SPECTRA LOGIC

Gator™ Architecture for Spectra 12000™ and Spectra 64000™ Tape Libraries

AN OVERVIEW

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AN OVERVIEW

INTRODUCTION

When engineering a new tape library or series of tape libraries, a storage technology company will design around a particular architecture. An architecture—or a method and style of design and construction—is comprised with specific goals in mind. The design goals of an innovative architecture will make the new design better than previous architectures as well as those of its competitors.

A tape library architecture, if well done, will give years of service to its users and protect its users' investments through time. Often, a library will not only outlast the tape drives it uses to store data, but also the tape technology that it was designed to automate. In fact, many of the tape drives that will eventually be used in the library may not be available or even announced when the library is designed. Because of this, a library's performance or capacity specifications are not cast in stone. A new tape drive technology can double or quadruple the aggregate capacity or throughput of the library. What cannot be altered with future drive technology, however, are any limits imposed by the library architecture.

Through time, Spectra Logic has proven the importance of forethought in tape library architectures with such innovations as improved robotics, firmware upgrades, and numerous interface upgrade options. Spectra Logic has always provided its customers with excellent investment protection through other architectural advantages; firmware updates have provided new functionality, and capacity upgrade paths have enabled the user to add more drives or slots in the field.

Spectra Logic's newest Gator architecture represents Spectra Logic's fourth generation of library products. This architecture is the culmination of a decade of experience in design, production, service, customer support, and software support. All of Spectra Logic's tape libraries are designed to provide unmatched capacity, performance, reliability, and high-availability. Gator architecture in particular is designed to accept new tape technology and networking options, to scale upward to meet users' growing needs, and be versatile and configurative enough to support the yet unseen requirements of the future.

AUTOMATED TAPE LIBRARY CHALLENGES

Modern tape libraries have evolved to high levels of reliability and fault-tolerance. Engineers of both library hardware and backup software applications have made great strides to facilitate automated backup with minimal human intervention. Even with all of the advances, backup remains a perennial challenge for information systems (IS) managers. The challenges that IS managers face in regard to costs, serviceablity, and connectivity have become the targets of design goals to solve these problems in the newest tape library architectures.

Challenge #1: Tape Drive Reliability

Historically, tape library robotics have been far more reliable than even the best tape drives. Tape drives tend to be the weak link in the chain of a failed backup operation, going offline at night, for example, when no one is around to fix the problem. This is very frustrating to systems administrators.

The main reason for this problem is duty cycle. Tape drives have a duty cycle in which they are required to perform in long, recurring successions. In a typical overnight backup, a four-drive tape library may move a tape to each drive each hour with perhaps 40 moves in a 10-hour backup window or only four minutes of activity. This four minutes of robotics use compares to 10 hours of use on the tape drives.

While improvements in tape library reliability are important, a 100 percent perfect robotic device will still fail if its tape drives fail. An intelligent tape library architecture would mitigate this problem in two ways. First, it would use extremely reliable tape drives, such as Sony Advanced Intelligent Tape™ (AIT), Ecrix VXA™, and Exabyte Mammoth-2™; and all tape drive technologies would have to pass an extensive drive qualification process. Secondly, the library architecture would allow the user to hot swap the tape drives without library or system downtime. A new drive should be able to be added or replaced very quickly and without tools, without cutting power to the library, and without changing system cabling, thereby minimizing costly server down time.

Challenge #2: Hardware Is Too Expensive and Cannot Be Shared

Typically, users have had to purchase and maintain different tape libraries on each backup server. This was because only the large and expensive tape libraries, such as huge silo libraries from companies like IBM and Storage Technology, would permit sharing between hosts. However, the purchase and maintenance of multiple units like these have been cost prohibitive for many sites and applications.

True intelligence within a library architecture should facilitate multi-host sharing without adding cost, complexity, or additional maintenance overhead to the library or to the enterprise. Library sharing can be accomplished in a number of ways. Some systems use a software application installed on a server where all commands from shared servers are queued and logically processed. This method requires a software application interface, often called an API, which backup applications must interface to become certified.

Challenge #3: Different Operating Systems and Applications Require Different Hardware

A data center might require a certain type of library for each server, operating system, and software. For example, an environment may have one library on its UNIX machines using NetBackup, a second one on its NT server with Networker, and a third one on Novell using ArcServe. This forces the IS manager to purchase and maintain many different libraries, all at increasing financial and labor-intensive costs.

Now, a smart library architecture would allow a user to not just partition a single physical library into multiple logical libraries. It would also allow each logical library to emulate different tape libraries as required, either current models or prior generations. For example, one logical partition could appear as an Exabyte EXB-210, another could emulate a StorageTek STK-9714, a third partition could emulate a Spectra 10000 library, while yet another could be a native Spectra 12000 or Spectra 64000 logical library. The physical library could connect to all servers, filers, RAID, and even direct clients; and all the while its resources are seen by the individual systems, the library itself remains transparent.

Another feature in an intelligent library architecture would be for the library to successfully support emulations of individual tape drives, and again, either current models or prior generations. Each drive within the library could have its own emulation within the physical library or within logical libraries. For example, a successful tape drive emulation feature would allow a Sony SDX-500 drive to appear and behave as a DLT-7000 or an Exabyte 8505 tape drive, or as a previous-generation Sony SDX-300 tape drive.

Challenge #4: Users Outgrow Throughput and Capacity

The cost of large-capacity tape libraries has resulted in many data centers making poor decisions in tape library purchases. Looking for lower cost, users often buy a library that is too small for their long-term needs, and then they will quickly outgrow its capacity. Or, even if the capacity is sufficient, the unit may lack necessary speed; it may not have enough drives to backup all of the data in an allocated backup window. Both of these are vital concerns because more and more data centers are experiencing increasing amounts of data and less time to back it up.

To meet this challenge, an intelligent tape library architecture would be highly scalable. It would allow users to buy only what they need now, yet plan for the future at the same time. In other words, they could purchase a large library without being required to fully populate it. That way, instead of having to buy a whole new library as needs grow, users could purchase additional controllers, drives, and cartridge slots to add to their existing library. To increase performance and capacity needs, users could add newer-technology tape drives with more capacity and throughput as the new drives become available.

Challenge #5: Library Hardware Is Too Large or Capacity Is Insufficient

Space on computer room floors and walls is becoming more valuable. The Internet and new trends like collocation further complicate the need to minimize space requirements for backup devices. Many libraries take up too much room without providing the amount of throughput and capacity that the customer needs. Old tape library architectures wasted space when space was not as much of a concern as now; and now, so-called new tape library designs have just been built upon the old designs instead of upon real improvements.

An intelligent tape library architecture would come in a totally new, innovative design based on storage density. It would fit a maximum number of tape drives and cartridge slots into the smallest amount of cubic space. It could fit into a standard-size rack, and it could fit maximum terabytes of data in a single rack instead of in multiple racks. In general, it would give users more of what they needed, and in the smallest amount of space.

Challenge #6: Interface Flexibility

Traditionally, storage has been a captive resource to servers in a Direct Attached Storage (DAS) architecture. New storage architectures, such as Storage Area Networks (SAN) and Network Attached Storage (NAS), are changing the way we administer storage today, which also affects backup strategies. These technologies offer their own architectural benefits.

DAS system issues:

- simple, understood, and cost-effective connectivity
- no sharing
- relatively simple—but limited—cabling options

SAN configurations provide:

- greatly enhanced sharing capabilities between servers and devices
- much improved cabling and interconnect options, including hot plugability
- some increased complexity associated with Fibre Channel interconnectivity and interoperability

NAS configurations provide:

- sharing capabilities at the file system level
- maintenance simplicity through years of advances in tools and device maturity of networking components

New tape library architectures should facilitate connectivity and not limit the user. For example, a smart architecture should allow Fibre Channel controllers to be mixed freely with SCSI controllers, and should also be able to use Gigabit Ethernet connectivity, making it possible for users to migrate to DAS/SAN/NAS solutions as the user's needs change. Such an architecture would enable different logical libraries to use different connectivity and control softwares at the same time, successfully integrating DAS/SAN/NAS architectures while ensuring that other systems can continue to use traditional, host-based SCSI backup methods.

The newest and best tape library architectures allow the user to easily configure, upgrade, and transition from interface to interface. Controllers are integrated rather than external. And the hardware using all of this ideal technology is not too expensive.

ABOUT GATOR ARCHITECTURE

As stated in the introduction, automated tape libraries are designed around architectures, which should give their users years of service and protect their investment through time. They will definitely be able to succeed in longevity and investment protection when they meet the typical challenges outlined for automated tape libraries:

- tape drive reliability
- cost-effectiveness
- shareability
- upgradeability
- storage density
- interface flexibility

These automated tape library challenges became the design goals for Spectra Logic's latest tape library architecture: Gator architecture.

Gator Architecture's Modular Approach

Gator architecture libraries allow modules to be swapped quickly and easily. Modular mechanics and revolutionary new electronics allow system components to appear as library resources on the Gator architecture's Controller Area Network (CAN) bus. On the CAN bus, modules talk to other modules within the library, like a small-scale network within the library. Each module has access to how the other modules are configured and performing. When necessary, high-risk modules such as tape drives can be hot swapped with no required downtime for the library or servers. Interface controllers can easily be replaced or moved to meet different connectivity requirements. Fans, controller boards, and even the robotic picker assembly can be replaced quickly with few or no tools.

Architecturally, the libraries can be divided into four major sections:

- The Control Panel
- The Quad Interface Processor
- Robotics / Tape Storage Slots
- Power / Fan / Chassis

The Control Panel

The control panel includes the color touchscreen user interface and the Gator Entry/Exit Controller (GEEC). These comprise the main interface between the human user and the library robotics. The control panel is used to:

Configure the library by splitting the physical library into different logical libraries, setting SCSI IDs and emulation modes for the controllers and drives, Fibre Channel addressing, and Gigabit Ethernet addressing.

Manually move media to either access a tape cartridge or to insert/eject tapes from the entry/exit pack for normal migration operations.

Run diagnostics from a simple system reset to accessing specific system diagnostic tests.

Upgrade firmware and software locally or over the internet for the picker, the GEEC, the interface controller cards or tape drives.

The Quad Interface Processor

As the control panel is the main human interface to the library, the controllers interface the library to the host computer. The controllers in Gator architecture libraries are called Quad Interface Processors (QIPs). Each QIP supports up to four tape drives, two on each of two SCSI busses. Each bus of each QIP can be configured to be a logical library partition (export a library), or be part of another logical library. Redundancy is another added benefit of this technology; when multiple QIPs are used in a logical library, control can be passed over from one QIP to another in the event of a failure.

QIPs are available for the following interface technologies:

SCSI Quad Interface Processors (S-QIPs) are available for conventional, direct SCSI attachment environments. The S-QIP provides high-voltage differential SCSI connections.

LVD Quad Interface Processors (L-QIPs) provide connections to new low-voltage differential systems as well as single-ended SCSI systems.

Fibre Quad Interface Processors (F-QIPs) are available for Fibre Channel connections. Fibre Channel allows longer cable lengths, and thus is a high-speed alternative to a direct SCSI connection. Fibre Channel is also a component in Storage Area Network (SAN) methods for sharing libraries. The F-QIP has dual Fibre Channel connections with Gigabit Interface Converter (GBIC) connectors. Each connection is capable of addressing all four drives associated with the respective F-QIP. In addition to its being high-speed, the dual Fibre Channel connection provides the added benefit of redundant data paths to the library, increasing the overall availability of the storage system.

Ethernet Quad Interface Processors (E-QIPs) provide Gigabit Ethernet connections for NAS architectures, allowing connectivity to existing network infrastructures using Spectra Logic's Tape Appliance Operating System (TAOS) architecture.

Robotics / Tape Storage Slots

Library robotic mechanisms include the picker and the Entry/Exit (E/E) packs. The picker is involved in all tape movement; the E/E pack transfers up to 15 tapes in or out of the library, either individually or in a removable cartridge pack with an integrated dust cover. The Spectra 12000 library has a single E/E port and uses one 15-slot E/E pack, the Spectra 64000 library has two E/E ports. The E/E slots are not included in the total slot count or capacity of either library.

The Spectra 12000 can be populated with 60 or 120 cartridge slots. At maximum capacity, it can be configured into up to four different logical libraries at one time. The Spectra 64000 can be populated with 100 up to 640 cartridge slots in increments of 60 slots. At maximum capacity, it can be configured into up to 16 different logical libraries at once. The cartridge slots in both libraries are upgradeable in the field.

Power / Fan / Chassis

Within a Gator architecture library, users will find a well-organized chassis design. Users are able to easily locate all of the library components in a compact, rack mountable enclosure. Users also have easy access to the library's hot swappable cooling fans and power supply modules. And, for the Spectra 64000 library, users can purchase additional, redundant, hot swappable power supply modules.

Spectra Logic has developed a new power conservation feature to address a recent concern for data storage in modern colocation environments: a renewed sensitivity to power utilization. With this feature, a Gator architecture library will be able to recognize when a drive has not been used for a given amount of time and will put the drive into a "sleep" mode until the drive needs to be used again. This function is a power-saving—and therefore cost-saving—benefit for the user. For more detailed information on power savings in Gator architecture libraries, see the Spectra Logic white paper on *Tape Backup In Power Blackout Environments*.

Shared Library Services™

Gator architecture libraries' performance, storage density, availability, and scalability position these libraries as ideal choices for the medium-to-large data center. However, one feature that sets them apart from other tape libraries in their class and also makes them viable for smaller data centers is Shared Library Services (SLS)—a new sharing feature which Spectra Logic introduced to the storage industry in its new Gator architecture. The SLS application gives the user the ability to partition a library into multiple, smaller virtual libraries and to connect these to the same or different hosts. For a visual example of SLS, see page 10.

Using SLS, Gator architecture libraries can be split into multiple logical libraries, guided by the following partitioning rules:

1. Drives must be added to partitions in pairs. A library is made of one or more two-drive SCSI busses, so while both drives do not need to be present, both drive locations are added to a logical library partition.
2. Tape slots are added to virtual libraries in multiples of 15 slots. Each logical library must have at least 15 slots.

The user may choose any logical configuration provided that only these two conditions are met. For example, a fully-loaded Spectra 12000 library can be a single eight-drive, 120-slot library; or four two-drive, 30-slot libraries; or two four-drive, 60-slot libraries; or one six-drive, 90-slot and one two-drive, 30-slot library. The fully-loaded Spectra 64000 library can be a single 32-drive, 640-slot library; or 16 two-drive, 30-slot libraries; or eight four-drive, 75-slot libraries; or many other logical configurations in between.

SLS partitioning offers several advantages over using multiple small libraries:

Initial cost. The purchase price of a Spectra 12000 library is considerably less than the cost of four two-drive, 30 slot libraries or two four-drive, 60-slot libraries. The cost of the robotics of one physical library is amortized across multiple logical libraries and their hosts.

Data centralization. Operators can collect tapes that need to be moved off site from one centralized location instead of four separate locations. New blank media can be added at the same time resulting in one trip instead of four or eight.

Future configurations. If one library needs more slots or drives, the user has the option of taking them from a less utilized logical library or, if the physical library is not fully populated, the user can physically add more slots or drives, thereby expanding the physical library and distributing the additional capacity and throughput in the best manner.

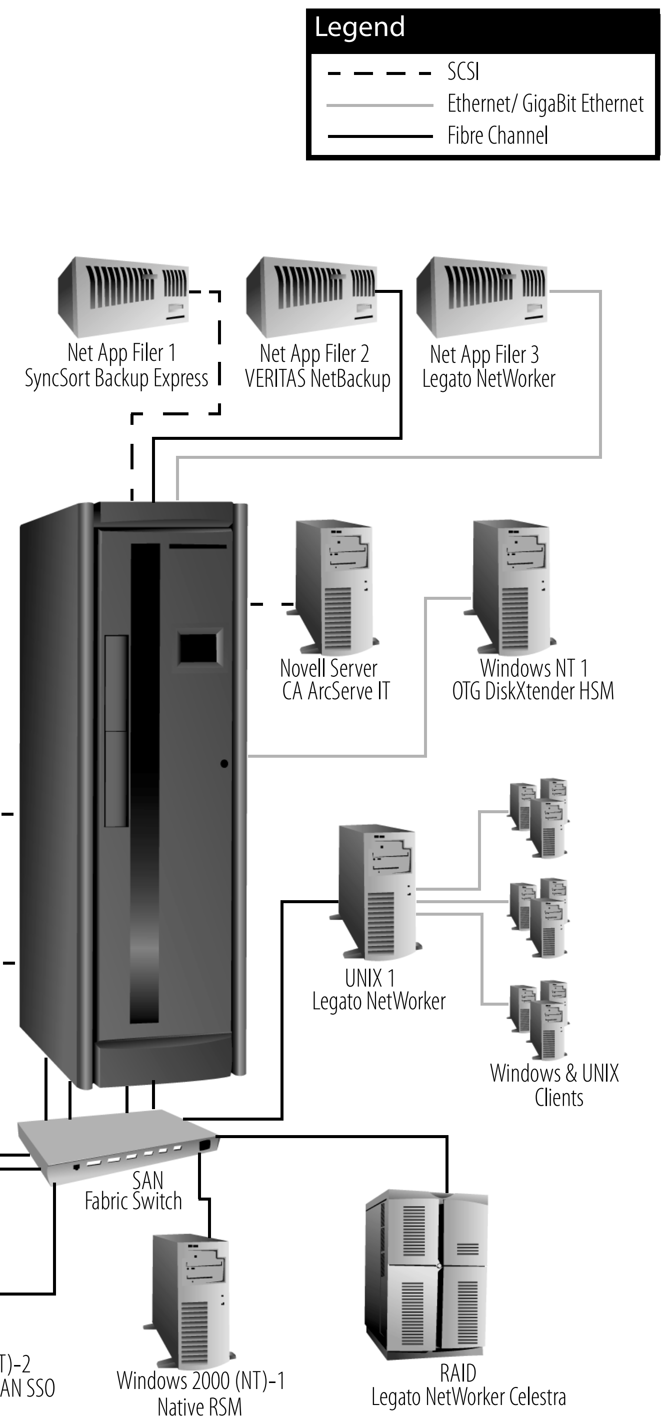
Reduced maintenance. One larger library is less expensive and less time-consuming to maintain and operate than multiple small libraries.

Enterprise library feature set. All partitioned logical libraries within the Spectra 12000 and Spectra 64000 libraries are able to use the features of enterprise-class libraries. Features like the color touchscreen user interface, hot swap capabilities, robustness, redundancy and high availability are not normally available in smaller physical libraries, but they are available here through logical library partitioning.

SHARED LIBRARY SERVICES

Example of a running Spectra 64000 using SLS Partitions

HOST	APPLICATION	INTERFACE	DRIVES	SLOTS
Net App 1	SyncSort	SCSI	2 AIT-2	15
Net App 2	NetBackUp	FC	2 AIT-2	15
Net App 3	NetWorker	GigE	2 AIT-2	15
Novell	ARCServeIT	SCSI	2 M2	15
NT 1	DiskXtender	GigE	2 AIT-2	45
UNIX 1	NetWorker	FC	2 AIT-2	60
RAID 1	Celestra	FC	4 AIT-2	105
NT 2000-1	NT Backup	FC	2 VXA-1	15
NT 2000-2	BackUp Exec SSO	FC	2 AIT-2	45
UNIX 2-4	NetBackup SSO	FC	6 AIT-3	120
UNIX 5	Tivoli TSM	SCSI	2 AIT-2	45
Linux 1-N	NetBackup	SCSI	2 VXA-1	45
Unassigned future expansion			2	100



Shared Library Services enable users to allocate large Spectra 64000 library resources from one to 16 logical libraries (user-defined configurations of cartridges, drives, interfaces, software packages and platforms).

SLS is Transparent to Host System and Software

As mentioned before, the controller (or QIP) provides the interface connectivity to the host. All SLS functions are encapsulated in the QIP. Connecting the SCSI bus of a host to a QIP module, therefore, is the same as connecting it to an individual library. When a robotic action is needed by the software, it passes a command to the QIP. The QIP then queues a request to the picker and provides an acknowledgment to the host when the picker reports the operation as complete.

For example, suppose a partition of a Spectra 12000 library is connected to a host running Veritas Backup Exec™. If the backup software wants the tape mounted from Slot 5 to Tape Drive 3, it makes the request of the S-QIP. The S-QIP accepts this request, and then translates the virtual Slot 5 to a physical slot in the library which has been allocated to this partition and translates the virtual Drive 3 to a physical drive address. Next, it verifies that the slot is full and that the drive is empty. If all is in order, the S-QIP passes a move command with the physical coordinates to the picker and waits until the move is complete. The S-QIP can then pass on the success status of the move to the host over SCSI.

Emulations

An additional benefit of the SLS functionality and the intelligence Spectra Logic has designed into its QIPs is the ability to emulate other devices. Emulations can be configured at the library level or within the tape drives themselves. Each logical library can be configured to emulate or “act as” any of a number of popular tape libraries.

For example, if a logical partition of a Spectra 64000 library were set to emulate a Spectra 10000 library, the S-QIP would behave exactly like a Spectra 10000 library. Neither the host nor the backup software have to understand SLS, library sharing, or even know about the library emulation. In addition, both the Spectra 12000 and Spectra 64000 libraries can be configured so that their drives emulate other tape drives. For example, a Spectra 12000 library with Sony AIT drives can look like a StorageTek STK-9714 with DLT-7000 tape drives. This is sometimes important when operating a library on closed architecture hosts or when using versions of an operating system or backup software that don’t support the newest technologies.

There are two levels to tape drive emulation. First is the SCSI Inquiry Response, i.e., the host asks, “What are you?” The QIP allows the drive to answer any string; for example, “SONY SDX-500” or “DLT 7000.” On most systems, this allows a drive to attach to a device driver, from a list of supported drives. Sometimes, all that is required to work on a system is to answer with an older model number or similar drive.

The second reason why emulations are often important is that these strings are used to match up device drivers with drives to support specific behaviors and features. Many tape drives feature DIP switches to change behaviors for different host operating systems, and these can be used to cause the drive’s firmware to respond in a known way to certain operating-specific instructions. On the Sony AIT tape drives, these switches can be set through the control panel and the QIPs. This greatly expands the compatibility and software supportability of the Spectra Logic libraries.

Availability and Robustness

Reliability is of primary importance when considering tape libraries. Much of the backup process is supposed to be unattended, either to run at night without any intervention or to run anytime with minimal human intervention. Gator architecture libraries have been designed to exceed 2 million mean tape cycles before failure and are rated for more than 600 tape handling operations per hour.

Tape devices have faced a number of challenges as capacities and performance specifications have increased. It is an impressive feat to design the inside of a rigid disk drive with rapid mechanical movements at atomic level tolerances. These devices are reliable in spite of this because the environment is controlled; outside air and dust are not allowed to enter the system. A tape library and its tape drives have to interface far more with the real world of dust and contaminants. Tapes are carried to vaults or off-site locations, inserted and removed from libraries and exposed to an even larger number of real world situations. Changes in temperature, humidity, physical damage and dust can often come into play as tapes are rotated in and out of the library. Tape drives will fail. Media will fail.

Extremely robust, Gator architecture libraries have been designed to minimize the impact of failures, continue performing after a failure, report the failure, and to be quickly repaired without interrupting other jobs.

Drives are hot swappable to make it easier to replace a failed tape drive. The tape drive is located in a sheet metal enclosure called a drive sled. In the event of a failure, the drive can be disabled through the front panel, pulled out and replaced quickly. Once the drive is replaced, a user can reconfigure the new drive through the control panel to the correct SCSI ID, switch settings and emulation, and then put the drive into operation. The robotic picker is shut down as a safety precaution while the front door is open. Upon closing the front door, the robotic picker will resume any tasks in its queue. During this time, all of the controllers and all of the other tape drives stay powered up and online. The only backup interrupted is the one on the failed drive. A drive swap can be accomplished in less than one minute without the use of any tools.

The same general procedure can be used to replace or upgrade a QIP. As these are accessed from the rear panel, the front door does not need to be opened, and the robotic picker will not be interrupted. The cooling fans hot swap with the use of a screwdriver. In the less likely event that a GEEC board or robotic picker needs to be replaced, both will swap easily—but the unit will need to be power cycled to read the system configuration and inventory information once the swap is made.

The Spectra 64000 library provides redundancy in power supplies that allow operations to continue if a power supply component should fail. Cooling of the library rack is provided with the fan tray, and either component can be hot swapped to minimize potential downtime.

Scalability and Growth Path

Users of Gator architecture tape libraries do not need to purchase a fully populated library. Instead of purchasing a fully populated Spectra 12000 library, an eight-drive, 160-slot Spectra 64000 library could be selected that would provide redundant power supplies, two E/E packs, and the opportunity to upgrade to up to 480 more slots and up to 24 more drives at a later date.

Additional QIPs can be purchased from Spectra Logic at any time to upgrade throughput or change interface connectivity. Additional slots are available in segments of 60 tape slots (four magazines) each, and includes the software activation code and license to use them. The additional drives and capacity could be used to create a new logical library partition or to augment the capacity and throughput for existing partitions. The ability to configure Gator architecture tape libraries in so many ways, combined with the scalability of the libraries, allows users to address their future storage needs as well as their current needs.

Gator architecture libraries will also grow with network connectivity needs by allowing a user to adapt to SAN/NAS strategies using Fibre Channel or Gigabit Ethernet. To facilitate these transitions, Spectra Logic supplies controllers utilizing different protocols and physical connections. Because the controllers are independent, S-QIPs can be mixed with or replaced by F-QIPs, protecting the tape library hardware investment.

See page 14 for tables of information on fully populated library configurations, aggregate throughput and total library capacity.

Gator Architecture's Fully Populated Library Configurations.

Model	Maximum Slots	Maximum Drives	Maximum SLS Partitions
Spectra 12000	120	8	4
Spectra 64000	640	32	16

Aggregate Throughput in Megabytes per Second (Native)

	Spectra 12000 or Spectra 64000		Spectra 64000 Only		
Tape Drive	4 Drives	8 Drives	16 Drives	24 Drives	32 Drives
AIT-2	24 MB/sec	48 MB/sec	96 MB/sec	144 MB/sec	192 MB/sec
AIT-3	48 MB/sec	96 MB/sec	192 MB/sec	280 MB/sec	384 MB/sec
AIT-4	96 MB/sec	192 MB/sec	384 MB/sec	576 MB/sec	768 MB/sec
Mammoth II	48 MB/sec	96 MB/sec	192 MB/sec	288 MB/sec	384 MB/sec
VXA	12 MB/sec	24 MB/sec	48 MB/sec	72 MB/sec	96 MB/sec

Total Library Capacity in Terabytes (Native/Compressed)

	Spectra 12000 or Spectra 64000		Spectra 64000 Only		
Tape Drive	60 Slots	120 Slots	240 Slots	480 Slots	640 Slots
AIT-2	3.0/7.8 TB	6.0/15.6 TB	12.0/31.2 TB	24.0/62.4 TB	32.0/83.9 TB
AIT-3	6.0/15.6 TB	12.0/31.2 TB	24.0/62.4 TB	48.0/124.8 TB	64.0/168.0 TB
AIT-4	12.0/31.2 TB	24.0/62.4 TB	48.0/124.8 TB	64.0/168.0 TB	128.0/335.0 TB
Mammoth II	3.6/7.2 TB	7.2/14.4 TB	14.4/28.8 TB	28.8/57.6 TB	38.7/77.4 TB
VXA	2.0/4.0 TB	4.0/7.9 TB	7.9/15.8 TB	15.8/31.7 TB	31.7/63.4 TB

CONCLUSION

Spectra Logic's longevity in the tape library industry and its unique position as a long time provider of both hardware and software solutions have brought unique insights into the challenges and rewards of the automated tape backup process. Gator architecture reflects this understanding of the storage market and technologies associated with backup. The result is an extremely robust, scalable, highly available, and highly configurative tape library product with no equals.

Gator architecture now offers Spectra Logic innovation to users for whom enterprise-class throughput and capacity is most important. Gator architecture offers features that were once available only to those purchasing very expensive library hardware, and it includes many features that are not available on any other library in the industry. This, and the resulting cost efficiencies, combine to make the Spectra 12000 and Spectra 64000 libraries the best solution for all mid-range to large data centers.

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