



LTO4 Pounces into the Data Center with New Life, Greater Capacity, and Higher Performance

Analyst: David Reine

Management Summary

Ever since they were first tamed, cats are either loved or hated. In any home with a feline, the cat is in charge. They are a uniquely persistent breed: drop a cat and it lands on its feet. They are so charmed that it is believed that they have nine lives. The average cat in fact remains active through its mid-teens (65-85 years, in human terms), with many reaching 20 years of age (92-100 years), and some even attaining the age of 30 (136 years). In the home, the cat can grow old and fat, but in the wild, cats rule their domain with agility, speed, and strength, witness the cheetah that can run up to 45MPH and the lion, the King of the Jungle, who lives up to 30 years based upon his size, strength, and survival skills. Cats don't die easily; they hang on and survive, year after year.

In the data center of every enterprise, large or small, you may have noted a parallel to the cat. There is a technology that refuses to die and is either loved or hated by proponents or naysayers. That technology is tape. How many epitaphs have you read that have assigned tape to the graveyard of computer technology, along with the mainframe. At 55 years of age, and still counting, I have no idea how many generations of tape media have come and gone. However, tape remains an active and vital part of the storage hierarchy of every data center, from enterprise to SMB. Tape offers IT a straightforward means of protecting data in the event of a disaster, and since tape cartridges are stored offline, they are not subject to sabotage or accidental corruption. They can be transported to a remote location for safe, low-cost archive. In addition, tape data can now be encrypted, helping to prevent security breaches. Tape has a very low TCO, as well as being a nice shade of green. That is, it uses far less (up to 20 times less) energy than disk systems. The age of open systems has seen the end of many proprietary tape architectures and the implementation of information lifecycle management. We have even seen the demise of some open technologies that could not keep up with the performance and capacity of Linear Tape Open (LTO).

Originated in 2000, *LTO-1* had a native capacity of 100GB per cartridge, with a throughput of 15MBps. With a 2:1 compression applied, these figures could double to 200GB per cartridge and a speed of 30MBps. This is a far cry from 1952 when a tape reel could store less than 2MB, with a throughput of 7KBps! The computer industry has seen a steady evolution of LTO since 2000, with a new evolution every two years, doubling of capacity and greater than 2X improvement in throughput, with *LTO-2* appearing in 2002 and *LTO-3* arriving in 2004. It must be noted that each new generation retained read/write compatibility with the previous generation and read back with two previous generations, protecting the investment that the enterprise made in storing their mission-critical data to tape.

In 2007, we now see the introduction of the fourth generation of LTO technology, *LTO-4*, with a re-doubling of capacity to 800GB and an increase in throughput up to 120MBps, and even more functionality. To see how *LTO-4* can reduce your costs and protect your data, please read on.

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The Data Explosion Crisis

Current estimates indicate that, in 2006, the IT industry created and/or replicated over 150 billion gigabytes, or more than 150 exabytes, of information. What is even more alarming is the fact that by 2010, with storage doubling every 18 months, this figure could approach 1000 exabytes. Even with the technological advances being made in disk capacity, every data center, whether enterprise or SMB, is going to be in crisis mode, attempting to find floor space to deploy disk storage to support this uncontrolled growth. Budgets will be broken attempting to install enough primary and secondary storage to handle all of the mission-critical and business-critical applications. **Even with the falling price per gigabyte of Fibre Channel, SAS, and SATA drives, the acquisition price alone will strain data center budgets. Unfortunately, the acquisition cost is merely the tip of the iceberg. Management and energy costs are rising precipitously, with no end in sight.**

In order to protect the enterprise from data loss, the data center backs-up all of this mission-critical information, creating additional copies, both locally and remotely, to ensure that the business can survive a human error, natural disaster, or a security breach. The data center staff must also back-up other non-mission-critical data such as financial records, email, and other business-critical data in support of industry and governmental regulations to protect confidential and/or proprietary data. How will the IT staff find the time to backup all of this information within the allotted window of opportunity? Furthermore, how can the staff secure this information while protecting the executive staff from incurring fines or even imprisonment due to loss of personal information?

Traditionally, dating back over 50 years, all enterprise data has been backed-up to tape. However, the response time necessary to meet the demands of an Internet society has caused the data center staff to rethink the backup environment, moving instead to a disk-to-disk (D2D) or virtual tape library environment, to fit the backup window and enable a faster restore in the event of a device application, or operational, failure. Archiving, however, for the long-term preservation of data, remains a tape environment for most.

Three factors, though, are causing some to reconsider the decision to move to a D2D

environment – architectural complexity, the need for portable media, and the cost of energy.

1. The IT staff adds complexity to the environment with the deployment of more tiers of disk storage in an information lifecycle management (ILM) architecture;
2. The need to share information with business partners and store information off-site requires a portable media;
3. The cost of energy is growing out of control. Saving data, mission-critical or otherwise, to spinning media places a further burden on the electrical resources consumed by the data center¹.

Regardless of the cost, there may not be sufficient energy in the data center to support any additional drain. On the other hand, tape cartridges sitting in an autoloader, robotic library, or on a shelf, consume no energy and provide a reliable platform for the retrieval of vital data.²
Tape is the green machine!

Tape Lives!

Despite the dire forecasts, or self-fulfilling prophecies, of many in the IT Industry, magnetic tape lives on, much as the mainframe continues to thrive, even though many have forecast its complete replacement by open systems platforms. We have seen, however, that mainframe demand can be best served under one brand, in this case IBM, due to the law of the jungle – survival of the fittest. In much the same way, there are fewer choices for magnetic tape today. Where once we saw a virtual plethora of open formats for the backup and archiving of open systems servers, from 4mm DDS to DAT, from 8mm Helical Scan to AIT, the choices today are more limited. The IT industry in the midrange segment gravitated to two basic formats, LTO and SDLT. Now, with the secession of new development for SDLT, LTO technology stands tall as king of the removable media jungle. **With a proposed roadmap through 2011, LTO provides a clear path for data centers wishing**

¹ See the issue of *Clipper Notes* dated February 1, 2007, entitled *Tape and Disk Costs – What It Really Costs to Power the Devices*, at <http://www.clipper.com/research/TCG2007014.pdf>.

² See the issue of *Clipper Notes* dated February 21, 2007, entitled *The Truth about Tape – Nine Myths to Reconsider*, and available at <http://www.clipper.com/research/TCG2007025.pdf>.

to control the TCO of storage. With the arrival of LTO-4 in 2007, the LTO technology provider companies – HP, IBM, and Quantum³ – are addressing the commitments made when LTO technology was established as an open alternative to DLT, dominating the midrange market.

Next Generation LTO-4

LTO technology is thriving as the tape backup and archiving option of choice for both the mid-range and enterprise data center. With primary storage doubling every two years, the data center needs a tape resource that can not only match that growth, but also retain compatibility with previous generations, to protect the investment that enterprises are making in large tape libraries. *LTO-1* initially appeared in 2000 with a native capacity of 100GB and a native throughput of up to 15MB/s. Two years later, *LTO-2* arrived doubling the capacity to 200GB and more than doubling the throughput, up to 35MB/s. In 2004, *LTO-3* arrived with a native capacity of 400GB, 800GB compressed, and a throughput of up to 80 MB/s. This means that a single LTO-3 drive can backup at 576GB/hr. *LTO-4*, introduced in early 2007, has even more impressive characteristics.

With a native capacity of 800GB and a throughput of up to 120MB/s, LTO-4 can meet the challenge of the modern data center equipped with an array of 750GB disk drives, while retaining complete read/write compatibility with LTO-3⁴ and read compatibility with LTO-2 for investment protection. With a compressed capability of 1.6TB, LTO-4 can easily back up the newest 1TB drives. A single LTO-4 drive can backup data at a rate of 864GB/hour. With a multi-drive library, the data center can backup and restore multiple terabytes of data per hour. With your choice of interface, UltraSCSI, Fibre Channel, or Serial Attached SCSI (SAS) the data center can deploy a reliable solution with an MTBF of 250,000 hours at a 100% duty cycle.

Even more importantly, LTO-4 builds on the functionality of its predecessors. Designed with a cartridge memory chip inside, LTO-4 enhances functionality by providing a number of items, including a redundant file log, as well as system health and security information. Along with the

WORM capability introduced in LTO-3, LTO-4 has added AES 256 bit data encryption to its bag of tricks. The data center can now simplify the security process by ensuring that each tape leaving the confines of the data center is encrypted, protecting the enterprise from embarrassment and potential legal action and loss of customers in the event of theft or loss.

Tape drive encryption can help eliminate the need for encryption appliances that add expense and management complexity. Tape drive encryption can also remove the overhead of server-based software encryption.

Further, there is no end in sight. The consortium's roadmap has *LTO-5* due in 2009 with a compressed capacity of 3.2TB and a transfer rate of 360MB/s (1.3TB/hr), and *LTO-6* with a compressed capacity of 6.4TB and a transfer rate of 540MB/s (almost 2TB/hr). We can only wonder if this "cat" also has nine lives.

Conclusion

Any CIO who has done his homework knows the value of tape. Having a reliable, secure removable media certainly will reduce the total cost of ownership for the enterprise infrastructure, lowering media cost, lowering energy expenses, lowering education expenses by retaining a well-known architecture. With LTO-4, the enterprise can halve the number of tapes in their library, they can shrink the backup window to a more manageable size, and most importantly, with encryption, they can protect the enterprise from appearing on tonight's evening news explaining the loss of personal information for thousands of employees and customers.

If you are already using tape for backup or archiving, you should consider updating your older LTO technology or migrating your SDLT to LTO-4. If you have implemented a D2D architecture, review your recurring costs and available energy before the red light comes on. LTO-4 may help you land on your feet.



³ The original trio consisted of HP, IBM, and Seagate.

⁴ LTO-4 drives can only write unencrypted data to LTO-3 media.

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- ***The Clipper Group can be reached at 781-235-0085 and found on the web at www.clipper.com.***

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 or at 781-235-0085 Ext. 123. (Please dial “123” when you hear the automated attendant.)***

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