LTO and Magnetic Tapes Lively Roadmap

"With a roadmap like this, how can tape be dead?"

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FujiFilm TapePower Industry Trends Perspective: LTO and Tapes Lively Roadmap

Introduction

There is no such thing as a data recession and no end in sight for the amount of data that will need to be stored and protected for longer periods of time. IT organizations of all sizes contend with a growing data footprint with more data to manage, protect and preserve for longer periods of time.

Tape is a technology that has been routinely declared dead over the past couple of decades. With the recently released LTO (Linear Tape Open) roadmap, it is safe to say there is plenty of life left in this data storage medium. The LTO roadmap shows a continuing trend of enabling more data to be safely protected and stored on an individual tape cartridge, helping to support continued data growth.

The Myth and Reality

As is often the case with time proven technologies, magnetic tape has been declared dead at the hands of other emerging technologies and startup vendors – largely as a result of more marketing resources being applied. The reality is that more data is being stored on magnetic tape today than in the past in a denser, more efficient footprint.

Tapes Changing Role and Trends

With the continued adoption of disk-based data protection, the demise of tape as a viable data storage medium has been greatly exaggerated. Instead, tape is currently undergoing a renaissance of sorts as a complimentary technology to disk and other tiered data storage mediums. Tape remains relevant for long term data retention needs while supporting compliance, green energy efficiency, cost containment and other business sustainability requirements.

Traditionally, backups have been done from disk to tape, either a standalone tape drive or a drive in a tape library system. Recent technology evolution is seeing an increase in disk-to-disk backups followed by a copy of data also being made to tape. With disk-based backups serving as a staging or buffer area to hold current data copies, tape's role is changing to holding larger copies of weekly or full backups, retaining gold or master backup copies and supporting data archiving and preservation.

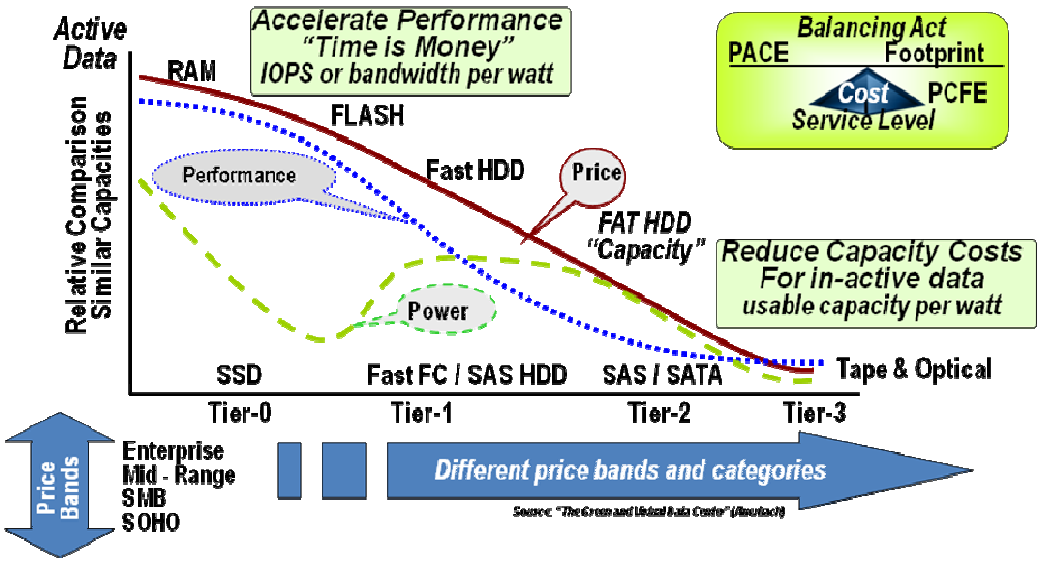

Figure 1 Tiered Storage: Balancing Performance, Availability, Capacity and Energy to QoS[1]

[1] Quality of Service (QoS) to meet business service requirements and objectives

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Technology alignment - that is, aligning the applicable type of storage medium and devices to the task at hand to meet application service requirements - is essential to achieving an optimized and efficient IT environment. Very I/O intensive active data, as shown in Figure 1, leveraging high-performance SSD (FLASH or RAM) Tier-0 or, for high I/O active data, Tier-1 fast 15.5K SAS and Fibre Channel storage based systems are a good solution.

For low activity applications where storing as much data as possible with the lowest cost is the objective, such as disk-based backup, slower, high capacity SATA-based storage systems are a good fit. For long-term bulk storage to meet archiving, data retention or other retention needs as well as storing large weekly or monthly full backups, tape is the ticket (Figure 1) with the best combination of performance, availability capacity and energy efficiency per footprint.

Why Tape Remains Relevant

Simply put, given its time tested reliability, low cost per TByte and energy efficiency when compared to other mediums used in a similar manner tape remains an excellent choice for storing large amounts of inactive or off-line data including for backup as well as archive.

A common misperception is that the hard disk drive (HDD) combined with data deduplication packaged as a VTL (Virtual Tape Library) or other storage system is or has killed off tape as a storage medium. While disk to disk (D2D) based backups continue to gain popularly, tape usage, particularly in mid to larger scale environments, continues to be relied on in more efficient and effective ways. For example, to boost utilization of tape drives along with reducing the number of devices required to accomplish backup, archive or other data protection functions in a given amount of time, D2D solutions are functioning as a buffer or cache for tape.

By performing a D2D backup, perhaps from a snapshot or replication copy, data is buffered such that when it is ready to be written to tape, a drive with adequate configuration can actually stream the data in a more effective manner. The net result is that the tape drives themselves can be used closer to 100% utilization other than for changing media or routine maintenance.

Ten Things Keeping Tape Alive

- Continued technology enhancements
- Proven data reliability and longevity
- Regulatory and other compliance needs
- Increased data density to reduce costs
- Energy efficiency enabling Green IT
- Routine backups shift to a D2D model
- D2D backups serve as a buffer for tape
- More efficient use of tape devices
- No such thing as a data recession
- Tape was never dead

With the continued enhancements in native, compressed storage capacities on tape media and improved resiliency for long term data survivability or shelf life, tape not only remains relevant, its role is changing to that of being used for large scale bulk data protection as well as long term data preservation.

Ironically, the HDD has not killed tape as a medium, rather, it has helped reinvigorate and keep the technology active in a complimentary manner. What is even more ironic is that the HDD has also been declared dead by some at the hands of Solid State Devices (SSD) which in fact are helping to give HDD new and extended life by off-loading some functions. However, there is more to why tape remains relevant than tiered storage best practices deployments or new roles for its use. Another thing that keeps tape viable is that, as a technology, it is not sitting still, despite what you may have heard or read.

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LTO Tape Lively Roadmap (Past, Present and Future)

As an example of how tape technology continues to evolve, Table 1 shows the current planned roadmap for LTO. In addition to the usual turn the crank enhancements (e.g. double the capacity, double the performance in the same footprint) there have and will be additional enhancements. For example, where LTO 3 saw the introduction of Write Once Read Many (WORM) for compliance, archive and other fixed data preservation needs, drive level encryption was introduced in LTO4.

LTO	Year	Native Capacity	Native Speed	Compress Capacity	Compress Speed	Features Functionality
8	TBA	12.8TB	Up to 472MB/sec	32 TB	Up to 1180MB/sec	WORM, Encryption, Partitions, 2.5:1 Compression
7	TBA	6.4TB	Up to 315 MB/sec	16 TB	Up to 788MB/sec	WORM, Encryption, Partitions, 2.5:1 Compression
6	TBA	3.2TB	Up to 210MB/sec	8 TB	Up to 525 MB/sec	WORM, Encryption, Partitions, 2.5:1 Compression
5	2010	1.5TB	Up to 140MB/sec	3 TB	Up to 280MB/sec	WORM, Encryption, Partitions, 2:1 Compression
4	2007	800GB	Up to 120 MB/sec	1.6 TB	Up to 240MB/sec	WORM, Encryption, 2:1 Compression
3	2005	400GB	Up to 80MB/sec	800 GB	Up to 160MB/sec	WORM, 2:1 Compression
2	2003	200GB	Up to 40MB/sec	400 GB	Up to 80MB/sec	2:1 Compression
1	2001	100GB	Up to 20MB/sec	200 GB	Up to 40MB/sec	2:1 Compression

Table 1 LTO Roadmap

With LTO another new feature is that of partitions to hold more frequently used data which, in theory, should help to make tape function more like HDDs in the future. For example, the dedupe catalog or index for data could be stored at the beginning of a tape in a partition to help enable safe, secure and efficient use of deduped tape. Also shown in Table 1 is that with LTO6 an enhanced compression algorithm appears, shifting from the traditional 2 to 1 (2:1) to a slightly higher 2.5 to 1 (2.5:1).

While lower than the ratios associated with dedupe that trade time or transfer rates for data reduction space, compression ratios for tape enable fast data transfer to support bulk load or unload. An example of how HDD and tape co-exist and compliment each other is having smaller more frequent data restoration coming from routine backups that have been deduped to save space while larger full volume or large scale restoration comes from a master gold or tape copy.

In addition to the roadmap enhancements for LTO shown above, there are additional proofs of life tape improvements in the works. For example, in January of 2010, IBM and Fujifilm announced[2] breakthroughs and enhancements to technologies that, combined, could in a few years result in 35TB (native) storage capacity per single cartridge. By comparison, most recent generation LTO4 supported up to 800GB (native) with LTO5 moving up to 1.6TByte and LTO8 roadmap coming in at 12.8TB native.

[2] http://www.fujifilmusa.com/press/news/display_news?newsID=879807

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Summary

Tape's role is changing and being complimented by magnetic hard disk drive (HDD) coupled with virtualization in the form of virtual tape libraries (VTL) and data footprint reduction impact technologies (compression and dedupe among others). Given its lack of energy usage when not being accessed to store data, tape remains the most effective and efficient data storage medium for inactive data from both a Green environmental as well as an economic standpoint.

With its economic and environmental - including power and cooling - benefits, time-tested reliability combined with new and emerging enhancements, it is safe to say that tape still has plenty of life left in it. Perhaps with tape's evolving roadmap and continued reliance resulting in sustained use what is really dying is the myth that tape is dead.

About the author

Greg Schulz is founder of Server and StorageIO, an IT industry analyst consultancy firm and author of the books *The Green and Virtual Data Center* (CRC) and *Resilient Storage Network* (Elsevier). Learn more at www.serverandstorageio.com or on twitter @storageio.