Oracle Fulfills Commitment — StorageTek T10000C Takes Leap Ahead

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Management Summary

How many times have we sat at a railroad crossing, watching the 5:03 freight train wend its way toward who knows where, bringing your commute to a halt, leaving you alone to count the cars with a cup of coffee and thoughts of a hot dinner waiting for you. How many cars are in this train? How much is in each car? Can't they build bigger cars to carry more freight? How many cars can this engine pull? It would be great if they could pack twice as much freight into each car. It would be even better if that engine could pull twice as much freight at a speed 33% faster! Unfortunately, that is when reality sets in and you realize that that is just not happening, at least not yet, not at this crossing. Unless, of course, you are in an enterprise data center where these things are happening every day.

In fact, with the consolidation and virtualization of the data center server network, the IT can process more workloads and generate more data than ever before. Not long ago, a typical open systems server was deployed with a single x86 microprocessor to run a single application. Pretty soon, multi-processor systems arrived on the scene followed in short order by multi-core processors capable of doubling the workloads and improving server utilization. Dual-core processors were quickly replaced by quad-core CPUs, which in turn are being replaced by 8-core and even 12-core powerhouse, which might increase workload compute power by 4, 8, and even 12 times. However, compute power alone will not get the enterprise IT load completed any faster. That requires faster I/O and greater storage capacity for both disk and tape. We have seen standard 1Gb I/O paths replaced by 10Gb pipelines, and sometimes even faster speeds, to move information through the data center. However, progress in the area of storage has been slower, as 1GB enterprise-class drives grew to 1.5GB and now to 2GB. Advances in tape technology have also been slow as native tape capacity has grown in recent years from 400GB to 800GB to 1.5TB with the *LTO (Ultrium)* format. Ultrium tape write throughput has also advanced slowly, growing from 80MB/s to 120MB/s to 140MB/s over the same period. Now, however, a new generation of tape and tape drive has arrived taking the data center to a cartridge capacity and throughput capability previously unimagined.

Oracle has now announced a new generation of their enterprise-class *StorageTek T10000 Tape Drive* family, the StorageTek *T10000C*. With a native capacity of 5TB and a throughput of 240MB/s, a single StorageTek T10000C drive can backup a 5TB data set in less than six hours, significantly shrinking the backup window to a manageable size. In addition, for many enterprises with multiple petabytes of data being archived, this new format means a possible reduction in the retrieval time for data, the number of frames required (and, therefore floor space), and the amount of energy being consumed. To find out how the introduction of Barium Ferrite tape technology can affect your tape library environment, please read on.

The Enterprise Data Center

Over the past six decades, the enterprise data center has witnessed different architectures come and go, and in many cases, come back and go away again. The *big glass house* has given way to *distributed computing*, which has given way to *scale-up architectures*, which has given way to *client-server*, which now has given way to *scale-out environments*. However, at the end of the day, magnetic tape not only survives, but thrives, providing the IT staff with the reliability, portability, and security that it needs to preserve and deliver enterprise data and maintain business continuity.

Over the past few years, data center storage has undergone an era of unprecedented growth. Between mergers and acquisitions, consolidations and virtualizations, industry regulations and government compliance, the enterprise data center is storing more data than ever before, more kinds of data, structured and unstructured, such as audio and video, and more copies of data in order to mitigate risk. Storage needs are doubling every twelve-to-eighteen months. Floor space, energy, and administrative costs are taking a very large bite out of the IT budget, not to mention maintenance and other operational expenses. The acquisition costs for much of this storage may be fairly stable, but these other costs contribute heavily to the total cost of ownership (TCO) of the IT infrastructure.

Primary storage will continue to find a home on a heterogeneous mix of disk devices, consisting of the highest-performing Tier-0 SSDs, high-availability Tier-1 Fibre Channel (F.C.), and high-capacity Tier-2 SATA, as will backup images for data with immediate recovery requirements. Enterprise recovery point and recovery time objectives will determine which backup information needs to reside on disk. However, best practices for data retention in the data center dictate that long-term storage of email and other compliance documents, along with archiving environments will continue to reside on tape in order to protect the enterprise and its officers from failure to comply with internal policies and government regulations. Many companies use both disk and tape to store information; many of those plan to increase their use of tape because of improved functionality and the TCO issues. **In the end, it doesn't matter where the information came from, it must be protected.** In fact, some data centers that may have evolved to a D2D environment

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Exhibit 1 — Advantages of Tape in the Data Center

- **Lower TCO** – Tape provides the data center with a lower cost for acquisition and operational costs;
- **Energy Efficiency** – enabling the "green" enterprise to fulfill its corporate obligation;
- **Data Security** – through WORM and encryption;
- **Portability** – to enable off-site data protection;
- **Automation** – for high performance and to help eliminate human error;
- **Data Retention** – with up to 30 years of shelf life for the media; and
- **Scalability** – With a space efficient architecture via high capacity in a small footprint.

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now find themselves returning to tape in order to take advantage of its high capacity, portability, improved reliability, low-cost WORM, and encryption technologies. These are all innovations introduced on tape, realizing the economies available in terms of energy and other environmental factors contributing to a lower TCO[1], as the capacity of tape cartridges rises, resulting in a reduction in the number of cartridges required. For a full set of advantages available in a tape architecture, see Exhibit 1, above.

Today, the capacity and throughput of tape cartridges have taken a giant leap forward with the announcement of the availability of new Barium Ferrite media from Fujifilm and the StorageTek T10000C tape drive from Oracle.

A New Tape Media from Fujifilm

In February, 2010, we reported on a breakthrough in storage capacity, with the announcement of a brand new development from Fujifilm, Barium Ferrite technology, enabling the data center with a future storage capacity of 35TB on a single cartridge[2]. Although no one had, or has, a device to deliver 35TB, it was

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[1] 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.

[2] See **The Clipper Group Navigator** entitled *IBM and Fujifilm Increase Tape Density – Raising the Bar on Tape Capacity* dated February 10, 2010, and available at http://www.clipper.com/research/TCG2010003.pdf.

great news for the tape industry as it raised the bar on storage capacity.

Researchers from Fujifilm demonstrated the capability to record 29.5 billion bits of data per square inch on an advanced prototype tape. This is a record for areal density on linear magnetic tape. Moreover, this is just a checkpoint on the way to achieving areal densities of 100 billion bits per square inch and beyond. This is the kind of technology required to keep up with the rapid increase in digital information.

This new media uses a dual-coated magnetic tape with ultra-fine barium ferrite (BaFe) particles. Combined with several key technological advancements, a single cartridge containing 800m of tape could enable the data center to protect 35TB of data, about 44 times the capacity of LTO-4 tape. This is a capacity sufficient to store the text of 35 million books. One of those new technology innovations is the dramatic improvement in the precision for controlling the position of read-write heads, resulting in a 25-fold increase in the number of tracks that can be written to a half-inch-wide tape. Another is a new, advanced detection methodology to improve the accuracy of reading tiny magnetic bits, increasing the linear recording density by more than 50%.

At about the same time last year, the LTO Program announced the availability of LTO-5 technology, with a native capacity of 1.5TB, the highest capacity of any tape cartridge available to date[3]. In poker terms, Oracle has now seen that LTO-5 technology and raised it by 3.5TB per T10000C cartridge, to a native capacity of 5TB. This also exceeds the current capacity of IBM's *TS1130* technology by a factor of 5.

The StorageTek T10000C Tape Drive

For the past year, many in the IT industry have been curious about the future of the *StorageTek* tape technology acquired by Oracle when it consumed Sun Microsystems. Despite the protestations of continuing relevancy and commitments for the future, last year from Oracle there were no announcements, no public roadmap for its enterprise-class tape solutions.

However, with today's announcement of the *StorageTek T10000C*, Oracle has enhanced the

StorageTek legacy environment with a new tape architecture, based upon the Fujifilm cartridge incorporating their BaFe and *NANOCUBIC* technologies. With a 5TB capacity, 10TB using an average 2:1 compression ratio, and 240MB/sec throughput, the StorageTek T10000C can back up a 5TB dataset onto a single cartridge in under six hours, enabling the IT staff to reclaim the backup window and reduce energy consumption, while ensuring the reliability of the process and securing valuable enterprise data from theft with device-level encryption. The StorageTek T10000C incorporates a 2GB buffer to improve write efficiencies and mask back-hitch[4] times, along with the *StorageTek Accelerator* to maximize data center efficiency. The StorageTek Accelerator features the *StorageTek File Sync Accelerator* that stores data on nearby wraps to minimize back-hitches and the *StorageTek Tape Application Accelerator* that converts tape marks to buffered tape. The T10000C also improves mainframe search and audit performance with the *StorageTek Search Accelerator*, using internal hardware over FICON to search for strings at drive speed.

The StorageTek T10000C not only has 3.5 times the capacity of LTO-5, but it also has five times the capacity of IBM's enterprise-class TS1130. The T10000C's throughput is more than 70% faster than LTO-5 and 50% faster than the TS1130. Furthermore, its enterprise design includes Oracle's unique *SafeGuide* with a longer tape path, reducing edge force on the tape, to ensure that the tape rollers are not in contact with the data surface, increasing data reliability. The *StorageTek Data Integrity Validation* validates a CRC, created at the host, for each record, which is checked as each record is received, ensuring that data is not corrupted while traveling along the data path, ensuring that the T10000C provides best-in-class data availability. In addition, the new StorageTek T10000C retains the same form factor as previous versions, providing read compatibility with prior generation *T10000A* and *T10000B* tapes.

When integrated with the *StorageTek SL8500 Modular Library System*, the data center can deploy a solution that can support an exabyte capacity library, with 100,000 compressed cartridges. With a roadmap to two exabytes,

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[3] See **The Clipper Group Navigator** entitled *LTO Program Announces Next Gen Tape – LTO-5 Raises the Bar for Tier-3 Storage* dated February 10, 2010, and available at http://www.clipper.com/research/TCG2010002.pdf.

[4] Eliminating back-hitches removes the shoe-shining effect caused when the tape has to stop and start because it is spinning faster than the I/O can send data to it.

native, by 2015, the StorageTek SL8500 with StorageTek T10000C drives and cartridges can lower the TCO over an SL8500 configured with LTO-5 drives and media. With both native FC and FICON connectivity, along with dual 4GB ports for full redundancy, the StorageTek T10000C works equally well with both open systems and mainframe architectures, without an external control unit. It also supports a host of new data management tools, including the *StorageTek Tape Tiering Accelerator* with wraps that span only one section of the tape, enabling faster seek to any given point on the tape, and the *StorageTek In-Drive Reclaim Accelerator* that allows the reclamation of tape when files are deleted, to facilitate the management of 5TB of data on a single cartridge. The StorageTek T10000C is also compatible with the leading third-party storage management applications.

With up to 640 drives and an aggregate performance of 500TB per hour using StorageTek T10000C technology, this new StorageTek solution can reduce the cartridge count, frame count and floor space of every tape library, while simplifying library management. If you need to deploy 1000 LTO-5 cartridges, you will need only 300 T10000C cartridges, at about the same cost, perhaps less when volume discounts are applied. With a throughput of 240MB/s, you can achieve the throughput of 10 LTO-5 drives with only six StorageTek T10000C drives, reducing the cost by 30% using Oracle announced list pricing.

As was discussed in our Clipper Note on the TCO of disk versus tape in archiving applications[5], LTO-5 tape is 15 times less expensive than disk, plus the entire TCO for a tape solution is equal to just the cost of energy for an equally-sized disk solution. With StorageTek T10000C drives installed, that difference will be even greater. With a roadmap that entails a five-year plan heading to two exabyte capacity, the TCO of Oracle's enterprise-class libraries now is sure to leave more on the bottom line.

Conclusion

One factor is unmistakably clear: Oracle has fulfilled at least one of its commitments from the acquisition of Sun. The future of the StorageTek tape family appears to be in good hands, enabling the CIOs who have invested in StorageTek over the years to rest easily.

Another factor that is also clear: The StorageTek T10000C is the most scalable, cost-efficient, and energy-efficient solution for heterogeneous data protection, consolidation, archiving, and cloud environments. With a compressed capacity of one exabyte, and a roadmap to two exabytes, native, Oracle's StorageTek SL8500 with the StorageTek T10000C tape drive has re-established the StorageTek line at the top of snow pile, and around here, right now, the snow piles are pretty formidable. If your data center needs the highest capacity with the fastest throughput, enterprise reliability and security protection, take a close look at the new StorageTek T10000C. It may be the solution that your enterprise has been seeking.

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[5] See the first footnote on page 2.

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