



Sun Challenges IBM for Enterprise Tape Drive Supremacy —T10000's Improvements Fall Short

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Management Summary

Being the best in the world is nothing new. We see that motivation everywhere – from the elementary school spelling bee to sports to the world of corporate business. Take sports for example. There are many motivations for setting a world record – some related to the ego, some to the pocketbook. During the 1960's, the greatest high jumper in the world was a Russian named Valeri Brumel. In the space of one year, from the summer of 1961 through the summer of 1962, he broke the world record five times – each time by just one centimeter. Could he have broken the record the first time by five centimeters? Probably, but he was paid a bonus by the Russian government *each time* he broke the record. He learned that it was better for his income to make a lot of little splashes instead of one big splash. Mr. Brumel knew exactly how high to set the bar!

In the world of Information Technology (IT), we face a moving target – a bar that is being set and reset every time a technology company makes a new announcement. In fact, we have put a name on it – *leap-frog technology*, with companies continually announcing a product just a little bit better than their competitors' last release. We see this phenomenon every year in the advancements of the x86-microprocessor architecture, with companies such as Intel and AMD going head-to-head. We see it in the storage environment with Hitachi, Maxtor, Seagate, Western Digital, and others battling it out for supremacy in the disk drive arena. We also see this competition, in a much more limited fashion, in the data center battle for high-end enterprise tape dominance. In this environment, there are only two significant combatants, IBM and Sun/STK, fighting for dominant position – the Gold Medal if you will – of data center tape.

In October, IBM lapped the enterprise tape field with the announcement of the *TS1120* (codename: *Jaguar II*), with a native or uncompressed capacity of 500GB and a native throughput of 100MB/s, in addition to extensive functionality. This set the bar high, indeed, creating a shooting target for all comers. It did not take Sun long to recognize IBM's lead and the need to leap past the *TS1120* with their own technological advancement. Thus we saw on, November 2nd, the introduction of the *T10000* (code name: *Titanium*), STK's first drive designed for a new role in data protection and archiving, working in concert with disk, to claim the #1 slot for "native tape drive throughput rate" – but is it really the fastest drive? Is it the best overall option? To find out which enterprise drive solution is right for your data center, please read on.

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Tape Requirements in the Enterprise Data Center

Significant attention has been paid of late to the backup/recovery and archive problems that are occurring in the data centers of small and medium sized businesses. Trying to improve the total cost of ownership (TCO) package at the lower end of the IT scale has captured the mind share and development dollars of every vendor with an SDLT, SAIT, or LTO library, and there are a lot of them. These problems are well defined (see Exhibit 1, in the next column) and are the same for the high-end enterprise, as well. However, the capacity and performance requirements at the high end are magnitudes greater than those seen in the SME¹ arena. There are many tape drive alternatives when you are backing up gigabytes. There are only two options at the high end, however, for high-performance tape drives capable of holding half a terabyte of uncompressed data with a throughput capability of at least 100 MB/s. When you are responsible for the security of tens of terabytes of mission-critical data, there is only IBM or Sun (formerly STK).

The Drive for Supremacy

The acquisition of StorageTek by Sun Microsystems has generated a lot of questions regarding Sun's intent for the future of STK's product set, some superficial, some much more significant. With the naming of Sun's new enterprise tape, we get a sense of a change in culture on the horizon. Instead of continuing with the familiar, Sun has presented this new drive in a Sun spotlight. Where once we had a T9840x or a T9940x, we now have a *T10000* – or should I say a *T10K*. The naming change is superficial; however, the lack of backward media compatibility is not. **The T10000 was designed from the ground up as a new platform and, as a result, will not share media compatibility with the successful T9940 series. This new media, however, does have the capability to support 1TB, so it is positioned for the future.** In order to migrate the enterprise tape inventory, potentially thousands of cartridges, the data center will have to contract with Sun, or a Sun partner, for professional services. Sun does provide library compatibility with an “*any media, any slot*” convenience allowing the data center to continue use of their T9x40 drives while adding T10000s; however, the older drives cannot take advantage of the capacity or performance now available. What might be more significant is Sun's apparent rush to respond to IBM's TS1120 announcement². Is the

¹ Small and medium-sized enterprises.

² See **The Clipper Group Navigator** dated October 11, 2005, entitled *Tape Virtualization in the Enterprise – Reducing Data Center TCO*, at <http://www.clipper.com/research/TCG2005062R.pdf>.

Exhibit 1 – Data Center Tape Problems

- **Capacity** – The sheer volume of data being saved is doubling and tripling the number of cartridges in the data center;
- **Performance** – The length of time necessary to complete a system save is exceeding the backup window;
- **Reliability** – Failure to complete the backup in the allotted time puts the enterprise at risk and is unacceptable; and
- **Security** - Creating unencrypted tape cartridges puts the enterprise at risk for civil and criminal penalties if lost or stolen.

T10000 really ready for prime time in the enterprise? Is the drive ready for general availability? Sun has advised that the T10000 will ship in limited quantities - once the final ASICs are available - but quantity shipments of the drive are expected to occur later in the first calendar quarter of 2006, while Sun raises the level and number of ISV certifications. Early shipments can be made to customers who do not require ISV application drivers.

At 120MB/s, the T10000 runs at, for tape, light speed. Unfortunately, with a 2 Gbps interface, the advantages of compression appear to be limited, especially with regard to throughput, as the bandwidth is soon saturated. It would seem that a maximum throughput in the vicinity of 160 to 180MB/s is the best that can be expected. With a similar *native*, or uncompressed, capacity, 500GB, the TS1120 is rated at 100MB/s in native mode; however, with a 4Gbps interface, the TS1120 can generate a sustained throughput of 260MB/s with a burst rate of 400MB/s. This is significantly faster than the projected T10K rates, although a 4Gbps drive, at the same price, is promised by mid-2006 for those customers who require it.³ Sun also announced a second generation capability of 1TB cartridges, however, their *Titanium B* drives supporting 1TB of uncompressed data will not appear for at least another 2 years. IBM's Statement of Direction is to develop and support a higher capacity cartridge for the IBM System Storage TS1120 tape drive. This future development is designed to help large enterprise customers address ILM challenges and issues such as storing more info, keeping information for longer periods of time, and reducing costs. (No timeframe given). It is unknown

³ Sun has committed to perform a drive replacement for customers who require the 4Gbps model with no charge to the customer during the warranty period if the upgrade is performed under service contract and during normal service hours.

if a cartridge migration will be required to support 1TB, but **IBM, at least, has protected data center investments in tape media, for now. The TS1120 will support 3592 media.** It must also be noted that, while IBM states that the TS1120 can be used in Sun 9310 libraries, Sun does not support this policy as IBM's drives have never been tested or certified by Sun/STK. In addition, the TS1120 is not supported in the SL8500. However, IBM fully tests and supports the installation of 3590, 3592 and TS1120 drives in 9310/silo libraries. Over 4,000 of the 3590 tape drives have been installed in silo libraries and already over 300 3592/TS1120 drives are in Sun/STK silos.

While hanging their collective hats on the performance criteria, Sun has not addressed the issue of T10000 data access time. With a dual-cartridge capacity strategy, IBM enables the TS1120 with a 27-second average file access time for their 100GB cartridge, through *Capacity Scaling*. This includes load/thread time with a random file access time of 9 seconds. Sun continues to provide the T9840C as the fast access drive solution, with a cartridge capacity of 40GB and an average access time of 8 seconds. However, the throughput of the T9840C is limited to 30MBps. With a 500 GB cartridge, the T10K has an average file access time of 62 seconds, 25% slower than the comparable TS1120 time of 46 seconds, including load and thread time. The same is true for rewind speeds with the T10K having a maximum rewind time of 91 seconds vs. 62 seconds for the 500GB version of the TS1120. The 100GB implementation rewinds in 11 seconds. Average rewind time for T9840C 40GB cartridges is 8 seconds.

Another important factor to overall performance and reliability is the ability of a tape drive to perform well with an application. This is largely determined by how it manages the number of start-stops - or *backhitches* - and remains streaming. A drive can help manage backhitches via large data buffers and data speed matching. The T10K has half the buffer size of the TS1120, 256 vs. 512MB. This gives the TS1120 a substantial advantage in reducing backhitch situations. The T10K has only two speed match data rate points (120 and 50MB/s) vs. the TS1120 with six speed match data rate points (from 104 down to 34.4MB/s). The TS1120's granular speed matching enables better performance, minimizing backhitches and maximizing streaming throughput.

The TS1120 also incorporates a "Virtual Backhitch" algorithm, through non-volatile caching, to keep tape streaming and enhance performance. This feature, also found on the 3592 model J1A, is doubled in performance on the TS1120. Virtual Backhitch allows the TS1120 to virtually eliminate backhitching in many applications. In this mode, the drive uses the large data buffer and alternate areas of tape as a work area to write working copies of

datasets to tape during write synchronize operations without backhitching. See Exhibit 2, on the next page, for a summary of drive specifications.

What about reliability and security? In these arenas, the TS1120 is a fairly-well established commodity. With a core drive technology based upon LTO, IBM has the reliability experience of 500,000 drives, as well as more than 18,000 3592 Generation I drives, to fall back on. The TS1120 has a WORM cartridge design with embedded security features to help prevent the alteration or the deletion of stored data, along with any number of encryption solutions through Tivoli. In addition, IBM has announced a Statement of Direction to address their customers' growing concern with data security. This strategy is for the development, enhancement, and support of encryption capabilities within storage environments. This capability will eliminate the requirements for a host server to do encryption, supporting "outboard" encryption at the storage device and also will leverage key management functions. IBM has already qualified the TS1120 with Tivoli *Storage Manager and the Backup, Restore, and Media Services (BRMS)* application under *OS/400*. Additionally, qualification is under way for Computer Associates' *BrightStor ARCserve Backup*, EMC Legato's *NetWorker*, and Veritas' *NetBackup*, with availability scheduled for the end of November.

The T10000 was designed with the *SafeGuide System* to enable longer drive and media life in high duty cycle environments. It will have STK's VolSafe capability available by the end of 1Q06, in order to satisfy a growing need for WORM media. Drive encryption for the T10K is expected to be available by mid-2006, with plans for an encryption key management system to be developed to manage multiple devices on the drawing board. More details on this system will be forthcoming early in 2006. Sun does have relationships in place with Kasten Chase, NeoScale, and Decru to deliver encryption solutions today, and certification of Tivoli applications is underway.

And then there is the subject of connectivity. Both IBM and Sun/STK support connection to open system hosts on a storage area network (SAN). They both support attachment to a mainframe via *FICON*. The T10000, however, does not support *ESCON* because the throughput is too slow to justify product development, thus limiting attachment to their *Virtual Storage Management (VSM)* to *FICON*⁴. *ESCON* support will continue to be provided by the T9940. IBM continues to support *ESCON* on the TS1120, at 17MBps, in order to protect the investment that their customers have made. However, with a 4Gbps *FICON* interface, the TS1120 can support mainframe

⁴ T10000 *FICON* support has been projected for 2Q06.

Exhibit 2 – Enterprise Drive Comparison

Drive Feature	IBM TS1120	STK T10000
Maximum Native Cartridge Capacity	500GB	500 GB
Native Data Rate	100 MB/s	120 MB/s
General Availability	4Q05	1H06
zSeries Attachment	FICON/ESCON	FICON
Open Systems Attachment	4-Gbps Fibre	2-Gbps Fibre
Virtual Backhitch	Yes	No
Tape Drive Buffer	512 MB	256 MB
Speed Matching Capability	6 speeds	2 speeds
Load Thread Time	13 seconds	16 seconds
Average File Access Time (500GB cartridge) (Includes Load/Thread Time)	46 sec	62 seconds
Maximum Rewind time (500GB cartridge)	62 sec	91 seconds
Encryption	Statement of Direction	Statement of Direction
Power Consumption	65 W/307 BTU/hour	90 W/420 BTU/hour
Price for Fibre drive (USD MSLP)	\$32,000	\$37,000

Sources: IBM and Sun

connections at a burst rate of 400MBps.

Throughout this examination, we have avoided the subject of price. I am not sure how important cost is to the data center, when compared to the issues of capacity, performance, security, and reliability. In this instance, however, they are not mutually exclusive. In fact, the drive with higher performance and reliability also has the lower price: \$32,000 for the TS1120 vs. \$37,000 for the T10K. Acquisition price is not the only factor in determining the TCO. Migration costs (for the T10K) and recurring costs such as tape media and electricity also have to be factored in. With a drive requirement of 65 watts (including the fan and power supply), the TS1120 needs 27% less power than the T10K at 90 watts. Further, cooling is easier, and less expensive, with the TS1120. It generates 307 BTUs/hour compared to 420 BTUs/hr for the T10K. With regard to media, cartridges for the TS1120 are available in the open market and range from \$100-\$150, depending upon capacity and format, and are readily available. The new T10000 cartridge has a list price of \$200, with a projected street price of \$130-\$150. Availability, for now, is limited to Sun/STK only.

Conclusion

While it is understood that most individual applications will not challenge the throughput levels of either of these drives, virtualization engines will enable the data center to push them to peak performance. The move to consolidation of storage

resources and the reduction of the storage infrastructure to reduce the TCO of the data center has already seen the acceptance of products such as IBM's VTS and TS7510 and Sun's VSM. Environmental evolution will occur continuously, demanding larger and faster storage media.

When the time comes for you to make a decision regarding enterprise tape purchase, there will be a number of criteria factoring into that decision. Native tape drive throughput rate may or may not be one of them. Protecting your investment in installed hardware and software may or may not be. One thing is for sure, however. Someone at Sun has misjudged the height of the bar. In their eagerness to compete with IBM, they have failed to emphasize at first ship some of the factors that the enterprise data center values most: overall performance, reliability, security, and total cost of ownership to name a few. We will need to revisit the tape drive scene in mid-2006 to see where Sun is at that time, but if you are going to call-out the fastest gun in town, you had better make sure that you're ready and that your gun is loaded with real bullets.



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