Data Mobility Group

Research Perspective
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Bridging Mainframe to Open Systems Storage

Storage buyers are expected to return to the marketplace in droves this year. And they are looking for storage capacity—and lots of it.

Why? Because much of the storage capacity purchased during the buying-frenzy years of 1998-2000 has been used to the point of saturation and many of the mission-critical applications that consume the capacity are now prime for a technology refresh.

However, as users begin to refresh their storage architectures, they will also look for ways to repurpose existing disk subsystems—many of which still have a significant capital asset valuation or are still under lease—to maximize the value of their IT operations.

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For IBM mainframe DASD users, the good news is that there are a number of options. Large vendors such as EMC, Hitachi Data Systems, and StorageTek all offer solutions, as do smaller vendors such as Bus-Tech. Based in Burlington, MA, Bus-Tech has been creating ways for users to leverage open-systems disk subsystems—new and repurposed—for use as mainframe DASD.

Bus-Tech's zDASD Controller

Bus-Tech's zDASD controller allows IT administrators to deploy open-systems disk as mainframe-attached DASD. The controller connects to mainframe on the front-end via FICON or ESCON and to open-system disk systems on the back-end via ultraSCSI, Fibre Channel, and IP (NAS).

Data written by the mainframe to zDASD devices is stored on open-systems storage in such a way that it can be retrieved in the same format as it was stored. The fact that that the data has been stored on open-systems disk, rather than traditional mainframe storage, is transparent to the mainframe hardware and operating systems.

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Figure 1

As shown in Figure 1, zDASD supports several types of open-systems storage connections, including Ultra320 SCSI (SCSI), Fibre Channel, and networked disks (GB Ethernet). zDASD can connect to networked storage via Unix/Linux Networked File System (NFS), or Microsoft's Common Internet File System (CIFS). A single zDASD controller supports one or two mainframe channel connections (FICON or ESCON) and up to (64) 3390 model 3, 9, or 27 DASD storage volumes. Each connection can emulate up to 64 concurrent devices. If the zDASD controller has two channel connections, devices can be attached to either or both channels and can be configured to point to each volume to provide alternate path support.

zDASD in the Mainframe Storage Hierarchy

To better understand where Bus-Tech's zDASD fits into a mainframe-based production environment, we first look at a three-tiered storage hierarchy. This type of storage hierarchy has received much attention lately due to the increasing popularity and availability of Serial ATA (SATA) disk arrays in the open-systems market. We then look at the service levels of each tier and how zDASD fits into this hierarchy and into the broader Information Lifecycle Management (ILM) architecture (described later in this report).

The combination of zDASD and Serial ATA disk technology represents a new breed of storage devices that IT managers can implement to help control the costs of ILM.

The storage hierarchy:

Immediate accessibility—data that must be immediately available and retrievable. This type of data is generally new or recently created and requires immediate access (i.e., sub-second response time). Once created, the data is often used by mission-critical applications for further processing. Typical of this data type are on-line, transactional databases, system files, virtual memory data sets, and newly created reports waiting to be disbursed or printed.

This type of data is almost always exclusively served by high-end DASD subsystems, such as Hitachi Lightning 9960, EMC Symmetrix, and IBM Enterprise Storage Server (ESS). These subsystems are specifically designed to provide both high-connectivity and high-performance. While zDASD is not generally used for data in existing large-scale mainframe environments, it can be used as a low-cost alternative to high-end DASD subsystems in the two targeted scenarios described below.

Intermediate accessibility—data that does not have the same processing demands as immediate access data types. This type of data can tolerate longer response times—from a few seconds up to a several minutes. This service level includes data that has been compressed; daily or weekly backup copies of data residing on primary storage; large, infrequently accessed databases; and archived reports.

Historically, intermediate data has been stored on a variety of devices, including DASD, tape, optical, based on the application access time tolerance. Data required within seconds is typically stored on DASD, while data associated with applications that

can tolerate longer access time (e.g., 30 seconds to several minute) is generally stored in tape silos or virtual tape servers.

zDASD is a good fit for data that falls into this intermediate service level category.

Long-term accessibility—deep archival and historical data that can tolerate response times that range from hours to days (e.g., data stored for regulatory compliance purposes). This type of data is generally kept on removable media and is often used when data transmission over MAN or WAN connections is not feasible or practical for off-site data storage.

We expect SATA arrays with removable drives to become available this year. This will allow users to configure Bus-Tech's zDASD with removable disks, providing disk-to-disk backup for the mainframe.

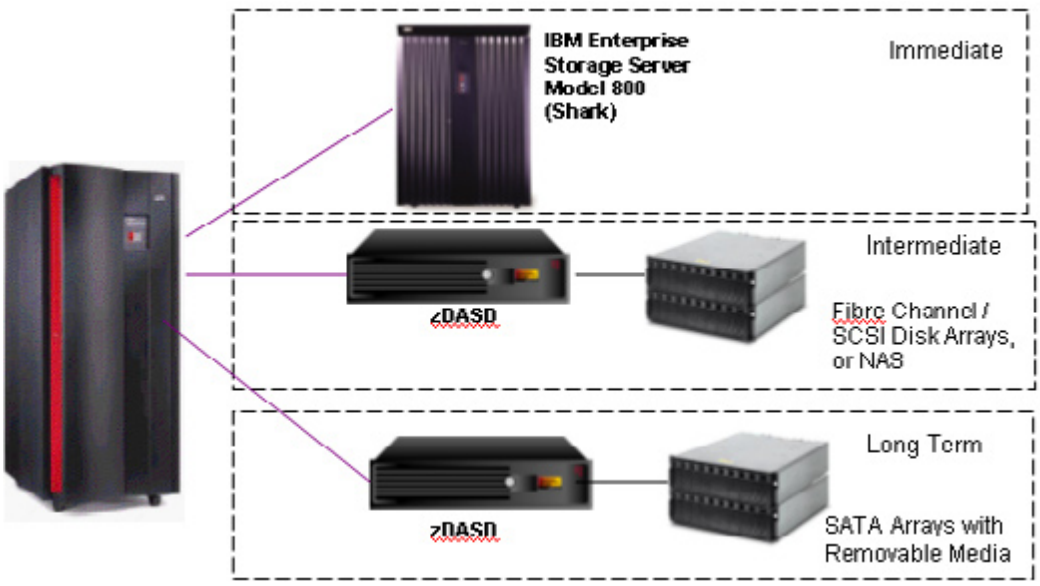

Figure 2

Figure 2 illustrates how Bus-Tech's zDASD is ideally positioned within the three-tiered storage hierarchy. FICON or ESCON-attached zDASD units can house many types of intermediate data, including compressed data from IBM's HSM product, infrequently-accessed online databases, report data from products such as Mobius ViewDirect, and a variety of application data whose storage and retrieval requirements do not necessarily warrant allocation to more expensive high-end DASD subsystems. zDASD can allow mainframe administrators to include disk-to-disk backup alternatives in their business continuance and disaster recovery plans, providing reliable, high-performance data recovery.

As SATA arrays with removable storage media become readily available, zDASD controllers can be deployed as a long-term storage alternative to virtual tape subsystems and/or tape silos, enabling mainframes to perform disk-to-disk backups for offsite data retention.

zDASD in Targeted Deployment Scenarios

In addition to the generalized applications outlined above, we have identified two specific deployment scenarios for Bus-Tech's zDASD, which address mainframe storage issues of immediate concern to IT administrators.

Unix Server Consolidation and Linux Migration

Current-generation IBM mainframes are designed to support Linux as both a native operating system and as a guest in a Virtual Machine (z/VM) environment. IBM positions zSeries mainframes as a platform for Unix server consolidation, highlighting the mainframe's ability to run multiple copies of Linux under z/VM. Unix clusters (e.g., HP and Sun) can migrate Unix workloads to the mainframe environment, which

allows users to take advantage of z/VM's well-developed storage and data management facilities.

To facilitate consolidation, IBM allows mainframe Linux to have direct write/read access to SAN-attached storage via zSeries FICON interfaces. Users of clustered Unix servers with shared Fibre Channel storage can replace their servers with a single zSeries mainframe running multiple copies of Linux and can directly attach their existing SAN storage to the mainframe environment via FICON.[1]

However, as shown in Figure 3, zSeries hardware and operating systems require both z/VM and Linux to be loaded or "booted" from traditional mainframe DASD (i.e., count-key-data) devices. This means that users without existing mainframe DASD have to purchase mainframe-class DASD (IBM ESS or equivalent) for the sole purpose of initiating the system. Prospective mainframe users find that the combined cost of a new zSeries mainframe and supporting ESS DASD is cost-prohibitive.

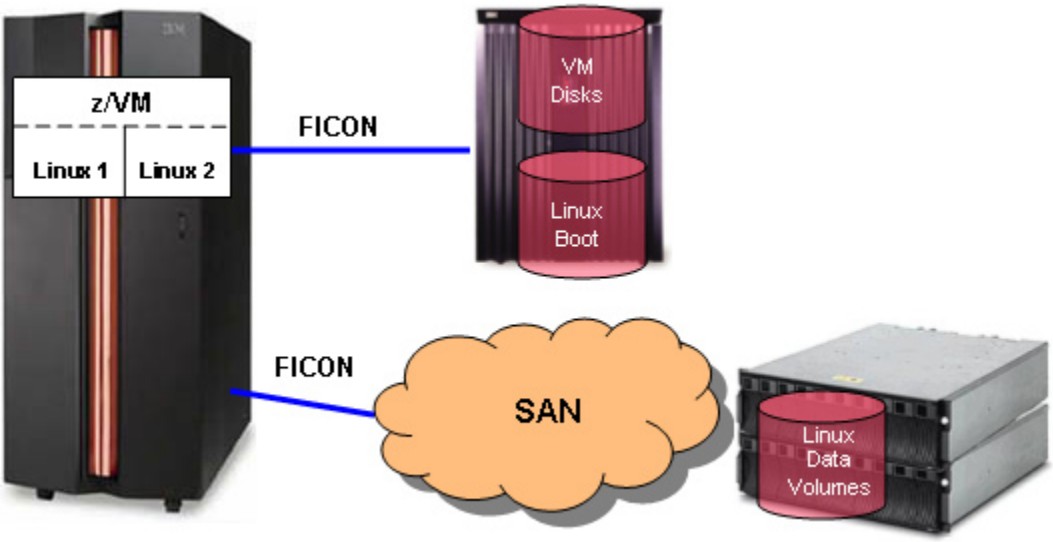

Figure 3

In mainframe server consolidations, zDASD can be combined with existing open-systems disk array (in lieu of traditional mainframe DASD) to fulfill the VM load requirement.

Using both zDASD and one or more FICON channels to connect an IBM zSeries processor to the SAN (as shown in Figure 4) satisfies all the storage needs of a consolidation effort. In this scenario, z/VM and Linux are both loaded (or booted) using the zDASD (which can be either ESCON or FICON attached). Once the operating systems are up and running, Linux guests directly access application data on the SAN through standard FICON channels.

Legacy System Upgrades

The IBM mainframe customer base represents a range of technology use from "latest and greatest" to "lagging edge." In fact, some mainframe users intentionally lag behind the current technology curve for the simple reason that they want to save money while still providing highly-reliable computing services across the enterprise. These users tend to support the computing needs of small to medium-sized enterprises with hardware that is typically one or two generations old (often acquired through used-equipment vendors or third-party leasing companies). Understandably, these users are also extremely sensitive to cost.

IBM's newest z/800 Series offers a low-end model that brings legacy systems up to the current generation of mainframe technology—and at the right price. However, for users, purchasing even an entry-level IBM ESS along with the z/800 can make the entire upgrade cost-prohibitive.

[1] No data conversion is required as long as the Unix file system used on their SAN is supported under Linux

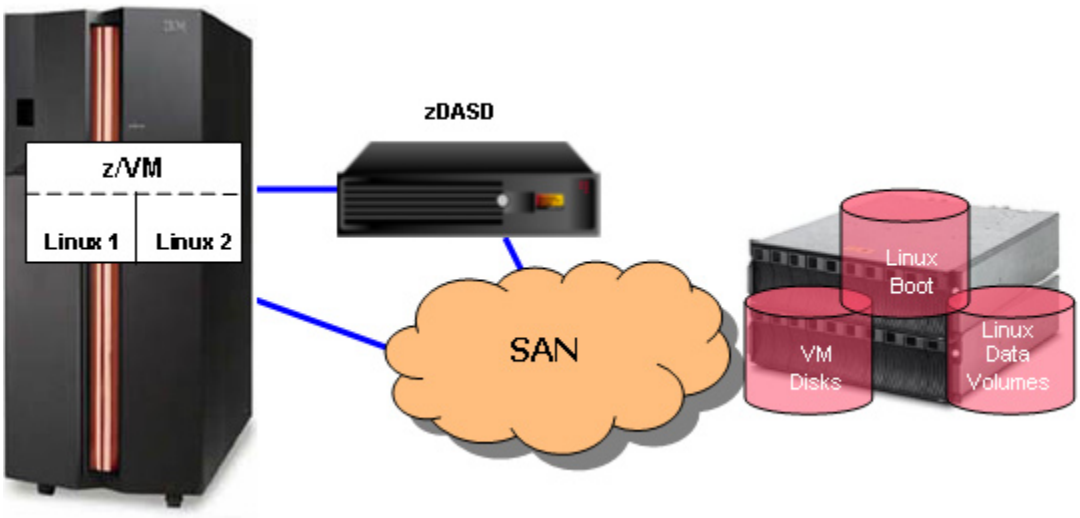

Figure 4

For budget-minded users, combining Bus-Tech's zDASD and low-cost SATA arrays is a compelling option. zDASD satisfies the need for ESS-equivalent DASD while replacing aged RAMAC Virtual Arrays commonly found in scuh environments. The combination does not provide the connectivity or performance of the Enterprise Storage Server; however, FICON-attached zDASD controllers do outperform the ESCON-attached RAMAC Virtual Arrays.

zDASD in ILM-Architected Storage Infrastructures

Today, all data tends to be treated in the same way: less-critical data typically resides on the same high-performance, high-value disk arrays as mission-critical data. Data is commonly stored on disk with little, if any, regard to the data's overall importance to the enterprise or the access patterns of that data. It's a simple approach to manage, but it is can also be a costly one in the long run.

The goal of Information Lifecycle Management (ILM) is to match data to the right device at the right time in the data's life cycle. It is all about managing information from the time it is created to the time it is retired, according to changing access patterns and business relevance.

ILM, when implemented properly, can save storage costs. Data that requires frequent and fast access can be stored on high-performance, immediate-access disk (as outlined above) and as access to that data decreases over time, it can be moved to less-expensive or repurposed intermediate disk. A good way of doing that is using zDASD.

Eventually data is either deleted when it is no longer required or archived for future reference to long-term storage, again using zDASD and SATA disk.

Conclusion

Bus-Tech has a tradition of supplying low-cost connectivity options to mainframe users—initially for Bus and Tag cable-attached peripherals, then with ESCON, and now with both ESCON and FICON interfaces. Bus-Tech's new zDASD appliance provides alternative mainframe DASD solutions to cost-conscious IT administrators.

zDASD allows customers to leverage low-cost open-systems arrays, including ATA/SATA disk. And while it does not provide the levels of connectivity, high-performance, or high availability of high-end systems and other mainframe-based storage products, zDASD does provide significant value and return to IT administrators—especially those committed to ILM concepts who recognize that not all online data has identical write/retrieve storage requirements and that applications require different levels of service.

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In highly cost-sensitive environments, a FICON-attached zDASD control unit with internal Ultra320 SCSI disks provides a low-cost, more reliable alternative for upgrading aging IBM RAMAC Virtual Arrays to higher-performance open-systems disk. Additionally, zDASD units can provide bulk storage for data with intermediate retrieval requirements, especially when it is FICON attached.

The bottom line: Bus-Tech's zDASD controllers can help mainframe IT managers balance the need to control operating costs against the requirement to provide adequate customer service levels to the businesses they support.

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