



## Back to the Future

**Virtualization brings  
 new technology  
 to mainframe tape**

By Ed Ahl

**W**hile IBM researchers can now store data in 12 atoms, it still takes considerably more atoms to do so using tape. Today, tape remains a major expense and performance roadblock for enterprise data centers. However, it's possible to bring advanced technologies to long-term storage through virtual tape backup.

Virtual tape libraries (VTLs) harness the speed of disk-to-disk and the cost-effectiveness of disk-to-tape. They also help consolidate and manage backup in increasingly heterogeneous data centers.

VTL for the IBM System z\* platform delivers superior ROI. On the cost side, it can reduce mainframe CPU cycle demands, CPU upgrades,

usage charges, space utilization, staffing charges and power consumption. On the benefit side, VTL can provide faster data recall, more reliable and realistic disaster recovery (DR), a smoother migration path to new storage technologies, and access from multiple servers—including Linux\* partitions—to channel-attached backup.

### Perception Versus Reality

Contrary to the popular misconception, only 20 to 30 percent of mainframe tape data is used for backup; the majority is operational data. Typically, the largest user of tape in the mainframe environment is hierarchical storage management (HSM). It's one of the applications best suited for virtual tape technology. Data can be written directly from a DASD (L0) to virtual tape (ML2), bypassing the intermediate, compressed-disk (ML1) phase.

By eliminating the ML1 step, the mainframe CPU no longer has to use processing cycles for compressing data, which is done by less costly virtual tape drives, thus enabling profound savings. In addition, eliminating ML1 data from DASD postpones the need to purchase additional DASD. Assuming a 3-to-1 data-compression ratio, approximately 25 percent of DASD can be freed. This is a significant savings because DASD is Tier 1 storage and very expensive.

### Reducing Space and Power

Modern disk technology used in VTL devices has become incredibly dense; drives are now measured in multiple terabytes, which reduces physical storage and power consumption. VTL can replace many of the automated tape libraries found in mainframe data centers, drastically reducing physical space requirements as well as power, air-conditioning and maintenance expenses.

By supporting newer, high-density FC tape libraries instead of the old, massive channel-attached libraries, VTL solutions offer a corresponding reduction in expensive equipment and associated maintenance fees. Often, a large percentage of the purchase price can be recouped based on maintenance savings alone.

### Rapidly Recall Data

Another advantage of VTL technology is the efficiency realized in reading

back the data. For example, a user might place complex invoices on physical tape quickly to avoid billing individual cost centers for disk usage. One potential problem with this is that frequent customer queries in the first week or two would require recalling

the data thousands of times a day. Each recall could take minutes, resulting in huge inefficiencies and customer dissatisfaction.

Moving HSM data directly to the virtual tape layer in disk-based cache, where it can be recalled rapidly, can



solve this problem. Users can write the HSM data to the virtual tape layer for a set period based on the need for frequent access. In fact, data can be written onto both the virtual tape layer and physical tape for long-term retention and access. Data in cache can be recalled at the speed of disk, in seconds, from the physical tape library.

### Assuring Disaster Recovery

For many, DR testing is an issue. Tests tie up human and physical resources for days and may be inconclusive, however, they must be conducted to demonstrate compliance.

Testing often amounts to little more than bringing up the DR site and proving it's operational, while in reality, the DR site is often too far away for the latest tapes to be on-site, signed in and accessible. Operations staff must be able to resume all operations within a set time frame but frequently they can't. This is untenable. Recent statutes enable shareholders to sue anyone who knowingly fails to provide proper safeguards for business continuance if such actions result in a loss of company value. Virtual tape backup devices provide a solution.

**1** First, by replicating volume serial numbers, or volsers, over standard TCP/IP lines or fiber, a copy of the tape data can be quickly and reliably sent to the remote DR site. Enhanced replication optimizes WAN traffic. After the first volsers are sent, only the changed data is sent to append those volsers. This reduces WAN traffic because data is only sent once.

**2** Second, a test copy of all volsers can be mounted at the DR site and fully tested against a complete data set. This testing takes place while live production tape replication continues.

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**3** Third, physical tape copies of volsers can be made available for data recovery. This is in addition to the virtual data layer in the VTL device's disk cache. These volsers are recoverable directly from physical tape and are written in native data formats.

**4** Fourth, replication in both directions between data centers allows sites to back up entire data sets to other locations for off-site storage requirements, removing the need for sending physical tapes off-site.

The implications of this are huge. After completing their first DR test using replicated data, many admit that, for the first time, they're confident they could survive a disaster and continue processing.

### Encrypting Data

With built-in Advanced Encryption Standard (AES) 256 hardware encryption, VTL devices can encrypt data at rest, residing in the disk cache layer, so data security compliance needs can be met through all stages of storage and movement. Data can

be unencrypted before it's sent to physical tape, allowing the physical tape drives to encrypt the data written to tape. This allows tapes to be moved to other locations to similar tape libraries, and data to be recovered with the proper encryption keys. Users can share an encryption key among multiple locations or accept keys from corporate key management systems.

### Migrating Data Painlessly

New tape technologies frequently emerge, but converting to the latest format can require a recall of every tape—in the library, at the DR site and elsewhere. This is expensive, time-consuming and disruptive. VTL provides the least disruptive method of physical tape migration. Built-in media managers can support virtually any tape library from any manufacturer, making migrating to new technology simple.

VTL separates the physical tape devices from the mainframe, presenting what it needs to see. Without disrupting operations, the new technology can be installed behind the VTL device.



Data can be moved to the new tape immediately, placing the latest data on the new technology, without disrupting operations. Nothing changes for the user or operations. The old library can remain in place and the VTL can restore data for as long as desired or as long as the data in the library remains active. The library can slowly be retired as legacy data expires, thereby saving maintenance costs.

### Overcoming Backup Roadblocks

In heterogeneous data centers, backup requirements become extremely complex. Many platforms require their own DASD that supports different OS requirements, backup utilities and applications. This results in multiple backup administrators, inefficient storage environments and costly underutilized storage devices. This challenge is highlighted in the System z\* world where many are adding Linux partitions and hit a backup roadblock when Linux partitions cannot access the mainframe's channel-attached tape devices.

New VTL devices, however, provide “any server to any storage device” capability, allowing them to overcome that roadblock and support the Linux partitions as well as other IBM server platforms such as Power Systems\* servers running IBM i, AIX\* and Linux, other vendors' servers and Windows\* networks.

### Back to the Future

IT professionals are bombarded with news of innovative storage technologies, but many are out of reach due to budget and legacy technology constraints. VTL provides a way to bring the future to tape, which is still a major expense for enterprise data centers. VTL can enable savings in floor space, energy usage, tape costs, human resources, CPU cycles and DASD.

These savings alone make VTL an attractive choice. Add

to that the speed of data access, increased reliability, extensive DR and compliance capabilities, data migration options, and the unification of backup, recovery and DR in multiserver environments—and the case for such a solution is clear. 



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