



Growing Demand

INCREASING PRESSURE ON THE CENTRAL STORAGE BY MEANS OF GROWING PRODUCTIONS 2K, 4K AND 3D, LEAD TO FASTER EXPANSION OF STORAGE. REGARDLESS OF HOW LARGE THE STORAGE IS, IT FILLS UP QUICKER THAN EXPECTED. HOW CAN THIS SITUATION BE AVOIDED? ONE PARTICULARLY FAVORED STORAGE MEDIA IS LTO TAPE. IN EARLY 2013, LTO-6 WILL MARK THE ARRIVAL OF THE SIXTH GENERATION OF LTO DRIVES.

➤ The most common approach to reducing the load placed on central storage is archiving. Completed productions are moved to the archive so there is space created on the main storage. A natural step would also be the avoidance of data, but who should be charged with handling it and

when? There is hardly any time to address questions such as whether the data is necessary or if the production really has to be done in largest format possible or how to sort out data. Since the planning and set up of an archive costs time and money, many companies shy away from the topic. This stance of avoidance is expensive and creates incalculable risk. Without an archive, the central storage has to be continually expanded. When storage reaches a tipping point, data and productions are often impulsively moved. In this process, the overview of the data is lost as well as the security of the data. When expanding the online storage, the backup capacity needs to grow as well, which incurs its own expense as well. Disk-based systems require roughly ten times the energy as tape systems, and with increasing energy prices can leave you with a hefty price tag. On the other hand, a tape archive pays itself off within just a few years through savings on disk storage costs, infrastructure, integration, and electricity costs saved. In the field of data security and archiving, one medium has made an impact around the globe in all industries. We're talking about LTO tape. What's the reason that nearly all banks, insurers, broadcasters, and large companies secure their data to LTO tape? Actually, the fact that LTO has become the norm is due to a stroke of luck in the IT field, with the best features of previous

technologies coming together to be combined into one. This is the reason why LTO tape has been superior to any other preceding tape technology since its creation in 1998. The LTO consortium, made up of IBM, HP and Quantum, continues to work to improve throughput, capacity, and security. The implementation of LTO-6 is beginning and offers again an increase in capacity.

Archiving is not just a question of large production and broadcasters. In the USA, consumers are also advised as to the archive-worthiness of their photos and documents, and presented with digital conservation options at all levels. Here, the meaning of protecting cultural possessions in digital form is recognized and actively pursued. (1) In comparison, such an overarching implementation in Germany is still missing. The archived formats there offer an insight into the broad use of many media formats. (2)

LTO-6 IN THE STARTING BLOCKS

In early 2013, sixth generation LTO drives, meaning LTO-6, will be available. Again the tape capacity has been increased, now to 2.5TB per tape. The particulars that the producers place on a higher compression factor often leads to talk of a 4TB tape. Its still to be determined if that will play out in reality. Because media data usually can't be compressed much more, the orientation to the native capacity is realistic.

LTO ADVANTAGES		
	LTO 5	LTO 6
Speed	up to 140 MB/s native	up to 160 MB/s native
Kapazität	1,5TB native	2,5TB native
Security	Servo Tracks, Auto-Speed, Verify, Error Correction	
Shelf Life	Certified for 30 years	
WORM	Compliant & long term	
Relocation	Simple & cost efficient	

Additionally, the throughput of data has grown to 160MB/s. As with past generations, tapes from one generation previous can be written and read, meaning LTO-5 is compatible. Compatibility in reading goes back two generations, bringing LTO-4 into the fold. On the whole, the increasing level of data growth is accounted for, and each new library can hold at least 66 % more data volume. (3)

NEWS ABOUT LTFS

LTFS, or Linear Tape File System, was introduced in 2010 and has become more visible in the last few years through marketing activity. Until now there has been little substance, the current state of the driver is still encountering some growing pains and is far from user friendly. Additional confusion is created by the vendor dependence of the drivers. Theoretically, each platform (Mac, Win, Linux) and each drive vendor (IBM, HP, Quantum) requires its own driver, meaning nine total. Also, the accessibility to LTFS feels old fashioned. Some drivers have to be compiled individually and are still spotty with errors. At least there is some good news: Archiware Software GmbH in Munich, Germany, offers a free tool called MediaLTFS which works with drives from all brands, and is installed easily via double click. (3a)

Furthermore, the question of how tape as a linear medium can address user expectations of flexibility and response time remains open. One also should know that technology limits the medium to the addition of information; deleting data doesn't open up space. Also, operations such as renaming or repositioning data on the tape have unexpected consequences. So many drive processes take place during these steps that the lifespan of the tapes and the drives can be impacted (so-called "shoe shining"). This doesn't even address the patience of the user. Its just as confusing and

irritating when the vendors talk about how tape can be used like a disk. Its more similar to CD- or DVD-RW. Like with these media the medium has to be erased completely to create space. The primary use has been for static storage or transport of data. So what is LTFS good for? The low price of LTO tapes is unrivaled, as is its dependability in the transport of large amounts of data. It also tallies points in delivery from service providers to customers, and transport between locations or workflow steps. The lightweight of tape in comparison to disk, and stability when shipped, means lower shipping costs and higher safety. Tapes are also quicker to read than the often-used USB 2 disks (140MB/s compared to 30 MB/s). When dealing with multiple TB's of data, this means saving day's worth of transfer time. Occasionally some will be tempted to archive in this format. As attractive as that sounds, it's far from the reality of the situation. First off, it bears consideration that an Archive depends on its catalogue, which should be searchable and tagable with metadata. This is precisely what LTFS does not offer. Each tape, upon mounting, displays its contents. The loading and reading of multiple tapes while searching for a particular file is time consuming and can take five minutes or more

per tape. Traditional Archive software, like P4 Archive from Archiware, targets this problem by offering a catalog with metadata, as well as a search function and previews, helping to reduce the time needed in determining which files should be restored. (6) There are no alternatives that come close to offering such options with LTFS. It is critical to reflect on the actions of the manufacturers, which hardly instills a sense of trust. Tapes that were written with the first generation of LTFS weren't readable with following generations. How and if future maintenance of the free drivers occurs is unknown. Because the main business of manufacturers is large (non-LTFS) libraries, you should approach the topic with at least some caution. In conclusion: LTO tape with LTFS can make moving data much easier. Other uses are currently far from attractive.

MAM IN THE MIDDLE

Media Asset Management (MAM) systems are used in organizing large amounts of media, increasingly also being used in smaller environments. In capturing both descriptive and technical Metadata, it makes sense to integrate the archiving process into the system. The user stays in the MAM interface and archives/restores from here. The Cologne, Germany based moosystems.com offers a new integration "CP archive App" for CANTEMO with P4 Archive. (5) Here you will also find a migration tool from Final Cut Server to CANTEMO. For Archiware's P4 Archive there is also integration with CatDV from SquareBox. In all cases, the central storage is relieved of accumulating data by archiving, and completed productions are stored on LTO tape. All media remains noted in the MAM and can be recalled from the archive when needed.

DATA MANAGEMENT

There are many points in the workflow where data management has its place. Starting with ingest, it can be necessary to make a copy for safe keeping, especially if the memory card will be put back into use and rewritten. The central storage requires a unique form of security, because its failure would be unacceptable and many users require access for their work. This requires a failover, which is achieved through cloning to a secondary storage device. In case of an emergency, the administrator can connect the second storage, and within minutes work continues as normal. A copy/restore would take too long. A solution that is used for this requirement is P4 Synchronize that is also capable of cloning SAN systems. The integrated File System Events feature helps to achieve even shorter intervals since no scanning is necessary. (6)

Data, which is less time-critical, can be covered under a traditional cyclical backup. The restore time in such cases varies. Disk backups offer faster access whereas tape backups offer easy offsite storage and longer retention time though better cost per TB ratio. Both media can be used in combination with P4 Backup. (7)

All completed productions should be moved to the archive, to open up valuable space. (8)

ARCHIVING, BUT HOW?

Small actions can mean big results when archiving because it is used over many years. The following food for thought should help you develop an approach:

- Archiving what belongs together even when it is created separately in the production process. Later, this junction is extremely important. Years after the production, earlier processes are no longer remembered. Everything that helps in the search should be taken into account.

CAN GO WITHOUT DATA FOR...	
Minutes	Data availability/Fail-over, no Restore necessary
Hours	Backup to Disk or Tape cycles, with restore, offsite storage possible
Day(s)	Long term archiving with offsite storage

- Coordinating the backup and archive cycles will reduce double archiving. Archiving too early leads to an accelerated growth of the archive. If a production is archived once it reaches a point where it is unlikely to be altered, then the archive won't grow with unnecessary data. Up until this point, the production remains in the backup cycle on the central storage.
- Archive a rendered low-res or online version as well. This can be restored and secured quickest, so that you can decide whether a hi-res or other media is needed. This version can also be easiest used as a preview, possibly even used to represent the full project.
- Project and production descriptions belong in the metadata fields of the archive. Here, it is often the simple way that is the best, copying the content of the text file into a metadata field. If you happen to have an XML file, this can also be copied into the metadata field. As the key is findability at some point in the future, special characters and readability can be ignored.
- When using descriptions, use controlled vocabulary or metadata dictionaries. The questions of who, what, where,

and when should be addressed. Consistency in these descriptions will improve the usability of the archive.

- How can a production be retrieved from the archive and reused in the workflow years later? Maintaining old hard- and software, or exporting in a flexible format such as MXF before archiving are possible solutions.

METADATA

Archiving is only as good as the metadata concept behind it. Metadata describe the content of the media archived. (9) "Use cases", or detailed descriptions of the process of using the archive in the future, are a good option to reflect on relevant metadata and search criteria. Careful planning pays off tremendously, as an archive is a long-term project.

META DATA		
Technical	e.g. camera type, resolution, focal length	
Descriptive	Who? What? Where? Workflow?	Structured/classified or unstructured e.g. content description

After a few years, file names or project references are most certainly forgotten. This is why the description of the media needs to be as consistent and encompassing as possible. This means a bit more work, but makes the archive complete and transforms it into the memory of the company. Be it for referencing, for reuse, comparisons, or even for the clients, a complete archive has many valuable uses. Metadata describe the content, list cast, responsibilities, and special conditions. Relevant notes about the workflow and technical parameters can also be added here. The quality of the metadata hold up only with consistency, meaning the use of clear terms or controlled vocabulary. In the USA, there is an extensive project for metadata in broadcast and television and public TV. (10)

TAPE ADVANTAGES

Although disk systems have gotten cheaper over time, tape systems have particular advantages that more than compensate for the cost in the long run.

- A tape drive or library can grow by switching out the media. This means you don't have to purchase new hardware like RAID's, which require integrating and maintenance of additional hardware. Scaling with an archive is really quite simple.

- Tapes are safe against damage such as malware, cyber attacks, renaming, and accidental deleting. Only the tape that is currently in the drive can be impacted at all.
- Tapes are the only proven long-term storage medium, and are made to do exactly that. Storing disk over a long period of time is and will remain a process of luck, as disks are made to be a running system.
- Tape libraries require roughly only 10 % of the energy which disk systems of a comparable capacity require. With energy prices rising, there is a huge amount to be saved.
- Tape systems in production are easier to keep out of reach from users than RAID systems. By granting restore rights from the tape archive, a tape can't be accidentally wiped.
- TCO (total cost of ownership) comparisons between tape and disk show dramatic savings by tape systems, up to 95%. (11)

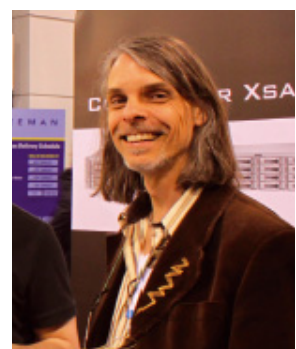
Those who have already archived to LTO tape can rest assured that it is the most professional and reliable technology available. If you entered the market with LTO-3, now is the time to make the move to LTO-5. Those who don't yet archive, would be smart to recognize the added cost and risk that waiting to begin archiving can bring. Simplified and unified workflows find the optimal support and foundation in an archive.

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His Text builds on the piece "Multiple Advantages (Vielfacher Gewinn)" in MEDIEN BULLETIN, Edition 12/11_01/2012, available at: <http://www.mebucom.de/special-detail/items/vielfacher-gewinn.html>

Links to additional literature (Numbers in brackets) can be found in the online supplement at [www.mebucom.de: http://www.mebucom.de/news-detail/items/links-zu-wachsende-anforderungen.html](http://www.mebucom.de/news-detail/items/links-zu-wachsende-anforderungen.html)



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LINKS AND LITERATURE

- (1) <http://www.digitalpreservation.gov>
- (2) [http://americanarchiveinventory.org/dashboard/records?pivot\[\]=year_facet&pivot\[\]=pbcore_instantiation_physical_s](http://americanarchiveinventory.org/dashboard/records?pivot[]=year_facet&pivot[]=pbcore_instantiation_physical_s)
- (3) http://en.wikipedia.org/wiki/LTO_tape
- (4) <http://www.archiware.com/blog/>
- (5) <http://moosystems.com>
- (6) <http://www.andre-aulich.de/en/perm/use-xsan-2-2-xs-filesystem-events-and-archiware-presstore-4-x-to-protect-large-volumes>
- (7) <http://www.archiware.com/p4-backup.8.1.html>
- (8) <http://www.archiware.com/video-archive.35.1.html>
- (9) <http://en.wikipedia.org/wiki/Metadata>
<http://microformats.org/wiki/video-metadata-model>
http://www.cinearchiv.de/images/abschlussdokumentation/sack_metadaten_struktur_analyse_suchsystematik.pdf
- (10) <http://pbcore.org/index.php>
http://cn2.wnet.org/thirteen/ptvdigitalarchive/files/2010/03/PDPTV_ReposDesign_2010-03-19.pdf

Other links to metadata projects

- http://www.loc.gov/standards/mets/METSOverview.v2_de.html
 - <http://www.loc.gov/standards/mods/>
 - <http://www.loc.gov/standards/premis/>
 - <http://metadataregistry.org>
- (11) Whitepaper "Why Tape is Back" contains numerous studies and sources:
<http://www.spectralogic.com/index.cfm?fuseaction=members.docContactInfoForm&DocID=4255>