



## XenData Product Brief: X64 Edition

The X64 Edition of XenData Archive Series software runs on a Windows server and manages one or more automated LTO tape libraries to create a cost effective digital video archive that is optimized for the requirements of the media and entertainment industry. It is a proven solution, with more than 300 media and entertainment installations worldwide.

The solution is high performance, writing and reading at many times real time. Yet it is non-proprietary, presenting the digital archive as a standard Windows file system. Files are written to LTO tape using the open standard POSIX tar format, ensuring that data may be restored by third party software for many years to come. The solution delivers high transfer rates and is optimized for archiving and retrieving high volumes of files - from 10s of terabytes to multiple Petabytes.

## About XenData

XenData is a software company that focuses on digital archive solutions for the media and entertainment industry - archiving to and restoring from LTO data tape. Based on a standard file system, XenData server software makes the digital archive appear as a Windows logical drive letter which provides easy integration with other standards-based systems.

Files are written to data tape using the open standard POSIX tar format. This is important for long term archives because it means that files can be restored for decades to come using a wide range of native Linux and Unix operating systems, Microsoft Services for Unix, as well as XenData software.

XenData's use of a standard file system interface makes for easy integration and creates a universal digital video archive that can be used by many automation, asset management, monitoring and post-production systems. It has proven compatibility with software from a broad range of companies including Apple, Avid, Cinegy, Crispin, Dalet, Fission Software, Gallery (Sienna), Media Alliance, Metus, NVerzion, Omneon, Pharos, Quantel, Snell Group, TMD, Vector 3, Volicon and VSN.

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## XenData X64 Edition – the Basics

Digital video archiving in the media and entertainment industry has previously involved complicated architectures, proprietary formats and proprietary interfaces. This has resulted in solutions which have been expensive to install and difficult to maintain.

In contrast, XenData software creates a digital archive on a Windows server platform with a straight forward architecture and non-proprietary interfaces. The software is tightly integrated into the Windows server operating system which means it delivers high performance with a simple and elegant configuration.

The XenData archive has a standard file system interface appearing as a single Windows logical drive letter which may be shared over the network. The solution is optimized for use with the standard Windows network protocol (CIFS/SMB) or FTP file transfers. This non-proprietary approach to the interface means that the archive can be used simultaneously by multiple standard applications including those running on Windows and Mac OS X. Furthermore, it does not tie the user to any particular asset management, automation or NLE system.

The archive consists of the following components:

- one or more robotic data tape libraries
- a server with RAID running Windows Server

XenData software supports a wide range of tape libraries from the leading suppliers including Dell, HP, IBM, Oracle/StorageTek, Overland Storage, Qualstar, Quantum, Rorke Data, Sony and Spectra Logic.

A basic network configuration is shown opposite. The data tape library is connected to the server via SCSI, SAS or Fibre Channel. The RAID may be implemented any number of ways, for example as internal or external FC, SAS or SATA disk arrays.

XenData software runs on the Windows server and presents the digital tape library and RAID cache as a single Windows logical drive letter. The file system within this logical drive is usually shared over the network. The combined storage within the tape library and RAID effectively appear as a very large capacity magnetic disk.

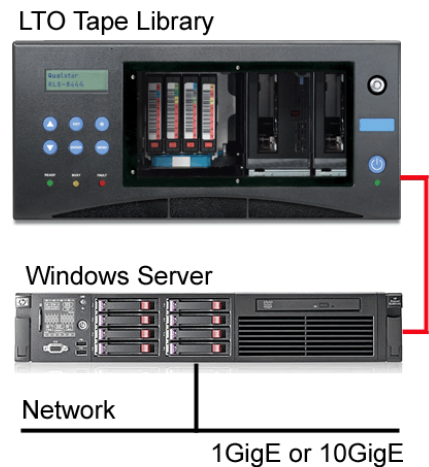
In addition to its standard file system interface, the solution offers many other non-proprietary features:

- All file types can be archived on the system and partial file restore has been implemented in a way that is not specific to the file type.
- The system uses the open standard POSIX tar format for recording to data tape. This ensures that that files can be restored for decades to come using a wide range of native Linux and Unix operating systems, Microsoft Services for Unix, as well as XenData software.
- All informational, warning and error messages are logged in the standard Windows Event Log and may be sent as on-screen messages or e-mail alerts.
- The system fully complies with the Microsoft security model based on Active Directory, which means that tedious special administration of file permissions is not necessary.

The X64 Edition runs on 64 bit Windows server platforms. In addition, an X32 Edition is available which runs on 32 bit Windows servers and has identical functionality and user interfaces.

Key functionality provided by the X64 Edition is summarized below.

**Standard File System Interface** The digital archive accepts all file types and presents them in a single Windows file system. Files are written to and retrieved from the archive as though from a standard magnetic disk drive.



**Example Digital Video Archive**  
*XenData software runs on the Windows Server and manages the LTO tape library.*

**Windows and Mac Compatibility** Windows and Apple OS X clients are natively supported without need for loading any client software.

**Standard Network Protocols** The solution is optimized for CIFS/SMB and FTP file transfers.

**Manages Nearline Disk, Nearline & Offline Tape** The administrator defines policies for RAID caching that can be tailored for different file types and folders.

**Standard POSIX tar Tape Format** The archived files are written to tape using the standard POSIX tar format. This means that, in addition to using XenData software, files may be restored using a wide range of Linux and UNIX operating systems.

**Self-Describing Data Tapes** Each tape cartridge contains all the file system metadata necessary to recover all the files stored on it whether using XenData software, Microsoft Services for Unix, Linux or UNIX operating system commands.

**Tape Replication** The software automatically generates replica data tape cartridges that may be exported from the library for off-site retention. Furthermore the tapes may be rapidly imported into a replica DR system.

**Supports Tape Cartridge Spanning** The Administrator defined policies can be set to allow or prevent files being spanned across multiple tape cartridges. This option is particularly useful when very large files are being archived.

**Multiple Tape Pool Support** The software allows groups of file to be allocated to specified pools of tapes. The Administrator defined policies can be used to group related files together on the same set of tapes.

**Dynamic Expansion of Tape Sets** The system will dynamically expand tape sets 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 tape (unless the files have been purged using a repack operation).

**Partial Read of Large Files** With very large files there is often a need to read only a portion of the file. For example, this frequently occurs with multi-gigabyte video files when a short clip is requested. XenData software supports partial reading of large files.

**Repack of Tapes** This copies only current files, excluding deleted files and old versions of files, to new tapes. Benefits: permits recovery of capacity from rewritable tapes; also provides ability to easily migrate to future generations of LTO. Note that this functionality is not available when using WORM tapes.

**System upgrade:** Upgrading to a later generation of LTO is the most cost effective way to increase the size of an existing archive system. XenData archive software makes for easy system upgrades, going from an older generation of LTO to a later generation.

**Transfer of Content between Systems** Export and import functions allow content to be easily transferred from one location to another.

**Supports WORM Tape** The software supports both standard rewritable data tape and unalterable WORM. The use of unalterable WORM tape cartridges is especially important for legal compliance applications.

**Metadata Backup and Restore** A file system metadata backup and restore utility provides rapid system restore in case of rebuild after 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.

**Tape Contents Reports** The files contained on any tape, including offline tapes, can be listed in a report which may be exported to Excel.

**Industry Standard File Security** The file server integrates fully with the Microsoft Windows security model based on Active Directory.

**Standard IT Hardware** XenData software runs on standard IT hardware. A wide range of tape libraries and servers is supported. Multiple tape libraries and stand-alone tape drives can be managed on a single server. Tape drive cleaning is managed automatically by the software.

## Data Tape Formats

The LTO tape format is ideal for long term retention of video files. Characteristics of LTO-4 and LTO-5 - the latest LTO generations - are described below.

	LTO-4	LTO-5
Capacity per cartridge (Native capacity i.e. without compression)	800 GB	1.5 TB
Equivalent hours recording per cartridge at 25 Mbps	70 hours	130 hours
Equivalent hours recording per cartridge at 50 Mbps	35 hours	65 hours
Maximum Data Transfer Rate in Megabytes per second (without compression). Note that this drive dependant.	120 MB/s	140 MB/s
Typical Specified Media Archival Lifetime	30 years	30 years

Barcode labels are available for LTO tape cartridges and are strongly recommended as a convenient method for keeping track of tapes both within a tape library and 'on the shelf'.

All LTO tapes also include an in-cartridge memory chip. When a tape cartridge is initialized in a tape library under XenData control, the bar code information is written to the in-cartridge memory chip. This is particularly useful when the tape has been exported from the library and inserted into a stand-alone tape drive. Tape drives do not contain bar code readers but can read the contents of the in-cartridge memory. XenData software provides a consistent identification of tape bar code, even when a tape is being used in a stand-alone tape drive.



In addition to LTO, the X64 Edition also supports SAIT and AIT tape formats.

## Combining Asset Management and the Digital Archive

Media Asset Management (MAM) provides indexing of digital material and the ability to search and retrieve the assets of interest. The asset management system stores the indexed material as files which are held in one or more digital video archives.

XenData software creates a digital video archive, managing a digital tape library and RAID and presenting these physical storage devices as a standard Windows file system. Furthermore the software provides hierarchical storage management, data protection via tape cartridge replication, partial read capabilities and file security.

XenData software, because it is file based, makes it easy and straightforward to integrate a MAM and archive together. A MAM that can archive to a standard magnetic disk-based file system will typically run with XenData archives with no modifications at all

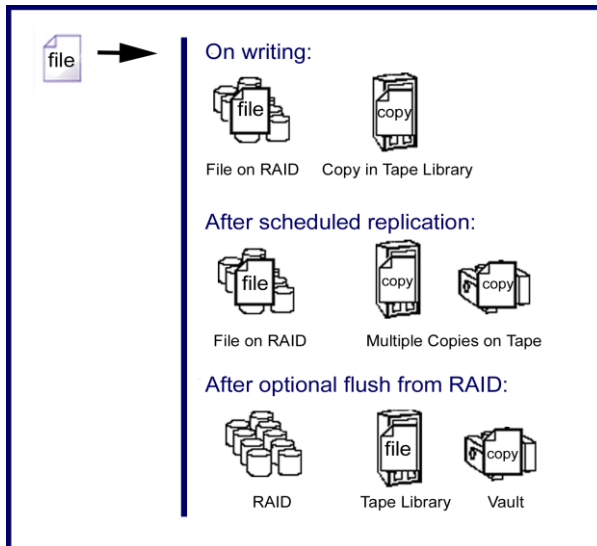
## XenData File Management Policies

The system administrator defines policies that determine where data files are physically stored on the digital archive. These policies support hierarchical storage management (HSM) and automatic tape cartridge replication.

XenData Archive Series software supports three main levels of storage hierarchy:

- Online with one instance of a file on RAID and, in addition, there will typically be one or more instances on tape. In this case the file will be retrieved from RAID when accessed over the network.
- Near-line with at least one instance of a file on tape within the library and no instance on RAID. When a near-line file is accessed over the network, the XenData software automatically transfers the file from tape to RAID cache. As soon as the file transfer to RAID commences, the file transfer over the network also starts.
- Off-line with no instance on RAID and one or more instances of a file on tape, all of which have been exported from the tape library.

Data protection is achieved by automatically generating multiple instances of a file. The XenData software can automatically produce copies of data tapes for export from the tape library and off-site retention.



A single server may have many different policies, tailored to the needs of the different file types that are being archived. A typical XenData file management policy is illustrated in the diagram below. On writing a file, it is first written to RAID. As soon as the file has been successfully written to disk, it is put into a queue to be written to a primary tape cartridge. After completion of this operation, there are two instances of the file – one on disk and one on tape.

Tape cartridge replication is optional and is scheduled according to an administrator policy. For a library with sufficient tape drives, it may be scheduled to occur immediately. Alternatively, it may be scheduled to occur within a defined time period or daily at a specific time.

The administrator can configure the system such that after a file has been securely written to tape, the instance stored on disk will be flushed (deleted) to release the disk space that was occupied by the file.

Files are available to users even if they have been flushed from disk and are only stored on tape. Flushing from disk does not affect the location of a file within the file system or make it inaccessible in any other way; the only impact of flushing is to increase the time taken to read the file because it first has to be retrieved from tape.

After a file has been flushed from RAID, its off-line attribute bit is set and the file is still available from tape within the library. The Microsoft off-line bit changes network timeout periods to allow retrieval of the file from media with long access times.

On reading from tape, a file is automatically restored to RAID as it is simultaneously transferred over the network.

**Enabling Partial Restore** XenData software manages very large files by using controlled file fragmentation. The administrator can optionally define policies that split large files into multiple fragment files. This is performed by the

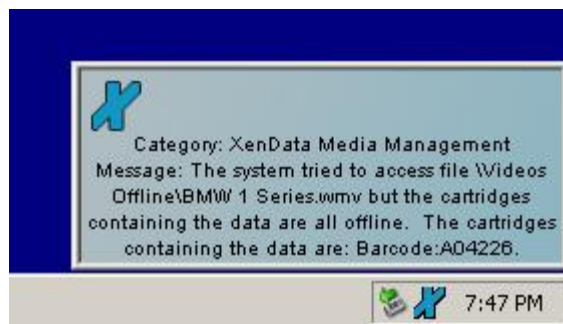
XenData software in a way that is hidden from the applications that are reading and writing files and it is useful for multi-gigabyte files. With digital video there is often a need to read only a portion of a very large file. For example, consider reading a portion of a 40 GB file that has been archived with a policy that splits it into forty 1 GB fragments. In this case, when a portion of a file is being read from tape, the software instructs the drive to rapidly seek to the start of the first fragment that contains the required portion of the file. The system then only retrieves the fragments from tape that contain the requested data. Without the controlled file fragmentation provided by the XenData software, the complete 40 GB file would have to be read from tape, which would take many minutes. In practice, this approach of using controlled file fragmentation is very easy to implement and enhances performance when dealing with large files.

## Off-line File Management

XenData archives are often used in a mode which keeps all files either online or near-line. This means that all files are automatically available from either disk cache or from the tapes held in the tape library. In this mode, when tape cartridge replication is enabled, duplicate tapes are exported from the library after they become full, always leaving one of the replica tapes in the library.

A XenData archive may also be used in a mode where some files are taken entirely off-line. This means that the capacity of the archive effectively becomes infinite. It also means that operator intervention is required to move tapes from the shelf to the library when there is a need to restore an off-line file.

When a file is taken off-line by exporting all the tapes that contain that file, it continues to be shown in the file system. However, this is not the complete file, it is a sparse file which has the same attributes as the complete file, such as reported size, modification date, etc. When an off-line 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 tape cartridges contain the requested file. This notification allows the correct tape to be easily identified and then imported back into the tape library. The file will then be automatically restored when the read request is retried.



XenData Archive Series software offers the administrator two utilities to keep track of the relationship between files in the file system and their physical storage locations:

- XenData History Explorer provides a file system view of the archive which identifies the physical locations of all instances of all files including old versions of files and deleted files. It identifies the bar codes of all tapes that contain a particular file.
- XenData Tape Cartridge Contents Report which lists the contents of any tape cartridge and allows export of the report to an Excel spreadsheet. This is illustrated opposite.

In addition to the above methods for managing off-line files, XenData software includes an API which allows third party programs to be tightly integrated for off-line file management.

No	File Name	Generation	Version	File Size (bytes)	Type
1	/test_01/foreign test files/Spanish/Español.xml	0	1	52,893	Current
2	/test_01/foreign test files/Spanish/Realmente versión 3.xml	0	1	52,893	Current
3	/test_01/foreign test files/Russian/Русский Язык/Книга1.xls	0	1	17,920	Current
4	/test_01/foreign test files/Russian/Русский Язык/Книга2.xls	0	1	17,920	Current
5	/test_01/foreign test files/long file names/Copy of New Wordpad Document_New Wordpad Document_New Wordpad Document_New Wordpad Document106.doc	0	1	4,484	Current
6	/test_01/foreign test files/long file names/New Wordpad Document_New Wordpad Document_New Wordpad Document_New Wordpad Document106.doc	0	1	4,809	Current
7	/test_01/foreign test files/long file names/New Wordpad Document_New Wordpad Document_New Wordpad Document106New Wordpad Document_New Wordpad Document_New Word145.doc	0	1	8,755	Current
8	/test_01/foreign test files/German.lproj/Apple Qmaster User Manual.pdf	0	1	640,484	Current

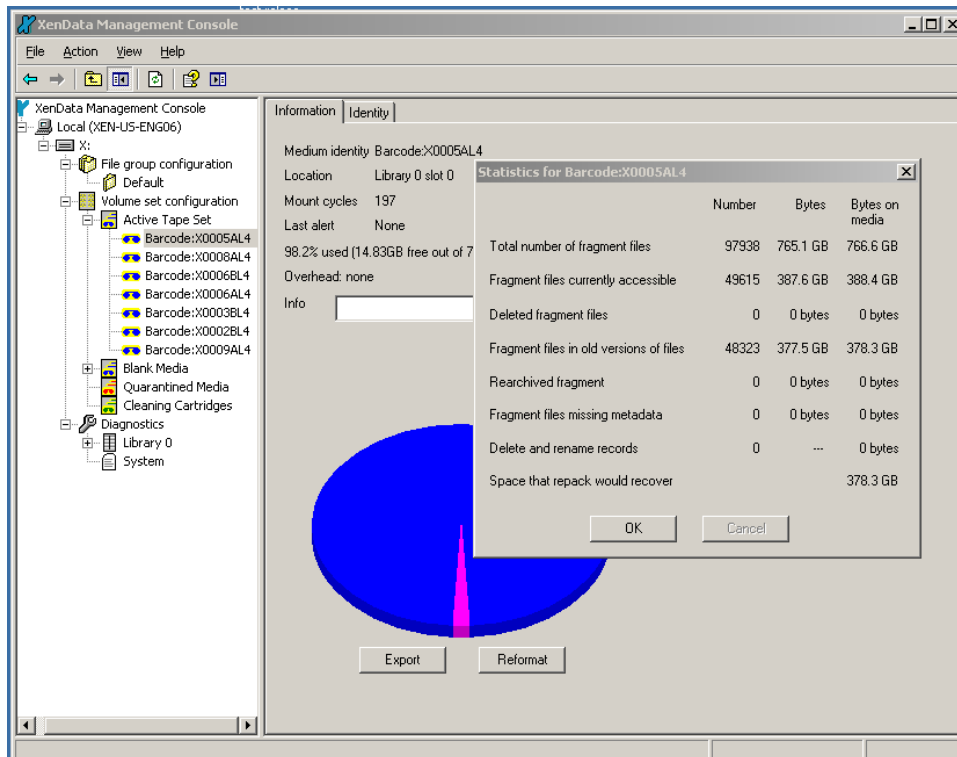
## Managing Tape Contents

XenData software provides comprehensive management of tapes and their contents. You can obtain information about a tape and its contents, transfer data easily between tapes to recover space from deleted files and upgrade to future generations of higher capacity tapes - all from the XenData Management Console (XMC).

**Statistics:** A short report on the statistics of a particular tape may be obtained using the XMC. The information includes:

- Number of files written and their consumed space
- Space that the Repack operation would recover

This is illustrated below. (Note, for more detailed information about tape contents, the XenData Tape Cartridge Contents Report should be used.)



**Repack to Recover Tape Space:** When a file is deleted from a XenData archive it disappears from the file system interface but the file remains stored on data tape. Similarly when a new version of a file is written to the archive, the latest version is the only version available via the file system interface. However, old versions of the file remain on tape. Space occupied by deleted files and old file versions may be recovered using a repack operation which copies only current files from one tape to another. Some programs like Final Cut Server “delete” every file that is restored from archive and consequently the XenData repack functionality is particularly useful with such applications.

**System upgrade:** Upgrading to a later generation of LTO is the most cost effective way to increase the size of an existing archive system. For example using a repack operation, archived data stored on LTO-3 format tapes can be concentrated 3.75:1 onto LTO-5. XenData archive software makes for easy system upgrades, going from an older generation of LTO to a later generation.

## Seamless Integration with Windows and Mac OS X Clients

Media organizations often have heterogeneous networks running both Windows and Mac OS X clients. OS X provides fast connectivity to XenData archives using the SMB protocol. XenData file management policies provide compatibility with Mac specific files, DS\_Store and resource fork files, ensuring optimized archive performance.

## Easy File Transfer between Archives

Different types of XenData archive provide tape cartridge interchange. For example, tapes may be exchanged between X800 systems, X32 and X64 single server archives and MX64 multiple server archives. When a tape cartridge becomes full, a contents catalog is automatically written to the end of the tape. The contents of a tape cartridge can be imported into a new archive by reading the catalog which takes only a few minutes.

The ability to easily and rapidly transfer tapes between XenData archive systems can be routinely used in two different ways:

- transfer of duplicate data tapes that are automatically created at a primary site to another XenData archive at a disaster recovery site
- sharing of video files between different locations

## Intelligent Bar Code Management

In addition to automatic recording of the bar code to the in-cartridge memory chip, XenData Archive Series software includes intelligent bar code management and provides:

- Automatic selection of blank media in bar code order
- Automatic selection of matched bar codes for replicated tapes
- Mirroring across multiple tape libraries based on matched bar code selection

It is impossible to keep tape cartridges in perfect numerical order in a tape library: a tape is exported from the library because its contents are being held on the shelf, new tapes are added, replica tapes are exported for disaster recovery purposes, etc. XenData software can manage this scenario very well. The software sorts through the inventory of blank media supplied by the tape library and archives to tapes in bar code order, no matter where they are physically located inside the library.

As described earlier, one of the key features of XenData software is tape cartridge replication. The software can be configured to automatically create replica tapes for disaster recovery purposes. This capability is typically used to create replica tape pairs and after a pair of tapes becomes full, one of the duplicate tapes is exported from the tape library and stored in a secure off-site location.

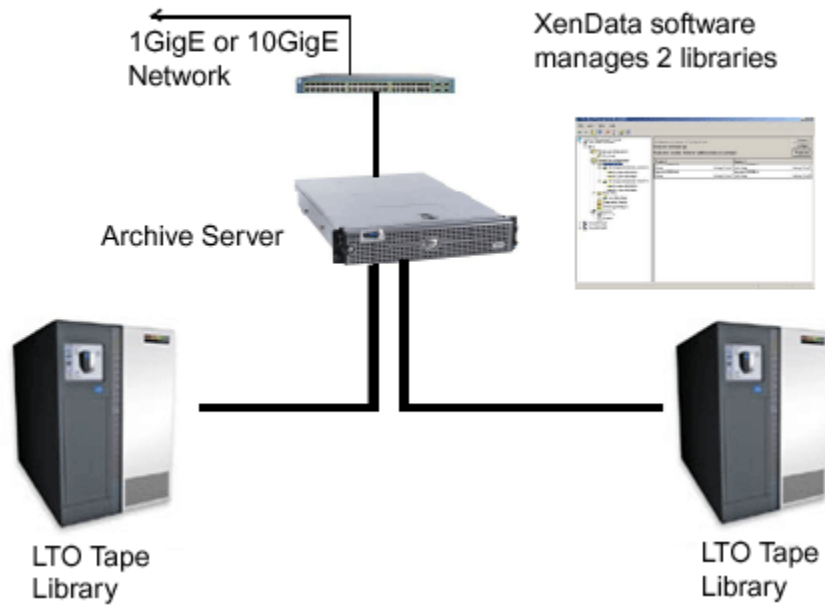
The XenData software provides tape cartridge replication when using regular bar code sequences. However, if a bar code sequence with matched A-B pairs is employed, the software will use the matched bar codes for replica tapes. For example, if we had the following sequence of matched pair bar coded tapes

**X0007AL4**  
**X0007BL4**  
**X0008AL4**  
**X0008BL4**  
**X0009AL4**  
**X0009BL4**

The XenData software would use the A letter tapes as a primary tape and make a replica on the matching B letter tapes before it would use any other blank tapes in the library.

## Mirroring Files Across Tape Libraries

The concept of using matched bar codes for matched pairs of replicated tapes described above can be taken one step further. The software will manage two (or more) tape libraries attached to a single server as shown in the figure below and by using matched bar codes loaded appropriately into the two libraries the system will mirror files across the libraries.



Using the A – B bar code sequence described in the previous section and putting all the A tapes into one tape library and the B tapes into the other, the software will automatically mirror across the two tape libraries selecting matched pairs of bar codes for the replica pairs of tapes.

## Further Information

For further information, please visit [www.xendata.com](http://www.xendata.com) or contact XenData:

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