IBM Adapts 3584 Tape Library for ILM —
3592 Drive Adds WORM Option

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Management Summary

Every Monday morning the Information Technology (IT) staff meets to discuss the issues of the week. Every Monday morning the Storage Area Network (SAN) personnel listen to the IT director complain about the issues involved in using the enterprise tape library. These include the cartridge capacity, the number of cartridges, the performance, the access time, and the total overall cost of storage. In addition, there are new issues involving the security surrounding the protection and preservation of email and financial data in support of government data retention regulations. They had fixed the Information Lifecycle Management (ILM) problems with the cost and performance of disk storage, complementing the primary storage with a secondary store for non-mission-critical data. They had added SATA disks to provide inexpensive, on-line storage. The data center, however, has not yet endowed tape with the same attention as disk; they have not improved the storage options within the library.

Tape is significantly less expensive than disk, but there is little difference between mid-tier drives, such as LTO and SDLT, the most common formats, in terms of throughput and capacity. Unfortunately, the federal regulations that necessitated the establishment of multiple tiers of disk, with varying degrees of data protection, also have requirements to ensure enterprise audit practices for the integrity of information archived to tape. That information requires protection to prevent changes. Moreover, the IT staff has the onus of ensuring that integrity. Therefore, in addition to standard tape cartridges, **the enterprise library also must also have access to Write-Once-Read-Many, or WORM, media**. Furthermore, file access time has also become a matter of concern, especially in environments that use tape as a data processing medium.

In order to create multiple tiers of storage within the library, **IBM has introduced modifications not only to the basic enterprise tape drive but also to the options available to the enterprise library.** Not only have they added WORM capability to the 3592 enterprise drive, but they have also updated the previously *LTO*-only *Ultrium UltraScalable 3584 Library* with the capability. They have also introduced multi-capacity cartridges for the 3592, in both standard and WORM formats to work with IBM 3592 drives. In order to see how this new offering can help the IT staff satisfy regulatory compliance, ensure business continuity by preserving mission critical data, and reduce the total cost of ownership of the data center library, please read on.

Storage Issues in the Data Center

The issues of Information Lifecycle Management (ILM) have commanded a significant amount of attention recently. As the value of information in the enterprise database changes over time, enterprises attempt to satisfy the requirements of federal regulations concerning the preservation of financial data and email for publicly held enterprises. The IT staff in the data center has addressed the front end of this problem by implementing multiple tiers of disk array storage to handle the variations in value and the need to access the data being stored on-line. Enterprises have installed primary storage arrays, such as the IBM *Enterprise Storage System (Shark)*, the EMC *Symmetrix*, or the Hitachi *9900* for that mission-critical information that requires instant access. They have also installed secondary storage arrays, such as *FAStT* or *CLARiiON*, for that data which is not as critical, but does have response characteristics that require the information be retained on-line. The data center has also set up sub-tiers within these device classes by intermixing 15K RPM drives with 10K drives, and by mixing SATA disk arrays with Fibre Channel (FC) arrays. As the value of the information on-line declines over time, the IT staff can move the data from one tier to another, reducing the cost of the storage used. Moreover, when the data center no longer requires this information on-line, but still needs to retain it in a near-line mode, it can be archived to tape.

Unfortunately, when dealing with tape, we find libraries can be greatly homogeneous structures. All of the drives configured with the same architecture and all of the cartridges configured to the same specification. In this way, the cost per gigabyte of archiving information, backing up files, or storing data in a real-time environment is the same. However, access to some of the information may be more critical than access to other data. For example, the rapid recovery of mission critical information might warrant the use of drives, and media, with fast access times that are more expensive than the storing of high volume data on high-capacity, inexpensive media. Likewise, if you are meeting a federal regulation to preserve enterprise documentation, additional cost to protect that data from being altered might be insignificant when compared to keeping senior executives out of jail and the enterprise solvent.

Rather than continuing to offer a library environment that could limit the enterprise in its storage options, IBM has modified the *LTO Ultrium UltraScalable Library*. It now allows the architecture to include IBM 3592 enterprise drives along with IBM's LTO drives. Moreover, they have upgraded the capabilities of the 3592 to include the WORM, or Write Once Read Many, feature.

Introduction of WORM 3592

In 2003, IBM introduced the *3592 Enterprise Tape Drive*[1] to ensure business continuity and to facilitate the backup and recovery process for both mainframes and open systems servers. Less than one year later, they have returned to center stage to announce the availability of Write-Once-Read-Many (WORM) media, designed to provide a non-alterable, non-rewriteable tape medium as a complement to the same architecture. By introducing the media in two capacities, 60 GB and 300 GB, IBM has provided solutions for two different requirements.

For those data centers that require fast access to "secure" data, the 60 GB WORM cartridge has an average access time of about 11 seconds. This includes environments where retrieval response time of individual data sets is critical and where recovery time for multiple data sets is of primary importance. Because of the shorter length of media, each cartridge costs about 35% less than the longer 300 GB tape.

For those environments where retrieval response time is not usually critical, or where reduction in the total cost of ownership is important, the 300 GB WORM cartridge could be the answer. This higher-capacity WORM cartridge allows for the economical storage of high volumes of secure data, thereby lessening the number of cartridge slots required. (See Exhibit 1, at the top of the next page, for a summary of WORM benefits.)

How does the WORM architecture work? Designed for long-term data retention and regulatory compliance, IBM has enabled the writing of a low level encoding not only to the tape media, but also to the Cartridge Memory within the WORM cartridge. A robust algorithm

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[1] See **The Clipper Group Navigator** dated August 31, 2003, entitled *IBM Delivers Advanced Enterprise Tape for Open Systems and Mainframes,* at http://www.clipper.com/researchTCG2003039.pdf.

Exhibit 1 –
Benefits of 3592 WORM Tape

- Simplify the infrastructure – Share the drive between traditional and WORM processing;

- Flexible architecture – The same drive can be used in a variety of environments: rack-mount, library, or with an open or mainframe server;

- Improved operational efficiency – One drive for fast streaming, fast access, and high-capacity data retention across multiple server environments;

- Reliability – Tape media with a shelf life of up to 30 years;

- Engineered Integration – IBM WORM tape is supported by their *Content-Manager*, *Tivoli Storage Manager*, and the *Data Retention Solution 450*.

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monitoring attempted accesses to tape prevents tampering with the data, while at the same time supporting appending to the media. The cartridges include a unique name, based upon the serial number, to allow applications to track and validate subsequent access to records stored on WORM media for security purposes.

These cartridges were designed to coexist in a variety of environments, including:

- IBM 3494 and 3584 libraries;

- C20 frame in a StorageTek 9310 silo[2]; and

- Standalone within an IBM 7014 T00 and T42 frame.

Whenever the 3592 drive detects a WORM cartridge, it will select WORM operational mode in order to prevent overwrite or changes to existing data while permitting the data center staff to append new data to the existing cartridge. The 3592 drive reads the data concurrently during the write operation to verify data integrity. Older 3592 drives must be upgraded with new firmware to ensure compatibility with WORM tape; otherwise, they will reject the WORM media.

Introduction of UltraScalable 3584

Though it is similar in many respects to the original *Ultrium UltraScalable Tape Library 3584*, the enhanced model is definitely new and improved. The *TotalStorage UltraScalable Tape Library 3584* has:

- A smaller footprint to save space in the data center;

- A lower entry point, and a lower price, for affordable archiving;

- On Demand Capacity Expansion to simplify upgrades;

- Support for the 3592 drive in addition to IBM's LTO Ultrium drive; and

- Dynamic partitioning between drive environments.

With these features, **IBM has positioned the 3584 to serve as a flexible, low cost solution for the storage of Retention Managed Data**. Available in four models, two in support of LTO drives and two supporting the 3592 environment, the new frames occupy 20% less floor space. The *L22/D22*[3] frames come standard with 3592 drives while the *L52/D52* come with LTO drives and use the existing canisters. Every library frame contains a maximum number of cartridge slots. The IT staff can install the frame with a minimum number of positions available and then activate more when needed, in an on-demand fashion. This enables the data center to control initial costs while preparing for future upgrades with no installation requirements. IBM also protects your investment in prior 3584 purchases by making all new frames compatible with the *L32/D32* frames from the original model. In addition, IBM delivers a decade of intelligent library management experience into the less efficient SCSI managed environment. With extensions to 3584 firmware, IBM introduces the new Advanced Library Management System (ALMS), which provides dynamic partitioning and dynamic assignment of LTO/3592 cartridges and drives, with no additional hardware or software required. (See Exhibit 2, on the next page, for the enhanced capabilities.)

Models L22/D22

With a 20% smaller footprint than the

L32/D32, the 3584 library now supports 3592 drives with the existing canister format. This enables portability between the various platforms that use them: the 3494, the 3584, and the C20 frames. The L22/D22 frames support up to twelve 3592 drives per frame and use single and dual port, open systems Fibre Channel connections. Compatible with the existing L32/D32 Models, the 3584 Picker is optimized for both LTO and 3592 cartridges. The L22 frame supports up to twelve 3592 drives with from 58 to 260 cartridge slots, while the D22 can support up to 400 cartridge slots, 360 with 12 drives.

Exhibit 2 – Enhanced Capabilities Of IBM's 3584 Library

- IBM's ALMS is the next generation of their patented Multi-Path Architecture and is designed to provide enhanced automation functionality, such as dynamic partitioning, including storage slot pooling and dynamic drive assignment. This type of partitioning allows heterogeneous applications to share the library robotics independent of each other. An example of heterogeneous sharing is a Microsoft Windows 2000 application using the drive and storage slots of one logical library while a UNIX application uses the drive and slots of another logical library. This helps make library management more efficient and effective.

- Tape drives can be assigned dynamically to any logical library using a Web user interface.

- Logical libraries can be added, deleted, or easily changed non-disruptively.

- Storage capacity can typically be changed without any impact to host applications. Cartridges under library control are not shared between logical libraries, nor allowed to be moved between logical libraries.

- A new 16 slot I/O station, with an optional 16 cartridge addition; support for 16 frames; 20% reduction in floor space; and an increase in storage density over the L32/D32 to more than 35TB/sq. ft.


Models L52/D52

The L52/D52 models integrate up to 12 LTO drives per frame into the 3584, with the same 20% footprint savings as the L22/D22. It reuses the existing LTO canister and connects to the drives via an open systems Fibre Channel interface. SCSI connections may be available by the end of the year via special request. As with the L22/D22, the L52/D52 models are compatible with the existing L32/D32 frames and employ a picker optimized for both the 3592 and LTO. The L52 frame supports up to twelve LTO drives, from 64 to 287 slots, while the D52 can support up to 440 cartridge slots, but no more than 396 with 12 drives.

Summary

Rather than being a dead technology, the evolution of tape libraries and tape drives is more vibrant than ever. **With the integration of LTO midrange tape and 3592 high-performance drives, IBM opens scalable library architecture to the world of Information Lifecycle Management.** They have created an environment where the IT staff can assign archive, backup, and on-line data to media cartridges appropriate to the value and processing requirements of the data. IBM has created a multi-tier environment for tape enabling:

- Information that needs to be secure, to be secure;

- Information that requires fast access to have fast access;

- Information that simply needs to be saved, to have the high capacity cartridge; and, most importantly,

- Information to be archived is a way to keep the TCO down.

By extending ILM to tape, IBM has empowered the IT staff to reduce the TCO of data center resources. **Taking advantage of what tape has to offer is up to you.**

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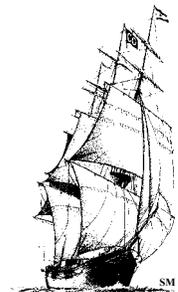
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