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Metrics that Matter: Evaluating Oracle's StorageTek SL150 Modular Tape Library for Small and Midsize Environments

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Introduction

Storage environments that utilize tape libraries with fewer than 500 slots have different requirements than large data centers. While large data centers rely heavily on high availability and performance metrics, small and midsize businesses tend to have lighter workloads so performance becomes less critical. Additionally, the nature of these workloads often makes the advanced storage features common in enterprise environments irrelevant.

Although performance characteristics still do matter to a lesser degree, the most critical metrics for tape libraries in small and midsize businesses are time and money. These companies look for savings in terms of product purchase and maintenance cost, as well as the time needed to install, upgrade, or manage a library. Keeping these interests in mind, Oracle developed the StorageTek SL150 modular tape library.

Oracle's StorageTek SL150 Modular Tape Library

For years, the entry-level tape library market has been dominated by one manufacturer of a 24-slot library and a 48-slot library. Over the years, many companies, including Oracle, have sold the libraries. Oracle sold them as Oracle's StorageTek SL24 tape autoloader and Oracle's StorageTek SL48 tape library. The same vendor has also manufactured the HP MSL2024/MSL2048, the IBM TS3100/TS3200, and Dell TL2000/TL4000. Oracle's customers spoke out about the need for a scalable library that they could install, upgrade, and manage themselves; and, in mid-2012, Oracle launched the StorageTek SL150 modular tape library as an alternative to these libraries. The SL150 modular tape library supports half-height (HH) LTO-5 and LTO-6 drives in interface options of Fibre Channel (FC) or Serial Attached SCSI (SAS). The StorageTek SL150 base configuration has 30 slots and one half-height StorageTek LTO drive from Oracle. It can scale as the customer's data and performance needs increase, up to a total of 450 slots (in 30-slot increments) and 30 drives.

Installing, Servicing, and Upgrading the StorageTek SL150

All of the libraries that cater to small and midsize environments offer customer installation as a core requirement. However, with the StorageTek SL150, Oracle has taken serviceability to the next level. Now, most service operations can be performed by the customer, preventing downtime caused by waiting for service personnel for simple issues.

Of course, service operations should be relatively rare given that the StorageTek SL150 is produced by Oracle, the leader in tape automation reliability. A far more likely event will be upgrading the library to support more capacity by adding additional slots. With 24- and 48-slot libraries, this means installing a whole new library; either by adding another new library to the environment or tearing out the small one and replacing it with a larger one. In the past, if customers required more than 48 slots, they moved to a scalable library such as Oracle's StorageTek SL500 modular library system or the Quantum i500. Installation, upgrades, and management of this type of library is generally not as simple, and often requires a high level of tape automation knowledge or service personnel assistance. For example, adding expansion modules to traditional scalable libraries can take as long as six hours to complete. In contrast, a customer can add a new expansion module (30 slots) to the StorageTek SL150 in just minutes.

An Electric Argument: Power Consumption Differences

Tape storage is already well known as a green technology, but the StorageTek SL150 provides additional savings compared to other libraries in small and midsize environments. A StorageTek SL150 with four half-height LTO drives, redundant power supplies, and 60 slots is relatively comparable to the StorageTek SL48 and the Quantum Scalar i80 tape libraries. In an idle state, the StorageTek SL150 will use about 78 watts of power. By comparison, a 48-slot library, such as the StorageTek SL48 tape library, uses 312 watts in the same maximum steady state scenario, a difference of 149 watts. Idle conditions should produce similar differences.

The StorageTek SL150 also beats Quantum's i40 and i80, which expect typical power consumption to be 200 watts[1]. If the StorageTek SL150 is used in an environment with four hours of a maximum steady state condition (such as a backup window), and is idle the rest of the day, then its power consumption averages out to just 92 watts per hour. That adds up to 108 watts per hour savings with the StorageTek SL150.

[1] Quantum Scalar i40/i80 User's Guide: 6-66545-09 Rev A

What do these power savings really mean? A leading gas and electric company charges almost $.18/kWh for small and midsize commercial business environments[2]. The one-year savings and inflation-adjusted five-year savings using a StorageTek SL150 is shown in Table 1[3]. Ultimately, using a StorageTek SL150 could save a user more than $1,800 over this time period. To put it in perspective, that's enough to pay for an expansion module and a 20-pack of LTO media!

TABLE 1: POWER COSTS OF STORAGETEK SL150 AND COMPARABLE LIBRARIES RUNNING A FOUR-HOUR PER DAY BACKUP JOB AND IDLE FOR TWENTY HOURS

Tape Library	Typical Power Consumption	Annual Power Cost	Additional Power Cost	Additional Cost Over Five Years
StorageTek SL150	92 watts/hour	$147.64	---	---
Quantum Scalar i80	200 watts/hour	$320.37	$178.07	$1,364.48
StorageTek SL48	250 watts/hour	$399.66	$257.36	$1,972.05

Price vs. Performance Comparison

While performance is arguably always important, the priorities of smaller businesses indicate that performance is not really a critical consideration. Since performance is historically a checklist datasheet component, it is often quoted as a potential differentiator by various vendors. However, the best way to compare tape libraries is through a metric commonly referred to as exchanges per hour (EPH). What becomes more important for small businesses, relative to this metric, is to compare EPH between libraries relative to their prices.

To illustrate this difference, similar configurations for different libraries were set up and tested. The base configuration of the StorageTek SL150 with 30 slots was used to compare with the StorageTek SL24 tape autoloader's full configuration. Each library was configured with two half-height LTO Fibre Channel drives. A similar configuration was tested with the StorageTek SL48 tape library, but with double the number of slots and drives. The performance tests first measured the drive mount time, meaning the time from when a tape cartridge is moved from its slot until it is fully loaded in a drive.

Drive dismount time was also tested. This is the time required to move a tape cartridge out of a drive and back to a slot in the library. Both "data path" dismounts and "forced" dismounts were tested. Drive "data path" dismounts are initiated by a host application, while "forced" dismounts are when the tape cartridge must first be unloaded from the drive by the library before it is moved to a slot. The dismounts are initiated from the beginning of the tape, though no files are read or written since the purpose is to measure library performance instead of drive performance. From these metrics, EPH can be determined. This is the most critical metric in measuring library performance as all other metrics are somewhat dependent on the tape drives or file sizes. The test results for the StorageTek SL150 modular tape library with the latest firmware version, the StorageTek SL24 tape autoloader and the StorageTek SL48 tape library are shown on the next page in Table 2.

[2] PG&E, A-10 Electric Rates for May 2014 - Present. http://www.pge.com/tariffs/electric.shtml#COMMERCIAL
[3] The Typical Power Consumption formula for the StorageTek SL48 is the same as described for the StorageTek SL150. The inflation-adjusted savings assumes an annual 3% electricity rate increase.

TABLE 2: STORAGETEK SL150, STORAGETEK SL24 AND STORAGETEK SL48 LIBRARIES EXCHANGES PER HOUR WITH LIST PRICE

Tape Library	Exchanges per Hour with "Data Path" Dismounts	Exchanges per Hour with "Forced" Dismounts	List Price
StorageTek SL150 base module with 2 LTO Drives	53 ex/hr	42 ex/hr	$12,585
StorageTek SL24 with 2 LTO Drives	38 ex/hr	33 ex/hr	$19,850
StorageTek SL150 base module and 1 expansion module with 4 LTO Drives	51 ex/hr	39 ex/hr	$26,570
StorageTek SL48 with 4 LTO Drives	37 ex/hr	31 ex/hr	$43,250

The SL150 performance numbers are on average 33% better than that of the SL24 and SL48. The SL150 provides better performance than the StorageTek SL24 at 37% less list price. In the larger environment the SL150 exchanges per hour are on average 32% greater than the SL48 at 39% less list price. The customer of the SL150 receives more benefits at a lower cost when compared to either the SL24 or SL48. When examined in this way, for smaller businesses, 24-slot or 48-slot libraries are an expense that would be tough to justify compared to the StorageTek SL150. The StorageTek SL150 has an additional benefit of having more slots in its base configuration. Further, the StorageTek SL150's maximum configuration is 300 slots, far more than the 45-slot limit of the 48-slot libraries, so there is room for customers to grow their tape environment over time as their data storage needs increase.

Figure 1: Oracle's StorageTek SL150 modular tape library

Forward-looking customers may recognize that this scalability is similar to the StorageTek SL500, which also starts at just 30 slots. Similar performance tests were also done with the StorageTek SL500, and again, the same configuration was used with two LTO tape drives. The StorageTek SL500 has enterprise-class components and was designed for more demanding environments, and by design the StorageTek SL150's performance is lower. However, for less demanding environments, the StorageTek SL150 offers a much more attractive performance-to-price ratio. For one third of the price, the StorageTek SL150 can produce half of the StorageTek SL500's performance (under certain use cases). Essentially, for every additional exchange per hour beyond what the StorageTek SL150 already provides, the customer must pay an additional $1170 for the StorageTek SL500. Most growing businesses would not consider that an ideal investment.

Converting Cost Savings into Smaller Backup Windows

There are two different strategies for utilizing the cost savings of the StorageTek SL150. Customers could simply pocket the savings, or they could use the savings to purchase additional components (such as drives, power supplies, or expansion modules) for the library.

Reducing backup windows is often a critical concern for small businesses where backups can't be made continuously. This is one way to consume the cost savings offered by the StorageTek SL150. By utilizing the savings to purchase additional drives, and therefore reducing the backup window of a business, the customer converts the cost savings into time savings.

To keep up with unprecedented data growth in all sizes of businesses, another option to take advantage of the savings offered by the StorageTek SL150 would be to purchase additional capacity (expansion modules; each module with LTO-7 stores 180TB of uncompressed data (max of 2.7 PB)). With no need to rip and replace to add more capacity, the customer, within minutes, can add an additional 30 slots (or more, up to 14 additional expansion modules) to a library. The StorageTek SL150 allows for higher density with both drives and cartridges than comparable tape libraries such as the Quantum i40/i80 libraries as shown in Table 3.

TABLE 3: STORAGETEK SL150 AND QUANTUM I40/I80 DENSITIES WITH LTO-5, LTO-6, AND LTO-7 FC DRIVES

	StorageTek SL150	Quantum I40/I80
Maximum Density – Capacity		
LTO-6 FC	1,125 TB in 31U	i40: 125 TB in 3U i80: 250 TB in 6U
LTO-7 FC	2,700 TB in 31U	i40: 300 TB in 3U i80: 600 TB in 6U
Maximum Density – Drives	30 drives in 31U	i40: 2 in 3U i80: 5 in 6U

The StorageTek SL150: The Best Value for Small and Midsize Environments

Whether a customer wants a simple tape library for backup and compliance or has visions of growing a tape environment to support archive initiatives, the StorageTek SL150 clearly provides value, whether using cost-based or time-based metrics. It represents about a 38%savings over 24-slot and 48-slot libraries, while also providing a more reasonable price point for performance among customers who might have previously considered a scalable solution such as the StorageTek SL500. It is easy to see how the StorageTek SL150 delivers an unprecedented value to small and mid-size customers looking for a scalable tape solution when considering these advantages, as well as the cost saving advances in terms of footprint, infrastructure requirements, and ease of use.

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