

# Mainframe Data Library – An Alternative for Mainframe Backup

## Mainframe Data Library

An Alternative for Traditional Mainframe Backup

### Executive Summary

Today's mainframe data centers are, for the most part, still highly dependent on tape systems to provide daily/weekly backups for disaster recovery as well as long term data archive. These tape systems are large and expensive; occupy huge amounts of data center floor space; often use tens of thousands of cartridges; and require on-going preventative maintenance and intense operations support. And, for all that, retrieval and/or recovery of data stored on tape remains time consuming and unreliable.

As disk technology has advanced, use of low-cost ATA disk storage for data backup and archive has become a popular alternative to tape in the open systems server market. Virtual Tape Libraries (VTLs) are available from a number of vendors, appearing on the SAN as a robotic tape library while actually storing data on RAID-protected disks.

Bus-Tech's Mainframe Data Library (MDL) provides a virtual tape library solution for IBM zSeries or compatible mainframes. Combining an industry-standard open systems storage bay with Bus-Tech's MDL system greatly reduces or eliminates a data center's dependence on tape by transparently replacing high-cost tape subsystems—including automatic tape libraries (ATL) and virtual tape systems (VTS)—with new, low-cost storage.

This paper provides an overview of this powerful solution and the benefits it can provide to customers who need to replace their aging tape and/or optical solutions with a solution designed for the 21st century.

### Tape Sub-System Overview

Tape has always been a prominent part of any large mainframe installation. From the early reel tape drives that were manually mounted to Automatic Tape Libraries (ATLs) and Virtual Tape Servers (VTS) meant to maximize cartridge utilization, mainframe computer operations has always spent large amounts of time and money managing large-scale tape systems. It is not uncommon for even a medium-sized mainframe environment to have anywhere from 16 to 64 tape drives and hundreds, or even thousands, of tape cartridges stored both locally with the mainframe and remotely at a disaster recovery site.

# Mainframe Data Library – An Alternative for Mainframe Backup

ATLs like the one shown here can have thousands of slots: each housing a single tape cartridge and providing hundreds of terabytes of capacity. Mechanical, robotic arms move cartridges from their storage slot to an available tape drive in response to a load request sent to the ATL from the mainframe.

And while ATLs are much more efficient than having a human operator physically mount a tape cartridge in response to a message on the operator console, much of the ATL's potential capacity can be wasted when small tape volumes—which are a fraction of the cartridge capacity in the library—are written to individual cartridges.



Virtual Tape Servers, such as IBM's VTS or Storagetek's VSM, attempt to address wasted capacity by temporarily caching small tape volumes to internal disk and then stacking multiple small volumes onto a single physical cartridge. But virtual tape servers create their own management problems as volumes expire and tape-to-tape copies are needed to recover space.

Moving tapes offsite for disaster recovery is almost always a requirement. For manually mounted tape systems (i.e., drives without robotic arms), sending tapes offsite is simply a matter of writing two copies of the tape and then sending one of them to the remote site by courier. But for an ATL and VTS, sending tapes to a remote site is much more complicated. ATLs can write two copies of a tape and

# Mainframe Data Library – An Alternative for Mainframe Backup

then export one through an export slot on the library. But virtual tape servers can have hundreds of logical tape volumes on a single cartridge; making it difficult—or practically impossible—to send physical cartridges offsite.

Automatic replication of tapes from a primary to secondary site is possible but generally very expensive. Even to consider such a proposition means that both the primary data center and the disaster recovery site must have the same or similar ATL or VTS. Then, high-speed and proprietary communication links must be established between the libraries so that volumes written to the primary library can be duplicated to the remote site.

There are two primary uses of tape within the mainframe data center: backup and archive. And included in both of these is data duplication for offsite storage for disaster recovery.

The requirements for backup and archive are different. Backup data is usually required for a relatively short time. For example, if a mainframe backs up its primary customer database each day then the current backup is only current until the next day when a new backup takes place. But, even though it may only be needed for a relatively short period of time, it still must be duplicated at the disaster recovery site in case the primary site goes offline.

On the other hand, archive data, which often no longer exists on primary direct access storage device (DASD), may need to be maintained for many years. And scheduling when data gets migrated from online DASD to an archive medium such as tape is a balancing act that depends on whether or not the data is likely to be needed for immediate online processing.

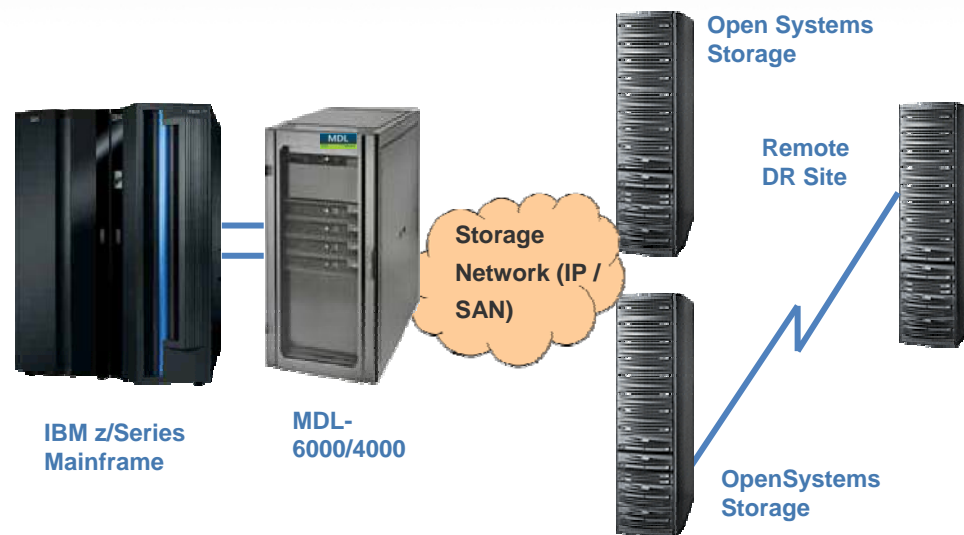
Consider a bank's customer data. Bank account data can typically be retrieved in a matter of a second or less if it is stored on DASD. But once it is migrated to tape it may take a minute or more for an ATL or VTS to locate, mount, and retrieve the required information. So bank data processing centers must determine how long to keep a customer's data on DASD, based on how often they expect their online banking systems to need the data. The current month's data, or even the last three months' data, is almost certainly going to be maintained on DASD. Especially considering today's online customer banking applications. But when should data that is six or twelve months old be archived to tape? If it is archived to tape too soon, then Internet customers may wait minutes for data retrieval and are likely to drop off before the system can respond. But keeping data that is almost never going to be retrieved on DASD increases

# Mainframe Data Library – An Alternative for Mainframe Backup

overall DASD capacity requirements and results in an increase in the cost per MByte for the data center's storage as a whole.

## MDL Overview

### MDL – a zSeries Tape-on-Disk Controller



As shown in the picture above, the Mainframe Data Library (MDL) connects directly to the IBM zSeries (or compatible) mainframe using FICON or ESCON (MDL 4000 only) attachments. The MDL appears to the mainframe operating system (z/OS, OS/390, VSE, VM, or TPF) as standard IBM tape drives. Existing mainframe-based applications can use MDL tape drives just as they would any actual mainframe-attached tape drive. No application changes are required.

But instead of writing data to physical tape cartridges, the MDL uses open systems storage to store a tape volume's data as a single file on an industry standard file system. Furthermore, each stored tape volume is named using its mainframe tape Volume Serial Number (VOLSER), allowing it to be easily identified and mounted in response to read or update requests from the mainframe.

The Mainframe Data Library is a family of controllers that offers a wide range of channel connectivity, device emulation, and performance options. The MDL-1000 is a single controller that provides a single FICON channel interface and emulates up to 256 3480, 3490, or 3590 tape drives. The MDL-2000 offers 2

# Mainframe Data Library – An Alternative for Mainframe Backup

FICON or ESCON channels. The MDL-4000 and MDL-6000 systems provide multiple independently operating controllers as a single solution providing built in high-availability and redundancy. A fully configured MDL-6000 can provide up to twelve (12) FICON interfaces and emulate a total of 1,536 tape drives.

Configuration of the storage component of the solution depends on the storage requirements of the solution. Multiple storage devices can provide file systems that can be combined by the MDL to form a single virtual library. Most commercially available Network Attached Storage (NAS) and Fibre Channel (SAN) storage systems offer data replication software tools so customers can build mainframe tape-on-disk backup solutions that include remote data replication for disaster recovery. This approach eliminates the need for multiple copies of backup tapes and physical transport of tapes to a remote location and can usually be implemented using simple IP connections to the Internet.

## Benefits

The benefits of implementing an MDL virtual tape library (VTL) are considerable. They include shortened batch processing windows, improved data retrieval, lower operating costs, and electronic disaster recovery. Whether measured in time or money saved, an MDL can quickly pay for itself.

### Shortened Batch Windows

When customers implement mainframe VTL solutions, a reduced batch processing window can be an unexpected benefit. For customers replacing non-automated tape drives or Automated Tape Libraries (ATLs), the reduced time an MDL takes to satisfy a mount request can provide significant time savings when a lot of tapes are involved. Additionally, since the MDL allows the customer to set their own tape cartridge size, backups that once took multiple volumes and multiple mount requests can now be reduced to a single volume with instantaneous mount resolution. Customers implementing demanding tape applications have realized as much as a 50% reduction in their overall batch processing windows.

### Improved Data Retrieval

Retrieval of data stored on traditional tape can be very time consuming. Even when data is stored in an ATL or VTS, mounting a tape to retrieve data can require several minutes or more if there are no drives available and the volume is not cached.

# Mainframe Data Library – An Alternative for Mainframe Backup

And then there is the issue of data reliability. Physical tape can stretch and break, especially when the cartridge has been repeatedly used. The inability to read a tape can make data retrieval impossible.

On the other hand, retrieval of data from a VTL solution such as the MDL is fast, efficient, and reliable. Tape mounts are usually instantaneous. And, once the tape is mounted, retrieval of data from a tape volume can be as fast as DASD retrieval. When applications use tape block locate commands, the MDL can access any block on the tape in roughly the same amount of time. There is no need to read through the volume sequentially.

Customers who have moved applications from an ATL to the MDL have found significant performance improvements in overall retrieval of data using the VTL approach versus waiting for an ATL to physically mount a cartridge. Improved retrieval of data from a VTL means that archive data can be migrated from a DASD to the VTL sooner than it would be migrated to physical tape. Where data may have once been kept on a DASD for up to 6 months, it may now only need to be kept on a DASD for 15 or 30 days. DASD resources are freed for other uses more quickly, lowering the overall cost of storage in the data center.

## **Lower Operational Expense**

Mainframe tape drives, Automated Tape Libraries, and Virtual Tape Servers occupy considerable amounts of space within the data center. Physical storage of thousands of cartridges can add significant space requirements. Electrical expense, maintenance contracts, and the ongoing need for new cartridges all contribute to making large-scale mainframe tape subsystems an expensive proposition.

An MDL can significantly reduce operational expense. An MDL occupies much less raised floor than a medium or large tape system. Electrical consumption is reduced by the elimination of tape drives and/or robotic arms. And the need to continually purchase new tape cartridges can be completely eliminated. Finally, there is no need to periodically take the MDL offline to perform preventative maintenance to mechanical robotic arms and drives.

## **Electronic Disaster Recovery**

In this day of high-speed networks and the global Internet, mainframe data centers continue to rely on disaster plans based on physical tape being shipped to remote storage locations. The only alternative is to install very expensive

# Mainframe Data Library – An Alternative for Mainframe Backup

dedicated proprietary communications links between facilities in order to allow duplication of volumes from one tape library to another.

MDL virtual tape solutions can alleviate or replace both the manual transport of tape and expensive proprietary communications links. Using NAS replication capabilities, tape volumes stored in an MDL can be duplicated automatically to a remote location over standard IP connections.

In the unlikely event of a disaster, data stored at a remote location can be retrieved just as if it were locally stored in the library. The difficulties of finding a physical tape and transporting it from the disaster site to be processed are replaced with online electronic efficiency.

## Summary

Mainframe data centers have always been highly dependent on tape. From the days when mainframes were only used for batch processing to today's mainframe-based online transaction-based systems, tape has always been the lowest-cost alternative for backing up and storing data when compared to the high cost of primary DASD.

But low-cost, open-systems disk solutions now enable disk-based backup solutions that offer significant advantages over tape. Today, tape-on-disk and disk-to-disk backup solutions have become the next hot technology in the open systems server arena.

For mainframe datacenters, however, tape subsystems continue to prevail. A virtual tape library for the mainframe, such as Bus-Tech's Mainframe Data Library, allows low-cost, open-systems NAS to be directly attached to mainframe Input/Output channels. Appearing to the mainframe as a group of individual tape drives, the MDL allows existing tape-based backup applications to store their data directly on disk. NAS-based replication capabilities allow expansion of Bus-Tech VTL to provide complete, fully-redundant disaster recovery solutions which can eliminate aging tape systems and advance the data center into the next generation of backup storage systems.