



LTO Program Announces Next Gen Tape — LTO-5 Raises the Bar for Tier-3 Storage

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Management Summary

We are living on an increasingly smarter planet, integrated and interconnected to a degree never seen before. Because of that, we are experiencing explosive growth in the rate in which new data is being created. This data intersects the lives of each and every one of us on a daily basis, with the medical industry generating MRIs, CAT Scans, and X-rays, the entertainment industry creating high resolution images and video rich media, and cities and towns using live cameras to control traffic flow and improve security. Whether it is for backup and recovery, disaster recovery, or compliance to regulations, multiple copies of this data are being saved, in order to preserve business continuity and to keep corporate executives out of jail.

For many businesses, their volume of data is doubling every 12 to 18 months. Every data center, whether enterprise or SMB, is facing the inexorable challenge to find a home for an ever-increasing amount of Tier-3 storage to preserve both mission- and business-critical data. The recent trend toward a disk-to-disk (D2D) solution for backup and recovery satisfies a need for those applications with immediate recovery demands, but is meeting with some resistance, in terms of budgetary restrictions, for the majority of business-critical application sets. The CIO not only must implement a program to deploy *more storage capacity*, but he must also *improve recovery time* and *increase throughput*, as well as meet all industry and governmental requirements for *security* and *compliance*. Furthermore, with limited floor space, and the cost of energy rising with tightened or limited availability, the data center may be restricted in its ability to roll out a D2D solution for other than short-term recovery efforts, even with the deployment of data deduplication techniques. Disk arrays simply occupy too much data center floor space and consume too much energy to be economically feasible for this tier of data and its rate of growth. The cost to implement compliance retention, disaster recovery, or archiving solutions in a D2D environment would be simply prohibitive. With the IT budget for storage frozen, or even reduced, the CIO must find a new and innovative technology to protect the increasing cache of data assets of the enterprise. **That technology is magnetic tape.**

We all know that as a technology, tape may not be new, as it is already present in almost every data center around the world, but it is still a source for innovation. Far from dead, tape not only continues to live, but it is also advancing in capacity and performance faster than disk, with a commodity format available to all, open or proprietary. With lower acquisition and recurring costs than disk systems on a per gigabyte basis, tape systems have a significantly lower total cost of ownership (TCO) than disk. With *Linear Tape Open (LTO)*, the data center has a technology that has been providing secondary storage for four generations. Now, we can make that five. With the forthcoming arrival of *LTO-5*, the data center has a vehicle for the consolidation of enterprise storage and a means to comply with a limited recovery window. To learn more about LTO-5, please read on.

IN THIS ISSUE

➤ A Brief History of LTO.....	2
➤ Raising the Bar with LTO-5.....	2
➤ Conclusion.....	2

A Brief History of LTO

Magnetic tape, as a storage medium, has been with us for over half a century, dating back almost 60 years to the IBM 726 *Magnetic Tape Unit (MTU)*. An original reel of tape for the 726 MTU had a capacity of almost two *megabytes*, paling in comparison to the near *terabyte* capacity of current tape cartridges¹. Enterprises of every size have been successful in satisfying their backup, archive, compliance, and data security needs on tape media, which now has a shelf life approaching 30 years when stored properly.

There has been a variety of open formats for tape media, including *AIT*, *DAT*, *DLT*, and most recently *LTO*, or *Linear Tape Open* (also known as *Ultrium*). LTO technology was developed by the LTO Technology Provider Companies, consisting of Hewlett Packard, IBM, and Seagate², in 2000, as a scalable open tape format to help address the growing demands for data protection in the SMB- and enterprise-class server environments. It was designed to deliver outstanding performance, capacity, and reliability for the data center with tape storage requirements.

LTO-1 was introduced with an uncompressed cartridge capacity of 100GB and a throughput of 15 megabytes per second (MB/s). Over the years, LTO has grown in both capacity and throughput, with Generation 4³, introduced in 2007, capable of storing 800GB of uncompressed data on a single cartridge, 1.6TB with 2:1 compression ratio, and a throughput of up to 120 MB/s. (See Exhibit 1, on the next page.) An Ultrium drive can read data from the current generation and at least the prior two generations; it can write data to the current media and the immediately past generation.

In addition to these quantifiable characteristics, LTO has also grown in functionality, adding WORM⁴ capability, to protect the integrity of the data, beginning with *LTO-3*, and 256-bit AES encryption, with *LTO-4*, to help protect the enterprise during the storage and transport of

sensitive data. Now, the LTO Program formally has announced the specifications for LTO-5, with higher capacity, faster throughput, and expanded functionality.

Raising the Bar with LTO-5

On January 19th, the LTO Program officially announced the specifications for the fifth generation of LTO, *LTO-5*, identifying the upgraded speeds and feeds, along with its expanded functionality. With a native capacity of 1.5 TB, 3.0 TB with a 2:1 compression ratio, LTO-5 can store almost twice the data of an LTO-4 media cartridge. It also has a native transfer rate of up to 140MB/sec, 280MB/sec compressed. With the *improved capacity*, enterprise data centers can free up valuable library space, enabling the preservation of an expanding data set within the same library footprint. Furthermore, with twice the capacity, LTO-5 media can reduce the cost per GB of storage, reducing the number of cartridges required, and lowering on-going acquisition costs for an IT budget already in jeopardy. The cost of media is a major contributor to the TCO of any tape library system⁵. With the *improved transfer performance*, the data center can more adequately meet the requirements of a limited backup window, and also improve the recovery time in order to maintain business continuity.

LTO-5 is also continuing in the tradition of the preceding generations to add new critical functionality in support of innovative tape management. In addition to its WORM and encryption capabilities, LTO-5 will include a new partitioning functionality, with two media partitions, to allow faster data access through the enhancement of file control and space management. This is especially critical in addressing the growing needs of applications, such as Rich Media.

Far from being dead, generation six of the LTO technology is already on the drawing board with a projected capacity in excess of 6TB (compressed) and a projected transfer rate of up to 270MB/s.

Conclusion

In order to preserve business continuity and protect the information assets of the enterprise, the data center needs to deploy a strategic mix of

¹ This refers the uncompressed capacity. Actual compressed capacities are usually about twice the uncompressed capacity (a 2:1 compression factor) but this varies with the data being stored.

² Seagate was succeeded by Quantum.

³ See the issue of *Clipper Notes* dated July 12, 2007, entitled *LTO-4 Pounces into the Data Center with New Life, Greater Capacity, and Higher Performance*, and available at <http://www.clipper.com/research/TCG2007073.pdf>.

⁴ Write Once, Read Many.

⁵ See the issue of *Clipper Notes* dated October 21, 2008, entitled *Disk and Tape Square Off Again – Tape Remains King of the Hill with LTO-4*, and available at <http://www.clipper.com/research/TCG2008056.pdf>.

**Exhibit 1 —
LTO Keeps Getting Better ... A Decade of Progress**

Year Introduced	LTO Generation	Capacity (Uncompressed)	Maximum Throughput – MB/Second (Uncompressed)	New Capabilities
2001	LTO-1	100GB	15	
2003	LTO-2	200 GB	40	
2005	LTO-3	400 GB	80	WORM
2007	LTO-4	800 GB	120	WORM, Encryption
2010	LTO-5	1500 GB	140	WORM, Encryption. Partitioning

Sources: http://en.wikipedia.org/wiki/Linear_Tape_Open and http://www.lto-technology.com/pdf/LTO-Gen_5_Spec_Release.pdf

both disk and tape technologies as the target for Tier-3 storage⁶. Expensive disk resources may be required to ensure the most rapid recovery of critical files, but tape is an essential component of this mix for the long-term storage and archiving of these assets, in order to lower the TCO of the IT infrastructure and to protect critical data.

Tape, in general, and LTO tape, specifically, exhibits significant cost efficiencies versus disk with regard to TCO.⁷ In addition, LTO-5 tape provides the enterprise with a portable and secure medium due to built-in encryption and WORM capability. LTO-5 provides an easy and painless transition from LTO-4. In fact, LTO-5 enables the data center with LTO-3 technology deployed the same easy transition. With almost double the capacity of LTO-4, and nearly four times the capacity of LTO-3, LTO-5 reduces tape media cost on a per gigabyte basis for data centers of all sizes. **Tape has been, and continues to be, the most cost-effective long-term storage solution for the enterprise.** With LTO-5 today, and LTO-6 on the drawing boards, that will continue well into the future. If you have been thinking that “Tape is dead”, take a close look at what LTO-5 can do for you!



⁶ One could have a debate on whether tape for long-term storage is at Tier 3 (or 4 or 5) but, while interesting, it doesn't change the recommendation to deploy tape and disk at lower-cost tiers.

⁷ Once vendor pricing is available for LTO-5 systems, drives and cartridges, we will analyze the TCO further.

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