Can Disk Storage Replace Your Tape Storage?

KEY ASPECTS FOR CHOOSING YOUR PRO VIDEO/FILM/TV STORAGE SOLUTION

LBL-003

$ 8001 GB

SILENT BRICK

Video Storage is Tape Storage

In the 1960s, the BBC wiped the original video tape recordings of **Doctor Who**. The reason was simple: Storage was expensive and limited. The BBC needed the tapes for new programs.

Ever since, tape has been used to store the vast amounts of data in video creation, production and playout. There are three main reasons for that:

1. Tape is considered being cheap.

2. Moving a tape from A to B is the fastest way to transfer data.

3. Capacity is just a matter of adding more tapes.

Unfortunately, tape storage also requires making compromises, especially in terms of:

1. Speed and availability, due to its linear data structure and the lack of random access,

2. Protection against losing data, since one tape holds one instance, and

3. Complexity, which created a big business for media asset management.

An ideal system for video storage would be fast, secure, scalable, flexible - and still competitive in terms of incremental cost and TCO.

A Closer Look At The Benefits Of Tape And Disk Storage

#1: Tape is cheap, disk is expensive

A LTO-5 cartridge, holding 1.5 TB (uncompressed), sells for around 25-50€. A 4 TB hard disk starts at around 125€. Not too far away, already.

However, none of the two can be used without a proper infrastructure. This infrastructure requires setup, maintenance and energy. Since tape storage libraries are very much mechanically complex devices, a lot of effort must be put into maintenance - resulting in costly service contracts and possible down time. On the other hand, usual disk libraries require special server hard disks. Those are much more expensive driving initial cost. Also, they must be running 24/7, leading to increased energy consumption for operation and cooling.

Another driver of storage cost ist data security. Losing data is not an option. And the BBC certainly would do a lot today to make sure, those Doctor Who episodes never get lost. Securing a tape requires one or two copies and regular reading checks. This doubles or triples raw storage costs and increases maintenance even more.

And while disk based storage can be secured using RAID or similar redundancy technologies, vendors still always very much recommend doing a tape backup to secure the data against loss.

Conclusion: Cost is not only $$ / TB. Both tape and usual disk libraries have a lot of hidden extra cost attached to the raw storage.

#2: Data on tape is movable, data on disk is stationary

Depending on the distance and the amount of data to transfer, nothing can beat a sneaker network. Moving a 10 pack of LTO-5s from one end of London to the other is just a matter of traffic. Not always predictable, but still faster than pouring 15 TB through that „broad-band" connection.

But there is more to look at. Prior to physically moving the data, it must be copied to the tapes, which also includes a verification process to make sure the data can actually be read on the other side. There, the data must the again be copied from the tapes - hopefully without any errors.

But apart from that - yes, data on tape is very movable.

There has been some attempts to offer movable, disk based media. Still remember ZIP and JAZ drives? The problem with disk based movable data: They are either not part of the scale-out storage system, making copy processes inevitable, or the whole system had to be moved, not very practicable.

The benefit of a disk storage system is its random access and built-in security through redundancy (RAID or other technologies). However, since disk systems usually do not store data on a linear basis, data is spread across the whole system or a particular redundancy set. Moving data without prior and post copying means moving at least the complete set of disks belonging to that redundancy set, better together with its controller to avoid mixing up disks. In addition, especially sever disks are not build to be moved. In a typical RAID-5 configuration, one corrupted (or lost) disk already puts you in danger of losing all of the data.

Conclusion: Moving data from A to B requires copying to a transport media - or really big data pipes.

#3: Capacity is just about adding tapes, disk systems scale only to a certain amount

Tape libraries consist of a certain number of drives (and slots), and virtually unlimited tapes. The raw capacity thus can be extended by just adding more tapes. Unfortunately, this capacity is only available on a per tape basis, depending on the number of drives / slots. Adding more tapes only adds offline capacity. To increase the available (online) capacity, more drives / slots are needed.

Disk storage systems usually provide their capacity as „always on". Since all disks are always connected, adding more capacity always means adding online capacity. But not all disk systems are built to scale equally well.

There are two terms regarding scalability: Scale out vs. scale up. Typical RAID solutions are scale-up systems, which basically means: once the configuration is fully set up, scaling means adding another system, a new configuration, often a different vendor, SLA, maintenance. This often leads to initially oversized storage systems, since nobody wants to run out of storage. Remember the BBC?

Enterprise storage systems often provide a virtualization layer, offering scale-out infrastructure. Adding another storage component really adds more capacity to the system. The added capacity is handled through a software layer, all applications only see more storage.

While typical scale-out storage systems are quite expensive, a new approach called Software defined Storage, SdS, separates the software layer and allows to utilize simple, inexpensive raw storage hardware, significantly lowering the investment, but introducing yet another layer of complexity.

Conclusion: Be careful about capacity and scalability, and distinguish between online and offline capacity.

Designing A Disk Storage System For Video Professionals

The requirements for an ideal storage system for video professionals would include the benefits of tape and disk systems, without their respective draw backs.

Random Access, Speed and Availability

Of course, a disk storage system offers random access, providing instant access to every single frame. The speed of the storage system must be fast enough to handle high definition video for multiple users without significant latency. Data availability should initially reside on a high level and be easily expandable if more concurrent users require more simultaneous access to more data.

Secure, Scalable and Flexible

Making use of latest technology, data should be stored secure enough to avoid the necessity of backups or the need to mirror the complete system. Single areas of storage should be replicable to increase security against the loss of a complete set of data due to theft, fire, water or alike.

The system needs to scale out properly without limitations - and without harming or compromising security. Scalability should be possible in every aspect - raw capacity, available online capacity, even performance.

Since there are a variety of different requirements in every pro video environment, the storage solution must be flexible enough to work with a number of software solutions and infrastructure components. Different storage areas need to be configurable differently with individual rights management, security and performance setups.

Movable Media, Offline Capability

Ideally, no copy process should be required to move data from a field storage device to a stationary storage array. Physically moving data must neither increase the risk of losing data due to mixed up or lost disks, nor compromise the security through redundancy.

Physically movable media must be able to be stored offline without consuming energy. Offline capability must be built into the system from the ground to avoid missing data and help moving data between storage systems.

Cost Effective & Less Complex

After all, the system must be low maintenance and energy efficient. Incremental storage cost must not be way off regular tape or disk storage media, taking security and ease of handling into consideration. The system must meet latest regulations and professional data center recommendations.

Ideally, a storage system should not add, but reduce complexity. Back in the days where everything was on tape, even editing, this was the only media. Today, a lot of different types of media, storage, servers are used. Frequent copy processes, different backup plans, multiple SLAs and a variety special skills to setup and maintain all this are needed.

Software companies even promote more complex structures, such as „hybrid storage architecture", „D2D2C2T" (disk to disk to cloud to tape), and other buzzwords. Adding more storage layers significantly adds to the overall complexity, cost, and risk of misconfiguration, down time and loss of data.

FAST LTA COLD Storage

FAST LTA has been a leader in secure storage solutions since 2005. Its Silent Cubes WORM storage solution protects data from healthcare, government & public, industry, legal & banking and other businesses in over 1500 installations.

Their storage systems are specifically designed for cold storage applications. Cold storage describes the 80+% of all data that, once produced, is rarely accessed but needs to be kept, secured against loss, and available when needed. FAST LTA dubs the technology on which their storage systems are based on as COLD Storage, short for Cost Optimized Linear Disk Storage.

Linear Disk Storage

On Linear Disk Storage, data is stored on standard hard disks in a strictly linear way - similar to a tape. Of course, reading is completely non-linear to provide true random access.

This linear data structure implies a number of advantages, especially for pro video environments:

- Data is kept together – Video files are usually large files, per definition they have a linear structure (i.e. a beginning and an end). It makes no sense to break up these files into small pieces and distribute them throughout the storage system, since most of the time, they are also read on a linear basis.

- Power management and offline media – Since the system is designed to keep data physically together, a granular power management can be realized. Keeping data physically together on a well defined array of disks also enables the possibility to create movable and offline media.

More information on Linear Disk Storage can be found in the White Paper „Linear Disk Storage" at www.silentbricks.de/en.

Erasure Coding, Disk Mix and Digital Audit

Erasure Coding (or: Erasure Resilient Coding, ERC) has been dubbed by INTEL[1] as the successor to RAID, providing higher security and less complexity with better net/gross capacity efficiency. FAST LTA has been successfully using Erasure Coding in their products since 2005.

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[1] http://www.intel.com/content/www/us/en/storage/erasure-code-isa-l-solution-video.html

Erasure Coding takes a file, breaks it up into 8 pieces, re-codes these to 12 new chunks and spreads those 12 chunks evenly across 12 hard disks. Providing 4-fold redundancy, any 8 out of these 12 chunks are sufficient to reconstruct the original 8 pieces and thus the original file. This means, that up to 4 hard disks out of the set of 12 can fail without losing any data.

To further increase the security against data loss, Disk Mix utilizes 4 disks from 3 different production charges (or even 3 different disk models) within every set of 12 disks. So even if a disk model is affected by an epidemic failure, e.g. due to a faulty production process, and all 4 disks from that particular model fail within a short time, no data is lost.

The third level of security is an automated process called Digital Audit which scans the data written on the disks on a regular basis, detects hidden errors and initiates a repair procedure. This is necessary because even if a write process reports no errors, hard disks have a statistical value of a bit error, resulting in unreadable file and data loss.

The Silent Brick Library

Based on FAST LTAs COLD Storage technology, the Silent Brick Library is a revolutionary new storage system with best of class data protection, maximum flexibility and lowest TCO for cold storage applications.

The Components

SILENT BRICK

Instead of fixed hard disks, the Silent Brick Library features removable storage containers, the Silent Bricks. Each Silent Brick contains 12 hard disks (2.5'' laptop disks, made for frequent power cycles and for traveling). Configurations are available with 1 and 2 TB disks, offering 12 and 24 TB (uncompressed[2]) gross capacity, respectively.

The data is protected through the three-fold security described above: Protected by Erasure Coding, 4 out of the 12 disks can fail without losing any data. 3 different disk models in each Silent Brick protect from loss due to epidemic failure. And the Digital Audit regularly scans the contents of the Silent Brick for corrupt data.

The Silent Brick features an e-paper display as electronic label and contains no battery. The display holds the data written to it even without power.

The disks are physically kept together and surrounded by a robust aluminium profile. The Silent Brick is made to move, but it is also easy to open and to service. Hard disks can be exchanged without special tools, without special training.

Using Erasure Coding, each Silent Brick provides 8 or 16 TB net capacity with 4 spare disks. An 8 TB Silent Brick sells for around 1000€.

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[2] We prefer to only report uncompressed, raw capacity. Be careful when looking at capacity statements, especially from tape vendors. They often state something like „1.5 / 3* TB", the * meaning a „typical" 2:1 compression. With video data, this simply does not apply, since most video footage already uses the world's most powerful compression algorithms.

CONTROLLER & SHELF

The place to fit the Silent Bricks in is the Controller and the Shelf, the tow main components of the Silent Brick Library storage system. A Controller already provides 5 slots, offering up to 120 TB gross capacity. A single Controller can provide online access to up to 120 slots - this is like having 120 tape drives in your library.

If those 5 slots are not enough, Expansion Shelves provide more storage. Each Shelf holds another 14 Silent Bricks, providing up to 336 TB gross capacity. Shelves do not need to be completely filled, storage can be added as needed at any time.

Shelves and Controllers are connected in a Serial Attached SCSI (SAS) loop topology. This ensures not only high speed access to every single Silent Brick in the system, but also provides integrated fail-over, since there are always two paths to every component. If one connection dies, the system automatically choses the remaining path.

For fail-over scenarios or connecting more clients, 2 or more Controllers can be connected in one system. Since all slots are independently connected through the SAS loop, every controller can have access to any Silent Brick in any slot.

NEW: SILENT BRICK DRIVE

Especially for pro video environments, the new Silent Brick Drive is a nice extension to the Silent Brick Library storage system. Featuring 2 slots in a slim 1U housing, the Silent Brick Drive is the ideal field storage device. Also, production companies benefit from the small form factor and the full compatibility with all Silent Brick Library systems.

The Silent Brick Drive will be available in 2016.

NEW: SILENT BRICK BIG SHELF

Also new for 2016, the Silent Brick Big Shelf lowers the incremental storage cost even more. For all those use cases where storage doesn't need to be moved, this stationary 4U component offers highest storage density with standard 3.5'' hard disks, while offering the same protection level and connectivity.

The Benefits

SO SECURE, NO ADDITIONAL BACKUP IS REQUIRED

With the three-fold security level, the Silent Brick Library provides best of class data protection. In fact, data stored on Silent Bricks is so secure that no additional (tape or cloud) backup is required. Only protection against catastrophic failure, such as theft, fire or water, requires an additional instance at second location.

MAXIMUM FLEXIBILITY

The physical separation of data on Silent Brick storage containers, which are also individually configurable, provides maximum flexibility. Each project, client, department, etc can have their own Silent Brick(s). If more space is needed, another Silent Brick can be added easily.

Every Silent Brick can also be replicated to one or more other Silent Bricks, within the same system (e.g. for offline storage) or to a remote location. Replicating is different from mirroring; the connection between the original source and its replicas is never lost, even if the replica is stored offline. At any time when a connection to the original Silent Brick is re-established, the content is synched. Of course, also dedicated copies are possible, allowing specific snapshots of a given state.

MINIMUM COMPLEXITY

Complexity is one of the most frequent reasons for loss of data or system down time. The more different components, configurations and software packages are involved, the likelier a system stops working the way it should.

In storage configurations, a lot of (software) vendors promote a „hybrid storage approach", introducing multiple layers (tiers) of storage and „automagically" moving data from fast/available/expensive to „hopefully never needed again"/unavailable/cheap. Not only are a number of different storage systems involved, of course some expensive software is required to move data around and make sure users still have access whenever needed.

While this might be true and necessary for mission critical applications such as databases and virtual machines, the majority of data, especially in pro video, is unstructured (static) that doesn't change. Including these 80+% of data volume in the complexity of multi-tiered storage structures drives costs and lengthen backup windows.

If unstructured data is stored on Silent Bricks, complexity is vastly reduced, backup windows are significantly shortened, and costs for D2D2whatever2T backup solutions are cut.

FAST LTA: A passion for data protection

We secure terabytes – the motto of FAST LTA AG, Munich. Underlying this slogan is a solemn promise to always serve the data of its customers. A promise reflected in each and every detail of the storage products developed by Matthias Zahn and his staff.

FAST LTA's own commitment: No bit lost. Which is why the company develops all the critical components itself, extensively testing and continually improving them. This includes the implementing of redundant erasure coding far superior to conventional RAID in protecting against data loss. FAST LTA supplements this technology with the self-checking Digital Audit and employs Disk Mix, the use of three different hard disk models within one storage unit, to provide each redundancy array with an added layer of security. Storage products from FAST LTA are so secure that – provided the physical location itself is secure – no further backup safeguard is ever necessary.

Ever since first being introduced in 2008, Silent Cubes has been employed in thousands of installations spanning such diverse fields as healthcare, public service, industry, commerce, banks and insurance as revision-proof WORM storage of vital data that can never suffer loss no matter the circumstances. The practical storage cube is certified for numerous solutions compliant with German GDPdU, GoBS and RöV directives.

The Silent Brick Library, the flexible "COLD storage" using portable storage containers, likewise capitalizes on the triple security standard of Erasure Coding, Digital Audit and Disk Mix. Combining a linear data structure with hard disk technology allows physically separable storage locations and particularly low marginal costs for memory. The Silent Brick Library is particularly well-suited to large active archives, as a backup storage or as a media storage, e.g. for video productions.

FAST LTA is certified according to ISO 9001.

Hello,