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# Lowering Storage Costs with the World's Fastest, Highest Capacity Tape Drive

Executive Overview .....	1
Introduction .....	1
Unmatched Capacity and Performance .....	3
Lowering the Cost of Tape Storage .....	4
Minimize Operational Costs Through Consolidation .....	5
Higher Efficiency Means Higher Reliability .....	6
Conclusion .....	7

## Executive Overview

Explosive data growth is causing storage costs to skyrocket, which is forcing IT organizations to look for more cost-effective archival and backup solutions. Oracle's StorageTek tape product family has maintained a technology leadership position for many years and now includes the StorageTek T10000D tape drive. With its record breaking capacity and throughput, the StorageTek T10000D tape drive enables storage administrators to lower costs and simplify by consolidating their existing environments into fewer tape cartridges, with fewer tape drives, and fewer tape libraries.

## Introduction

To cope with today's explosive data growth, many IT organizations are using a tiered storage approach that balances the cost of different types of storage media against application performance requirements. Tape solutions still offer the most cost-effective means to maintain long-term copies of infrequently used data and to back up large data sources. Since applications are generating and utilizing greater amounts of data, it is becoming challenging to back up hard disk drives to tape in a reasonable timeframe. Tape drive performance is therefore becoming a critical factor in completing backups within an allotted time window.

Similarly, as data sources keep growing, more and more data is being migrated or archived from hard disk to near-line storage repositories such as tape libraries. While disk-to-disk backup solutions are useful for some situations, their capacity is much more limited—generally measured in hundreds of terabytes (TB), whereas tape libraries can store several orders of magnitude more data. Yet even tape library capacity can be stretched by today's storage and archival requirements. Today's IT managers need tape solutions that can keep massive amounts of archived data available to applications while requiring minimal data center floor space.

Managing the vast amounts of data stored on tape also can be a big challenge for large enterprises. This is especially true when hard disk storage is nearly fully utilized and older data must be frequently archived to make room for new data. Data management becomes more complex and time consuming in this environment, and since more data is being archived, there are more tapes to manage as well. IT managers need tape solutions that can help reduce complexity and streamline data management processes to drive increased efficiency.

With the introduction of Oracle's StorageTek T10000D tape drive, Oracle has raised the bar again, delivering the world's highest capacity tape drive and the first tape solution to offer 68 exabytes (68 million TBs) of storage capacity in a single tape library.

## Unmatched Capacity and Performance

Oracle's StorageTek T10000D tape drive is the fourth generation of the StorageTek T10000 enterprise tape drive family. StorageTek T10000 tape drives are known for high capacity, high throughput, and enterprise reliability to meet the requirements of the most demanding open systems and mainframe data centers.

With up to 8.5 TB of native capacity per cartridge and a native data rate of 252 MB/sec, the StorageTek T10000D tape drive stores and retrieves more than 3x the data per cartridge and is more than 50 percent faster than LTO-6. With compression, it achieves data rates more than 20 percent faster than the IBM TS1140, while storing more than twice the data per cartridge.

The StorageTek T10000D tape drive is backward read compatible with all three previous generation StorageTek T10000 tape drives and records up to 8.5 TB on the same media as its predecessor, enabling customers to increase capacity 55 percent without investing in new media.

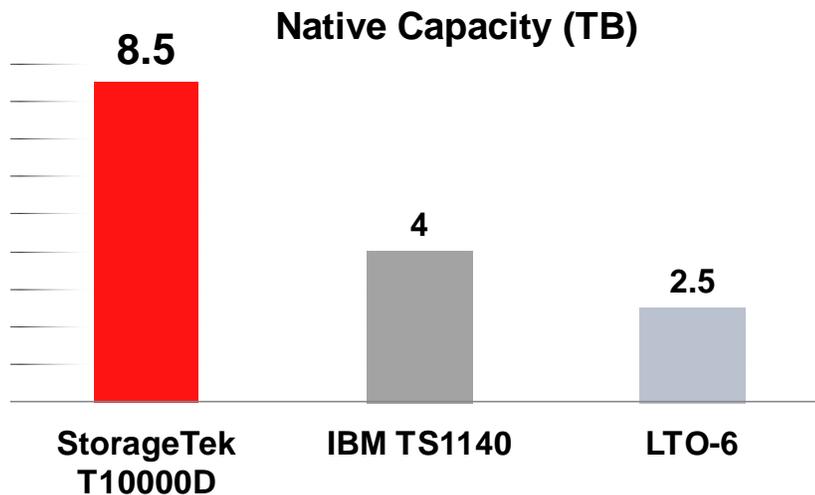


Figure 1. A comparison of StorageTek T10000D tape drive capacity with other tape drives.

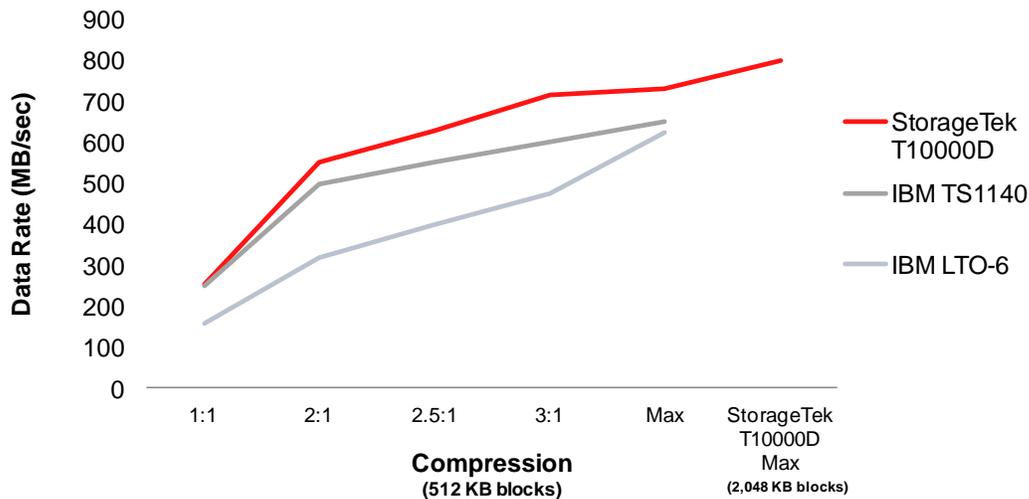


Figure 2. A comparison of StorageTek T10000D tape drive performance with other tape drives.<sup>1 2</sup>

In addition to leading the industry in capacity and performance, the StorageTek T10000D tape drive is the first tape drive to offer 16 Gb Fibre Channel and 10 Gb Fibre Channel over Ethernet (FCoE) interface options, ideal for next generation converged data centers.

Carrying forward the enterprise-proven architecture of the StorageTek T10000C tape drive, Oracle engineers have designed the StorageTek T10000D tape drive to handle the 24/7 requirements of the most demanding data centers in the world. Compatibility with Oracle's StorageTek SL8500 and StorageTek SL3000 modular library systems ensures existing investments in Oracle tape automation products are protected. For maximum data security, StorageTek T10000D tape drives offer in-drive encryption capability and write once read many (WORM) technology.

## Lowering the Cost of Tape Storage

With the StorageTek T10000D tape drive's record breaking capacity and performance, fewer cartridges, tape drives, and tape libraries are needed to do the same job. Less media and equipment translates into lower total cost and a smaller tape storage footprint. What may surprise many readers is that the total cost of a StorageTek T10000D tape drive solution is not only lower than other enterprise tape drive solutions but also lower than LTO-6 solutions. With StorageTek T10000D tape drives, Oracle has proven, once again, that a tape solution offering enterprise-class capacity, performance, and reliability can actually cost less than LTO while consuming a much smaller data center footprint.

<sup>1</sup> IBM System Storage TS1140 Tape Drive Performance Whitepaper, June 2011

<sup>2</sup> IBM System Storage LTO Ultrium 6 Tape Drive Performance White Paper, September 2012

Figure 3 highlights the cost and footprint advantages of the StorageTek T10000D tape drive solution versus competing enterprise and midrange solutions. Faster performance means half as many StorageTek T10000D tape drives are required to deliver 2 TB/hour as LTO-6. Up to 8.5 TB of capacity means less than a third of the cartridges and library slots are required with StorageTek T10000D tape drives to store 1 PB of data compared to LTO-6.

## Storing 1 PB at 2 TB/hour

	StorageTek SL3000 Library		IBM TS3500	IBM TS3500	HP ESL G3	Quantum i6000	Spectra T950
	StorageTek T10000D x2	LTO-6 x4	TS1140 x2	LTO-6 x4	LTO-6 x4	LTO-6 x4	LTO-6 x4
<b>Tape Drives + Media + Library (List USD)</b>	\$162,354	\$201,143	\$268,477	\$251,109	\$301,563	\$219,344	\$229,470
<b>Footprint (Sq. Ft)</b>	25	31	46	68	34	34	35
<b>StorageTek T10000D Cost Advantage</b>		19%	40%	35%	46%	26%	29%
<b>StorageTek T10000D Footprint Advantage</b>		21%	47%	64%	28%	28%	29%

Figure 3. StorageTek T10000D tape drive solution to store 1 PB at 2 TB/hour costs less and consumes less space than LTO-6.<sup>3</sup>

## Minimize Operational Costs Through Consolidation

As the data explosion continues, resources available to manage that data are not keeping up. Data center managers often are required to manage 30 to 50 percent annual increases in data with the same (or fewer) number of employees and expenditures (both capital and operational). Oracle has designed the StorageTek T10000D tape drive to maximize scalability, simplify management, and provide the best value for the money.

As shown in Figure 4, a StorageTek T10000D tape drive, at 8.5 TB of capacity and 252 MB/sec native throughput, enables massive consolidation of LTO tape storage environments.

<sup>3</sup> Assumes 1:1 compression. Floor space calculations include service area.

	Cartridges to Store 1 PB	Tape Drives to Store 500 MB/sec
<b>StorageTek T10000D</b>	<b>118</b>	<b>2</b>
LTO-6	400	4
LTO-5	667	4
LTO-4	1,250	5

Figure 4. LTO-4 users benefit with more than a 10:1 reduction in tape cartridges and a 2.5:1 reduction in tape drives.

With fewer cartridges, tape drives, and libraries to manage, IT organizations can ease data center resource constraints with StorageTek T10000D tape drives. Fewer cartridges also mean a proportional reduction in offsite tape storage costs.

### Higher Efficiency Means Higher Reliability

Assuming a typical compression ratio of 2.5:1, the StorageTek T10000D tape drive is capable of storing up to 21.25 TB of user data on a single cartridge. By comparison, a LTO-6 tape drive requires four cartridges to record this amount of compressed data to tape. Figure 5 highlights the differences in run time and load/unload cycles between StorageTek T10000D tape drives and LTO-6 when recording this amount of data. With five hours less run time and one-fourth the cartridge loads and unloads, the superior efficiency of StorageTek T10000D tape drives results in less drive wear, higher reliability, and less human intervention.

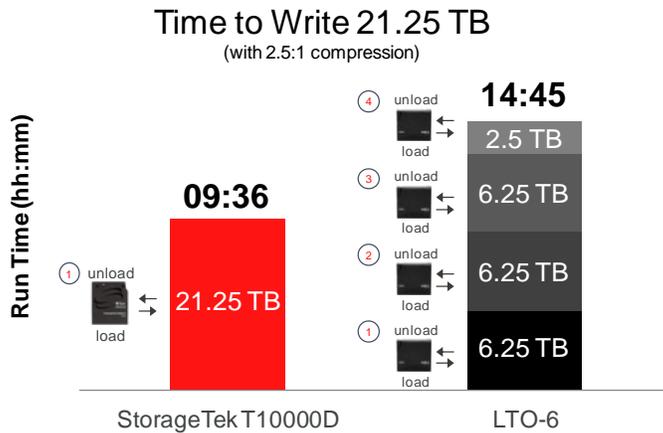


Figure 5. Less run time and fewer cartridge loads and unloads means less drive wear with StorageTek T10000D tape drives.<sup>4</sup>

<sup>4</sup> Run times do not include the additional time required for loads and unloads.

## Conclusion

Oracle's StorageTek T10000D tape drive, with its unprecedented 8.5 TB capacity and compressed throughput of up to 800 MB/sec, offers customers a direct path to storage consolidation—on a massive scale.

- World-record capacity means lower costs through fewer tape cartridges, smaller tape libraries, and smaller footprint.
- World-record throughput means lower costs through fewer tape drives, faster backup windows and less drive wear.

Each of these features contributes to a reduced total cost of ownership, often hard to achieve in this environment of massive data growth and limited IT management resources. Before choosing tape drives to help meet backup or archiving needs, IT organizations will want to consider how much can be saved by investing in enterprise-class StorageTek T10000D tape drives.



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