Mainframe Appliance for Storage (MSA)
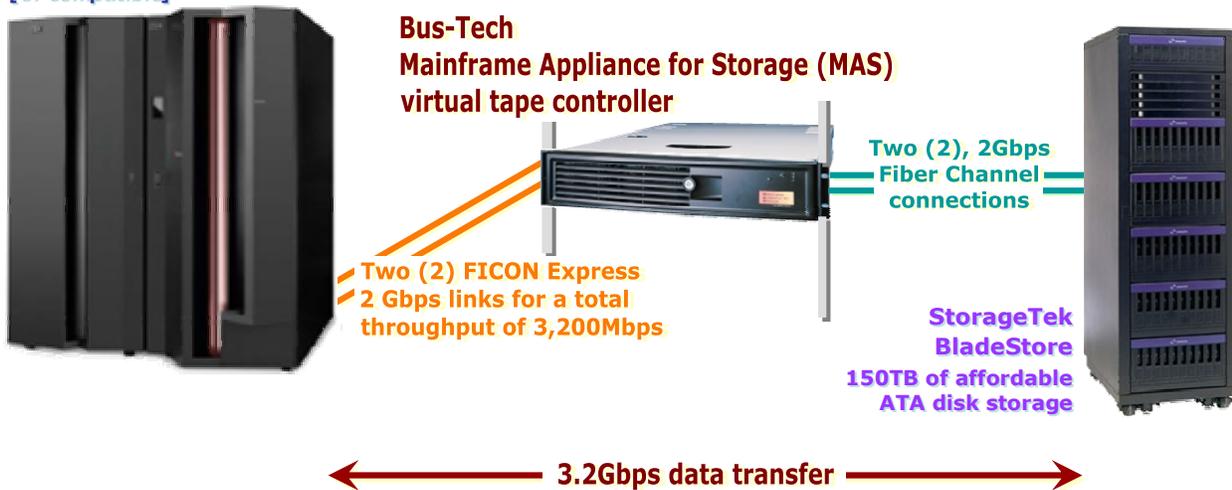
The Next Chapter with FICON and ATA

Dual 2Gbps FICON Express mainframe connectivity, 'tape-mark'-based fast tape access emulation[e.g. fast forward], and support for the highly economical 'Advanced Technology-Attached' (ATA) disk arrays [e.g. StorageTek's BladeStore] ushers in a whole new era of affordable, high-performance TAPE-ON-DISK applications.

The Bus-Tech Mainframe Appliance for Storage (MAS) is a 'near-zero' latency, TAPE-ON-DISK virtual tape controller for modernizing tape-based mainframe applications. MAS eliminates the need for tape cartridges and tape drives. Instead, IBM 3480-oriented tape operations are emulated using fast, inexpensive, and permanently mounted disk drives. Rather than reading from and writing to slow, error-prone and labor-intensive tape cartridges, mainframe applications can now use fast, reliable, petabyte range disk stores – without any changes to the application software. Hence the notion of the MAS being a TAPE-ON-DISK controller for IBM [or compatible] mainframes running z/OS, OS/390 or VSE.

A single, 2U (3.5 x 19 inch) rack-mount MAS can emulate up to 64 IBM 3480 tape dives. Connectivity between a MAS and a mainframe can be realized using one or two 2Gbps FICON Express channels or 17MBps ESCON channels. Disk storage, including the emerging, low-cost ATA drives, can be attached to a MAS using 10Mbytes/sec Ultra 320/LVD SCSI, 2Gbps fiber channel or Gigabit Ethernet connections. The MAS has been tested and certified with all leading, open-system disk platforms.

Bus-Tech's acclaimed mainframe connectivity technology and expertise, as attested to by over 15,000 worldwide customers (including IBM), is the cornerstone of the now highly proven and widely deployed MAS solution.
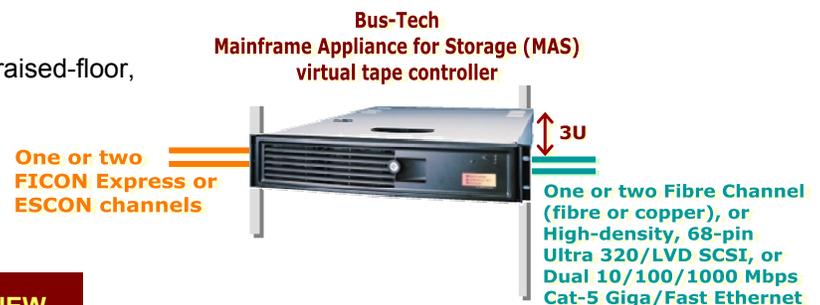

IBM Mainframe [or compatible]

Bus-Tech Mainframe Appliance for Storage (MAS) virtual tape controller

Two (2), 2Gbps Fiber Channel connections

Two (2) FICON Express 2 Gbps links for a total throughput of 3,200Mbps

StorageTek BladeStore 150TB of affordable ATA disk storage

3.2Gbps data transfer

Affordable, high-performance, low-latency MAS configuration with FICON Express mainframe connectivity and 2Gbps SAN connection to ATA disks

PROVEN AND DEMONSTRABLE ADVANTAGES OF THE MAS SOLUTION

❖ Reclaim valuable mainframe capacity by significantly expediting the completion of tape dependent batch jobs by eliminating tape mount delays.

❖ Reduce, if not totally eliminate, the need for expensive tape cartridges – most of which, moreover, are but sparsely used.

❖ Forgo the high, recurring maintenance costs on tape drives.

❖ Enhance operator productivity (and satisfaction) by getting rid of frustrating tape operations related interruptions.

❖ Reduce the time taken for tape backups by as much as 60%.

❖ Facilitate disaster recovery scenarios by permitting, high-throughput, unattended remote backups.

❖ Unattended, no intervention required, 'TAPE-ON-DISK' operation permits the optimization of data center shift staffing, particularly at weekends.

❖ Significantly reduce tape library costs, in terms of floor-space, racks, equipment and personnel, given that a single open-system storage rack, à la StorageTek's BladeStore, can take the place of over 50,000 IBM 3480 250MB tape cartridges!

❖ Minimize the need for expensive 'primary' DASD storage for fixed-content data by exploiting the very fast, "no-delays-for-tape-mounts", data retrieval possible with the MAS TAPE-ON-DISK approach.

❖ Better utilize scarce and expensive raised-floor, data center real estate by pace-hogging tape drives.

Bus-Tech Mainframe Appliance for Storage (MAS) virtual tape controller

3U

One or two FICON Express or ESCON channels

One or two Fibre Channel (fibre or copper), or High-density, 68-pin Ultra 320/LVD SCSI, or Dual 10/100/1000 Mbps Cat-5 Giga/Fast Ethernet

APPLICATIONS FOR THE MAS -- OVERVIEW

1. Optimize and enhance daily 'tape' backups – by considerably speeding up the whole operation.

2. Maximize data backup integrity by eliminating the well-known media corruption and media mix-up problems associated with tape backups.

3. High-throughput, heavy-volume data mining.

4. Direct, systematic, high-performance data exchange between mainframes and other platforms [e.g. Unix/Linux servers, iSeries machines and Windows systems].

5. Disaster recovery.

6. Seamlessly assimilate mainframe storage with open-system storage on other platforms to facilitate unified data backup and recovery strategies.

BUS-TECH INC.

MAS: PRINCIPLES OF OPERATION

The Bus-Tech Mainframe Appliance for Storage (MAS) is a TAPE-ON-DISK virtual tape controller. It connects IBM System/390 or zSeries class (or compatible) mainframes to high-capacity, open-system disk storage products – making the disk storage appear to mainframe software as if it were tape cartridges. A single MAS can emulate from one to 64, IBM 3480 tapes drives, with each mainframe connection capable of emulating up to 32 tape drives. A MAS is recognized by OS/390, z/OS or VSE as a logical aggregation of 3480 tape drives. To achieve this, a MAS provides the IBM **Hardware Configuration Definition (HCD)** utility with its own customized **Unit Information Module (UIM)** modeled on the 'CBDUS005' definition supplied by IBM.
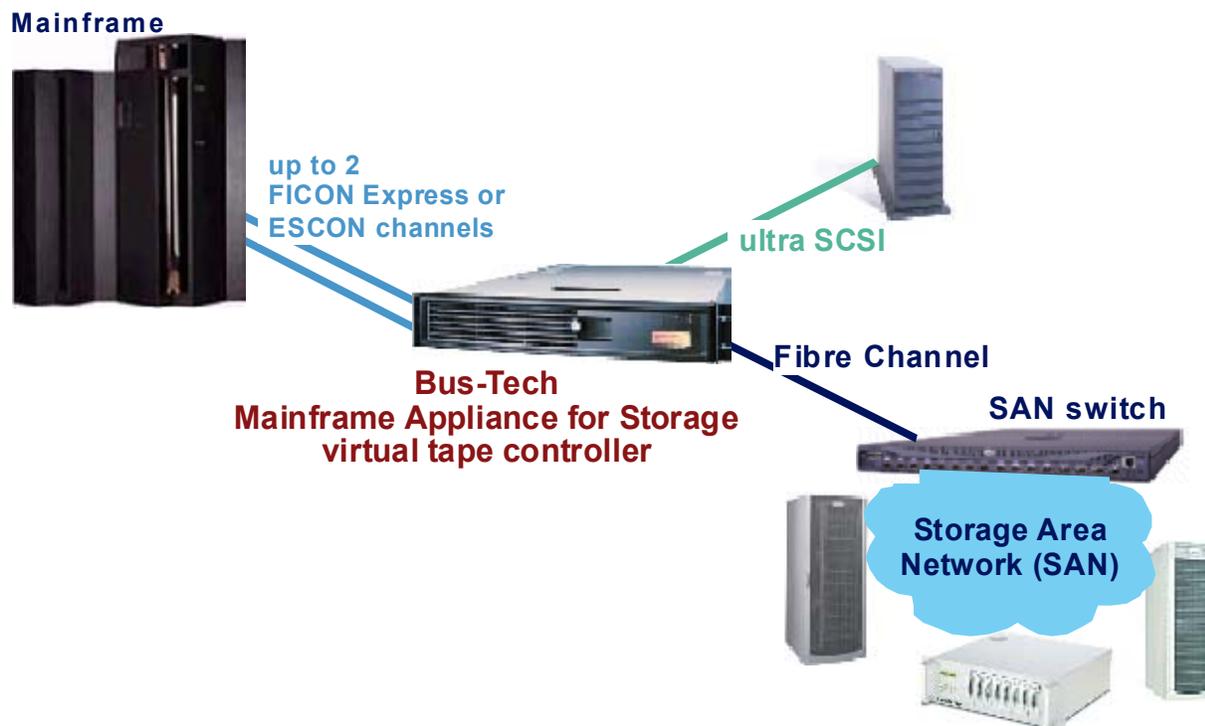
The MAS UIM ensures that all of the tape drives being emulated by a MAS can be collectively referred to as "VTAPE" in all job control language (JCL) data definition statements. Prior references to tape drives are now replaced with a "UNIT=VTAPE" operand. I/O operations to such "VTAPE" units will be sent to the MAS. When a job with JCL DD statements containing "UNIT=VTAPE" is initiated, the MAS will automatically (and transparently) allocate virtual tape drives [i.e. emulated tapes-on-disk] to that mainframe job. Jobs and tasks running on z/OS, OS/390 and VSE can allocate tape volumes on an emulated virtual tape drives in exactly the same manner they would with a real tape drives. The emulated tape drives are totally transparent to the mainframe applications. There are no changes required to the application software. The only changes required are restricted to the JCL statements.

Though MAS functioning is based on IBM 3480 emulation, the operational characteristics of the MAS are in no way restricted by the speeds or cartridge size limitations of real IBM 3480s. The MAS supports virtual cartridge sizes that are greater than 2GB – though this is the standard, default. A user parameter that is included in the JCL statements is provided to permit allocation of virtual cartridge sizes that exceed 2GB. Each MAS can emulate up to 9,999 tape volumes. These tape volumes, per standard IBM JCL conventions, are assigned tape volume serial numbers ranging from "BT0001" to "BT9999". Each volume corresponds to a disk file on the SAN, SCSI or Giga-bit Ethernet attached open-system disk storage product.

INSTANT TAPE MOUNTS AND FAST TAPE ACCESS

If a mainframe application requests a 'scratch' tape to create a new volume, the MAS immediately assigns it the next available "BTxxxx" volume serial number and creates a corresponding disk file with that name. It then returns a positive response to the mainframe to indicate the successful completion of that tape mount operation. The whole process takes milliseconds. If an application requests the mount of a specific volume, the MAS checks that the corresponding data set exists on disk and then honors the mount. Again the entire mount operation is completed within milliseconds.

The MAS also supports fast tape access features, in particular the Fast Forward space file and relative block offset commands. The Fast Forward space file command when used with a MAS permits near instantaneous access to the end of the current file being read. This 'FF' feature is widely used to add new files to an existing tape volume. If a real tape drive was being used, the tape would have to be mounted and then sequentially read until the EOF mark was reached. The new file would be written following that EOF mark. With the MAS there is no need to sequentially read the file to reach the EOF mark. Instead, the MAS, through the use of pointers, can get to the end of any file within 50 milliseconds. Suffice to say that mainframe applications can get their work done considerably faster.

Mainframe

**up to 2
FICON Express or
ESCON channels**

ultra SCSI

**Bus-Tech
Mainframe Appliance for Storage
virtual tape controller**

Fibre Channel

SAN switch

**Storage Area
Network (SAN)**

The flexible architecture of the Bus-Tech MAS highlighting the options available for both mainframe and open-system disk storage connectivity.

The relative block offset command is used by mainframe applications when they wish to read a specific block of data from a tape file. It is widely used by applications dealing with fixed content data. If a real tape cartridge was being used, it would have to be first mounted and then sequentially read until the desired data block was encountered. In some cases the tape drive has to first get to the end of the file so as to locate the pointers to the requisite block. In marked contrast, the MAS can always locate any specific block within a data file within 100 milliseconds. The bottom line is that the near instantaneous tape mounts and these fast tape access features considerably speed up and streamline data center operations.

FAITHFUL TAPE EMULATION USING "AWSTAPE"

IBM 3480 tape volumes contain several different types of records including tape marks for separating files on a volume, header records, trailer records, and data records. Each of these records are of different lengths and formats and a single tape volume may contain multiple data files – each with its headers, trailers, data content and tape marks. In addition, it is possible to for records within a given data file to be of varying lengths. Since the MAS guarantees mainframe applications with total tape operation fidelity it has to ensure that the virtual tape volumes that it maintains are no different to those that would be written to an actual 3480 tape cartridge. Given that no changes get made to the mainframe application, the MAS has to ensure that it can reproduce tape volumes during a read operation from a mainframe application in exactly the same manner that the files would have been written to the actual, physical tape in the first place.

**BUS-TECH
INC.**

MAS relies on a standard IBM file format, known as "AWSTAPE", to realize the necessary tape emulation fidelity. AWSTAPE is a tape emulation file format for use with disk files. Each AWSTAPE disk file emulates one physical volume and contains an exact replica of the data that would be written to a tape including all tape marks, headers and trailers. Each record written to a virtual tape volume by a MAS is represented on the disk with a block header followed by the actual data. A tape mark is represented by just a block header. The block header includes the exact length of the data that follows, thus allowing the MAS to recreate tape records in exactly the way they would have been stored on a real tape cartridge.

APPLICATIONS FOR THE MAS

OPTIMIZING DAILY TAPE BACKUPS

The instantaneous, totally automatic, tape mount capability of the MAS makes a huge tangible difference when it comes to daily tape backup operations. Not only does it significantly expedite the backup process but it also ensures that operators do not have to scurry around attending to tape drives. On average a MAS will slash the time taken for a daily mainframe tape backup by 60%. This quick completion of data backup, frees up valuable mainframe resource for other, revenue-generating tasks. The automated, unattended backups also enables the streamlining of data center shift staffing. Some of Bus-Tech's MSA customers have achieved a positive ROI within 6 months on just the increased mainframe usage and shift staff optimization – without even having to factor in the cost saving resulting from phasing out tape cartridges and tape libraries.

The MAS TAPE-ON-DISK approach also greatly enhances the integrity and validity of the data that is being backed-up. Tape media is renowned for its vulnerabilities that can result in unrecoverable data. With tape-based backups there is also always the danger of accidental tape volume mix-ups that can thwart the recovery of needed data. The inability to totally and accurately recover data that has been backed-up on tapes is nightmare that continues to confront data center professionals. TAPE-ON-DISK, à la the MAS is a sure-fire solution to this problem, particularly so in that the RAID disk technology that can be used with the MAS excels in offering cost-effective data protection (and auto-correction) features including affordable and automatic data mirroring.

DISASTER RECOVERY

With its Fibre Channel SAN connectivity, FICON Express mainframe channels and 'lights-out' unattended mode operation, the MAS is uniquely suited for mainframe disaster recovery scenarios. SAN and FICON each provide significant remote operation capabilities. FICON by itself can support 10 km [i.e. 6 mile] channel spans at giga-bit data transfer rates. In parallel, IP-based, high-performance wide-area network operations is a hallmark of SAN. Using SAN, Ficon Express or both, a MAS can provide totally automated, high-bandwidth, unattended mainframe data backup configurations between physically distant sites.

Furthermore, as described above, the complete elimination of tape mount and Fast Forward to EOF delays, significantly speeds up the time taken to complete a mainframe backup. Plus the use of disk technology also minimizes the risk of data corruption and media deterioration. With a MAS-centric, open-system disk storage based disaster recovery scenario one is unlikely to be confronted with the unacceptable situation of discovering that the disaster recovery data is not recoverable. All-in-all, more

and more mainframe customers are discovering, post 9/11, that the MAS approach is the right and optimum way to realize contemporary disaster recovery scenarios for data centers.

UNIFYING ENTERPRISE DATA

Mainframes are no longer the only mission-critical computing platforms in use at enterprises. With the advent of Web servers, application servers and portals, most mid- to large-size enterprises now rely on a range of platforms for their vital IT needs whether they be Unix/Linux servers, Windows 2000/2003 servers or mini-computers [e.g. IBM iSeries]. Despite this mix of platforms, enterprises favor having a standardized and unified data backup and recovery backup mechanism – typically controlled by a proven data backup software suite such as the IBM Tivoli Storage Manager.

Prior to the MAS it was invariably difficult and expensive to include mainframe data into such a unified, open-systems storage-based backup and recovery solution – given that mainframe backup software is geared towards mainframe-specific tape backups. The MAS is an elegant solution to this problem. With a MAS an enterprise can easily assimilate mainframe data into a unified, enterprise-wide data backup and recovery scheme [replete with disaster recovery where needed] with no changes to the mainframe applications and just minimal changes to the JCL.

INTER-PLATFORM DATA EXCHANGE

This is an extension to the multi-platform back-up and recovery scenario described above. With the proliferation of disparate IT platforms, with mainframes just being one of these, enterprises often have a need to transfer large volumes of data from one platform to another. The MAS with its unsurpassed connectivity can act as a powerful and flexible data switch between mainframes and other systems. Since tape emulation is MAS' forte, mainframes can exchange data with other platforms using standard data transfer utilities which think that they are reading or writing data to standard 3480 tape cartridges.

MODERNIZING BATCH PROCESSING APPLICATIONS

The high cost of mainframe DASD in the past dictated that large batch processing mainframe applications were designed to use tapes as their primary data storage and data retrieval mechanism. Batch processing, in general, consisted of reading data from one set of tapes, performing the necessary operations on that data and then writing back the new data onto a new set of tapes. Just the time demands imposed by tape mounts, tape dismounts and re-mounts meant that these jobs were long drawn and consumed significant operator resources.

A MAS can effortlessly modernize such legacy, batch processing applications without the need for any software changes or application rewrites. The application continues to function as before, but rather than relying on slow, cumbersome and labor-intensive tapes, all I/O can be realized using affordable, high-performance open-system disk storage systems.

CONNECTIVITY AND CONFIGURATUON

The MAS is a 2U (3.5") high rack mount controller designed to be installed in industry-standard 19" rack units. The MAS comes standard with a single 17Mbytes/sec ESCON mainframe channel, Ultra 320/LVD SCSI port and dual 10/100/1000 Giga bit Ethernet connections. The MAS has internal, mirrored disks which house the MAS embedded Linux operating system and virtual tape software. The MAS requires a

monitor, keyboard, and mouse which are used as the MAS operator console. The MAS operator console is used to:

❖ Configure the MAS Virtual Tape Drives

❖ Configure the attached direct access storage (disk)

❖ Monitor the operation of the MAS

❖ Provide maintenance on the virtual tape library.

The MAS can be enhanced with a second ESCON interface, fibre channel connectors or 2Gbps FICON Express channels. The MAS can support up to two mainframe channels, whether they be ESCON or FICON and multiple open-system disk storage connections. It has been tested and certified with all leading open-system disk storage solutions – including the emerging ATA technology disk systems.

SUMMARY

The Bus-Tech MAS is a proven solution for modernizing tape-based mainframe applications without the need for rewriting any of the software . It is a high-throughput, 'near-zero' latency, TAPE-ON-DISK virtual tape controller that supports 2Gbps FICON Express mainframe channels, 2Gbps Fibre Channel SAN connections as well as Ultra SCSI attachments. It faithfully emulates IBM 3480 tape unit operation using IBM's prescribed "AWSTAPE" tape emulation file format. The MAS eliminates the need for tape cartridges and obsoletes expensive and space-hogging tape libraries.

The MAS delivers near instantaneous tape mounts, Fast Forward to EOF in less than 50 milliseconds and locate any specified block of data within 100 milliseconds. Since all tape volumes are emulated on disks, there is never a need for operator intervention. It thus greatly expedites tape-centric mainframe operations – in particular nightly tape backups. Backups, including disaster recovery, can be realized in unattended mode, thus permitting considerable streamlining of data center shift staffing. Moreover, the use of affordable disk storage, including the emerging ATA technology disks, minimize the data recovery vulnerabilities brought about by tape media deterioration and tape volume mix-up.

ABOUT BUS-TECH

Bus-Tech, Inc., founded in 1987 is the industry's leading provider of state-of-the-art connectivity solutions for the data center to Original Equipment Manufacturers. IBM is one of its leading customers. The company's powerful suite of adapter and platform solutions satisfy even the most rugged demands of data processing professionals for high-bandwidth, high-availability and high-performance connectivity. With more than 15,000 installed sites worldwide, Bus-Tech is a recognized leader in the data center interconnect market. Headquartered in Burlington, MA, the company is privately held with locations around the world. For more information about Bus-Tech and its products, please visit the Bus-Tech World Wide Web site at http://www.bustech.com, send email to info@bustech.com, or call 800.284.3172.