

## XenData LTO Archive Appliances

Connect One or More LTO Libraries to create a Powerful Active Archive



When combined with an LTO library, a XenData Archive Appliance creates an LTO Active Archive with rich functionality.

XenData Archive Appliances are proven in many applications and industries, including for secure long-term retention of healthcare, life sciences, engineering and scientific data files.

In media and advertising applications, XenData Archive Appliances have become a standard that is hard to beat. They are installed in hundreds of TV stations, many video production and post-production companies, in Hollywood studios and the marketing departments of many large corporations.

### Highlighted Functionality

- ✓ Provides secure long-term retention of files.
- ✓ Access the LTO archive as an SMB or NFS share.
- ✓ Adding an object storage interface allows access to the LTO archive as a private cloud.
- ✓ It supports unlimited externalized LTO cartridges.
- ✓ It automatically replicates LTO Cartridges.
- ✓ LTFS or TAR formats.
- ✓ Disk cache provides enhanced performance.
- ✓ Easy migration to later LTO generations.

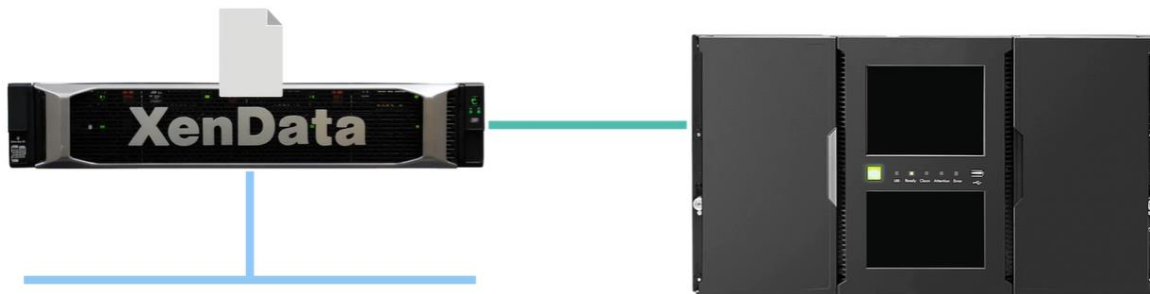
## XenData Range of Appliances Optimized for Different Performance Requirements

XenData offers different Appliances which are optimized for different performance needs. They range from the X1 Appliance that manages one or more external LTO drives to an X100 Cluster with no single point of failure which manages one or more LTO libraries and scales to 100+ PB. Each of the Appliances runs the same software – the LTO Server Edition of XenData Archive Series software.

### Overview of Archive and Restore Operations

The Appliance runs a Windows operating system and the XenData software presents the archive as a local logical drive letter with a standard file-folder interface which can also be accessed as a standard network share. When you first use the archive, the archive logical drive is empty, and you or your applications create the required folder structure.

The Appliance includes a disk cache to deliver greatly enhanced performance. Archiving a file is just like writing a file to disk and in fact that is what is happening. A file is either written over the network to the disk cache using either SMB, NFS or the FTP network protocol or alternatively is written to the local logical drive letter by an application running on the XenData server.



After file is written to the cache, a XenData policy defines what happens next. As an example, illustrated below, a file is written automatically to a duplicate pair of LTO cartridges within a robotic library managed by the XenData software.



After the file has been written to a pair of LTO cartridges, there are three instances of it: two on LTO and one on the cache.

When a file has been written to its designated locations, it becomes eligible for conversion to a stub file on the cache. After conversion to a stub file, the full file is no longer retained on the disk cache, but it still appears in the file-folder structure.

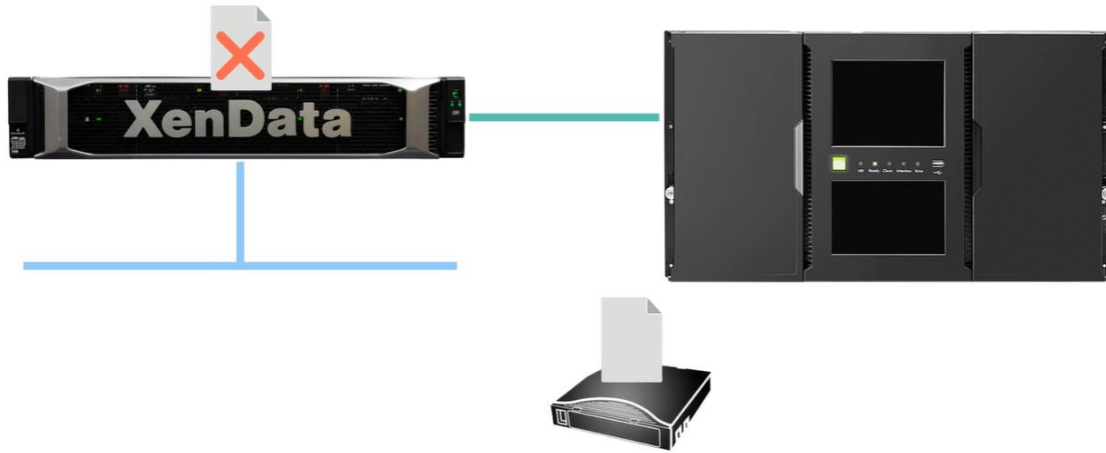


The stub file has the same properties as the original except the Microsoft offline attribute is set, indicating that the full file is no longer immediately available. Conversion to a stub file frees up space on the cache because the file representation on the disk is just a few Kilobytes in size.

Typically, when automatic replication is used to create duplicate LTO cartridges and after the tape pair is full, an operator will export one of the cartridges from each pair and retain it in an offsite location for safe keeping.

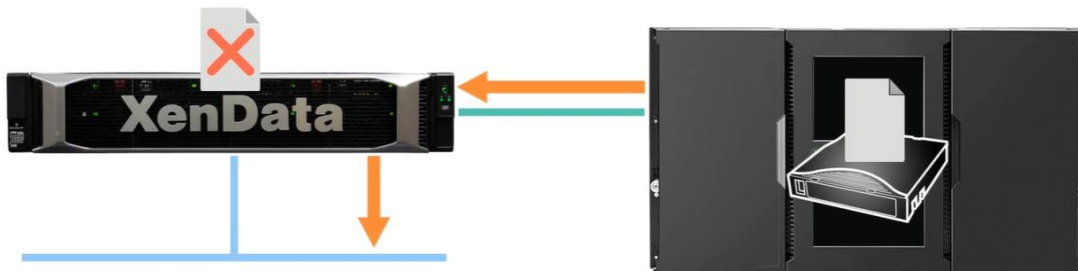


As time goes by, the other cartridge may also be exported from the library perhaps because the library is full at this stage and, in this case, all the files on the tape pair will be held offline. Under these circumstances the file continues to be seen in the archive file-folder structure.

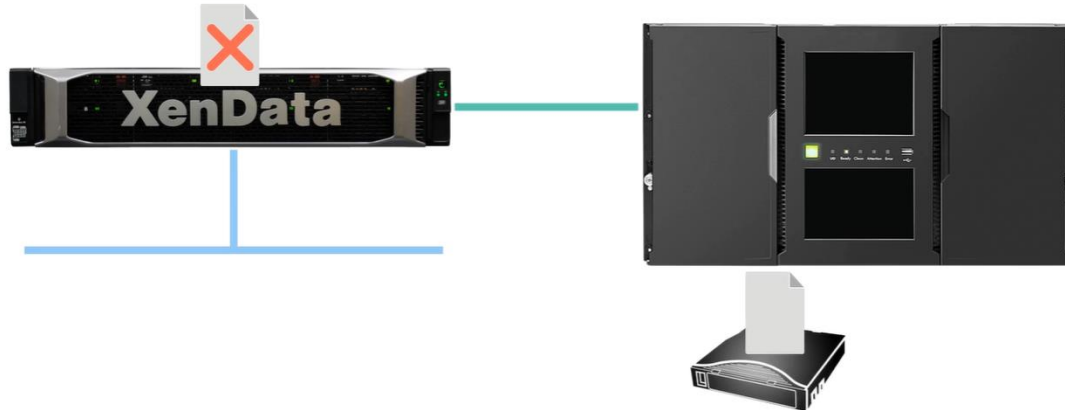


We will now turn to the internal workflow associated with file restores from the archive for the three different cases of online, near-line and offline files.

In the case of online when the full file is stored on disk, it is very straight forward: the file is simply restored from the cache even if other instances of the file are available from LTO.



The case of a near-line restore from LTO is shown above. With LTO, near-line refers to a file that is a stub file on the disk cache, but it is stored on a cartridge within an attached tape library. The application that requests the restore issues a standard command to read the file. The XenData software will then cause the cartridge containing the file to be loaded into an available LTO drive and the drive then seeks to the beginning of the file. It is then restored to fulfill the read request.



Above we see the case of a request to restore a file that is offline. With LTO, offline refers to a file that is a stub file on the disk cache and is stored on one or more cartridges, all of which have been exported from the robotic library. When there is an attempt to read an offline file, the XenData system will issue an on-screen message and / or an email alert. This identifies the name of the file and the barcodes of the cartridges that contain it. An operator can then import the cartridge back into the library which automatically brings the file near-line. The restore request must be re-issued and the file will be automatically restored as for any other near-line file.

## Functionality in Base Configuration

All XenData LTO Appliances provide the following functionality.

- ❖ **Standard File System Interface**  
Accepts all file types and presents them in a single Windows file/folder structure. Files are written to and retrieved as though from a standard disk drive.
- ❖ **Standard Network Protocols**  
The solution is optimized for SMB, NFS and FTP, as well as local file transfers.
- ❖ **LTFS and TAR**  
May be configured with tape pools using the LTFS or TAR format.
- ❖ **LTO Cartridge Replication**  
Automatically generates replica LTO cartridges that may be exported from the library for off-site retention. Replication may be configured to occur immediately or scheduled to occur at a specified time, typically overnight.
- ❖ **Near-line and Offline LTO**  
Manages LTO cartridges in a library and an unlimited number of cartridges taken offline.
- ❖ **Disk Cache Enhances Performance**  
The user defines policies for disk caching that can be tailored for different file types and folders.
- ❖ **Easy LTO Migration**  
XenData archive software makes for easy system upgrades, going from an older to a later generation of LTO.

- ❖ **End-to-End Verification**  
Provides an automated check-sum operation for all data written to LTO.
- ❖ **LTO Cartridge Spanning**  
Policies can be set to allow or prevent files being spanned across multiple LTO cartridges.
- ❖ **Multiple Tape Pool Support**  
The software allows groups of files to be allocated to specified groups of LTO cartridges.
- ❖ **Auto-Expansion of LTO Pools**  
The system will dynamically expand LTO cartridge pools to meet capacity demands, minimizing system administration.
- ❖ **Optimized Restores**  
The system restores a queue of files in the shortest possible time. The restore requests are processed in an order that minimizes unnecessary tape movement.
- ❖ **File Version Control**  
The software provides comprehensive file version control. Deleted files and old file versions may be restored from LTO.
- ❖ **Supports WORM Tape**  
XenData systems support both standard rewritable cartridges and unalterable WORM cartridges.
- ❖ **Metadata Backup and Restore**  
Provides rapid system restore in case of rebuild after a RAID failure.
- ❖ **Alert Module**  
A software module is included which provides e-mail and on-screen alerts. These are tailored to the needs of archive system operators, system administrators and IT support personnel.
- ❖ **Cartridge Contents and Search Reports**  
The files contained on any cartridge, including offline cartridges, can be listed in a report. Additionally, search reports list all the files and their LTO cartridge barcode locations that match a search term.
- ❖ **Industry Standard File Security**  
The appliances run a Windows Server 2022 or Windows 11 Pro operating system and integrate fully with the Microsoft Windows security model based on Active Directory.
- ❖ **Support Most LTO Libraries**  
The Appliances support LTO libraries from a wide range of manufacturers including Dell, HPE, IBM, Oracle, Overland Storage, Qualstar, Quantum and Spectra Logic.

## Functionality Available from Upgrade Options

### ❖ Private Cloud Option

This allows secure access to the archive from anywhere using HTTPS. It provides an S3 compatible object storage interface that creates a private cloud.

### ❖ Cloud File Gateway Option

Allows files to be stored on cloud object storage in addition to LTO. Support includes the following public cloud providers: AWS S3, Azure Blob Storage, Backblaze S3, Seagate Lyve Cloud and Wasabi.

### ❖ Sync Option

FS Mirror utility provides file synchronization across your local network. You can mirror file systems from any accessible storage location.

### ❖ XML Interface Option

The Workflow API is used by many complementary applications to move files to and from the archive.

### ❖ Multi-Site Sync Option

When you have LTO archives at different facilities, you can use XenData Multi-Site Sync to integrate them in a single global file system accessible from any location.

## Automated Tiered Storage Management

The user defines policies that automatically determine where files will be physically stored on the digital archive. These policies support tiered storage management and automatic LTO cartridge replication. The Appliance supports three levels of storage hierarchy:

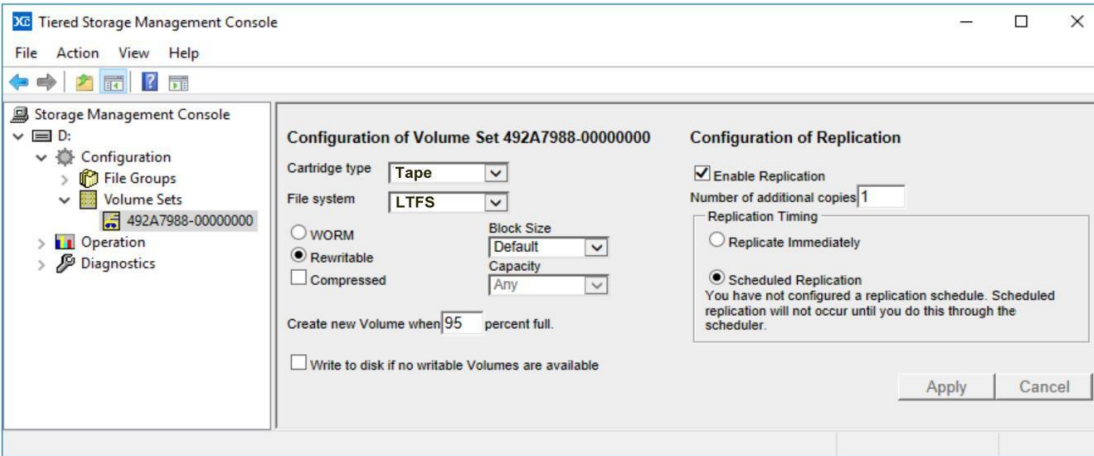
- ❖ **Online disk** with one instance of a file on the managed disk volume and, in addition, there will typically be one or more instances on LTO. In this case, the file will be retrieved from disk when accessed over the network.
- ❖ **Near-line LTO** with at least one instance of a file on an LTO cartridge within the library and no instances on disk. When a file on near-line LTO is accessed over the network, the XenData software automatically transfers the file over the network directly from LTO in response to the network read request.
- ❖ **Offline** with no instances on disk and instances of a file on one or more LTO cartridges, all of which have been exported from the tape library.

No matter where a file is held in the storage hierarchy, its position in the archive file/folder system does not change. When a file transitions from near-line disk to near-line LTO and to offline LTO, the file path, file name and properties do not change, except the Microsoft offline attribute becomes enabled when the full file is no longer on disk.

## Defining Storage Policies

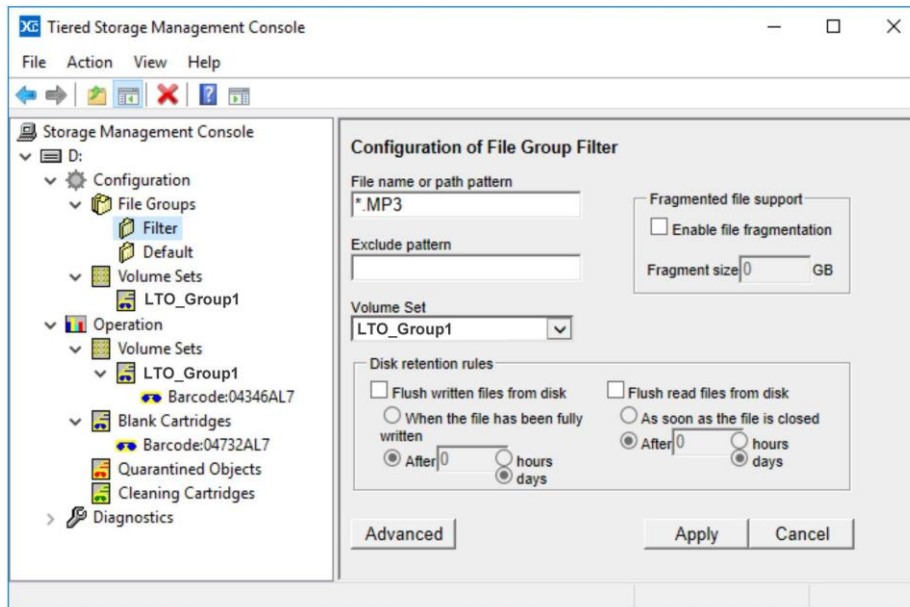
The Archive Series software provides a Tiered Storage Management Console which is used to define storage policies. The console supports configuration of many different policies, tailored to the needs of the different file types and folders within the archive file system.

The user first defines one or more groups of LTO cartridges, as illustrated below.



The LTO format, LTFS or TAR, is defined for the group of LTO cartridges, together with replication. When replication is enabled, the system can be configured to replicate LTO cartridges immediately or at a scheduled time. Scheduled replication delays updating of the replica cartridges until a quiet time, perhaps overnight. This part of the user interface is also used to configure dynamic expansion of LTO cartridge groups: it defines when blank cartridges will be pre-initialized and added to the group of LTO cartridges.

After configuring at least one group of LTO cartridges, the user defines which groups of files will be allocated to which groups of LTO cartridges and how long specific groups of files will be retained on the disk cache. The user interface is illustrated below.





The Tiered Storage Management Console is also used to perform many LTO cartridge management functions, including:

- ❖ Exporting cartridges from the library
- ❖ Write protecting cartridges
- ❖ Obtaining status and cartridge properties
- ❖ Management of cleaning cartridges
- ❖ Repacking cartridge contents, as described below

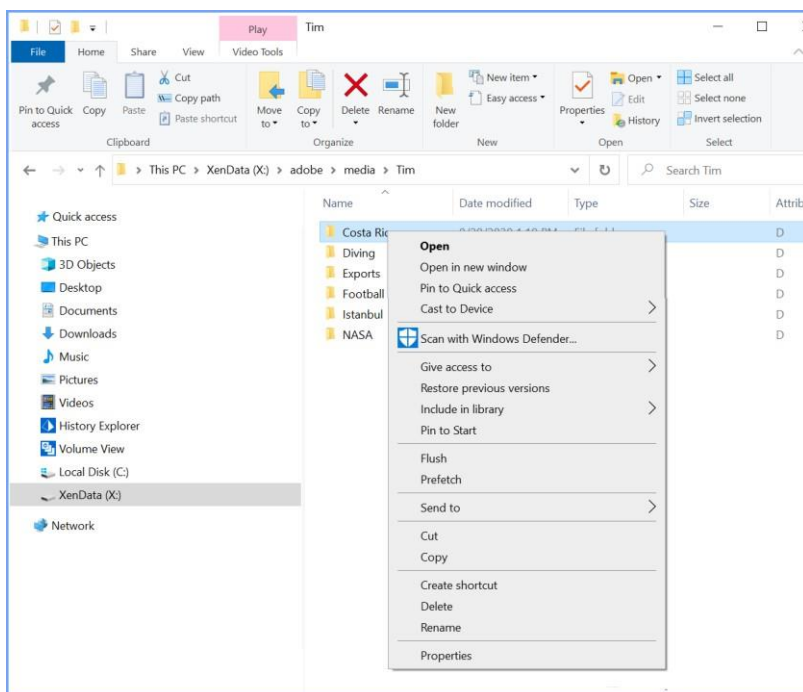
## Migrate to Later LTO Generations

The repack operation may be performed using the Tiered Storage Management Console. This allows the contents of cartridges and groups of cartridges to be moved from one generation of LTO to another, for example from LTO-6 to LTO-9. It is an operation that has zero downtime for the system. All the files stay in the same place in the file system but are moved from one generation of cartridges to another in background.

Other LTO archive solutions make the job of migrating to a later generation of LTO very difficult. But with a XenData Appliance, it is a seamless background task.

## Manual Over-Ride of Automatic Policies

The storage policies defined using the Tiered Storage Management Console determine the disk retention policy for archived files. They run automatically without manual intervention. But sometimes they need to be overridden. For example, when a big project is postponed, there might be a need to temporarily transition the associated files and folders from online disk to near-line LTO. And when the project becomes active again, those files should be prefetched to the managed disk. The Archive Series software extends the capabilities of Windows File Explorer and allows manual override of the automatic policies, as illustrated below.

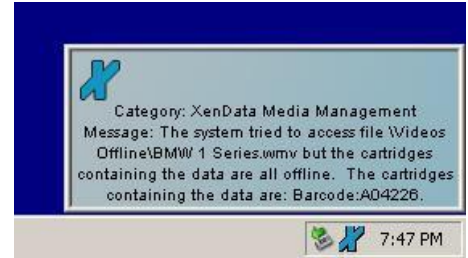


In this example, the entire folder 'Costa Rica' can be manually converted to a stub file or prefetched. Conversion to a stub is a quick operation that transitions all files in the folder and its sub-folders to near-line LTO. Of course, the system checks that all files are securely stored on LTO before conversion to a stub file. Prefetch reads all the files from LTO and caches them on the managed disk. The prefetch operation reads all the files from LTO in the optimum order to minimize any unnecessary tape movement and cartridge swapping.

## Externalized LTO Management

A XenData LTO Appliance manages an unlimited number of LTO cartridges that have been externalized by being exported from a library. And the Archive Series software is always licensed to support an unlimited number of externalized cartridges.

When a file moves from near-line LTO to being offline because the LTO cartridge on which it is stored is exported from the tape library, the file remains unchanged in the archive file system. However, this is not the complete file; it is a file representation which has the same attributes as the complete file, such as reported size, modification date, etc. When an offline file is accessed by a program, a message is returned immediately that identifies that the file is not available. Also, the XenData software puts a message in the Windows Event Log and optionally sends an e-mail and/or on-screen message that identifies which LTO cartridges contain the requested file. This notification allows the correct cartridge to be easily identified and then imported back into the LTO library.



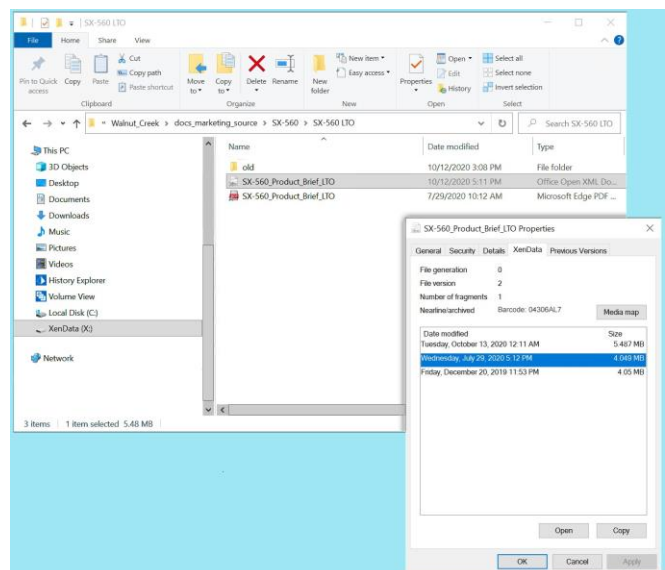
Third party applications that use a XenData API may also access information about offline cartridges and display barcode information within the application user interface.

## File Version Management

When an archived file is overwritten, the file system interface presents the latest version of the file and when a file is deleted, it is hidden from the file system interface. Unlike standard disk-based file systems, old versions of files and deleted files continue to be retained on LTO. The Archive Series software allows access to these deleted files and old file versions using its extension to Windows File Explorer.

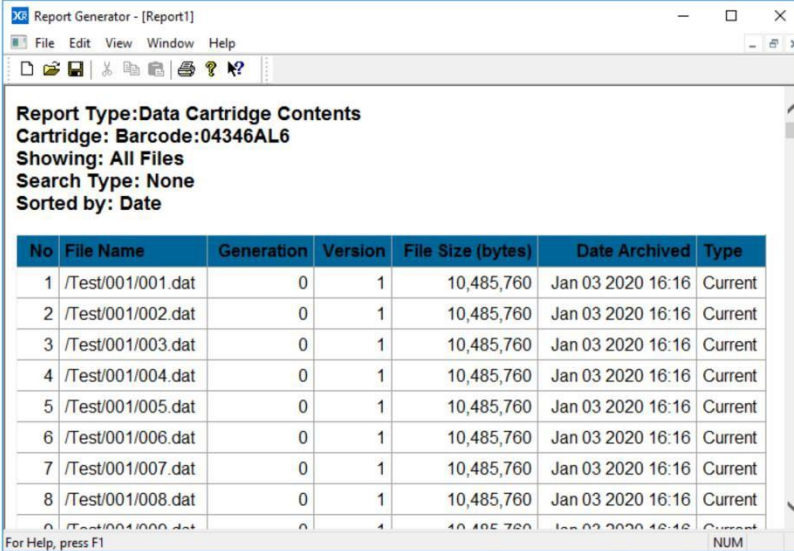
To access old versions of files that have been overwritten, a user can browse to the file using Windows File Explorer, right click, select 'properties' and the XenData tab to obtain a list of all file versions. The required old version can then be selected, copied and pasted into the file system.

A similar process is used to restore deleted files, but because they do not appear in the normal file system, Windows File Explorer has been extended to include a History Explorer view of the file system which includes deleted files. History Explorer is launched from the left pane of File Explorer as illustrated opposite.



## File Search and Cartridge Contents Reports

The Archive Series software allows the user to run reports including LTO cartridge contents and file search listings. Reports can be saved in different formats including tab delimited plain text (.txt) or XML. The text format is useful for exporting the results to Microsoft Excel or other applications.



Report Type: Data Cartridge Contents  
Cartridge: Barcode:04346AL6  
Showing: All Files  
Search Type: None  
Sorted by: Date

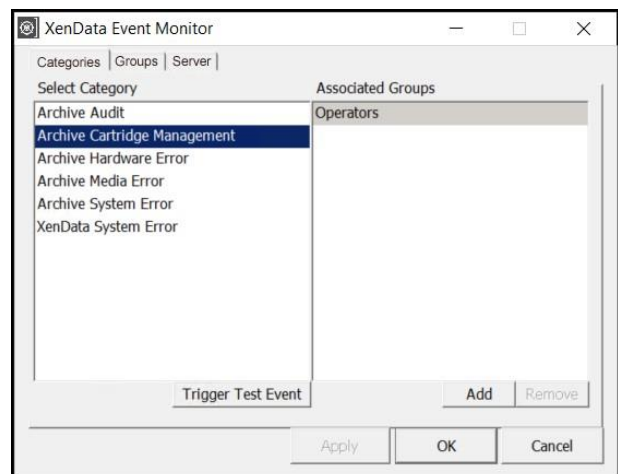
No	File Name	Generation	Version	File Size (bytes)	Date Archived	Type
1	/Test/001/001.dat	0	1	10,485,760	Jan 03 2020 16:16	Current
2	/Test/001/002.dat	0	1	10,485,760	Jan 03 2020 16:16	Current
3	/Test/001/003.dat	0	1	10,485,760	Jan 03 2020 16:16	Current
4	/Test/001/004.dat	0	1	10,485,760	Jan 03 2020 16:16	Current
5	/Test/001/005.dat	0	1	10,485,760	Jan 03 2020 16:16	Current
6	/Test/001/006.dat	0	1	10,485,760	Jan 03 2020 16:16	Current
7	/Test/001/007.dat	0	1	10,485,760	Jan 03 2020 16:16	Current
8	/Test/001/008.dat	0	1	10,485,760	Jan 03 2020 16:16	Current
9	/Test/001/009.dat	0	1	10,485,760	Jan 03 2020 16:16	Current

## System Monitoring

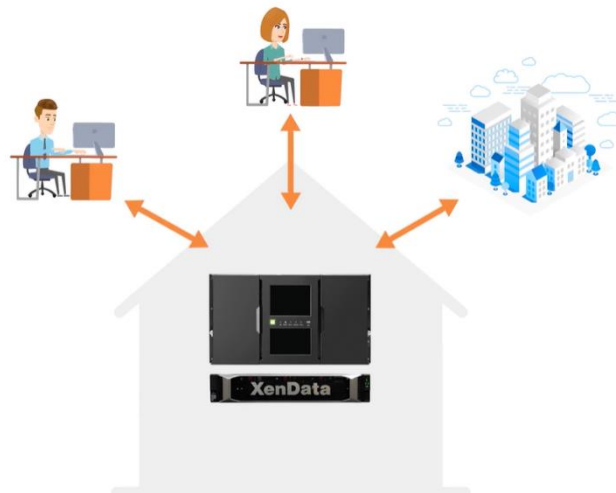
The Archive Series software monitors error messages issued by the LTO drives and libraries, creating alerts and notifications which are logged in the Windows Event Log. The XenData software includes an Alert Module which characterizes these alerts and notifications into five categories:

- ❖ Archive Audit: This category of event messages describes the successful completion of routine operations.
- ❖ Archive Media Management: This category of event messages may require routine action from the archive operators.
- ❖ Archive Media Error: This event category consists of error messages associated with LTO cartridges.
- ❖ Archive Hardware Error. This event category consists of error messages associated with the LTO library and drives.
- ❖ Archive System Error: This event category consists of error messages associated with a system problem.

The XenData Alert Module provides email alerts to designated groups of recipients. The messages received by the different groups may be tailored to their specific needs. For example, operators may receive messages related to Archive Media Management, such as notifications related to management of externalized LTO cartridges. Whereas another group of support engineers may receive media, hardware and system error messages. In addition to sending email alerts, the system may be configured to provide on-screen notifications.



## Option: Access Archive as Private Cloud

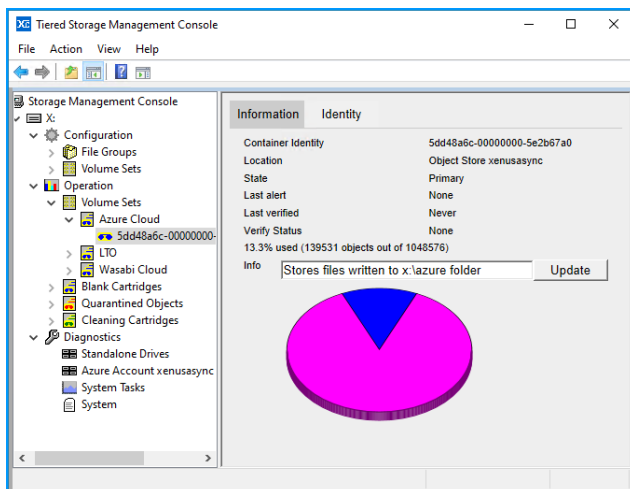


Adding an object storage S3 Server Interface to a XenData LTO archive system allows files to be written to and read from the archive from anywhere worldwide using fast and secure HTTPS. This option creates a private cloud interface. The on-premises interface and associated permissions are not affected: the LTO archive continues to be accessible locally using SMB, FTP or NFS.

## Option: Sync to Cloud

The Archive Series software that runs on a XenData LTO Appliance may be extended to manage cloud object storage in addition to an LTO library. The cloud connection is secure, using HTTPS, and fast, using multipart uploads and downloads.

After installing and licensing the Cloud File Gateway Extension software, the tiered storage management policies support archiving to object storage or LTO.



Supported cloud storage includes AWS S3, Azure blob storage and Wasabi S3. The system is multi-cloud, simultaneously supporting multiple cloud object storage accounts from different providers. And by adding FS Mirror, selected files and folders may be replicated across local LTO and one or more cloud object storage accounts. This creates a cloud copy of the content stored locally on LTO. The content copied to the cloud may be part of your disaster recovery strategy or simply a way to share content with remote users.

## Option: FS Mirror Syncs Local & Network Storage

FS Mirror, a XenData utility that provides file-folder synchronization and mirroring of any local or network storage, is an optional upgrade. You can schedule tasks to sync any accessible file-folder structure to LTO.

FS Mirror tasks are easily configured using the User Interface illustrated opposite.

### Task Performance

Start Time/Date: 9:45:00 AM 11/26/2019  
 Stop Time/Date: 9:47:39 AM 11/26/2019  
 Volume of Data Copied: 691 KBytes  
 Average Transfer Rate: 43 KBytes/s

### Task Summary

Total number of files processed on source	50454
Files successfully copied	5
Files skipped due to error	0
Other files skipped	50449
Number of files deleted on destination	1

### Errors

None

### Files Deleted on Destination

X:\S-Drive\Companies\N-Z\Invoices\Inv US19xxxx Oct14-19 - PO 2Checkout.pdf

### Files and folders copied

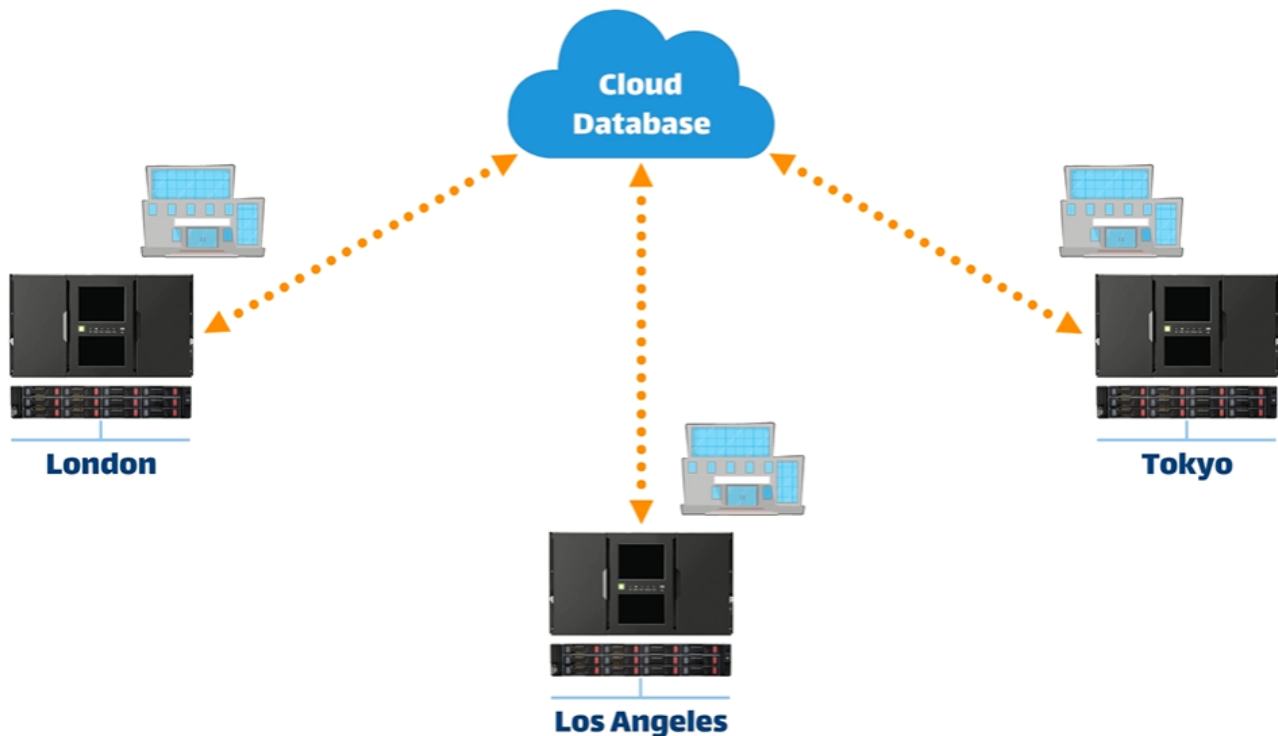
\\xen-us-06.xd-us.local\All\_Users\OneDrive - XenData\Shared with Everyone\Sales\Companies\N-Z Services\Invoices\_POs\Inv US19555 - Jul15-19 - PO 2Checkout-PAID.pdf  
 \\xen-us-06.xd-us.local\All\_Users\OneDrive - XenData\Shared with Everyone\Sales\Companies\N-Z Foundation\Invoices\Inv US19803 Nov04-19 - PO 2Checkout-PAID.pdf  
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 \\xen-us-06.xd-us.local\All\_Users\OneDrive - XenData\Shared with Everyone\Sales\Full\_Access\LatinAmerica\Companies\Quotes\LEE191126-1.pdf  
 \\xen-us-06.xd-us.local\All\_Users\OneDrive - XenData\Shared with Everyone\Sales\Full\_Access\LatinAmerica\Companies\Quotes\LEE191126-2.pdf

By enabling logging for an FS Mirror task, a log report is created each time the task is run. This can list all files copied, all deleted files and any files that were skipped due to being open. An example log report is shown above.

## Option: Multi-Site Sync

Multi-Site Sync for LTO is a synchronization service that links multiple archives in different locations, creating a single global file system accessible anywhere worldwide. As soon as a file is archived to LTO at one location, it becomes available as a stub file within the global file system. When a user makes a change by writing, overwriting or deleting a file, that change is propagated to all locations. This provides a consistent up-to-date set of files across the entire distributed organization.

When files are restored from another location, they are transferred directly using peer to peer multi-threaded HTTPS which delivers secure fast file transfers. The Multi-Site Sync service uses a cloud database, but the files themselves are never stored in public cloud object storage, avoiding cloud storage and egress fees. Furthermore, because the new service only synchronizes file system metadata, it requires minimal Internet bandwidth.



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