is the directory pathselected for the **index capture** setting in the advanced options of the HPE LTFS configuration GUI). TheCartridge Browser utility then displays all the index files in the folder. Move the mouse over a particular indexfile to see the details about the index.

If user double click any of the index files, the utility will open another window which shows a detailed view ofthe selected index as a nested expandable tree. Selecting a particular file shows the information regardingthat file.

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Installation and configuration for HPE LTFS 3.2.0 (Linux)

When using HPE LTFS with LTO-5, LTO-6, or LTO-7 tape drives, the following components are required:

- A drive firmware revision that supports dual partitioning. HPE LTFS checks and tell any requiredupdates for tape drive . HPE L&TT must be used if a firmware update is required.
- The software package that contains the **run-time** executable. Click here to find the package .
- The FUSE kernel module.
- The International Components for Unicode (ICU) libraries.

NOTE: Click here to download HPE L&TT .

Downloading and installing HPE LTFS (precompiledbinaries)

Procedure

1. Before starting to install and use HPE LTFS, ensure that the FUSE kernel module is presentand loaded.

   To check, execute the following command: `$ lsmod | grep fuse`

   a. If the module is not listed as currently loaded, must load it before proceeding:

      `$ modprobe fuse`

   b. If the module is not present on system, must first obtain and install it. Details are beyondthe scope of this guide. Click here for more information .
2. Determine whether user want to use precompiled binaries or build own version of the HPE LTFSapplication. To build own version, download and unpack the tar source file and then follow the instructionsin **ltfs-<version>/doc/BUILDING.linux** .

   NOTE: Only the installations that use Hewlett Packard Enterprise supplied binaries are supported.
3. To use precompiled binaries, download the appropriate package file and unpack it. For example, theinstallation package for RHEL x64 contains the following files:
   - RPM package file for installation on 64 - bit systems
   - README file (general usage information)
   - INSTALLING.linux (prerequisites and installation instructions)
   - COPYING.lib (LGPL v2.1 required licensing text)
4. Install the appropriate RPM package depending on user architecture:

   `$ rpm -ivh <file_name>`

   NOTE: Upgrading to SOS 3.2.0 from 3.0.0 or earlier versions is not supported, you must uninstall theearlier version before installing SOS 3.2.0 version. Upgrading to SOS 3.2.0 from 3.1.0 issupported. For installation instructions on Linux and Mac operating systems, seeINSTALLING.linux or INSTALLING.macosx file respectively.
5. HPE LTFS is now installed.

   NOTE: The precompiled binaries supplied by Hewlett Packard Enterprise require additional shared librarieswhich may not be present on every system, or which may need to be updated in order for thebinaries to execute. Refer to the LTFS release notes for more details.

   If the dependencies are installed by compiling the source, user must use the --nodeps switch withthe rpm command for installing the rpm.

To uninstall HPE LTFS

To uninstall HPE LTFS from user's system:

`$ rpm -e hpe-sos`

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Installation and configuration for HPE LTFS 3.2.0 (Mac OS X)

When using HPE LTFS with LTO-5, LTO-6, or LTO-7 tape drives, the following components are required:

- A drive firmware revision that supports dual partitioning
- The software package that contains the **run-time** executable
- The OSXFUSE kernel module (or, for older systems, the MacFUSE kernel module)
- The ICU libraries (included in the Installer package)

NOTE: HPE LTFS will check and tell you for required updates for user's tape drive. HPE L&TT must be usedif a firmware update is required. Click here to download .

Downloading and installing HPE LTFS (precompiledbinaries)

Procedure

1. Determine whether wanting to use precompiled binaries or build own version of the HPE LTFSapplication. To build own, download and unpack the source tar file and then follow the instructionsin **ltfs-<version>/doc/BUILDING.macosx.**. In this case, user must also obtain and install theOSXFUSE and ICU packages.

   NOTE: Only the installations that use HPE supplied binaries are supported.
2. To use precompiled binaries, download and install file for Mac Os. This file contains the threepackages that are necessary for operation: OSXFUSE, ICU, and LTFS.

3. Install the ICU package first by double-clicking the file **ICUFramework-<version>.pkg** andfollowing the instructions.
4. Install the **OSXFUSE** package in a similar way.
5. Install the HPE LTFS package by double-clicking the install file and following the instructions.
6. HPE LTFS is now installed. The installation package also places a "HPE Linear Tape File System"application in user's Applications folder which can be used to simplify the tasks of preparing, formatting,and mounting an LTFS volume.

To uninstall LTFS

If at a later date user want to uninstall HPE LTFS from system, delete /usr/local/bin/*ltfs*and then delete the tree under /Library/Frameworks/LTFS.framework.

The GUI management application can be uninstalled by dragging it to the Trash. To cause the PackageManager subsystem to remove references to LTFS, execute the command: `pkgutil --forget com.hpe.ltfs`

To delete the ICU package as well, delete the tree under/Library/Frameworks/ICU.framework.

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Link to the list of available documents

Click here to view a list of documents available for the HPE StoreOpen and Linear Tape File System (LTFS) Software .

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Disclaimer

NOTE: One or more of the links above will take users outside the Hewlett Packard Enterprise website, HPE does not control and is not responsible for information outside of the HPE website.

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