



## IBM Restores Order to Data Center Storage LTO Ultrium Generation 3 on Target

Analyst: David Reine

### Management Summary

**“The reports of my death have been greatly exaggerated”**. These could be the words of (a) the New England Patriots in response to queries from the Philadelphia media the day after the Super Bowl; (b) They could also be the words of Mark Twain upon hearing rumors of his demise; or (c) they could be the words of an entire industry – the tape industry – as a variety of storage solutions arrive upon the Information Technology (IT) scene to fill the void allegedly caused by the passing of tape into that great computer museum in the sky, or in San Jose, whichever is closer. (Okay, it really is (b)).

Virtual Tape Libraries, SATA tape drives, and a myriad of other solutions have materialized recently with a goal to replace tape as the solution for business continuity and data preservation applications, as well as a response to the newest threat to enterprise executive longevity – regulatory compliance. New laws, such as Sarbanes-Oxley and HIPAA for example, require the retention of data for years, and even decades. **Data must be protected against overwrite or erasure upon penalty of prosecution.** Unfortunately, all of the replacement strategies for tape carry burdens of one kind or another, each having a negative effect on enterprise profitability, due to issues affecting the total cost of ownership (TCO). Keeping data online does improve the speed of recovery; however, at what cost? Power expenses to keep disk drives spinning and air conditioning running to dissipate the heat often outweigh the advantages of faster access. I.T. management is still concerned over the ROI of storage systems, only now ROI not only represents the Return on Investment; it also represents *Reducing the Odds of Incarceration*. In fact, **today, the best solutions for protecting the data assets of the enterprise involve improving the security, capacity, and throughput of the current environment while lowering costs**, rather than spending enterprise assets on paradigm shifts that may not improve the price/performance of the solution to the data center.

One company that continues to invest in the existing architecture with new and improved open systems tape solutions is IBM. IBM has developed a new generation of LTO tape drives with faster throughput, higher density, and an upcoming security option, WORM (Write Once, Read Many), which complies with the most stringent regulations which the government has implemented. To find out how Generation 3 of LTO can protect your enterprise without breaking the data center budget, please read on.

### IN THIS ISSUE

➤ Data Center Environment .....	2
➤ An Open Systems Tape Solution .....	2
➤ LTO Ultrium-3 From IBM .....	3
➤ Conclusion .....	4

## Data Center Environment

Up until now, the complexity of storage solutions has complicated the modernization of the storage environment in the data center. Inflexibility, management costs, and the lack of an alignment between the costs of storage and the value of information have all contributed to an information access problem. Shrinking IT budgets and the requirement for a higher ROI have compounded the situation. The data center staff must balance data growth, compliance, and Information Lifecycle Management (ILM).

These problems increase the demands placed upon the IT staff to ensure data availability to meet competitive pressures, conform to regulatory requirements and guarantee the security of the information under the CIO's responsibility. **The IT staff needs to implement an improved infrastructure for the effective access to, and management of, enterprise information, their most important enterprise asset.** The new infrastructure needs to support business continuity, security, and data longevity. It must be capable of managing all internal data retention policies. **Most importantly, the data center needs to control the ILM process so that the cost of accessing the data does not exceed the value of the information, or the penalty for slower accessibility.**

This new storage infrastructure must conform to (fit in with) the current environment within the data center. This means being able to communicate across a complex network of open systems servers and disk arrays. It means being able to support backup and restore, disaster recovery, and other data collection and data archiving applications, for commodity servers built upon AIX, Linux, and Windows, as well as interfacing to existing mainframes.

What is the goal, or goals, for IT staff?

- It needs to be able to restore a lost file quickly and accurately **to avoid the prolonged loss of mission-critical data.**
- Most of all, the data center must remain within budget. Some of these targets may be perceived as mutually exclusive, i.e.,

bigger, faster, and cheaper.

Therefore, **it is crucial for IT to hit the right target, not just any target.** They must balance keeping costs low, i.e. within the technology budget, while at the same time implementing a reliable, multi-tier ILM storage system.

What is the best medium to manage growth? Does the data center take the plunge with a complete paradigm shift and remake the data replication environment into a completely on-line environment? Do they create multiple iterations of the same information on spinning media with all of the encumbant costs? **Or, do they evolve the existing tape environment, transitioning to higher capacity, faster throughput devices that protect the data in compliance with the regulatory boards?** Which course of action will enable the data center to more efficiently manage storage data, minimize space consumption, increase flexibility, and remain with budget? **The development and implementation of Generation 3 of Linear Tape-Open (LTO) tape drives may well provide the answers** to these questions.

## An Open Systems Tape Solutions

With 50 years of experience in the design and manufacture of tape drives, IBM teamed with HP and Certance (formerly Seagate) in 1997 to develop a new tape standard to compete with DLT (and SDLT). The prime motivation behind this partnership was to standardize on a common tape format with high capacity and high throughput that could legitimately be considered an open standard, with multiple vendors manufacturing product. The new tape format was made available via open licensing to any company wishing to make a tape drive or cartridge conforming to the new specification. This consortium developed a tape format with significantly higher density. With the inclusion of a timing-based servo, developed by IBM, this technology could use very precise positioning information to interleave bands of data, written in a serpentine manner, eight tracks at a time, to build 384 tracks capable of initially storing 100GB of uncompressed data at 15 MB per second (MBps). This LTO generation 1 unit was

delivered in September 2000. A second generation of LTO increased the capacity by 100%, to 200GB, uncompressed, and with a maximum native throughput of 35 MBps offered by IBM, in 2002. In addition to the speed and capacity, LTO was designed with a robust format, supporting reliability, high data integrity, scalability, and interchangeability. It was also designed for manageability with a cartridge memory to keep track of the tape contents, including the secure life of the data.

In November 2004, IBM announced generation 3 with the introduction of an entry-level, external LTO tape drive with an uncompressed capacity of 400GB and a throughput of 80 MBps, native. With a 2:1 compression ratio, this results in an LTO-3 capacity of 800GB – almost 1TB per cartridge, and a throughput of 160MBps, or 576 GB per hour (GBph). **This means that the data center can backup an average 1TB database in less than 2 hours on a single cartridge.** This far exceeds the current capability of SDLT, which has an uncompressed capacity of 300 GB per cartridge with a throughput of 36 MBps.

LTO Generation 4 is already on the drawing board with an uncompressed capacity of 800GB and a throughput of up to 120MBps. Taking compression into consideration, the data center will be able to backup 1.6TB of information, at a rate of up to 864 GBph, on a single cartridge. This is ideal for an unattended backup in the data center or, even more importantly, in a remote location.

### LTO Ultrium-3 from IBM

In their continuing effort to provide industry standard midrange tape storage capability to every enterprise, regardless of size, IBM announced in November 2004 the availability of the LTO-3 SCSI attached drive. In February 2005, IBM announced LTO 3 in a variety of additional tape drive and tape library products. These products will all support a myriad of IBM, and non-IBM, servers including the *eServer p5*, *pSeries*, *eServer i5*, *iSeries*, *xSeries*, *RS/6000*, *AS/400*, and *Netfinity* systems. These *TotalStorage* platforms also support a variety of operating systems, including *AIX*, *OS/400* and *i5/OS*, *Microsoft Windows 2000*,

*Windows Server 2003*, *Sun Solaris*, *HP-UX*, and *Linux* from both Red Hat and Novell. *BladeCenter* LTO tape support is provided by the *IBM 3581 2U LTO 2 and 3 Tape Autoloader* and the *4560SLX* with LTO 2, with LTO-3 capability planned for later this year.

In addition to the *TotalStorage 3580 LTO Ultrium 3 Tape Drive (Model L33)* already being delivered, IBM announced availability of the following.

- The new TotalStorage 3588 LTO Ultrium 3 (Model F3A) drive with 2Gb per second Fibre Channel interface intended for use in the TotalStorage 3584 UltraScalable Tape Library;
- Ultrium-3 support for the TotalStorage 3581 Tape Autoloader, 3582 Tape Library, and the 3583 Tape Library;
- The intention to introduce and support Write Once, Read Many (WORM) functionality in products featuring IBM LTO 3 Tape Drives. This will enable Ultrium-3 to address industry and governmental regulations regarding the security of data written to Ultrium-3 cartridges;
- An upgrade for the firmware for LTO-3 drives installed prior to the availability of WORM.

Although the LTO-3 format is a result of the efforts of the consortium, each company has produced some value-added features to their own versions of the tape drive. The common features of LTO-3 are itemized in Exhibit 1 (below), while IBM's Ultrium-3 capabilities follow.

#### Exhibit 1 –

#### Common LTO-3 Highlights

- **High volume capacity** – 400GB, uncompressed;
- **Increased data tracks** – 16 data track layout designed to provide increased capacity;
- **Larger internal buffer** – increased to 128MB to reduce start/stop operations and improve streaming performance.

- **High native data rate of 80MB/second** via increased aerial and linear densities, highest in the industry. This is essential for taking advantage of the faster disk arrays that are becoming available.
- **A new independent tape loader and threader motors** with positive pin retention – to help improve drive reliability;
- **Graceful dynamic braking** to help reduce tape breakage, stretching, or loose tape wraps in the event of a power failure. The reel motors are designed to maintain tension and gradually decelerate;
- **Digital Speed Matching** to reduce start-stop for improved streaming performance;
- **Highly integrated electronics** utilizing IBM copper chip technology to reduce the total number of components in the drive, lower chip temperature, and reduce power requirements to improve reliability;
- **Low power consumption** implements a sleep/idle mode at 9.5 watts to reduce costs and improve the TCO; and
- **2Gbps Switched Fabric Fibre Channel drive port** for high-speed data transfer and SAN connectivity.

Highlights for the various library products are as follows.

#### ***TotalStorage 3581 Tape Autoloader***

The *TotalStorage 3581 Autoloader* now supports one LTO Ultrium 3 Tape Drive with a data rate of up to 160MB/second (compressed) using LVD SCSI (Model L38) or Fibre Channel (Model F38). Using compression, the Ultrium 3 autoloader supports a capacity of up to 6.4TB with eight cartridge slots. As before, the 3581 can be rack-mounted or installed in a standalone configuration with sequential or random access and an optional bar code reader and/or remote management unit.

#### ***TotalStorage 3582 Library***

The *TotalStorage 3582 Tape Library* is to be used in small to medium environments, with support for one or two LTO Ultrium 3 tape drives with a drive throughput of up to 160MB/second (compressed) per drive, using LVD SCSI or Fibre Channel. The library has

a capacity of 19.2TB (compressed) with 24 cartridge slots. The 3582 library has multi-path support for a multi-server environment with homogeneous or heterogeneous servers and *Control Path Failover* or *Data Path Failover* high availability options.

#### ***TotalStorage 3583 Library***

With the capability to support up to six Ultrium 3 tape drives and 72 cartridge slots, the *TotalStorage 3583 Library* can be used in the data center which has a requirement to save up to 57TB of compressed information with a throughput requirement of up to 3.5TB per hour (compressed). The 3583 support both SCSI Ultra160 LVD and 2Gbps switched fabric Fibre Channel. This library can be installed standalone or rack-mounted and may be partitioned up to three logical libraries. The 3583 also has an option for Control Path and Data Path Failover.

#### ***TotalStorage 3584 Library***

The largest enterprises can take advantage of the expanded capabilities of the *TotalStorage 3584 Library* with hot swap and redundant power. With a compressed capacity of 5.2PB over 16 frames and up to 192 partitions, the data center can backup and recover data at up to 111TB per hour compressed using 192 LTO Ultrium 3 (SCSI Ultra160 LVD or Fibre Channel) drives. The 3584 library also supports IBM 3592 enterprise tape drives, in combination with LTO drives. A new high availability model of the 3584 (Model HA1) can also be installed with a second active accessor to improve library availability and performance up to 1,000 mounts per hour. The Model HA1 supports a non-disruptive failover to the redundant accessor. Control Path and Data Path failover options are also available. New service bay options allow adding additional frames with minimal disruption. These options help make this a highly available tape library suitable for critical data storage.

#### **Conclusion**

Despite words to the contrary, **advancements to tape drive and tape library architecture continue to improve and simplify data center infrastructure.** Ultrium-3 provides an ideal environment for

consolidation of storage requirements through higher capacity and improved performance. The 3584 helps to ensure business continuity through increased redundancy and the planned addition of WORM technology to the Ultrium-3 drive will aid in controlling the costs of securing storage in an ILM environment.

Specific user benefits we believe IT managers can expect to derive from the IBM offerings to help manage data storage in the enterprise include:

- Improved access and protection for network data with scalable growth;
- Reduction in tape handling and operator error improving ease of use;
- Improved affordable reliability;
- Protection of legacy investment in the data center;

IBM appears to be focused on delivering high capacity, ultra-fast, ultra-powerful tape drive solutions to help users simplify their infrastructure and enhance business efficiency while controlling the total cost of ownership. **And, they appear focused upon doing it first.** While all members of the consortium have announced LTO-3 products, IBM is among the first to make LTO-3 available within an automated tape solution and the first to make LTO-3 available with Fibre Channel, with these functionalities scheduled for early March availability. If these are benefits that will help your enterprise then a data center upgrade to your tape environment may be better than a data center upheaval.



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### ***About the Author***

***David Reine*** is Director, Enterprise Systems for The Clipper Group. Mr. Reine specializes in enterprise servers, storage, and software, strategic business solutions, and trends in open systems architectures. He joined The Clipper Group after three decades in server and storage product marketing and program management for Groupe Bull, Zenith Data Systems, and Honeywell Information Systems. Mr. Reine earned a Bachelor of Arts degree from Tufts University, and an MBA from Northeastern University.

- ***Reach David Reine via e-mail at [dave.reine@clipper.com](mailto:dave.reine@clipper.com) or at 781-235-0085 Ext. 23. (Please dial “1-23” when you hear the automated attendant.)***

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