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The LTO-6 Race Is On — SpectraLogic Off and Running Ahead of the Pack

Analyst: David Reine

Management Summary

They say that "The early bird catches the worm." This is very true, especially if the bird is hungry. In many industries, the objective is to whet the appetite of your customer base for something that they may not have or even may not have seen. The entertainment industry, for example, creates "trailers", which are actually previews, for movies that may not be released for another six months, or longer. They show these trailers prior to the feature attraction that you *have* come to the theater to see. Moreover, you can be pretty sure that if you have already paid to see one adventure movie, for example, they will show trailers for other adventure films, i.e., not romance or children's films." This same philosophy is used in the automobile industry where, each year, manufacturers gather together to present their new models and "concept cars" to an audience that will not be able to procure one for months, *but often they can place an order*.

This is not new news to anyone in an enterprise data center. Their previews typically come in the form of roadmaps. We all have seen them – one-year, three-year, and perhaps even five-year forecasts of what to expect, eventually. We have also seen the fine print which says, in short, "subject to change without notice". Sometimes, however, that roadmap can take a more material form, not yet an available product, but your vendor is willing to make a firmer commitment, and, in fact, even freeze the price for you up front, as a sign of faith.

With data protection and archiving at "top of mind" for every CIO, planning for the future is more than just a thought. Today's data center must protect and store more data, files, images, objects, and videos than ever before. Data storage is doubling every 18 months, or so. The long-term storage (often approaching "forever") of everything from email to important financial documents has placed an unusual burden on the IT staff of every enterprise data center, whether large or small. They must not only be able to store and access today's mission- and business-critical files, they must be able to scale that storage for years to come. No need to whet the appetite here, as the hunger pains already exist.

With a renewed importance for the long-term storage of terabytes and petabytes of critical information, tape once again has returned to the consciousness of every CIO. It is now more critical than ever to have the highest capacity and functionality available, at the lowest cost. In the arena of commodity tape, LTO tape drives have led the way for the past decade. Today's solution, however, LTO-5 with LTFS, will not suffice for the next decade. In fact, the LTO Program has already announced their roadmap for LTO-6, -7, and -8. Spectra Logic, however, has taken that announcement one step further with their announcement of an LTO-6 Pre-Purchase Option. To learn more about LTO-6 and how this Spectra Logic announcement can help your data center, please read on.

IN THIS ISSUE

Storage Growth in the Data Center

How old are you? Are you old enough to remember when storing a kilobyte (KB) was a big deal? How about having to store a megabyte (MB)? Open reels of 0.5" tape were 10.5" across and were mounted on drives deployed in sophisticated, floor-standing cabinets that used vacuum columns to buffer long loops of tape. Well, as they used to say in commercials: "We've come a long way, baby!" Today, we can hold hundreds of gigabytes in the palm of our hand in the form of a flash drive. Who would have ever thought that hundreds of gigabytes would not even come close to protecting the mission- and business-critical data being created by the many applications proliferating in the data center?

Today's data center IT staff must deal with terabytes (TB) and petabytes (PB) of long-term capacity, especially for archiving. Can exabytes (EB) be far behind? In order to deal with all of this "Big Data", the data center has to deploy an architecture that will provide today's applications with sufficient capacity to store and protect not only the active, critical information, but also the active and inactive archived information that is so critical to some future endeavor of the enterprise. The CIO needs to deploy an architecture that will not require him/her to completely migrate from one environment to another, as time goes by. There must be a smooth transition from one generation to the next so that no fork-lift upgrade is required. With existing data growth patterns of anywhere from 50% to 100% every 18 months, many of these data centers will be approaching an EB of data (or more) soon. Supporting *only* hundreds of PBs is a major challenge to any data center budget; supporting an exabyte or more economically is an even greater task.

The *Linear Tape Open (LTO)* format has been providing data centers with that economical, scalable, fully-functional tape architecture for the past decade. Introduced in 2000, *LTO-1* supported 100 GBs of compressible data (2:1), with a transfer rate of 20 MB/sec. Since then, the data center has seen a steady improvement in LTO's capacity, performance, and functionality, while maintaining backwards read compatibility for at least two generations, and write compatibility with the previous one. The current version, *LTO-5*, introduced in 2010, supports a native capacity of up to 1.5 TB with a throughput of up to 140 MB/sec, while maintaining compatibility with the previous two generations.[1] LTO has also improved in functionality through the years, with LTO-5 still supporting the same compression ratios, but now also supporting WORM[2], encryption, and multiple partitions to enable LTFS[3]. These have all been significant accomplishments in support of the enterprise data center over the past 11 years. But what does that mean for the enterprise in 2012? With the continual doubling of data during that time, the data center, in fact, is rapidly outgrowing the capabilities of LTO-5. With an 8-hour backup window, a typical data center would need 13 tape drives and 34 cartridges to backup only 100 TBs of data. What will happen when 100 TBs becomes 500 TBs? **Does your data center have room for 65 tape drives and at least 170 cartridges *per week*? Do you have the staff to manage that many drives? Can your budget support the maintenance requirements?** These are all valid questions, questions that can be answered by the newest generation of LTO, *LTO-6*[4].

Anticipating LTO-6

LTO-6 remains on schedule – to be available for enterprise deployment in late 2012.[5] When available, it will have the highest capacity and throughput for any commodity tape cartridge. With a native capacity of 3.2 TB, LTO-6 reflects a 113% increase in capacity over LTO-5. However, with a compression ratio of 2.5:1, LTO-6 can hold up to 8 TB of data. This is a 167% increase in compressed capacity. With a native throughput of 210 MB/sec, LTO-6 has a 50% increase over LTO-5. In fact, LTO-6 can stream data at up to 525 MB/sec, compressed, making it an ideal medium for large sequential writes. If you look

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[1] See *LTO Consortium Announces Next Gen Tape - LTO-5 Raises the Bar for Tier-3 Storage* in **The Clipper Group Navigator** dated January 31, 2010, and available at http://www.clipper.com/research/TCG2010002.pdf.

[2] Write Once, Read Many.

[3] *Long-Term File System*, a.k.a. *Linear Tape File System*.

[4] The LTO Program has also announced LTO-7 with a compressed capacity of up to 16TB and LTO-8 with a compressed capacity of up to 32TB. However, we will not be addressing their capabilities or schedule in this bulletin.

[5] The LTO Program has maintained a strict adherence to their roadmap for all releases. LTO-6 should be no exception.

back to 2000, you will see a 3100% increase in capacity and a 1300% increase in throughput.

What does this mean for the enterprise data center with 100 TBs of data? In 2012, the enterprise data center will be able to backup 100 TBs of data within an 8-hour window with only 7 drives and only 13 cartridges, significant improvements over LTO-5. Alternatively, with the same number of drives, the backup could be completed in slightly over four hours!

In addition, with a miniscule energy consumption rate of 0.0084 Watts/GB, LTO-6 decreases power consumption from that of LTO-5 by 53%. LTO-5 already held a significant advantage over the disk alternative[6]. LTO-6 also represents a 98% decrease in power required per GB since LTO-1.

LTO-6 also maintains the functionality introduced in previous generations: WORM, encryption, and partitioning. Linear partitioning (along the length of the tape) makes it possible to use LTFS, essentially by allowing a tape to look and behave like a disk with a mountable file system. It provides a self-describing file system that enables direct and easy "Drag & Drop" access to files stored on tape. It enables the capability to preserve both data and metadata on commodity tape to facilitate the search of long-term data. LTFS provides the file system that all applications understand, even those that do not understand "tape", with a common on-tape format for the easy exchange of data. Significantly, no separate backup or archive software is required to view the content of an LTO-6 tape formatted for LTFS. All of these features enable an LTO-6 cartridge to appear to the application in the same way as does disk, without the disadvantages of higher TCO and power consumption.

With an uncorrected error rate of $1x10^{17}$, LTO-5 has proven to be more reliable than FC, SAS, or SATA hard drives.[7] Only time will tell how much more reliable LTO-6 will be. The probability of a disk error has forced data centers to install RAID technology to ensure data stability. When a 3TB disk does fail, the best case for rebuilding it is about 24 hours, causing access to the RAID group to slow down while the replacement gets repopulated.

However, what does the data center do when it needs to buy more tape capacity *now* (whether a new library or just more drives, frames, and/or cartridges), but also covet the significant benefits expected in LTO-6? (This is akin to "having your cake and eating it too.") Spectra Logic has come up with one solution: buy additional LTO-5 drives today, with a guaranteed upgrade when LTO-6 drives become available.

The Spectra Logic Way

Founded in 1979 in Boulder, Colorado, Spectra Logic has been deeply involved in the business of tape storage since 1992, adding commodity tape libraries to their product set in 1995. Throughout the past ten years, Spectra Logic has been a leader in tape library innovation, especially in the areas of encryption, energy conservation, media lifecycle management, and archiving. Spectra Logic also has been a leader in the formation of the *Active Archive Alliance*, an industry group that was formed to establish archiving standards and develop both hardware and software to facilitate the deployment of scalable archive solutions[8].

In an effort to simplify the deployment of a storage system that can support twenty-first century requirements, Spectra Logic has renewed their LTO upgrade program option, this time for the forthcoming LTO-6. This program enables the data center to deploy LTO-5 today, resolving their immediate capacity issues, with a plan in place to upgrade to LTO-6 later this year, with all costs covered by the *Pre-Purchase Option* for LTO-5 today, simplifying the ordering process for the data center. What does this program entail?

First, there is a cost; there is no free lunch here. The costs are nominal considering the value that the enterprise will receive. However, you will have to contact Spectra Logic to determine what your costs will be. The arrangement will work like this. For a fee, Spectra Logic will deliver an LTO-5 drive today and

[6] See the issue of Clipper Notes dated December 20, 2010, entitled *In Search of the Long-Term Archiving Solution – Tape Delivers Significant TCO Advantages over Disk*, and available at http://www.clipper.com/research/TCG2010054.pdf.

[7] See http://www.spectralogic.com/index.cfm?fuseaction=home.displayFile&DocID=2513&RedirAuth=9X7b92.

[8] See **The Clipper Group Navigator** entitled *IBM's New Simplified, Online Access to Archived Data – Turning History into an Active Archive*, dated June 11, 2011, at http://www.clipper.com/research/TCG2010029.pdf.

then replace it on-site when the LTO-6 drive reaches a general release status, probably in 4Q12. This will enable the enterprise to satisfy their immediate storage requirements and also plan for the future with a single CapEx investment as opposed to having to go through a second budgeting cycle with the incumbent upgrade justifications. The Pre-Purchase Program also includes the extra shipping charges, installation, additional warranty coverage and professional services. The data center does not have to delay the acquisition of vital IT resources; it can deploy one solution today and upgrade it at the end of the year.

Conclusion

Once again, Spectra Logic has assumed a leadership role in the tape industry, this time with LTO-6. Not only are they the first company to announce the future availability of an LTO-6 drive, but as of this writing, they are the only one doing so. If your data center is experiencing unprecedented growth that you need to address immediately, and you wish to manage your future storage procurements at the same time, check out what Spectra Logic and LTO-6 can do to resolve your storage headaches for years to come.

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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 a Senior Contributing Analyst for The Clipper Group.** Mr. Reine specializes in enterprise servers, storage, and software, strategic business solutions, and trends in open systems architectures. In 2002, 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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